The Evaluation of Community Engagement in a Science Musical Performance

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Abstract

In response to Australia's declining interest in science, the Commonwealth Scientific and Industrial Research Organisation sponsors *Ologism*, a science-based rock band, to improve science engagement. Using observations, peer-assisted informal interviews, and a case-control study we assessed *Ologism*'s effectiveness in stimulating an interest in science during a live performance. We concluded that *Ologism* can stimulate scientific interest among attendees but alone cannot stimulate prolonged scientific engagement. However, in coordination with similar efforts, *Ologism* has the potential to engage Australians in science.

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Without any of the assistance provided by any of these people, our project would not have been what it is now.

Executive Summary

Can rock 'n' roll increase public interest in science?

To the Commonwealth Science and Industrial Research Organisation (CSIRO) an answer is worth having, because interest in science among Australia's youth (age 18-35) is declining. Students view science as interesting, relevant, and important, yet few aspire to be scientists.

To promote science education CSIRO sponsors *Ologism*, a science-infused rock band that uses science-based lyrics and onstage demonstrations to engage their audience. *Ologism* provides Australia with a way to redefine social norms, changing the general public's perception of what makes science 'cool' or 'interesting' and promoting a long-term interest in science. By popularising a science-related activity with a unique, alternative approach, *Ologism* can engage a broader audience, including individuals without a prior interest in science.

We tested the effectiveness of *Ologism* in stimulating the public's interest in science during a free live performance on 3 February 2013. By adapting standard observational and case-control techniques, we discovered that *Ologism*'s performance stimulated an in-the-moment interest in science among attendees. Post-performance surveys revealed no change in scientific interest after attending the performance, but the attendees we observed displayed a consistent level of interest throughout the performance's songs and demonstrations.

We believe that *Ologism* has the potential to stimulate a prolonged interest in science. However, their alternative approach would be most effective if they performed alongside similar alternative approaches to promoting interest in science and if they added replicable demonstrations to their set.

We observed that attendees at *Ologism*'s live performance had a higher level of engagement when they were affiliated with CSIRO or *Ologism* or had prior knowledge of the science content of *Ologism's* performance. We gathered this information by implementing a novel, semi-structured interviewing scheme we called peer-assisted informal interviews or, more informally, peer-assistants. We sent our peer-assistants into the crowd with a set of guideline questions to probe attendees we were observing about prior interest in science, the attendee's career, and what brought the attendee to the performance that day. This information was shared with us only if the interviewee consented. We coupled the findings of

our peer-assistants with our observational assessments of interest showing that *Ologism* stimulated in-the-moment interest. However, *Ologism*'s approach is more effective when attendees are fully aware of *Ologism*'s science content.

To continue evaluating the success of *Ologism*'s performance, as well as other science programs, we assessed the three methods we implemented (observations, case-control study, and peer-assistants) to create a framework for CSIRO and *Ologism* to use as a unique approach for measuring scientific engagement. We also proposed three other methods involving social media, a contest, and a commentary booth, but these proved unsuccessful given venue restrictions on the day of the performance. Our alternative approach includes the six proposed methods and a research-based framework using five descriptive indicators of interest in science (*enjoyment of science, personal value of science, interest in science-related activities, future-oriented motivation to learn science, expectations for a scientific career)* that could be measured by each of the implemented and unimplemented methods.

Overall, we identified the nature of *Ologism*'s in-the-moment success in stimulating interest in science and ways of enhancing that success. In addition, we provided CSIRO with a proven methodology and a research-based framework for assessing the success of non-traditional approaches to stimulating interest in science.

Table of Authorship

Chapter	Author(s)	Editor(s)	Final Editor(s)
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Introduction

Science influences several aspects of daily life in both subtle and obvious ways. Every text message sent, every medication taken, and every cosmetic product used involves scientific thought to ensure that the product and its outcomes are reproducible and safe to use. However, science is so deeply integrated into daily life that it is often unnoticed and underappreciated, contributing to a lack of interest to further engage in scientific study and information (*Inspiring Australia,* 2011). Over the past fifty years, science has advanced rapidly while interest in studying science among students in many developed countries has declined; students around the world see science as interesting, relevant and important, but few students aspire to be scientists (Jenkins & Nelson, 2005).

Australia in particular faces a decreasing interest in science. Australian students develop increasingly negative outlooks on science as they move to secondary education. There is also a decrease in the number of students that participate in post-compulsory science subjects. Only 35.9% of teachers believe that students at the secondary level are interested in science and only 3.8% believe that students have an out-of-school interest in science (Tytler, 2007). In 2002, less than a quarter of degrees awarded were in science disciplines (i.e., physics, chemistry, biology) and by 2010, this percentage dropped further to 18.8% (Australian Government, 2012).

To address this declining interest, the Australian government established the Inspiring Australia program in 2011. This program gave $21 million (AUD) through special grants over three years to "unlock Australia's potential" for science (Unlocking Australia's Potential, 2012). This program funded a range of alternative education approaches, including interactive exhibits and hands on activities, musical performances, and summer and holiday science programs. These alternative approaches provide a variety of options to engage and maintain an interest in science in the Australian community.

An organisation taking an alternative approach to scientific education is the Commonwealth Scientific and Industrial Research Organisation (CSIRO). CSIRO aims to increase interest with the mission of "deliver[ing] great science and innovative solutions for industry, society and the environment" (CSIRO, 2012). CSIRO offers holiday programs and online

activities to promote interest in science. CSIRO also offers a unique scientifically engaging experience by sponsoring *Ologism*, a band that performs science-based music and demonstrations for the public. Although CSIRO and *Ologism* work to encourage interest in science in an alternative way, they have yet to evaluate the effectiveness of their ability to stimulate scientific interest.

The goal of this project was to help *Ologism* evaluate the effectiveness of a particular public performance (on 3 February 2013) in stimulating attendees' interest in science. In order to determine if the performance increased attendees' interest in science, we conducted formal observations of members of the audience during the live performance as well as employing four supplemental methods. Two supplemental methods were successful: peer-assisted interviews and a case-control study. Two were unsuccessful: social media participation and a post-performance contest. We combined observations of attendees with the two successful supplemental methods to measure five indicators of scientific interest identified by the 2006 Program for International Student Assessment (PISA): *enjoyment of science, personal value of science, science-related activities, future-oriented motivation to learn science, and expectations for a scientific career.*

In addition to evaluating the effectiveness of the live performance, we assessed these evaluation methods and developed recommendations for each method that can be used to measure scientific engagement according to the preferences of the researchers and the restraints of the venue. We have provided CSIRO, as well as other researchers, with a variety of options and explanations regarding how to implement the methods effectively and what outcomes to expect. We have also explained the constraints and limitations of each method, providing the researcher with more time for conducting trials to collect data than using time experimenting with unknown methods.

Through our combination of methods, we collected and analysed data that lead us to a variety of findings and overall conclusions. We found that the demonstrations in *Ologism*'s performance stimulated a greater level of interest than the band's songs. We also concluded through observations that *Ologism*'s performance stimulates an in-the-moment interest in science; however, the case-control study failed to reveal a long-term change in interest in

science due to the performance. We have also offered a variety of recommendations for CSIRO and *Ologism* based on our conclusions.

The next chapter of this report, Background, further details the problem Australia faces with declining interest in science. It also introduces the five descriptive indicators of interest in science mentioned above and explains how they frame our research objectives and project. Following the Background chapter, the Methods, Data, and Analysis chapter encompasses a method by method description of each method, the data obtained with it, an analysis of that data, and findings and recommendations for that method. For example, the first section addresses our observation method: the goals of the observations and how we implemented them, our data and analysis of the data associated with the observations, and finally our findings and recommendations based on the observational data. After the descriptions of our successful methods, a short section addresses our unused and unsuccessful methods and recommendations for their future use. The final chapter of our report details our overall conclusions from our assessment of *Ologism'*s performance, our conclusions about the assessment methods themselves, and the recommendations associated with both sets of conclusions.

Background

What is "Interest in Science?"

Science is "knowledge of the world," according to H. K. Carr, Minister for Innovation, Industry, Science and Research (*Inspiring Australia*, 2010, p.xi). Science is influential in several realms of societal development and sustainment in the fields of technology, economics, and medicine. New knowledge and ways of thinking, evaluating, and addressing problems allow us to better understand how the world works and improve societal functioning.

A public survey conducted in 2007 in Victoria indicates that 84% of people agree that science is improving society and the lives of individuals (Quantum Market Research, 2007). However, in 2006 at the Australian Council for Educational Research Conference, Masters showed that between the years 1978 and 2002 the number of Australian students enrolling in a science major at a university had dramatically declined (Tytler, 2007). A 2007 report published by the Victorian Department of Innovation, Industry and Regional Development identified that only 27% of the surveyed population actively looked for and understood scientific information, while 19% were not interested and were not actively searching for information, see Table 1 (*Inspiring Australia*, 2010). Although citizens of Australia recognize that science is important for societal innovations and improvements, they appear uninterested in actively contributing to scientific advancements.

%	Interest in Science
23	Interested in science, but not active in searching for information
27	Interested in science, active in searching for information and able to find information they can understand
16	Interesting in science, active in searching information, but unable to find it and have difficulty understanding
8	Neutral towards science and not actively searching for information
19	Not interested in science and not actively searching for information
8	Neutral or not interested in science, but active in searching for information

Table 1: Analysis of community interest and engagement in science in Victoria by the Victorian Department of Innovation, Industry and Regional Development (*Inspiring Australia,* 2010).

Engaging Australians in Science

In order to address declining interest in science, the Australian government has made efforts for the advancement of scientific research through ambitious programs like "Super

Science" (an investment and funding program in science research) and commitments to university research and business commercialisation.

Another such program, "Inspiring Australia – A national strategy for engagement with the sciences", aims to create a unified approach for a more scientifically aware and engaged Australia (2010, p.xiii). Inspiring Australia recognises that steps need to be taken to actually engage the public in science. Through various societal and community-based programs, Inspiring Australia targets those that may have interest in science, but who may not be actively engaged. Inspiring Australia notes that "for Australia to progress... full exploitation of the benefits of the sciences will require attitudinal and behavioural changes in individuals, companies and communities in order to make a difference" (2010, p. ix).

In order to create a scientifically engaged Australia, it is necessary to "develop a culture where the sciences are recognised as relevant to everyday life and where the government, business, and academic and public institutions work together with the sciences to provide a coherent approach to communicating science and its benefits" (*Inspiring Australia*, 2010, p. xiv). A national framework must be developed for public engagement, recognising community-based, state, and national activities led by volunteers and professionals, and being supportive of their conditions for increased participation. The framework will address the need for:

- a "continuing supply" of scientists, technologists, mathematicians, and engineers to do research, solve problems, and create knowledge;
- a strong infrastructure, resources, and base of institutions to create a "knowledge economy";
- decision makers and leaders who understand the relationship between science and its ability to solve complex issues; and,
- a strong relationship between society and science, bound by effective communication of science and its benefits.

In July 2011, the Inspiring Australia program was funded with $21 million (AUD) over three fiscal years for efforts designed to "unlock Australia's [scientific] potential" (Unlocking Australia's Potential, 2012). A quarter of the funding was set aside for the program "Unlocking Australia's Potential," which aims to increase the engagement of Australians in science by

"target[ing] people who may not have had interest in or access to science engagement activities" (Unlocking Australia's Potential, 2012).

Teaching Science in Australia

Despite Australia's national recognition of science as important, "science teaching has a low status in the primary [school] curriculum" and parents rank science as the third most important subject for primary school children (Hackling, 2006, p. 4). In Australian primary schools, science is only allocated 2.7% of teaching time (Angus et al., 2004). A rich curriculum in science is the basis for effectively improving learning outcomes and stimulating scientific interest at an early age (Hackling, 2006). In 2003, less than 60% of a sample of Year 6 students reached the proficiency standard in six of eight jurisdictions (Hackling, 2006). New strategies must be developed to stimulate an interest in science. These newly developed strategies offer options for people to engage in programs that best suit their preferred learning styles. By self-selecting a program, a person may be more engaged and willing to learn the scientific information presented, rather than learning from a pre-selected method.

To help develop and expand science education in Australia, the Commonwealth Scientific and Industrial Research Organisation (CSIRO) built CSIRO Science Education Centres (CSIROSEC), a network of science education centres located in major cities in each of Australia's territories. Each CSIROSEC offers a range of developmental and supplemental programs designed to "engage, enthuse, and educate students, teachers and the wider community about science and its applications" (CSIRO, 2012). These programs are described in Appendix A.

One new development CSIRO supports to make scientific education more exciting is *Ologism*, a musical group that aims to stimulate public engagement in science by blending scientific demonstrations with science-themed music during live public performances. "Unlocking Australia's Potential" awarded *Ologism* $180,000 (AUD) to fund this alternative method of science education (Unlocking Australia's Potential, 2012). *Ologism* has gained additional financial support from a variety of organisations including the Department of Industry, Innovation, Science, Research and Tertiary Education in partnership with CSIRO, the University of Tasmania, Royal Institution of Australia (RiAus), and Questacon (*Ologism*, 2012).

This recognition indicates that discovering effective alternative methods for interest in science is becoming a priority in the Australian education system.

Operationalising "interest in science"

In order to determine the effectiveness of a program's ability to stimulate interest in science, we must first identify ways in which "interest in science" could manifest itself. Given the broad scope of scientific disciplines, stimulating interest could entail a number of factors. Drawing on the work of Krapp and Prensel (2011), we will use five descriptive indicators in our measurements of "interest in science":

- *Enjoyment of science*
- *Personal value of science*
- *Science-related activities*
- *Future-oriented motivation to learn science*
- *Expectations for a scientific career*

These five descriptive indicators are part of a broader study conducted in 2006 by the Program for International Student Assessment (PISA) that sought a new way of assessing attitudes about science among youth. The investigators asked questions regarding these five descriptive indicators to "allow attitudes to be explored in the context of students who were…engaging with science, rather than just thinking about it in the abstract" (OECD, 2006, p. 26). PISA constructed descriptive indicators that would capture different forms of students' expression of a personal interest in scientific matters.

Krapp and Prensel (2011) used these five descriptive indicators to develop theories and methods to assess and improve interest in scientific education. These indicators are "not aim[ed] at measuring science interest directly but provide information about variables that are in a theoretically convincing way associated with science interest" (Krapp & Prensel, p. 35) This approach forms a broader "domain" of data collection about participants' interests. A single indicator-based study leaves room for bias; one unfavourable experience can undermine the perception of scientific interest by not allowing the individual to see interest in science as multidimensional. The five descriptive indicators can open this space to include science in ways in ways not previously considered by the subject.

Krapp and Prensel (2011) concluded that institutions should take a more enthusiastic approach towards promoting scientific interest in students. The five descriptive indicators illustrated by PISA provide a framework to assess a level of active scientific engagement for an individual in the present and the future.

Measuring scientific interest helps to understand how society will function in the future. This precise thought process can lead to societal development, sustainment, and advancement that provide the world with a working knowledge of how to solve problems and replicate results (Weaver, 1961). Understanding and measuring an interest in science provides a guide to the public's desire to take on a leading role in development, sustainment, and advancement.

Enjoyment of science involves experiencing pleasures and a general level of positive response to activities involved in learning science (Ainley & Ainley, 2011). By measuring this level of enjoyment, it is possible to indicate that a person is intrigued by scientific content and could have a desire to learn more. A study aiming to interest young girls in science created a program that made science applicable in everyday life (Tucker, Hanuscin, & Bearnes, 2008). The study hypothesised that if the girls could appreciate the relevance of science to everyday life, then they would be able to enjoy knowing how science is everywhere, not only in a textbook. Tucker, Hanuscin, and Bearnes (2008) found that 25% of the girls liked the fun activities the most in the program; they helped them gain an appreciation for science in daily life. Leisure time spent reading science articles, watching scientific documentaries, or attending scientific performances can also provide *enjoyment of science*. These are simple ways to stimulate thoughts about science without a classroom or structured setting.

Personal value of science reflects a better understanding of the world and how science effects people's well-being (Ainley & Ainley, 2011). Inspiring Australia supports the idea that science should be "recognised as relevant to everyday life" (*Inspiring Australia*, 2010, p. xiv). Personal value can also include individuals' feelings that the sciences can help them in the future (Ainley & Ainley, 2011). Recognizing that there is a personal aspect to science can cause a person to feel more compelled and connected to the subject. Therefore, *personal value of science* is an important indicator to measure because a person who values science recognizes

that advancements will not happen on their own; they need the power of a scientist to actively make changes and improvements.

Immersing one's self in *science-related activities* outside a formal learning environment may include attending after school programs, conducting experiments, or even talking about scientific news to other individuals. It can also include going to a science program and helping educate younger generations about science (Tucker et al., 2008). Attending a performance where scientific information is presented in songs and demonstrations interwines the descriptive indicators of *enjoyment of science* and participation in a scientific related activity. Participating in science-related activies shows a deeper level of interest to learn about science. By measuring this indicator, it is possible to see if people are actively pursuing scientific knowledge outside of a rigid learning structure.

A projected vision of a scientifc future includes *plans for future studies in science* or devoting one's life to a *scientific career*. Plans for future study encompass students who may want to study science at a universtiy or someone who wants to start attending science programs outside of a classroom. A person may choose a scientifically oriented path at a university to pursue a career of thinking methodologically and precisely. For example, Sládek, Miléř, and Benárová (2011) aimed to engage children in a program to motivate further study of science and technology, showing an increase in "interest in science." This program included the use of video clips that displayed "applications of acquired knowledge and their importance in the students' further life" (Sládek, Miléř, & Benárová, 2011). Questionnaires revealed that these video clip demonstrations combined with textile materials were the most effective way to interest students in science and improve knowledge of presented material (Sládek, Miléř, & Benárová, 2011). Measuring *expectations for a scientific career* indicates if an individual strives to deliver new ideas and ways of thinking, to solve problems, and to make effective changes.

Live performances and demonstrations can connect people to scientific content in a way that is fun and easily understood. Musical live performances have the potential to improve communication between scientists and the public and encourage and promote an interest in science more accessibly. *Ologism* uses their music and demonstrations to stimulate the brain and thought process, thereby using music as an accessible approach to engage the public in

scientific information (Weinberger, 2004). Although the band *Ologism* aims to address interest in science, its members have not yet found suitable methods for evaluating if their musical performances and experimental displays are effectively stimulating scientific interest in their audience. This project developed and assessed such a method.

Methods and Assessment

Our project assisted CSIRO with evaluating the effectiveness of a public musical performance by *Ologism* on 3 February 2013, in stimulating attendees' interest in science. To achieve this goal, we met two objectives:

1.) Evaluate the public performance on 3 February 2013, using a framework of five descriptive indicators of interest in science (see Operationalising "interest in science"):

- *Enjoyment of science,*
- *Personal value of science,*
- *Interest in science-related activities,*
- *Future-oriented motivation to learn science,*
- *Expectations for a scientific career.*

2.) Assess our methods as a general approach to evaluate science engagement and suggest improvements based on our experience.

To measure these five descriptive indicators of interest in science, we employed three methods: observations of audience behaviour, peer-assisted informal interviews of members of the audience, and a case-control study involving members of the audience and others who did not attend the performance. The three methods each measured one or more of the five descriptive indicators shown in Table 2.

Method	Indicators
Observations	• *Science-related activities*
Peer Assisted Informal Interview	• *Enjoyment of science* • *Science-related activities* • *Future-oriented motivation to learn science* • *Expectations for a scientific career*
Case Control	• *Enjoyment of science* • *Personal value of science* • *Science-related activities* • *Future-oriented motivation to learn science* • *Expectations for a scientific career*

Table 2: Methods employed in relation to the descriptive indicator each measures.

The Performance: 3 February 2013, Hosier Lane

Ologism's performance took place on 3 February 2013, in Hosier Lane, a graffitied alleyway located across from Federation Square in downtown Melbourne. *Ologism* set up their stage halfway down the alleyway to allow room for pedestrian access to the alleyway. The performance ran about 50 minutes, from 4:20 PM until 5:10 PM, during which *Ologism* performed a combination of songs and demonstrations, in order as follows:

- "15 Milliseconds of Fame"
- "Cyber Nose"
- "DHA"
- a vacuum/trash bag demonstration of atmospheric pressure
- "Sheep Burpin' Blues"
- "Croc of Golden Staph"
- "Supermodel"
- a Nano-technology water bottle demonstration
- "Nanotechnology"
- "SKA Man"
- "Buzzed Off"
- "Brain in Between"
- "Ant Establishmentism"

Although the band obtained permits to use the alleyway for their performance, construction was underway further down the alleyway behind the stage. The occasional burst of loud noises may have detracted from the performance and distracted some audience members.

Observations

Observations of audience behaviour identified the songs and demonstrations – the science-related activities in *Ologism*'s performance – that best engaged the audience as well as the age range and gender of attendees; observations targeted one specific descriptive indicator, *interest in science-related activities*. The decision to focus on the single indicator was

driven by Bitgood's (1988) assertion that observers can only measure interest by assessing time spent in an exhibit (in this case *Ologism's* performance), social interaction with other attendees, and visual attention to the exhibit. For example, keeping one's eyes on the stage during the entire performance would indicate a high level of interest and visual attention. Following his lead, our observations recorded attendees' proximity to the stage, body language, facial expression, side conversations, and reactions to songs and demonstrations in order to determine the level of engagement in those science-related activities.

Methodology

We observed the behaviour of attendees over two different time scales, long and short. Muller (2006) identified six distinct phases of interaction with a public display (*i.e.,* the band's 50 minute performance) beginning with ignoring the display and ending with a close and personal interaction with the display. To have an opportunity to see such transitions in *Ologism*'s audience, our long observations recorded the difference in one attendee's behaviours once every five to ten minutes. In contrast, our short observations of audience behaviour recorded reactions to the science-related activities in the performance at one single moment. We used the beginning of the performance to account for the first phase (ignoring the display) of Muller's six phases of interaction. The remainder of the timeline uses the middle of songs and demonstrations to utilise the points where attendees should be engaged in the performance (personal interaction). Over the entire fifty-minute performance, we conducted long observations on five attendees at six different moments in the performance, each during the middle of a song or a demonstration. A short observation consisted of a single observation, between one and five minutes long, of a randomly selected attendee interspersed among the long observations of a (different) single attendee.

We organised our observations to cover distinct zones (Figure 1) of the space the audience could occupy. We used score sheets to record the locations of attendees within these zones, their behaviours, and rubrics to evaluate the level of interest those behaviours represented. We assigned ourselves to four distinct zones of the performance area (left and right sides, front and rear) to determine if proximity to the stage correlates with interest in the band's scientific activities. The zone assignments also avoided overlapping observations or

neglecting a portion of the audience. Our scoring sheet during the performance recorded body language, eye contact, facial expression, side conversations, and reactions to songs and demonstrations. A section of our scoring sheet used during the performance is shown in Figure 2.

Figure 1: Schematic image of Hosier Lane identifying the four observation zones and observers positioning.

The scoring sheet records observations of attendees' body language, eye contact and facial expression to measure *interest in science-related activities*. For example, we observed Attendee 4 to be foot tapping and head bobbing (score of 3) at the start of the show. In the middle of the first song (Mid Cyber Nose) Attendee 4's body language remained the same (score of 3). By the middle of the first demonstration, Attendee 4's body language displayed a decrease in interest by standing still (score of 2). We followed the same process for each behaviour category. The entire long and short scoring sheets can be seen in Appendix B and C, respectively.

Time in Show		Start of show					Mid cyber nose					Mid 1st demo				
Attendee		1	2	3	4	5	1	2	3	4	5	1	2	3	4	5
Body Language	Folded Arms										1					
	Standing/ sitting still	2	2			2	2		2					2	2	2
	Foot tapping and head bobbing				3					3						
	moving to the music											4				
	Dancing and singing															
Eye Contact	Not looking at the stage															
	Occasionally looking at the stage	2									2					
	Occasionally looking away from the stage								3							
	Eyes on stage		4		4	4	4			4		4		4	4	
	Eyes always on stage and taking pictures															5
Facial Expression	Disappointed/ bored															
	No expression	2				2			2							
	Focused		3								3			3		3
	Smiling				4		4			4		4			4	
	Smiling and laughing															

Figure 2: Section of scoring sheet that records an attendee's body language, eye contact and facial expression. The numerical values in the rows represent the corresponding interest in *science-related activities* score based on the rubric in Appendix D.

We evaluated the behaviour recorded on the scoring sheet using the rubrics summarised in Table 3. An attendee observed as slightly interested in a *science-related activity* (indicated by an interest score of 3) exhibited behaviours such as: foot tapping/head bobbing; focused but occasionally looking away from the stage; having limited side conversations; and a short clap after a song or demonstration. There are many combinations of body language that can result in similar scores for level of interest in the band's songs and demonstrations.

Rank	Behaviour	1 (Not Interested)	2 (Neutral)	3 (Slightly Interested)	4 (Fairly Interested)	5 (Very interested)
Science-Related Activities	Body Language	Folded arms	Standing/ Sitting Still	Head Bobbing/ Foot tapping	Moving to the music	Dancing/ singing
	Eye Contact	Not looking at the stage	Occasionally looking at the stage	Occasionally looking away from the stage	Eyes on the stage	Eyes on the stage and taking pictures
	Facial Expression	Disappointed /bored	No expression	Focused	Smiling	Smiling and laughing
	Side Conversations	Excessive	Some	Limited	Very Few	None
	Reaction to Song	No reaction		Short clap after song/demo		Long clap after song/ demo

Table 3: Observation Rubric. Behaviours from the observation scoring sheets (Figure 2 and Appendix B and C) and corresponding interest score for *science-related activities*.

The distinct zones, scoring sheets, and rubrics provided a system to keep observations consistent and comparable among four different observers. Scoring sheets confirmed that each observer looked for the same behaviours of each attendee observed. The rubrics allowed us to consistently assign an interest score to the different behaviours of a single observed attendee. The rubric created a quantifiable score that could be calculated and compared between any of the observers.

Observational Data

We converted one observation of an attendee's body language, eye contact, etc. into distinct numerical interest scores based on the rubrics in Appendix D. The numerical values we determined became the data points used for our analysis; Figure 3 illustrates this process. We averaged the interest score of each attendee's body language, eye contact, etc. to obtain an overall score for that single observation, as shown in Figure 4.

	Attendee	1
Body Language	Folded Arms	
	Standing/ sitting still	X
	Foot tapping and head bobbing	
	moving to the music	
	Dancing and singing	
Eye Contact	Not looking at the stage	
	Occasionally looking at the stage	
	Occasionally looking away from the stage	X
	Eyes on stage	
	Eyes always on stage and taking pictures	
Facial Expression	Disappointed/ bored	
	No expression	
	Focused	X
	Smiling	
	Smiling and laughing	
Side Conversations	Excesive	X
	Some	
	Limited	
	Very Few	
	None	
Post Song Reaction	No reaction	
	Short clap after	X
	Long clap after song	

Rank	Behaviour	1 (Not Intereste d)	2 (Neutral)	3 (Slightly Interested)	4 (Fairly Intereste d)	5 (Very intereste d)
Science-Related Activities	Body Language	Folded arms	Standing/Sitting Still	Head Bobbing/ Foot tapping	Moving to the music	Dancing/ singing
	Eye Contact	Not looking at the stage	Occasionally looking at the stage	Occasionally looking away from the stage	Eyes on the stage	Eyes on the stage and taking pictures
	Facial Expression	Disappointed/bored	No expression	Focused	Smiling	Smiling and laughing
	Side Conversations	Excessive	Some	Limited	Very Few	None
	Reaction to Song	No reaction		Short clap after song/demo		Long clap after song/demo

Figure 3: Translation of observed behaviours into numerical values.

Rank	Behaviour	1 (Not Interested)	2 (Neutral)	3 (Slightly Interested)	4 (Fairly Interested)	5 (Very interested)
Science-Related Activities	Body Language	Folded arms	Standing/Sitting Still	Head Bobbing/ Foot tapping	Moving to the music	Dancing/ singing
	Eye Contact	Not looking at the stage	Occasionally looking at the stage	Occasionally looking away from the stage	Eyes on the stage	Eyes on the stage and taking pictures
	Facial Expression	Disappointed/bored	No expression	Focused	Smiling	Smiling and laughing
	Side Conversations	Excessive	Some	Limited	Very Few	None
	Reaction to Song	No reaction		Short clap after song/demo		Long clap after song/demo

Attendee 1	
Category	Score
Body Language	2
Eye Contact	3
Facial Expression	3
Side Conversations	1
Post Song reactions	3
Average	2.4

Figure 4: Averaging the scores of behaviours from a single observation to determine an attendee's interest score for that observation.

For a short observation – by definition, an observation of one attendee at one moment in time – this is the average score assigned to the attendee. Figure 5 depicts these averages.14 of 21 randomly chosen members of the audience, i.e., nearly two-thirds, were slightly interested (score = 3) or interested (score = 4) in the song or demo they watched on the single occasion we observed them.

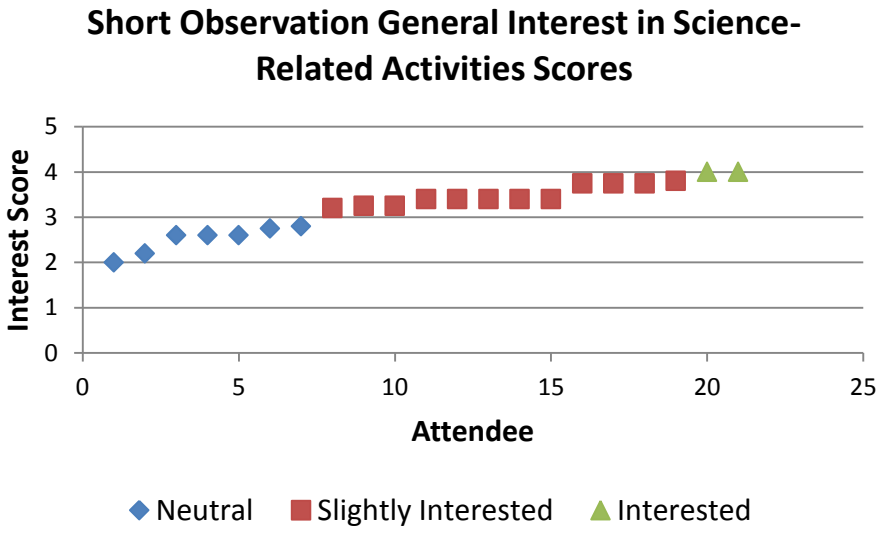


Figure 5: General interest in *science-related activities* per attendee for short observations.

For a long observation, which followed one attendee over time, we calculated an average interest score for each of the single observations, one such average interest score at each point on the timeline of the long observations. We also assigned a 'time score' that reflected how long an attendee attended the performance. For example, an attendee who stayed at the performance for five minutes would receive a time score of 1(not interested), but a person who stayed for the entire performance (fifty minutes) would receive a time score of 5 (very interested). To get the overall interest score for the long observations, we averaged the observations at each specific time interval together with the time score, as seen in Table 4. We added the average observation scores of the example attendee (highlighted in purple) and the average time score (highlighted in blue) to calculate an overall interest score (highlighted in yellow).

Time (min into performance)		Start of show	Mid Cyber nose	Mid 1st demo	Mid Croc of Golden Staph	Mid Nano Demo	Mid SKA Man Song	Mid Ant Establishm entism
Person		1	1	1	1	1	1	1
Body Language	Folded Arms							
	Standing/ sitting still	2	2					
	Foot tapping and head bobbing			3	3	3	3	3
	moving to the music							
	Dancing and singing							
Eye Contact	Not looking at the stage							
	Occasionally looking at the stage							
	Occasionally looking away from the stage	3	3	3	3	3	3	
	Eyes on stage							4
	Eyes always on stage and taking pictures							
Facial Expression	Disappointed/ bored							
	No expression							
	Focused	3	3			3	3	3
	Smiling			4	4			
	Smiling and laughing							
Side Conversations	Excessive							
	Some			2	2			
	Limited	3	3			3	3	
	Very Few							4
	None							
Post Song Reaction	No reaction							
	Short clap after	3	3	3	3			
	Long clap after song					5	5	5
Average		2.8	2.8	3	3	3.4	3.4	3.8
		Time Score for 50 min at performance					5	
		Overall Average Score with time score					3.4	

Table 4: An example of a long observation-scoring sheet with behaviours translated into numerical values.

Figure 6 is a graphical representation of long observation data points derived from attendees' average interest scores as calculated by the process in Figures 3 to 6. Figure 7 illustrates average observational scores per song (blue bar) and demonstration (red bar)

displaying that attendees were slightly interested (score = 3.0 to 3.6) in every song or demonstration.

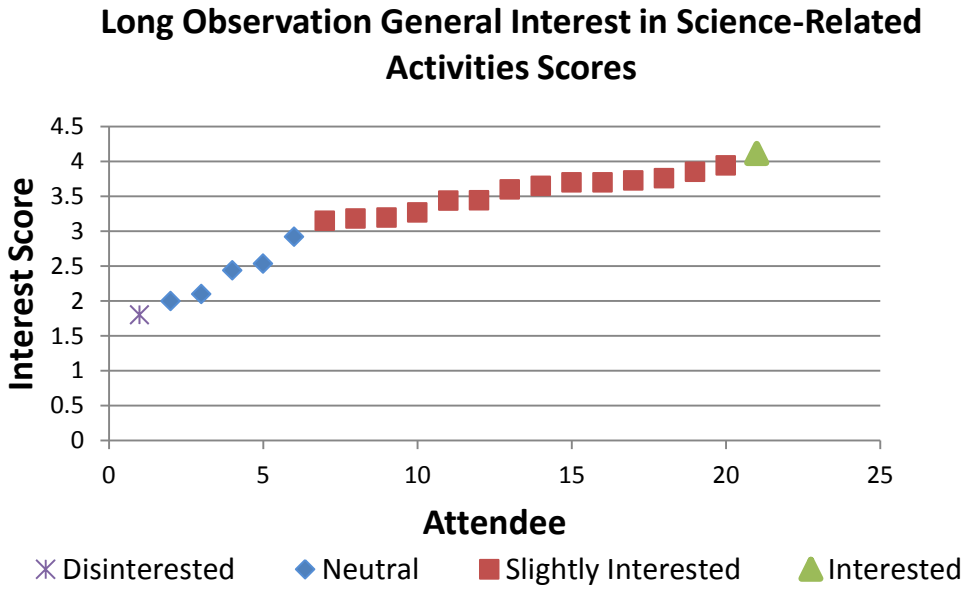


Figure 6: General interest in *science-related activities* per attendee for long observations.

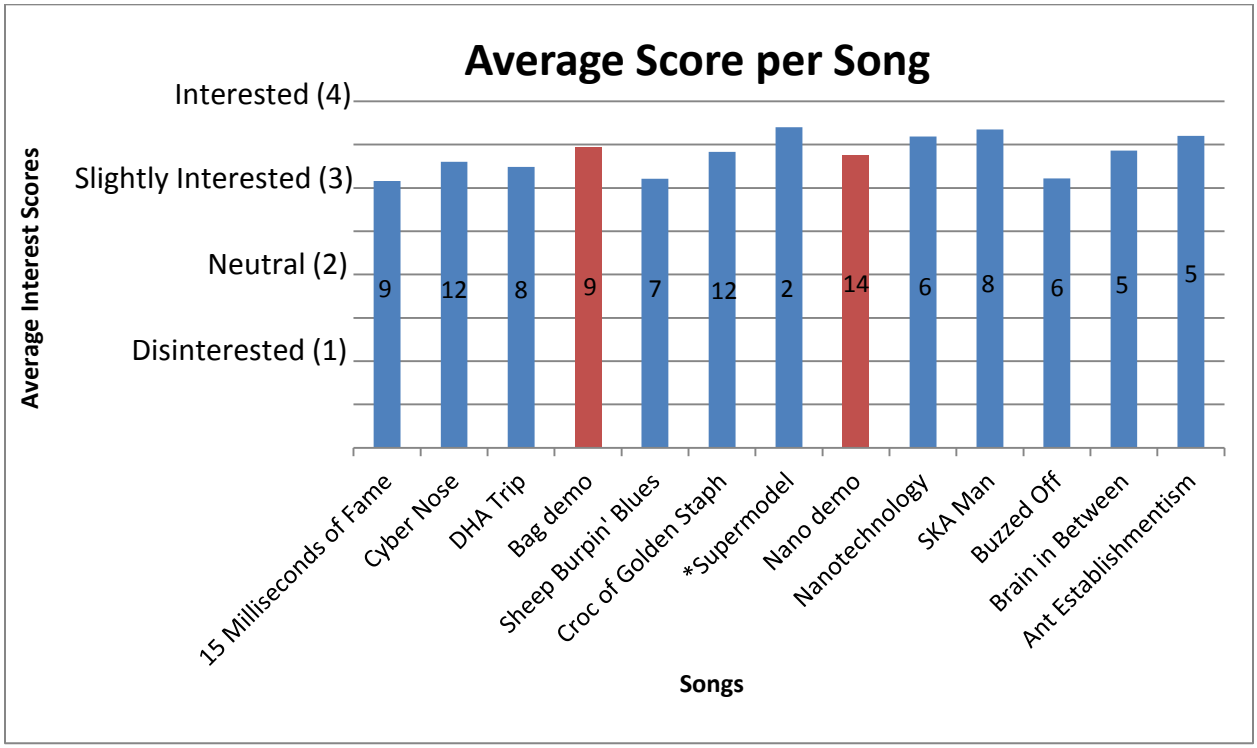


Figure 7: Average level of interest in the science-related activity per song. The numbers in the bars represent the number of observations used to obtain the song mean. Blue bars represent songs; red bars indicate demonstrations. * This mean was calculated with only two observations; therefore, the score is not significant.

Observational Findings

From these long and short observational methods, we determined that *Ologism* successfully stimulated *interest in a science-related activity* – the band's songs and demonstrations. The next few paragraphs argue that:

- The audience displayed interest in the band's songs and demonstration.
- The audience showed the same level of interest in the band's science-oriented performance regardless of age, gender or songs.
- Demonstrations engaged the audience more than songs.
- *Ologism*'s science-oriented performance successfully engaged their targeted youth population (18-35).

Approximately 70% of attendees observed appeared slightly interested, as defined in the observational rubric in Appendix D, **in *Ologism*'s performance.** The average interest score of the long and short observations in Figure 5 and Figure 6 is 3.2, which denotes slightly interested. The figures show the *science-related activity* interest scores of the attendees observed in both the long and short observations. Showing that one attendee appeared uninterested, a score of 1 based on our rubric, in the performance (blue coloured marker) and three attendees appeared interested, a score of 4 based on our rubric, in the performance (teal coloured marker). Five attendees were neutral (neither interested nor not interested) at the performance (red square markers). The remaining attendees (green triangle marker) appeared slightly interested in the performance, a score of 3 based on our rubric. As shown in Figure 7, mean interest level between songs varied between 3 and 3.6 (slightly interested) throughout the performance.

Engagement in the performance seemed consistent across song or gender, and to a lesser extent, across age groups. Figure 8 shows the percentages of men and women attendees observed representing each interest score; nearly equal fractions, 63.2% of women and 60.9% of men, scored between a 3 and 4 on our rubric indicating a slight interest in the performance.

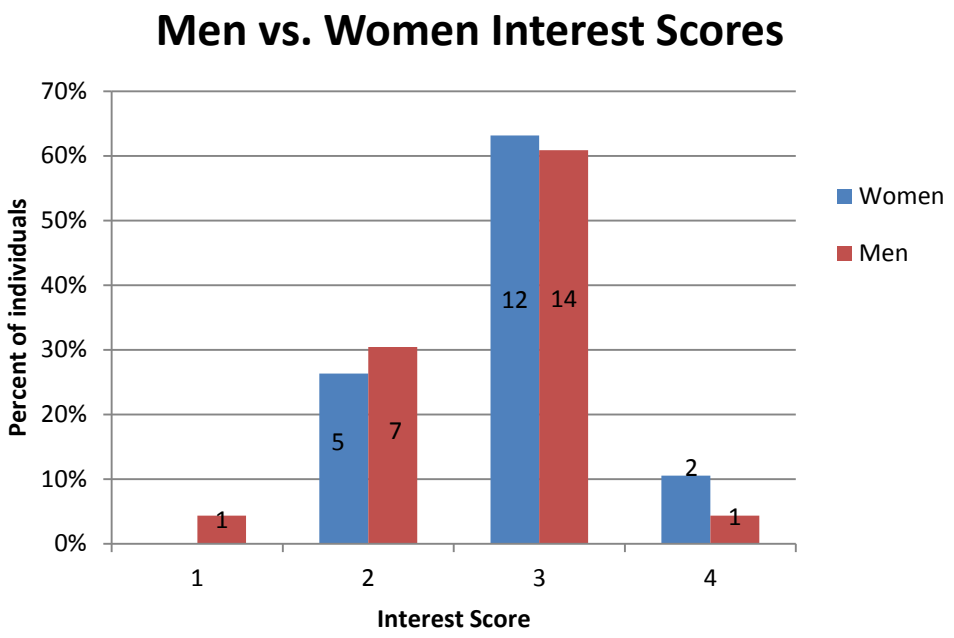


Figure 8: *Science-related activity* interest score between men and women. The numbers in the bar represent the amount of females or males at that score including both long and short observations.

Omitting the teen and mature adult age categories (only one observation in each) shown in Figure 9, youth and middle age interest levels are scattered somewhat similarly. 66.7% of youth attendees were either interested or slightly interested in the performance; 71.4% of middle-aged attendees exhibited the same behaviour. Therefore, no clear upward or downward trend can be concluded.

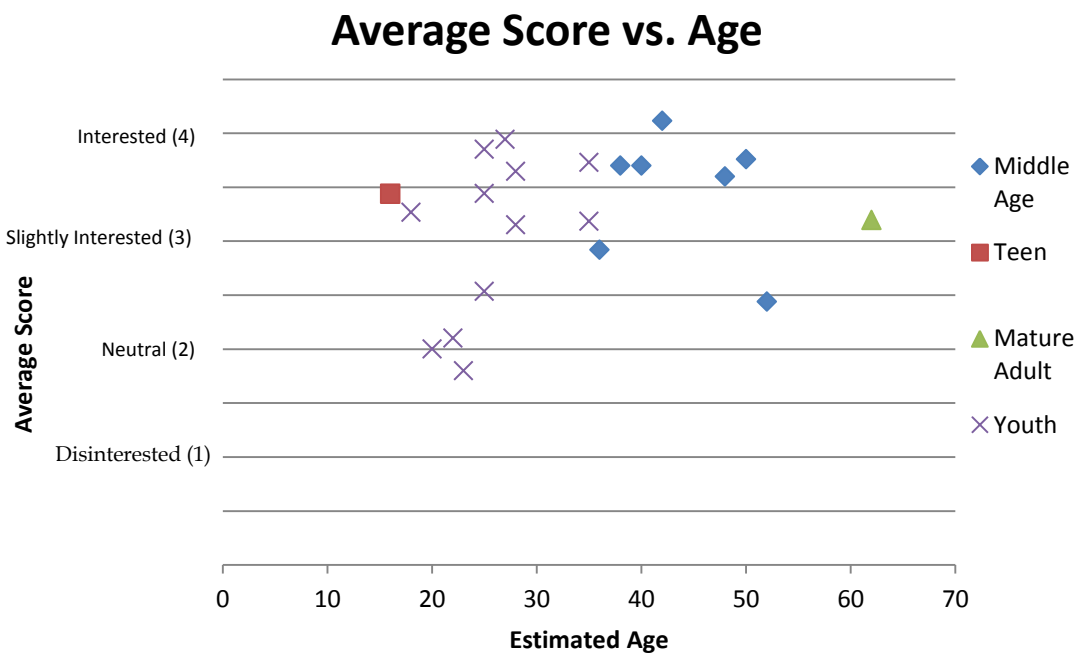


Figure 9: Mean *science-related activity* interest score compared to estimated age group of attendees.

Demonstrations engaged attendees more than songs. We observed 15 attendees' behaviours for both a demonstration and a song. These attendees exhibited four different behaviour patterns as shown in Figure 10:

- Higher interest in both demonstrations than in songs;
- Lower interest in both demonstrations than in songs;
- No difference in interest between demonstrations and songs;
- Higher interest in the first demonstration than the second. (The first demonstration engaged 60% more attendees who saw both songs and demonstrations than the second demonstration.)

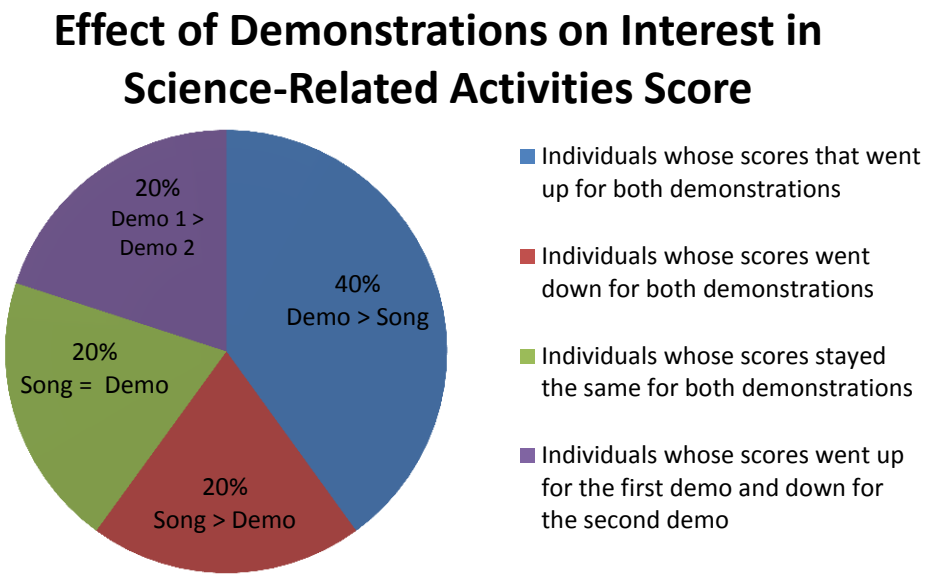


Figure 10: Four categories of change in interest in *science-related activities* seen during the demonstrations.

***Ologism*'s performance appealed to their target group of youth, ages 18-35.** During the performance, we recorded on our sheets the estimated age range of the attendee observed. Following the performance, we separated the observations by age group, and produced the graph displayed in Figure 11; 72% of the observed attendees fell into the youth age range of 18-35.

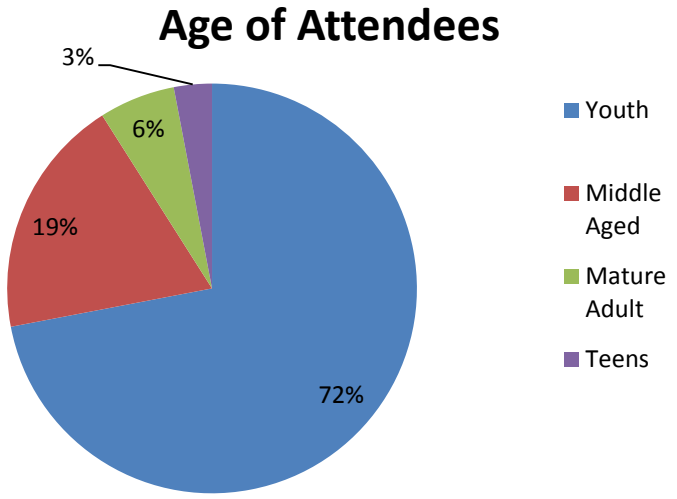


Figure 11: Estimated age ranges of attendees at the performance (*science-related activity*).

Methodological Recommendation

Observational findings assessed *Ologism*'s effectiveness in stimulating *interest in science-related activities*, but we recognise that the limited number of attendees, construction at the venue, and time constraints may have influenced those results. For example, with a small audience or a small venue, multiple observers might accidently observe the same attendee or audience members may come and go at a free performance. These limitations suggest that different types of observations should be used according to allotted time, venue size, and audience access to the performance:

- For long observations, each observer should conduct two to three observations;
    - Five long observations per observer are too many to track.
- Long observations should be carried out closer to the stage and short observations towards the rear of the venue;
    - Attendees towards the rear of the venue did not stay long enough to observe over the duration of the performance.
- Add a comment section on the observation sheet, Appendix B, to explain why an observation fails.
- Be sure to have on hand a sufficient number of scoring sheets formatted to be filled out quickly and easily.

With such refinements, observations are an efficient method for measuring the effectiveness of a performance.

Peer-assisted Informal Interviews

Peer-assisted informal interviews of observed attendees gathered information about those attendees' prior interest in science and determined if they intended to broaden their scientific appreciation at the performance. This method measured the descriptive indicators

- *enjoyment of science*
- *interest in science-related activities*
- *future-oriented motivation to learn science*
- *expectations for a scientific career*

Peer-assisted interviewers probed the attendees' feelings and thoughts about the performance through casual conversation.

Methodology

Peer-assistants gathered attendees' reactions and thoughts about the performance *(a science-related activity)* by casual conversations structured by specific guidelines (including disclosure). We recruited two Worcester Polytechnic Institute students from other Interactive Qualifying Project (IQP) groups to gather personal information from the attendees. We paired each peer assistant with an observer to discover correlations between observed behaviours and personal thoughts. We provided peer-assistants with guidelines on the day of the performance (Appendix E). Among other pointers, the guidelines instruct the peer-assistants to:

- Ask: why they were there? How they found out about the performance? Did they understand what the performance was about? What was their profession?
- Make these inquiries in the course of a casual conversation
- Identify themselves by asking if they can use the attendee's answers in a study. An example statement would be "I found what you said to be really interesting. Would you mind if I share your responses with my friends conducting a research study on this performance? You will remain anonymous."
- Report the information back to the observer at the end of the performance through handwritten notes or a text message.

Peer-Assistant Informal Interview Data

The sneaky friend information supplemented and informed the observational findings; it was not the basis for any interest score. The comments recorded by the peer assistants were matched with the observational record of the attendee in question. For example, one attendee was observed to exhibit the following behaviours: foot tapping and head bobbing; taking pictures; smiling; having no side conversations; and clapping after the song. Based on our rubric this attendee received a score of 4, corresponding to 'interest' at that point in the performance. The supplemental information provided by the 'sneaky friend's' conversation revealed that this attendee is the sister of *Ologism*'s lead singer, explaining her high level of interest in *Ologism*'s performance.

Every attendee who was both observed and contacted by a peer interviewer is listed in Table 5; it shows both the attendee's mean interest score from observations and the corresponding sneaky friend's comments.

Attendee	Mean Observation Score	Peer-assisted Interview comments
Long Observation Attendee 2	3.72	Wife of performer, loves shows, profession: cancer researcher
Long Observation Attendee 4 (group *)	3.44	Among a group of four girls about to graduate high school, all going into science majors: BME, Actuarial, Biology, Science; liked the performance, heard about it from Carly Siebentritt (project sponsor)
Long Observation Attendee 5	3.60	Said he was a scientist, but through outside circumstances, lost his job/money
Long Observation Attendee 11	3.85	Identified *Ologism* as a science rock band, has seen them a couple of times before, from Melbourne (pre-interest)
Long Observation Attendee 12	3.70	Said the band was doing an experiment and not much else, knew they were a band from the performance, too focused to give up any more information
Long Observation Attendee 13	4.11	Presented postcard indicating who *Ologism* was, Chris's sister

Table 5: Mean score and comments of attendees interviewed at the performance. *A group of four girls observed and recorded as one observation score. This row indicates the collaborative score the group obtained and their comments to the peer-assistants.

Peer-Assistant Informal interview Finding

The sneaky friend's conversations with performance attendees revealed that **those affiliated with CSIRO or *Ologism* had on average a higher interest in *Ologism*'s performance**. Supplemental information gathered from peer-assistants allowed us to split the 21 long observed attendees into two categories: known affiliation with CSIRO or *Ologism* or no/unknown affiliation. Attendees with a known affiliation with CSIRO or *Ologism* expressed higher interest scores then attendees with no/unknown affiliation. Figure 12 shows the average interest score of each category.

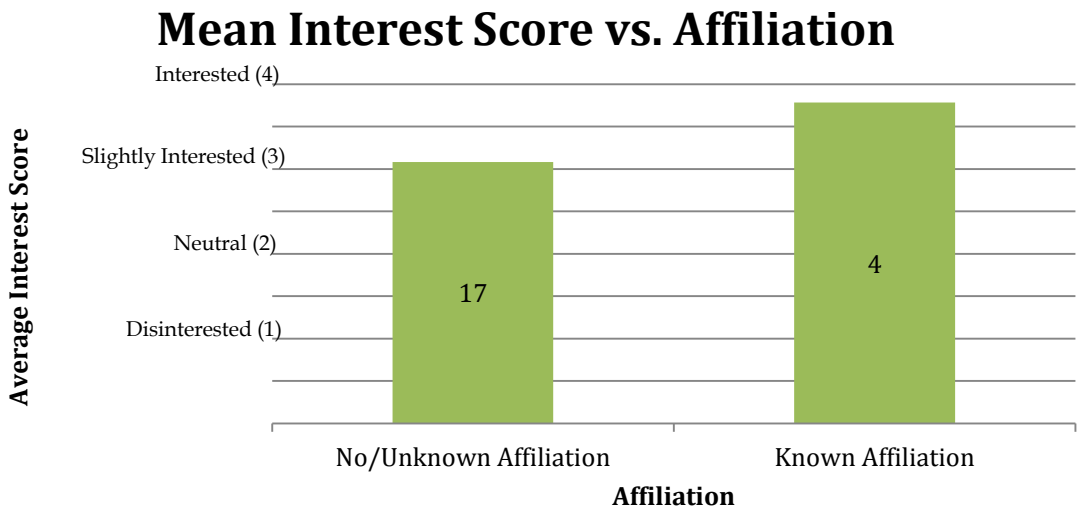


Figure 12: Mean interest scores based on affiliations groups: known affiliation and no/unknown affiliation.

Methodological Recommendations

To ensure the success of future peer-assistant informal interviews an adequate number of peer-assistants need to attend the performance, they need to be out-going, and the venue has to allow free movement of peer-assistants among attendees. To successfully implement this novel method, we recommend:

- Plan one peer-assistant per 20 people.
- Recruit extra interviewers as backups in case of unforeseen circumstances.
- Use extroverted peer-assisted interviewers.
- Carry out peer-assisted interviews when there isn't assigned seating.
- If people at a performance do not stay very long, more peer-assistants are required to make sure that peer-assistants speak with all attendees observed.

Case-Control Study

We used a case-control study to survey groups of individuals to measure the change over time in scientific interest caused by the *Ologism* performance. We measured change in scientific interesting using all five descriptive indicators of interest in science:

- *Enjoyment of science*
- *Personal value of science*
- *Interest in science-related activities*

- *Future-oriented motivation to learn science*
- *Expectations for a scientific career*

The case group, seven friends and family members of CSIRO employees ages 18-25, attended the performance to isolate the performance as the variable causing a change in scientific interest. The control group, 11 ultimate Frisbee players ages 18-25, did not attend the performance to measure change in the absence of participation in a science-related activity. The ultimate Frisbee players were teammates of one the authors of this report.

Methodology

We implemented the case-control study by administering pre and post surveys to the case and control groups one week before and one week after the performance. We designed the survey to probe participants on the five descriptive indicators of interest in science. Table 6 shows each descriptive indicator and its corresponding survey question.

Indicator	Question
Enjoyment of science	How interested are you in new technological advancements?
Personal value	How much more would you appreciate your mobile phone if you knew how it worked?
Science-related activities	What kind of science-related extracurricular activities have you participated in?
Future-oriented motivation to learn science	What do you want to learn more about in the future?
Expectations for a scientific career	What kind of career do you see yourself having?

Table 6: Each Indicator of interest in science and the corresponding questions on the pre and post surveys Appendix F and G).

We administered the pre-performance survey (Appendix F) to both groups in person and through email one week before the *Ologism* performance. Post-performance surveys (Appendix G), administered one week after the performance, and used the same questions as the pre-performance survey with three additional questions:

- Did you attend the *Ologism* performance?
- If you answered, “yes”; would you be interested in attending future performances similar to this one?

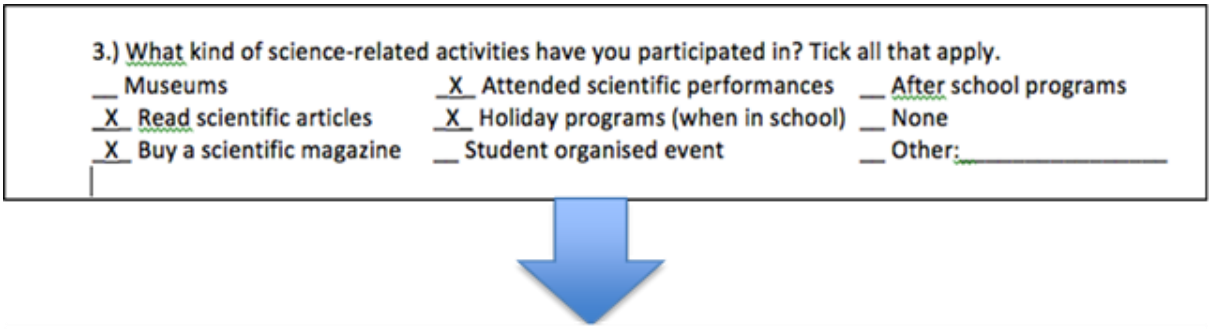
- If you answered, “yes”; on the scale of 1 (strongly disagree) to 5 (strongly agree) to what extent you agree with the statements?
    - I found this performance interesting.
    - I found this performance enjoyable and entertaining.
    - This performance provided some value for the community.
    - I found this performance educational, but fun.
    - My attendance was rewarded.

The three additional questions identified the participants in our case group that did not attend the performance. We eliminated the seven participants from the case group that did not answer these questions from our study, leaving seven case group participants.

We evaluated the surveys using a rubric (Appendix H) that assigned a composite interest score using a scale from uninterested (score = 1) to very interested (score = 5). For example, according to the rubric, a person who finds science somewhat enjoyable, considers how technology works, attends three science-related activities, wants to learn more about two science-related topics in the future, and is unsure of her/his career path would be considered slightly interested in science, an interest score of 3.

Case-Control Data

We converted answers to the survey questions (Appendix I) into distinct numerical interest scores based on the rubric in Appendix H**.** The interest scores we determined became the data points used for our analysis. Figure 13 illustrates how a question from our survey would be scored using the rubric.



Rank	1 Not Interested	2 Neutral	3 Slightly Interested	4 Interested	5 Very Interested
Enjoyment of Science	Indicates no enjoyment in science	Indicates little enjoyment in science	Indicates some enjoyment in science	Indicates moderate enjoyment in science	Indicates a lot of enjoyment
Personal Value of Science	Does not care how technology works	Little interest in how technology works	Considers how the technology works	Appreciates how technology works	Fully understands how technology works
Science-related activities	Does not attend any science-related activities	Attending 1-2 science-related activities	Attending 3-4 science-related activities	Attending 5-6 science-related activities	Attending 7+ science-related activities

Figure 13: Example scoring procedure for survey question #3. The red box indicates the interest score based on the rubric for attending four science-related activities.

Each question on the pre- and post-surveys related to one of the five descriptive indicators. We calculated the mean score for all questions corresponding to the same indicator. Table 7 shows survey question combinations for each indicator; refer to Appendix F to review the survey questions.

Indicator	Questions for scoring
Enjoyment of Science	1, 6a
Personal Value of Science	2, 6c.
Science-Related Activities	3, 6b.
Future-Oriented Motivation to Learn Science	4, 6d.
Expectation for a Science Career	5, 63.

Table 7: Survey question numbers that we combined to formulate an average for each descriptive indicator.

After we combined and averaged all of an individual respondent's answers with respect to the five indicators, we calculated the mean scores of all indicators to determine an average

interest in science score, following the pattern of the example displayed in Table 8. Figure 14 compares these calculated average scores for both the case and control group's pre- and post-performance surveys.

Indicator	Score
Enjoyment of Science	2
Personal Value of Science	4
Science-Related Activities	3
Future-Oriented Motivation to Learn Science	2
Expectation for a Scientific Career	2.5
Average	2.7

Table 8: Example descriptive indicator scores based on the survey rubric and question combinations in Table 7.

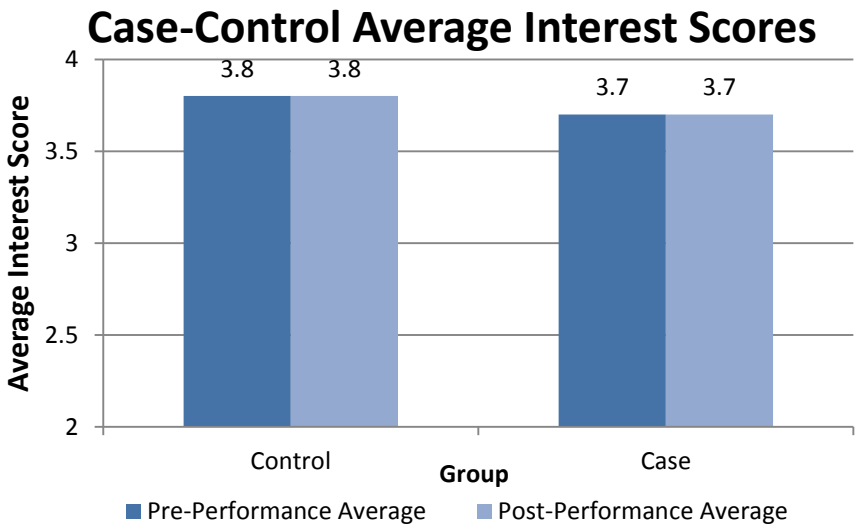


Figure 14 : Pre- and post- survey average interest scores for cast and control groups.

Case-Control Finding

The control survey group viewed science as influential to daily life but did not desire to pursue a scientific future prior to or following the performance (Figure 14). The pre-performance survey mean of the participants' interest scores indicated that participants appreciated how technology works (personal value, interest score = 4.38) and enjoyed science (*enjoyment of science*, interest score = 4.38). The same participants planned to learn between

four to six science-related topics (*future oriented motivation to learn science*, interest score = 3.00) and were unsure of their future career path (*expectations of a science career*, interest score = 3.50). The results of the post-performance survey reflected similar results as those presented by the pre-performance survey.

The case survey group did not display any change in overall interest in science after attending the *Ologism* performance, as seen in Figure 14. Pre-performance survey results revealed that science intrigued the case group although its members did not actively engage in scientific activities or careers. In reference to our rubric, individuals surveyed indicated a moderate interest in science (*enjoyment of science*, interest score = 4.40), attended three to four science-related activities (*science-related activities*, interest score = 3.50), and expressed uncertainty about that future career path (*expectations of a science career*, interest score = 3.75). The results of the post-performance survey reflected similar results as those represented by the pre-performance survey. The case group indicated they had interest in the performance, but it was not enough to change their overall interest in science.

In summary, the case-control study failed to detect any change in overall interest in science from one week before the performance until one week after the performance.

Methodological Recommendations

The case-control study sought to assess *Ologism's* effectiveness in stimulating a prolonged interest in science, but we recognise that the limited number of participants and time constraints may have influenced those results. For example, due to the small amount of time available to contact an organised club, our case group consisted of unrelated participants with less motivation to attend the performance alone. To ensure a more successful case-control study we recommend:

- Using organised clubs for the case group.
- Providing enough time to send reminders about the performance.
- Using a large sampling pool, about 30 people, to compensate for those who will not attend the performance.

Potential Methods

During the development of our project, we also proposed three additional methods to measure the five descriptive indicators of interest in science: a commentary booth at the performance, social media participation during the performance, and an online contest initiated at the performance. In the end, they were either unused or ineffective. We did not use the commentary booth because of venue constraints; social media participation and the online contest proved ineffective because we did not receive sufficient responses, perhaps because they were not promoted adequately during the performance itself.

Commentary Booth

We proposed a commentary booth to collect audience members' reactions to *Ologism*'s performance, as well as their intentions for attending and thoughts on interest in science. The commentary booth could have potentially measured four of the five descriptive indicators of interest in science:

- *Enjoyment of science*
- *Personal value of science*
- *Future-oriented motivation to learn science*
- *Expectations for a scientific career*

If implemented, the booth would be set up at the venue in an area easily accessible to all attendees. A video camera inside the booth would be available for the participants to record their responses. Participants' responses would be prompted by a series of questions available in the booth corresponding to the four descriptive indicators. Following the performance, recorded responses would be transcribed and evaluated using a coding system based on a rubric (Appendix J) with specific key words or phrases to determine an interest in science score.

Constraints of the performance venue on 3 February 2013, prevented our team from implementing the commentary booth. Hosier Lane is too narrow of an alleyway to accommodate the commentary booth, and a bulky commentary booth would detract attention from the performance. The commentary booth would also require one member of the team to monitor the booth and distribute consent forms (Appendix K) to any attendees willing to

participate. With one team member monitoring a commentary booth, we would have one less member available for observations.

Although we could not implement the commentary booth, we recognise its potential to measure different aspects of scientific interest with appropriate advertisement, manpower, guideline questions, and accessibility. *Ologism* would need to make an announcement encouraging attendees to participate. The team has to be sure that there is an available team member to monitor the booth to ensure it is not misused and participants are aware of how their responses will be used. Useful responses depend on prompting participants' with guideline questions to minimize the number of irrelevant or off-topic responses. Collecting responses would be easiest by setting up the commentary booth in a place that s easily accessible and does not distract attendee attention from the performance.

Social Media

We aimed to utilise social media (*i.e.,* Facebook and Twitter) to collect attendee responses to the performance to indicate *interest in science-related activities.* Social media would have provided in-the-moment reactions to the performance corresponding to four of the five descriptive indicators of interest in science.

- *Enjoyment of science*
- *Personal value of science*
- *Future-oriented motivation to learn science*
- *Expectations for a scientific career*

We prompted attendees to share their reactions and comments during the performance using social media by advertising *Ologism*'s social networks on a banner behind the band. Ideally, the band should have made multiple announcements promoting the use of social media sites (*i.e.,* tweeting #*Ologism*Live). If we received responses from social media, responses would be scored in terms of *interest of science-related activities* conveyed using our rubric (Appendix L).

Social media proved to be ineffective because *Ologism* failed to announce the social media options during the performance and venue restrictions on further advertising led to no responses. Despite the banner we posted behind the band, attendees did not respond to the

social media prompt. Laws regarding advertisements and passing out flyers prevented us from promoting the use of social media more in Hosier Lane during the performance. We planned to use *Ologism* as a form of advertisement for social media, but due to time constraints, the band failed to make the announcements. To implement social media successfully, we recommend advertisements about the use of social media be repeated frequently during the performance. We also suggest using different mediums of advertisement such as band announcements, posters, banners, and flyers (Appendix M).

Contest

We created an online contest to determine if the performance created a prolonged interest in science and *Ologism* among attendees. The online contested targeted all five descriptive indicators of interest in science:

- *Enjoyment of science*
- *Personal value of science*
- *Interest in science-related activities*
- *Future-oriented motivation to learn science*
- *Expectations for a scientific career*

We designed the contest to include science-related questions and supplemental questions to correspond to the five descriptive indicators of interest in science. The contest page can be seen in Appendix N. We asked three subjective science questions. The first two questions asked the participant to research unfamiliar topics (DHA and chemical reactions) and submit a concise answer. The third subjective science question, regarding extra-terrestrial invasions, asked the participant to answer a science-related question in a creative and unique way. Supplemental questions asked the participant to provide their age, gender, and occupation or future career goals. We also asked the participant if he or she attended the *Ologism* performance on 3 February 2013, to determine if attendees had enough of an interest to proceed to *Ologism*'s website and participate in another *science-related activity.* We confirmed performance attendance by asking participants for a code that *Ologism* announced with the contest during the performance. Participation would indicate a prolonged interest in

science. *Ologism* posted the contest on their website five days after the performance and closed the contest one week later.

We received a low number of responses because limited advertisement and venue restrictions prevented promotion. *Ologism* announced the contest only once, at the end of the performance. Many attendees left the performance before *Ologism* announced the contest. Melbourne law prohibited distributing flyers to attendees or hanging posters in Hosier Lane with contest information, further reducing our intended contest advertisement. With limited advertising, we received three responses. Only one out of the three respondents identified attending the performance using the correct code. Responses would have been scored using the rubric in Appendix O.

Based on our experience, we suspect that a successful contest requires multiple forms of advertisement. *Ologism* needs to announce the contest at several different points in the performance to account for individuals who do not stay for the entire performance. Posters around the venue and take-home fliers for attendees would be effective visual strategy for reminding attendees of the contest details. For *Ologism*, we suggest integrating the contest announcements into the set list prior to the performance.

Conclusions and Recommendations

Methodology

Long observations are more successful at performances when those being observed are more likely to remain for the whole performance; e.g., they purchased tickets. Observers successfully conducted long observations on attendees who had an obligation to be at the performance (*i.e.,* sister or wife of a band member, member of case group, CSIRO employee), as revealed by peer-assisted interviews. The observer in the zones furthest from the stage relied on short observations to record attendee behaviour because attendees did not remain at the performance for enough time to observe a single individual more than once.

We suggest using long observations at performances where people purchase tickets and short observations for free public events. Researchers should use peer-assisted informal interviews to understand why individuals attended a given performance or to determine if attendees had a specific obligation to remain for the entire performance.

Overall, we believe **the combination of observations and peer-assisted informal interviews offers an effective approach to collecting and evaluating data.** Although observations provide useful information regarding an attendee's level of engagement based on body language, the added information obtained from peer-assisted informal interviews is invaluable. Peer-assisted informal interviews put thoughts and reactions to observed body language, adding a second dimension to behaviours assessed through observations. We strongly recommend combining the proper use of observations and peer-assisted informal interviews for future studies in order to obtain the best data possible.

Performance

Demonstrations increase attendee's level of interest; we suggest adding one or two more demonstrations to every performance. Based on our long observations, attendees generally had a positive response and exhibited behaviours contributing to a higher *interest in science-related activities* score during demonstrations (Observational Findings). In general, the members of the audience showed more interest in the two demonstrations than the songs. Therefore, *Ologism* should integrate one or two more demonstrations during their live performances, especially demonstrations that can be reproduced at home. Attendees can then

conduct simple science experiments on their own, leading to *future-oriented motivation to learn science. Ologism* should incorporate more volunteer-based demonstrations to help the audience participate more fully in the *science-related activities.* They could also use this time to involve people standing further away from the stage to bring them forward.

People passing by a free public performance on the street were more difficult to engage. Long observations failed when conducted furthest from the stage (zones 9 through 11 in Figure 1) because individuals did not stay long enough for an observer to make multiple observations on a single individual. Individuals in zones 9 through 11 generally photographed the venue's graffiti and paid little attention to the performance.

To engage those furthest from the stage during a free public performance, *Ologism* should remind the audience of the band's name, keep the performance more interactive, and mention the science content. *Ologism* should find ways to keep the audience engaged by utilising the layout of the particular venue, as well as direct interaction and participation. Some standard tactics include asking the audience to clap hands or repeat lyrics after the band, choosing more audience volunteers to participate in demonstrations, having signs near the entrance or rear of the venue to lure people closer, or reducing the space between the stage and the rear of the venue to draw the audience closer.

***Ologism* more effectively engages attendees who have prior knowledge of the science content of the performance.** Peer-assisted interviews (Peer-Assistant Informal Interview Data) revealed that attendees exhibiting high observed interest scores often had seen *Ologism* before or had an affiliation with CSIRO or *Ologism*. *Ologism* should invite more people that are already fans to their performances. *Ologism* can utilise advertising, social media, and organised clubs and groups to inform more people about the event and provide a brief statement about the science-based content of their performance.

People who already have an interest in science will enjoy the performance more. Attendees with *scientific careers* or *motivation to learn science,* identified by the Peer-Assistant Informal interview Findings, exhibited behaviours that expressed high overall interest in the performance through observed behaviours and conversations with peer-assistants. *Ologism* should reach out to science groups, universities, secondary schools, and science-related Twitter

and Facebook pages to inform scientifically interested individuals about upcoming performance details. By going through these groups, *Ologism* can further reach out and attract more individuals with the idea that 'science can be fun' and 'mixing science with rock music is cool.' This popularises the idea of *Ologism* and science, which increases the chances of stimulating the community's interest in science.

The performance stimulated an interest in *science-related activities* during the performance, but our methods failed to show evidence of a prolonged interest as a result of the performance. According to our observations, most attendees appeared slightly interested in the performance during the songs and demonstrations. However, our case-control study showed that the case group, who attended the performance, had the same interest score for both the pre- and post-performance surveys; they did not show any change in scientific interest after attending the *Ologism* performance. If *Ologism* does include the replicable demonstrations that we have suggested, attendees may be more inclined to try *science-related activities* in their free time. Trying more *science-related activities* can lead to an individual researching other science-related topics and endeavours, thereby indicating a prolonged interest in science.

Ologism's Potential

Ologism has the potential to effectively engage and stimulate scientific interest among performance attendees, but their efforts would be most effective in conjunction with other alternative science-based approaches that Inspiring Australia suggests and that 'Unlocking Australia's Potential' funds. *Ologism* provides Australia with a way to redefine social norms, changing the general public's perception of what makes science 'cool' or 'interesting.' By popularising a science-related activity with a unique, alternative approach based on popular culture, *Ologism* can engage a broader audience, including individuals without a prior interest in science.

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Appendix

Appendix A: CSIROSEC Programs

Program	Description
Double Helix Science Club	The Double Helix science club offers student and teachers a choice of magazines, scientific or The Helix, with teacher guides, member events and holiday programs and online science resources.
Scientists in schools and Mathematicians in schools	This program creates and supports ongoing professional partnerships between scientists or mathematicians and teachers in primary and secondary schools across Australia.
CREativity in Science and Technology (CREST)	CREST is an award program that encourages and supports primary and secondary school students in the creation of a practical science or technology project.
Holiday Science Activities	The Double Helix club puts on whole day educational and fun science activities for all ages.
Science By Email and Maths by Email	Science and Maths by email both provide a free e-newsletter that includes breaking news, at home activities, quizzes, brainteasers, facts, event listings and competitions.
CarbonKids	An in school program that encourages kids to learn about science in sustainability. This encourages students to take a part in lowering the amount of carbon emissions.
BHP Science Awards	These awards recognize science excellence in primary and secondary students that are involved in scientific research and innovative science teachers.

Appendix B: Long Observation Scoring Sheet

Time (min into performance)		Start Of Show	Mid Cybernose	Mid Bag Demo	Mid Croc of Golden Staph	Mid Nanotech Demo	Mid SKA Man	Mid Buzzed Off	establishmentism
Attendee		1 2 3 4 5	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5
Body Language	Folded Arms								
	Standing/ sitting still								
	bobbing								
	moving to the music								
	Dancing and singing								
Eye Contact	Not looking at the stage								
	stage								
	from the stage								
	Eyes on stage								
	taking pictures								
Facial Expression	Disappinted/ bored								
	No expression								
	Focused								
	Smiling								
	Smiling and laughing								
Side Conversations	Excesive								
	Some								
	Limited								
	Very Few								
	None								
Post Song Reaction	No reaction								
	Short clap after								
	Long clap after song								
Point in Performance	15 mil seconds of fame								
	Cyber nose								
	DHA trip								
	Bag suck demonstration								
	Sheep burbon blue								
	Croc of golden staff								
	Super model								
	demo*								
	Nanotechnology								
	Scarman								
	Bazzed Off								
	Brain in Between								
	Antestablism								
Proximity									
Count and time of count									
Individual 1		Age	Gender	M / F					
Individual 2		Age	Gender	M / F					
Individual 3		Age	Gender	M / F					
Individual 4		Age	Gender	M / F					

Appendix C: Short Observation Scoring Sheet

Attendee		1	2	3	4	5	6	7	8	9	10
Body Language	Folded Arms										
	Standing/ sitting still										
	bobbing										
	moving to the music										
	Dancing and singing										
Eye Contact	Not looking at the stage										
	stage										
	from the stage										
	Eyes on stage										
	taking pictures										
Facial Expression	Disappinted/ bored										
	No expression										
	Focused										
	Smiling										
	Smiling and laughing										
Side Conversation s	Excesive										
	Some										
	Limited										
	Very Few										
	None										
Post Song Reaction	No reaction										
	Short clap after										
	Long clap after song										
Point in Performance	15 mil seconds of fame										
	Cyber nose										
	DHA trip										
	Bag suck demonstration										
	Sheep burbon blue										
	Croc of golden staff										
	Super model										
	demo*										
	Nanotechnology										
	Scarman										
	Bazzed Off										
	Brain in Between										
	Antestablism										
Proximity											
Age											
Gender											

Appendix D: Observation Rubric

Rank	Behaviour	1 (Not Interested)	2 (Neutral)	3 (Slightly Interested)	4 (Fairly Interested)	5 (Very interested)
Science-Related Activities	Body Language	Folded arms	Standing/ Sitting Still	Head Bobbing/ Foot tapping	Moving to the music	Dancing/ singing
	Eye Contact	Not looking at the stage	Occasionally looking at the stage	Occasionally looking away from the stage	Eyes on the stage	Eyes on the stage and taking pictures
	Facial Expression	Disappointed /bored	No expression	Focused	Smiling	Smiling and laughing
	Side Conversations	Excessive	Some	Limited	Very Few	None
	Reaction to Song	No reaction		Short clap after song/demo		Long clap after song/ Demo
	Time Score	0-5 minutes	5-20 minutes	20-30 minutes	30-40 minutes	40 min – end of show

Appendix E: Peer assisted informal interviews

Guidelines for Peer informal interviews:

1.) At the end of every conversation held please ask the following question: I found what you said to be really interest, would you mind if I share your responses with my friends conducting a research study on this performance? You will remain anonymous

2.) Make the conversations between 2-5 min long.

3.) Try to determine the following information:

a.) where the individual is from?

b.) Why the individual came to or stopped at the performance?

c.) Does the individual understand the content?

f.) What is the individuals occupation?

5.) Try to make the conversation as natural as possible.

Appendix F: Pre-Performance Survey

Survey

This survey will be used for a research project about science interest on behalf of the Commonwealth Scientific and Industrial Research Organisation (CSIRO) and the musical group of *Ologism*. Students from the Worcester Polytechnic Institute (WPI) in Worcester Massachusetts, USA, are conducting this survey. Your participation in this survey is completely voluntary and you may stop at any time. None of your personal information will be included in the project report or publications.

For comparison purposes, please indicate the following:

Second letter of first name: ____ Second letter of last name:____
Month you were Born (MM):____ Last two digits of phone #: ____
Age:____ Suburb: _____

Please answer the following questions to the best of your ability.

1.) On a scale of 1 (not interested) to 5 (very interested) how interested are you in new technological advancements? 1 2 3 4 5

2.) On a scale of 1 (no more) to 5 (much more) how much more would you appreciate your mobile phone if you knew how it worked? 1 2 3 4 5

3.) What kind of science-related activities have you participated in? Tick all that apply.

__ Museums __ Attended scientific performances __ After school programs
__ Read scientific articles __ Holiday programs (when in school) __ None
__ Buy a scientific magazine __ Student organised event __ Other:_____

4.) What do you want to learn more about in the future? Tick all that apply.

__ Medicine __ Writing __ Languages
__Astronomy __ Animals __ Business
__ Literature __ Nature/Environment __ None
__Other?:_____

5.) What kind of career do you see yourself having 0?

_____

6.) Please indicate your level of interesting in the following activities: (1 = Not at All, 5 = Very Interested)

Activity	**1**	**2**	**3**	**4**	**5**
a. How interested are you in science?					
b. How interested are you in scientific activities?					
c. How interested are you in the way that science impacts your daily life?					
d. How interested are you in science based classes?					
e. How interested are you in having a science career?					

Appendix G: Post-Performance Survey

Survey

This survey will be used for a research project about science interest on behalf of the Commonwealth Scientific and Industrial Research Organisation (CSIRO) and the musical group of *Ologism*. Students from Worcester Polytechnic Institute (WPI) in Worcester Massachusetts, USA, are conducting this survey. Your participation in this survey is completely voluntary and you may stop at any time. None of your personal information will be included in the project report or publications.

For comparison purposes, please indicate the following:

Second letter of first name: ____ Second letter of last name:____
Month you were born (MM):____ Last two digits of phone #: ____
Age:____ Suburb: _____

Please answer the following questions to the best of your ability.

1.) On a scale of 1 (not interested) to 5 (very interested) how interested are you in new technological advancements? 1 2 3 4 5

2.) On a scale of 1 (no more) to 5 (much more) how much more would you appreciate your mobile phone if you knew how it worked? 1 2 3 4 5

3.) What kind of science-related extracurricular activities have you participated in? Tick all that apply.

__ Museums __ Attended science-inspired performance
__ Read Scientific Articles __ Buy a Scientific Magazine
__ Other?:_____

4.) What do you want to learn more about in the future? Tick all that apply.

__ Medicine __ Writing __ Animals
__Astronomy __ Literature __ Nature/Environment
__ Languages __ Business __Other?:_____

5.) What kind of career do you see yourself having?

6.) Please indicate your level of interesting in the following activities: (1 = Not at All, 5 = Very Interested)

Activity	1	2	3	4	5
a. How interested are you in science?					
b. How interested are you in hands on scientific activities?					
c. How interested are you in the way that science impacts your daily life?					
d. How interested are you in science based classes?					
e. interested are you in having a science career?					

7.) Did you attend the *Ologism* performance? ____ Yes _____ No

8.) If you answered "yes" to Q7: would you be interested in attending future performances similar to this one? ____ Yes ___ No ___ Unsure

If no or unsure, please explain why: _____

9.) If you answered “yes” to Q7; on the scale of 1 (strongly disagree) to 5 (strongly agree) please place an X in the box to indicate to what extent you agree with the statement?

Question	1	2	3	4	5
a. I found this performance interesting					
b. I found this performance enjoyable and entertaining:					
c. This performance provided some value for the community:					
d. I found this performance educational, but fun:					
e. My attendance was rewarded:					

Appendix H: Survey (Pre- and post-performance) Rubric

Rank	1 Not Interested	2 Neutral	3 Slightly Interested	4 Interested	5 Very Interested
Enjoyment of Science	Indicates no enjoyment of science	Indicates little enjoyment of science	Indicates some enjoyment of science	Indicates moderate enjoyment of science	Indicates a lot of enjoyment
Personal Value of Science	Does not care how technology works	Little interest in how technology works	Considers how the technology works	Appreciates how technology works	Fully understands how technology works
Science-related activities	Does not attend any science-related activities	Attending 1-2 science-related activities	Attending 3-4 science-related activities	Attending 5-6 science-related activities	Attending 7+ science-related activities
Future-oriented Motivation to learn science	Has no plans to learn about anything science-related	Plans to learn about 1-3 science-related topics	Plans to learn about 4-6 science-related topics	Plans to learn about 7-8 science -related topics	Checked all boxes on the survey
Expectations for a science career at 30	Does not want a career	Does not want to pursue a career in science	Unsure of a career path	Wants to pursue a career that isn't directly science-related	Wants to be a scientist

Appendix I: Survey Attendee Scores

Case

Case Group Pre Performance

Indicator	Score
Survey Code	AS1068
Enjoyment of Science	5
Personal Value of Science	3
Science-related Activities	4
Future-oriented motivation to learn science	4
Expectations for a scientific career	4.5
Average	4
Interest Level	interested

Indicator	Score
Survey Code	AO0662
Enjoyment of Science	3
Personal Value of Science	3
Science-related Activities	3
Future-oriented motivation to learn science	3
Expectations for a scientific career	2.5
Average	2.9
Interest Level	neutral

Indicator	Score
Survey Code	EE0985
Enjoyment of Science	5
Personal Value of Science	5
Science-related Activities	4
Future-oriented motivation to learn science	5
Expectations for a scientific career	5
Average	4.8
Interest Level	interested

Case Post Performance

Indicator	Score
Survey Code	AS1068
Enjoyment of Science	5
Personal Value of Science	3
Science-related Activities	4.5
Future-oriented motivation to learn science	3
Expectations for a scientific career	4
Average	3.9
Interest Level	slightly interested

Indicator	Score
Survey Code	AO0662
Enjoyment of Science	4.5
Personal Value of Science	5
Science-related Activities	4
Future-oriented motivation to learn science	4.5
Expectations for a scientific career	3.5
Average	4.3
Interest Level	interested

Indicator	Score
Survey Code	EE0985
Enjoyment of Science	5
Personal Value of Science	5
Science-related Activities	4
Future-oriented motivation to learn science	5
Expectations for a scientific career	5
Average	4.8
Interest Level	interested

Indicator	Score	Indicator	Score
Survey Code	TU0632	Survey Code	TU0632
Enjoyment of Science	5	*Enjoyment of Science*	4.6
Personal Value of Science	5	*Personal Value of Science*	4.75
Science-related Activities	4.5	*Science-related Activities*	5
Future-oriented motivation to learn science	4	*Future-oriented motivation to learn science*	4.5
Expectations for a scientific career	5	*Expectations for a scientific career*	4
Average	4.7	Average	4.57
Interest Level	interested	Interest Level	interested
Indicator	Score	Indicator	Score
Survey Code	AE0306	Survey Code	AE0306
Enjoyment of Science	4	*Enjoyment of Science*	2.8
Personal Value of Science	4	*Personal Value of Science*	2.5
Science-related Activities	2.5	*Science-related Activities*	2
Future-oriented motivation to learn science	3.5	*Future-oriented motivation to learn science*	1
Expectations for a scientific career	4	*Expectations for a scientific career*	3.5
Average	3.6	Average	2.36
Interest Level	slightly interested	Interest Level	neutral
Indicator	Score	Indicator	Score
Survey Code	EO0834	Survey Code	EO0834
Enjoyment of Science	4.5	*Enjoyment of Science*	3
Personal Value of Science	3	*Personal Value of Science*	3.5
Science-related Activities	3	*Science-related Activities*	3
Future-oriented motivation to learn science	3.5	*Future-oriented motivation to learn science*	4
Expectations for a scientific career	1.5	*Expectations for a scientific career*	1.5
Average	3.1	Average	3
Interest Level	slightly interested	Interest Level	slightly interested

Control

Pre performance control group scores

Indicator	Score
Survey Code	he1167
Enjoyment of Science	4.5
Personal Value of Science	5
Science-related Activities	3.5
Future-oriented motivation to learn science	3
Expectations for a scientific career	4.5
Average	4.1
Interest Level	interested

Indicator	Score
Survey Code	ra0897
Enjoyment of Science	5
Personal Value of Science	5
Science-related Activities	3
Future-oriented motivation to learn science	3.5
Expectations for a scientific career	3
Average	3.9
Interest Level	slightly interested

Indicator	Score
Survey Code	AO0186
Enjoyment of Science	3
Personal Value of Science	4
Science-related Activities	2.5
Future-oriented motivation to learn science	3
Expectations for a scientific career	5
Average	3.5
Interest Level	slightly interested

Indicator	Score
Survey Code	ER0551
Enjoyment of Science	4.5
Personal Value of Science	4.5
Science-related Activities	3.5
Future-oriented motivation to learn science	2.5
Expectations for a scientific career	4.5
Average	3.9
Interest Level	slightly interested

Post Performance Score

Indicator	Score
Survey Code	HE1167
Enjoyment of Science	4
Personal Value of Science	4
Science-related Activities	3.5
Future-oriented motivation to learn science	3
Expectations for a scientific career	4.5
Average	3.8
Interest Level	slightly interested

Indicator	Score
Survey Code	ra08978
Enjoyment of Science	4
Personal Value of Science	4
Science-related Activities	3.5
Future-oriented motivation to learn science	3
Expectations for a scientific career	3.5
Average	3.6
Interest Level	slightly interested

Indicator	Score
Survey Code	AO0186
Enjoyment of Science	3.5
Personal Value of Science	3
Science-related Activities	2.5
Future-oriented motivation to learn science	2.5
Expectations for a scientific career	4.5
Average	3.2
Interest Level	slightly interested

Indicator	Score
Survey Code	ER0551
Enjoyment of Science	4
Personal Value of Science	3.5
Science-related Activities	3.5
Future-oriented motivation to learn science	3
Expectations for a scientific career	4.5
Average	3.7
Interest Level	slightly interested

Indicator	Score	Indicator	Score
Survey Code	AI0285	Survey Code	AI0285
Enjoyment of Science	3.5	*Enjoyment of Science*	3.5
Personal Value of Science	4	*Personal Value of Science*	3.5
Science-related Activities	3.5	*Science-related Activities*	3.5
Future-oriented motivation to learn science	4	*Future-oriented motivation to learn science*	4
Expectations for a scientific career	4	*Expectations for a scientific career*	4
Average	3.8	Average	3.7
Interest Level	slightly interested	Interest Level	slightly interested
Indicator	Score	Indicator	Score
Survey Code	EI1208	Survey Code	EI1208
Enjoyment of Science	5	*Enjoyment of Science*	4.5
Personal Value of Science	5	*Personal Value of Science*	4.5
Science-related Activities	3.5	*Science-related Activities*	3
Future-oriented motivation to learn science	3	*Future-oriented motivation to learn science*	3
Expectations for a scientific career	3	*Expectations for a scientific career*	3
Average	3.9	Average	3.6
Interest Level	slightly interested	Interest Level	slightly interested
Indicator	Score	Indicator	Score
Survey Code	Ia0125	Survey Code	IA0125
Enjoyment of Science	4.5	*Enjoyment of Science*	4
Personal Value of Science	4.5	*Personal Value of Science*	4.5
Science-related Activities	4	*Science-related Activities*	4
Future-oriented motivation to learn science	2.5	*Future-oriented motivation to learn science*	2.5
Expectations for a scientific career	4	*Expectations for a scientific career*	3.5
Average	3.9	Average	3.7
Interest Level	slightly interested	Interest Level	slightly interested
Indicator	Score	Indicator	Score
Survey Code	AR0216	Survey Code	AR0216
Enjoyment of Science	5	*Enjoyment of Science*	5
Personal Value of Science	5	*Personal Value of Science*	4.5
Science-related Activities	4.5	*Science-related Activities*	3.5
Future-oriented motivation to learn science	3	*Future-oriented motivation to learn science*	3
Expectations for a scientific career	5	*Expectations for a scientific career*	5
Average	4.5	Average	4.2
Interest Level	interested	Interest Level	interested

Indicator	Score	Indicator	Score
Survey Code	oo1003	Survey Code	OO1003
Enjoyment of Science	4.5	*Enjoyment of Science*	4
Personal Value of Science	4.5	*Personal Value of Science*	4
Science-related Activities	3	*Science-related Activities*	3.5
Future-oriented motivation to learn science	3.5	*Future-oriented motivation to learn science*	3.5
Expectations for a scientific career	3.5	*Expectations for a scientific career*	3.5
Average	3.8	Average	3.7
Interest Level	slightly interested	Interest Level	slightly interested

Indicator	Score	Indicator	Score
Survey Code	IA0826	Survey Code	IA1028
Enjoyment of Science	5	*Enjoyment of Science*	4
Personal Value of Science	5	*Personal Value of Science*	3.5
Science-related Activities	4.5	*Science-related Activities*	3
Future-oriented motivation to learn science	4.5	*Future-oriented motivation to learn science*	3.5
Expectations for a scientific career	4	*Expectations for a scientific career*	4.5
Average	4.6	Average	3.7
Interest Level	interested	Interest Level	slightly interested

Appendix J: Commentary Booth Rubric

Rank	1	2	3	4	5
Enjoyment of Science	Indicates no interest in science	Indicates little interest in science	Indicates some interest in science	Indicates moderate number of interest in science	Indicates a lot of interest
Personal Value of Science	Does not care how technology works	Little interest in how technology works	Considers how the technology works	Appreciates how technology works	Fully understands how technology works
Future-oriented Motivation to learn science	Has no plans to learn about anything science-related	Plans to learn about 1science-related topic	Plans to learn about 2 science-related topics	Plans to learn about 3 science-related topics	Plans to learn about 3+ science-related topics
Expectations for a science career at 30	Does not want a career	Does not want to pursue a career in science	Unsure of a career path	Wants to pursue a career that isn't directly science-related	Wants to be a scientist

Appendix K: Commentary Booth Intention Form

We are students from Worcester Polytechnic Institute (WPI) in Worcester, Massachusetts, USA. We are conducting a research project on behalf of the Commonwealth Scientific and Industrial Research Organisation (CSIRO) and the musical group of *Ologism*. From this project we are hoping to be able to determine if musical performances are an effective way to promote scientific interest. Based upon your experience at this performance can you please tell us if the performance has impacted your attitude towards science and why that is the case?

Your participation in this video commentary is completely voluntary and you may stop at any time. You will be kept completely confidential; none of your personal information or images will be included in the project report or publications.

Appendix L: Social Media Rubric

Rank	1	2	3	4	5
Enjoyment of Science	Expressed a strong dislike in the performance/ subject matter	Expressed a dislike in the performance/subject matter	Neutral	Expressed that they liked the performance /subject matter	Expressed excitement about the performance/subject matter and want to go again
Key Words	Hate, sucks, lame, stupid	unimpressed, boring, weird	Okay, alright, decent	Interesting, like, cool	Awesome, great, amazing, fun, love

Appendix M: Example Flyer

Appendix N: Website Contest Application

***OLOGISM* CONTEST**

STEP 1: Please answer the following questions.

Prompt: What chemical reactions can allow a brunette to become a bleached blonde?

Response 1:

Prompt 2: What DHA and what does it do for the human body?

Response 2:

Prompt: If an alternative life form visited the planet, how would you describe life on earth to them? (50 words or less)

Response 3:

NEXT >>>

(on next screen)

Step 2 Application:

Name First/Last: Age: Gender:

Address:

Occupation: Or Full-time Student: Yes No

If yes (student) what career do you want to pursue?

What keyword did *Ologism* give you at the 3 Feb 2013, performance?

-What were your thoughts about the performance?

How did you hear about *Ologism*?

***Official Contest Rules**:

1.) 1 entry per person.

2.) Do not plagiarise. Reference all works. Any entry found directly copied from a source will be disqualified.

3.) If you are under the age of 18, please be sure to have parental consent.

4.) You must have attended or watched the *Ologism* performance online to enter.

5.) The keyword must be correct to be qualified to enter to win a prize. Any incorrect access code will be disqualified.

Appendix O: Contest Rubric

Rank	1	2	3
Enjoyment of Science	Incorrect with no relation to the question	Incorrect but obvious efforts were made	correct
Personal Value of Science	Doesn't answer this part of the question	doesn't appreciate their cell phone more	Appreciates their cell phone more
Participates in science activity	Answered question, didn't attend concert	Answered question, attending concerted	X
Expectations for a scientific career	No response	Does not have or want a science-related career	Holds or wants a scientific career

Appendix P: Summative Team Assessment

We spent our time in Australia working on our Interactive Qualifying Project and learning how to work more effectively as a team, to work closely with an advisor and compose a professional document. We have learned that we can improve our future teamwork experiences by addressing any issues that arise from the project immediately and making sure that little details don't distract attention from the main goal.

We determined that having a daily schedule and individual and team tasks led to positive outcomes. To monitor our progress as a team we created a daily schedule that identified tasks that could be completed individually and tasks that required a team effort. We recognize that 8 hours of working consistently with a group is challenging therefore we assigned individual tasks for pre-lunch work and focused on team tasks in the afternoon. Individual tasks consisted of, but are not limited to, formulating graphs, contacting survey groups, analysing data and creating agendas for sponsor and advisor meetings. As a group we discussed feedback received from our sponsor and advisor and completed major editing. This process included time to identify our understanding of the comments and time to incorporate the comments in our report or address the comments in a cover memo. Once we discussed the comments we individually reflected on the comments and edited separate sections of the paper. Once each individual finished we collaboratively edited the paper to assure consistency.

We identified that communication with advisors and sponsors, through cover memos and meetings, was an essential part to our IQP and the professional world. We created cover memos for each major submission that addressed the comments made about the section, our understanding of the comments, any questions we had about the comments and how we incorporated the comments into our report. Meetings with our advisor and sponsor clarified project goals; therefore, we found it essential to have a plan for these meetings. Before the meeting we would decide what to discuss in order to gain the most effective feedback and have an agenda for ourselves. For example, we entered our sponsor meeting, on 19 February, 2013, with a completed conclusions and recommendations outline and asked our sponsor two specific questions: are our conclusions being presented effectively? And are there any other areas you wish for us to analyse?

To ensure that we work respectfully and effectively together we had open lines of communication. When one individual of the team does not agree with a statement, idea or part of the paper, all group members explained their idea and the whole team decided which direction to take. For example, during our first attempt at data analysis we could not agree on the best way to display the data. Ryan believed that we should display only proximity vs. score data because gender data would not be significant. Heidi believed that gender fell into the same category as proximity and that we should look for trends through both angles. After a five-minute discussion we were able to come to an agreement as a team that we should analyse both gender and proximity.

To improve our future teamwork experiences in group projects and real-world situations we can address any issues that arise immediately and make sure that little details do not distract attention from the main goal. Through the first seven weeks of our project (in ID 2050), our group did not effectively talk about frustrations. When we arrived in Australia we made a distinct effort to openly discuss any issue or frustration that arose so the group could function at its full potential. We feel that this can be further improved in our future to foster an atmosphere where all individuals are willing to contribute their ideas without the fear of being disregarded. While working through our project we found times where we focused our attention on detail that was not essential to our main objective. For example, we expressed concern that we couldn't make profound conclusions on interest in science. However, we realised that any steps moving towards new approaches for analysing interest in science would provide CSIRO with beneficial information.