Effective science communication: Key factors and considerations

In the age where essentially all information, knowledge, opinions, half-truths and lies are available on demand, boundaries blurred and indistinct in the black box of data; getting a pertinent message across to the public poses a difficult task. This complex world for science communication is set amongst a backdrop of mass media, funding bodies, institutional and individual reputation. Despite this public interest in science remains high, with more than half of people in the UK feeling that they are not subjected to enough scientific information.1 In order to maintain this desire to learn more about science and to satisfy the interest of the public, appraisal of the key factors and considerations in partaking effective science communication is vital. In doing so, this will ensure that a new generation of science communicators may adapt appropriately to engage their audiences providing a multitude of benefits for scientist and public alike. This essay will discuss science communication broadly but with a particular focus on the following themes: audience, evaluation, medium and topic.

Before undertaking any science communication task, an audience will either be selected or assigned. Once this has occurred the demographics can be looked at to help pitch science at an appropriate level which both attracts interest and is able to be understood by the audience. Age, social background, current understanding and interest in the topic are important considerations.2 If the discussion is too complex, the audience may lose interest as they are unable to follow. Equally, they may lose interest if the information they are given feels basic or is reiterating pre-existing knowledge.

Whilst undertaking my science communication task, I noticed the audience was relatively homogenous, as they were all studying the same curriculum at school. Yet there was obvious variation in general background knowledge, attention span and interest. To overcome this, the presenter offered opportunities for the children to ask for help in doing tasks, giving further explanation as needed, as well as taking regular breaks and utilising different teaching styles to maintain enthusiasm and interest. I was particularly struck by the difference in interest in allowing the children to see their own DNA on gel electrophoresis, as opposed to one pre-prepared or on a screen. Not only did this further engage them in their curriculum it allowed them to ‘see’ science and hopefully create a memorable moment encouraging them to further explore science. This programme had a limited number of participants partly due to the expense and availability of equipment, however it was repeated throughout the year. The ability to scale to a different audience size, or to facilitate the presentation to take place in a different physical setting, allows for a greater audience potential, although it does limit the equipment that can be used. Choosing props, models, displays and computer-based presentations, which are mobile and require little set up, can help alleviate this as well as cater to a variety of learning styles.

Science communicators, and the projects they run, can be funded by a variety of sources. Many are employed by media to publish articles, videos or segments. Others work for higher education institutions and charities to provide a direct link between researchers and the public. Less formal science communication occurs when academics give inaugural lectures or offer open days to the general public, although without formal training the quality of such events can vary significantly. Whilst the frequency of such events used to be low, due to the Wolfendale committee recognising the importance of effective science communication-and subsequently research councils putting clauses into funding packages stipulating public engagement must be undertaken- it is now increasing.3 It is hoped that this will have a long term impact by increasing public engagement and dialogue with scientists. Currently most funding has been shown to be for ‘educating the public’ style engagement, lacking in dialogue.4 Effectiveness of science communication, through direct feedback from participants, is essential for securing funding and ensuring the presentation is as effective and engaging as possible. The use of both qualitative and quantitative data can be used to this effect, with both providing valuable information.

Distance methods of science communication, such as those done through mass or social media, do not involve direct dialogue between science communicators and their audience. Though this increases the potential audience size, it poses a problem in ascertaining who the audience is. Focus groups and feedback on previous presentations can be used to help mitigate this, although it can prove time consuming and expensive. Science blogs, categorised by producing a minimum of 50% scientific content, are an example of an accessible online medium with a large audience.5 However, these resources are generally utilised by older, wealthy and English speaking individuals, suggesting more needs to be done to widen appeal to low participation groups.6 Website design has been shown to increase engagement and enhances the reader’s ability to retain understand and interpret the information given.7 Increased exposure of blogs and videos on platforms typically used by younger audiences, such as social media, could further increase their appeal and impact.

When it is up to the presenter to decide what medium to engage an audience with they must consider their own personal presentation style, the availability of props and technology and how in depth they are planning on communicating the science. Failure to choose the correct medium may result in the audience misinterpreting the science or losing interest in the topic. For example, power point presentations are more appropriate for shorter time periods which require in depth science communication whereas day long science fairs will most likely rely on interactive props and models accompanied by text. The presenter’s style of engagement will also vary when interacting with different audiences and topics. For young children learning basic biology their pitch and tone will be different compared to communicating the same science to older children and adults.

Gatekeeping theory, broadly defined as how many billions of messages that are available in the world get cut down and transformed into the hundreds that reach a person each day, has been applied to topic choice in communicating science.8 It found that the communicator’s personal interest, being a neutral provider at the individual level, the potential impact and public appetite for their work, are all important factors for them in deciding a topic. To avoid controversy presenting topics, the presenter needs to understand the potential viewpoints which may be encountered and approach topics in a broad and balanced manner, offering an unbiased perspective and avoiding particularly emotive language.9 If the science communicator fails to remain unbiased it has the potential to mislead the audience and poses moral issues as those who are unfamiliar with the topic may assume the accuracy of the information given. However, apprehension that science communicators experience in presenting these topics may cause them to exaggerate the response from the audience. It has been shown that science communicators may over-estimated the negative reaction received from audiences and so clear and accurate terminology should be upheld.9Examples of topics which have the potential to cause controversy include embryonic stem cell use or animal testing and as such these topics should be handled with caution. Niches audiences, such as suffers of conditions which are being discussed, can also prove a challenging task.

Overall the key factors and considerations for effective science communication involve: identifying and engaging the audience effectively- by pitching at the right level and utilizing different teaching styles; evaluating effectively- to ensure presentations are engaging and informing as well as allowing auditing by backers; effective medium choice - to ensure that the topic is communicated as effectively as possible to the correct depth; and thought out topic choice- to ensure that the science communicated is done so effectively and appropriately whilst minimising the potential to cause controversy. Through my engagement in the science communication task I saw all of these factors in effective use. It was clear that the topic choice was highly relevant to the audience and it was presented using a wide variety of methods to cater to different learning styles. The effective use of props in particular, in the form of interactive DNA segments which helped student’s visualise science, allowed them to interact with, and learn off, each other. It was clear that this effective choice of medium further engaged the audience and facilitated the learning of science through there wholehearted uptake in the exercise. The session had been run many times before and it was clear that it had been highly refined from the effective use of feedback, gained through evaluation. The fact that everything ran so smoothly definitely increased the audiences overall impression of the event, and in my opinion its effectiveness and audience perceived trustworthiness. Whilst I found presenting the slides daunting I thoroughly enjoyed the experience and in the future I hope to be calmer by using some of the techniques developed in the interactive seminars. I feel that I participated well in the task as I engaged freely with the students to explain the science to them. In doing so I demonstrated knowledge of the subject, tailored my language used to the student’s level, and offered to demonstrate tasks, all of which helped improve the student’s experience. Going forward, I wish to further increase my science communication skills by exposing myself more to the subject and undertaking more hands on experience.

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