THE ART AND SCIENCE OF ENGAGEMENT: A PCST 2018 ROUNDTABLE REVIEW ON SCIENCE COMMUNICATION THROUGH THE ARTS

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Abstract
This paper reviews a roundtable panel during the 15th Public Communication of Science and Technology (PCST) conference 2018 in Dunedin, New Zealand on geographically and methodologically diverse examples of the use of the arts to communicate science. It provides recommendations for art-based science communication projects with a focus on epistemic practices, science journalism, science filmmaking, science festivals and spectacles.

Introduction

Despite society's increasing dependence upon, and increasing need for scientific solutions to global and local challenges, the diffusion, understanding, and use of science in society remains an area that is daunting. Use of the arts can be a powerful strategy to effectively communicate the understanding and use of scientific information in ways that can appeal to people who may not naturally gravitate to science events, and thus potentially both spark interest and engagement with science as well as potentially increase science informed-decision making (Lesen, Rogan & Blum, 2016; Friedman, 2013) Unlike science, the arts traditionally have been regarded as emotional in character, and people engage with it "in order to take a ride on the wings that art forms provide: the arts are ways to get a natural high" (Eisner, 2008, p.3). This occurs largely through our sensory responses to the way images and sounds are arranged. Research demonstrates that involvement in the arts can positively influence brain performance, improve learning outcomes and enhance intrinsic motivation (Franklin, Fernandez, Mosby & Fernando, 2004). The arts engage audiences physically, intellectually, and emotionally. Increasingly, science communicators around the world are using an art-based approach to science communication through mediums such as theatre, music, parody, comics, filmmaking, photography, poetry, and storytelling to engage diverse audiences.

We participated in a roundtable panel during the 15th Public Communication of Science and Technology (PCST) conference 2018 in Dunedin, New Zealand on geographically and methodologically diverse examples of the use of the arts to successfully communicate science. This conference review summarises our projects and key findings to provide recommendations for art-based science communication projects with a particular focus on epistemic practices, science journalism, science filmmaking, science festivals and spectacles. Currently, no dedicated interest group for science engagement through the arts exists within the PCST network. We intend to develop further interest in such a group by addressing both theoretical and practical contributions of the arts to science communication, with the goal of establishing a PCST interest group as a new and unique development in the history of the organisation.

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The Art of Engagement

Wolfgang Goede presented his work on science journalism as a means for communicating complex topics using narrative. Here, science journalism serves to explain research and scientific results from various perspectives and stakeholder perceptions and provide a critical assessment. For Goede, the primary role of science journalism lies in the debate of the advantages and disadvantages of science and its effects on citizens, taxpayers, consumers, the society as a whole and to shed light into conflicts of these groups. In his own work he developed "fictional science journalism" where Goede utilizes the tools of science journalism and applies them to fiction which resulted in a book called *Alpha Deus*. The book deals with the promises and risks of artificial intelligence and its ethical standards on the grounds of the Colombian civil war and peace finding missions.In these two terms, the technology and how it is embedded into society, it is authentic and real as it can be. In its plot and interpolations, it is artistic. Hybrids of this kind could help to provide science journalists with new perspectives of professional development. "Alpha Deus"* is experimental and so far only exists in German. However, to Goede his project is an adaptation to a changing science journalism mediasphere and the importance for developing more innovative cross-genres to adapt to a changing science-journalims market. Here, it is important that art-based science communicators can adapt (and re-invent themselves) in an ever-changing and largely self-mediated science media-sphere based on audience demands and needs.

Wiebke Finkler discussed the storytelling qualities of films as a vehicle for science communication through the visual arts. Her work on video-based science communication for sustainable whale watching draws on documentary filmaking, TV commercials and viral videos to identify key elements and conceptual frameworks for more effective science communication videos (Finkler, 2017). She has a special interest in how video, when combined with strategic social science-based research can be used as a tool for change and social impact for science communication. Drawing on marketing communication, elements of documentary filmmaking, TV commercials and viral videos she has developed a science communication video-format and model to improve sustainable management of whale watching and increase public awareness about responsible practices. Finkler argued for the development of a visual rhetoric for science communication to develop more effective film-based science communication techniques and strategies founded on rigorous audience-specific testing and evaluation of video-strategies. She described the power of visuals to send audience along emotive pathways, which makes filmmaking so valuable to science communicatio. Here, a visual rhetoric approach to science communication involves storytelling through elements of applied media aesthetic, shot framing and composition, camera position and camera movement, lighting, soundscape design and music. Finkler argued for increased participatory approaches to science video content production to promote role models and social diffusion (for example, in many contexts stakeholders representing the actual targt audience as interviewees and messengers can have more impact than using scientists).

Edward Duca, University of Malta, outlined his research on science engagement through art festivals and events. Duca outlined the process that went into developing artwork for his project *Light Pushes Stuff* which focuses on quantum mechanics and a phenomenon called radiation pressure where lights exhorts a physical force on the objects it hits. The

phenomenon has sparked concepts like solar sails in space to fuel trans galactic journeys, but back on Earth it's being used to create computers that use light instead of electricity. His research focused on how to convey such an abstract idea to a large audience. The artwork (https://vimeo.com/238043141) took more than two years of planning. By collaborating with Dr Andre Xuereb (University of Malta), a successful Public Engagement Work Package was designed for the Hybrid Optomechanical Technologies (HOT), which was successfully funded by the EU. This lead to employment of a science communicator to manage the artwork, who worked with the artists known as Late Interactive to attract national funding from the Malta Arts Fund. Coupled with support from the festival Science in the City Malta, where the artwork was first produced for, the interactive light installation (together with a cartoon video and tablet game around the scientific concept) was exhibited to thousands of Maltese citizens for European Researchers Night. Duca highlighted key lessons learnt from over seven years' experience on how to manage large scale science and arts projects, including the importance of long-term planning, that acquiring large funding requires time commitment and strategy (considering that developing an abstract scientific or artistic concept and experiment takes time) including several iterations for successful development.

Bronwyn Bevan presented a current study of the epistemic connections between science and art. Science and art are often integrated in instrumental ways: Adding a dash of paint to hands-on science activities, or briefly explaining a scientific concept that has inspired a dance performance. Across six studies conducted in three countries (US, UK, Ireland), this research explores the epistemic practices—how knowledge is built—in integrated art and science programs. They share practices of deep noticing, experimentation, and the development of representations and models. But science has different, often field-specific, standards for what counts as usable knowledge. And art brings a critical historicity to its representations of knowledge that, while part of peer review, remains, in science, largely invisible to the public. The study conjectures that integrating evidence-based epistemics of the sciences with critical historicity of the arts can more deeply engage young people who otherwise may not identify with science by allowing them to engage with evidence with a critical, personal, and even socio-political stance.

Recommendations

The roundtable identified shared recommendations for art-based science communication projects. It is imperative to identify actual target audiences (their needs, attitudes and motivations), and to consider the platforms (festivals, conferences, online). Strategic science communication has to understand how to create artworks that conveys both the values, emotions and needs of the audience while staying true to the underlying scientific concepts. Successful projects require a multi-disciplinary team including scientists, artist/s, mediator/production manager/science communicator, and other relevant support (e.g. legal, financial, logistics, and creative). Bottom-up participatory approaches to art-based science communication are important and can lead to increased engagement through value co-creation processes. To help develop projects multiple stages are required. Here, a design thinking process is valuable to adopt and incorporate in engagement platform where interdisciplinary activities are fed new information which is coalesced into more singular outcomes over multiple rounds. Projects require monitoring and evaluation. Additionally, the objectives of the project need to be clear from the onset including an evaluation package to

identify if objectives are actually met. Without a good evaluation strategy a project's success is difficult to ascertain. Here, evaluation can only be as good as the concepts and rationale underlying the actual research design. Finally, it is imperative to make art-based science engagement projects and creative outcomes 'legal' by clarifying intellectaul property rights, and signing contracts to identify how the project should be communicated and what acknowledgements are needed. Financial obligations, and project outcome obligations should be clearly outlined to manage the expectations of all involved. We hope to continue further development of an interest group and future collabroative projects within the PCST betwork and beyond.

References

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Panelists Bio

Dr Wiebke Finkler is a science communicator and filmmaker based at the University of Otago, who has worked on a variety of video-based science communication projects including climate change, sustainability, risk and health communication. Wolfgang Goede is an international science journalist based in Munich, Germany, and Medellín, Colombia. He is board member of German Science Writers and the World Federation of Science Journalists, and a member of the International Science Writers Association (ISWA). Dr Edward Duca is a Science and Innovation Communication Lecturer at the University of Malta, the Editor-in-Chief of the research magazine Think, runs the science communication STEAM Summer School, involved in several large EU funded projects, and has created and managed several science communication events through the Malta Chamber of Scientists. Bronwyn Bevan is a senior research scientist at the University of Washington where she studies learning in out of school contexts. She is on the editorial board of the journal Science Education.