

Making Your Region the Heart of the Universe: Regional Engagement Through an Astronomy Exhibition

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This article focuses on how exhibitions can be developed to help tackle regional disengagement in space sciences, and more broadly in STEM, using the Life Science Centre's *Space Zone* as a case study. We will describe techniques for creating an exhibition experience that responds to regional challenges and fosters active engagement, analyse preliminary results of a small study and discuss feedback on the exhibition.

Introduction

At the core of the diverse science communication and outreach community is our shared mission: to inspire people to engage with STEM (science, technology, engineering and mathematics), to ignite curiosity for the world around us, and to encourage a sense of inquisitive questioning. Rather than catering only for people who already show an interest in science, Life Science Centre aims to appeal to and engage with all members of our community, North East England, including those who may be more challenging to reach or who are not yet engaged in STEM.

This article describes the development process and design techniques used for the Life Science Centre's *Space Zone* to encourage engagement in space science, and more broadly in STEM, with disengaged visitors by putting the local community at the heart of the exhibition.

Life Science Centre's *Space Zone* opened to the public in 2019 and was inaugurated in 2020 by Dr Helen Sharman. It covers 750sqm and hosts 58 exhibits, taking the visitor on a journey into outer space from the heart of Newcastle-upon-Tyne, North East England. The North East is one of the most challenged regions in England in terms of material poverty and youth career aspiration. The exhibition aims to overcome these challenges and contribute to our visitors' science capital (Archer et

al., 2015) through space science, a popular topic in the community (Figure 1).

We will first describe techniques to design an inclusive, engaging, and empowering exhibition for local visitors. This includes theoretical and academic underpinnings of the work and also describes how *Space Zone* puts this into practice. We will then analyse a small sample of qualitative visitor feedback about the exhibition to understand its success and limitations of

the results and key lessons learnt during the exhibition development process.

Background

Previous and ongoing studies help describe how socioeconomic, familial, and individual situations can predict a person's likelihood of engaging in STEM (Grossman & Porche, 2014). However, the science capital model has been shown to be more effective in understanding how



Figure 1. Entrance to Space Zone. Credit: The author

STEM engagement is ignited, shaped and maintained. Archer *et al.* (2015) wrote:

The concept of science capital can be imagined like a ... bag, containing all the science-related knowledge, attitudes, experiences and resources that you acquire through life. It includes what science you know, how you think about science (your attitudes and dispositions), who you know (e.g., if your parents are very interested in science) and what sort of everyday engagement you have with science. (p.2)

While personal science capital cannot, for now, be accurately quantified, the science capital framework allows us to conceptualise effective approaches to science engagement activities. That is, not only communicating science facts, but also working towards impacting attitudes and access to resources. For people with lower science capital, encouraging STEM engagement through this holistic approach in publicly accessible locations, such as science centres, is thought to contribute to broadening access and equity in science participation and pathways (Martin *et al.*, 2016). In the context of exhibition development, this can involve being mindful of factors such as the inclusiveness of set design and role models, management of power structures presented through content and the curated presentation of the culture of science.

Life Science Centre (hereafter, "Life") in Newcastle-upon-Tyne, North East England, is committed to a mission of inspiring everyone in the region to explore and enjoy science and to discover its relevance to their own lives. Rather than only focusing on educating, we aim to contribute to the science capital of our target audience – young people from 6-18 years old – by creating experiences that are inclusive and empowering. As Life has a remit to serve the local community, it is essential to understand the region's specific challenges.

The population of North East England, where Newcastle-upon-Tyne is the largest city, faces many challenges. Poverty is the biggest challenge to the region, inhibiting action on other societal challenges. The North East is amongst the most deprived parts of the UK: there are 500,000 people living in poverty in the

North East and, compared to the England average, Newcastle has more lone parent households, more low-income families, more children eligible for free school meals and more children with disabilities (Office for National Statistics, 2017). Among the multiple causes of poverty are low wages, insecure jobs, and unemployment (Public Health England, 2018).

The community, however, is not homogeneous. Comparing the poorest and wealthiest wards in Newcastle, there is a 10- and 12-year difference in life expectancy for men and women, respectively (Public Health England, 2018). This example captures the scale of inequality present in our community. However, it is not systemic barriers alone that deter the most deprived communities visiting Life Science Centre. The two most deprived areas of the region, Byker and Walker, are both situated within 5km of the Science Centre and are well connected by public transport routes. Societal and attitudinal barriers around science and culture have a much weightier influence on people's interests, access and aspiration. A report by City and Guilds (2016) found that young people in our region were the least confident in the country about their futures and that 42% do not expect to hold down regular employment. The Children's Commissioner found that young people growing up in the North East were concerned about their future and were unlikely to aspire to careers in STEM (Children's Commissioner, 2018). This was attributed to a concern about the lack of opportunities for the future and the notion that it would be more challenging to succeed in the North of England than in more affluent areas.

The Children's Commissioner (2018) report also pointed to career aspirations for young people as tending to be informed by friends and family rather than any knowledge of sectors of employment specifically available in the North. Most young people indicated that they had aspirations for blue-collar jobs and did not identify that broader careers were a viable choice: STEM careers, in particular, did not feature highly. The report suggested that this may be because these roles and professional fields fall outside of their immediate experience. Several young people specified that they were unconvinced that senior scientific careers would be

available in their city and that they could not achieve a career in science locally. Gender bias also played a role, as young women in particular identified with gender-stereotypical career options such as caring professions (e.g., teaching, nursing, and beauty), indicating that defined roles in the North were impacting young people's perceptions and aspirations of STEM.

Despite the difficulties faced, most of the young people surveyed stated that they enjoyed living in the North, were proud of their Northern heritage, and felt a strong sense of home and regional belonging (Children's Commissioner, 2018). The North East region is well known across the country as a tight-knit community, brimming with local "geordie" pride (Drape-Comyn, 2019). Life's Space Zone was developed within the framework of science capital to draw on this regional pride while remaining sensitive to specific challenges faced by the region. The exhibition is organised in four immersive spaces: space technology on Earth, Mission Control, the International Space Station and our Solar System. Each zone looks at content through the prism of fulfilling jobs and local people who do them.

Framing the Local Community as the Heart of the Universe

Given Life's commitment to serving the region, it was essential to make sure the exhibition themes were of interest to the local community. Space science, as a theme, was chosen following an internal survey of our visitors, which indicated that space (as well as animals and dinosaurs) was a popular topic. The current interest would be used as a hook to spark curiosity in the exhibition and encourage visits. The challenge was to maintain engagement throughout the visit, in particular for those who were distanced from STEM, and to empower visitors by framing the local community as central to the field of space.

Essential considerations for engaging science exhibitions are often grouped into three categories: narration, participation, and interaction with others (Hayward & Cairns, 2006). The development of Space Zone aimed to make use of this understanding in order to create a meaningful narrative, design participative and interactive experiences, accommodate



Figure 2. School children looking at the case study of Dr Ramin Lolachi, NASA planetary scientist from Consett, North East England. Credit: The author



Figure 3. Children using the interactive digital exhibits in Space Zone's mock-up Mission Control. Credit: The author

different learning styles, and, in keeping with the times, create spots for photos and selfies.

The exhibition narrative is key to visitor engagement as it frames the content and the interactions with exhibits, texts, graphics, and other visitors. Other science centres and museums have created successful and engaging space exhibitions by putting the visitor at the centre of exhibition narratives. For example, *Made in Space* at the Tycho Brahe Planetarium in Copenhagen frames their exhibition narrative around the fundamental question “where do we come from?”, using this as a way of talking about the origins and composition of the Universe (Nicolaisen et al., 2021).

Despite the demonstrated interest in space sciences, we worried that our local visitors might not feel represented in an exhibition aimed at the “universal self.” We wanted to create an experience that celebrated North East England more explicitly and its current, tangible achievements. *Space Zone's* narrative, hence, was framed, not simply around the individual, but the individual from North East England. Creating such a narrative drew on the sense of regional pride felt by our local visitors in the hope of evoking emotions of inclusion, investment and aspiration. *Space Zone's* narrative is captured in the exhibition's introduction text, displayed at the gallery's entrance:

Here in the North East, stargazers love our famous dark skies. But did you know that the world relies on our dazzling space tech and engineering too?

Explore our world-class space industry in the Space Zone. Find out about the people on a mission to tackle problems, answer questions and make life better.

Your journey into space starts here. (Life Science Centre, 2018)

Like all *Space Zone's* exhibition text, this text refers to local places and landmarks as “our” in a bid to include the visitor in the narrative, putting them in an active role rather than a passive one. Further, *Space Zone's* exhibits are inspired by contemporary science at local universities, and the case studies spotlight local researchers, experts, businesses and universities. In addition, the exhibition's voiceovers, films, and audio clips were all created with the community's help to highlight the highly recognisable local accent (Figure 2).

This is motivated by a desire to include, not alienate, our visitors, and avoid psychological disengagement, whereby visitors mentally retreat from the experience of differential treatment based on group membership (Major & Schmader, 1998), or do not feel part of the in-group (Tougas & Beaton, 2008). It has been suggested that psychological disengagement can be a defence mechanism when

individuals dissociate themselves from situations in which they feel undervalued or underrepresented (Beaton et al., 2014).

Similarly, this is the fundamental basis for the representation of genders and ethnic origins in the examples chosen for the exhibition, even though space science and the space industry do not yet reflect societal diversity (Pold & Ivie, 2018). By offering a different narrative to the current perceived attitudes about space science (that meaningful careers in the space industry can only be achieved in Paris or Houston) and providing positive role models, we hoped to build confidence, aspiration, and pride in our visitors. Equally, the case studies and stories of local space scientists and experts added a more human and approachable aspect to the field, making it feel accessible.

Further, many of *Space Zone's* exhibits were designed to highlight the space science that visitors already engage in, though perhaps unknowingly. Opening the exhibition with technology, such as GPS, and techniques, such as trial and error, that visitors use in their everyday lives, makes a subject of astronomical proportions feel more within reach and attainable. This approach builds on the idea that exhibitions have greater levels of and longer-lasting engagement when they showcase the relevance of science in everyday life (Martin et al., 2016) and is supported by the idea that everyday engagement in STEM is a recognised

element of science capital (DeWitt et al., 2014).

Co-creation for Regional Relevance

In order to ensure that our design and development would indeed result in positive engagement and regional representation, *Space Zone* was created with the guidance of an advisory board of local academics and entrepreneurs. As well as assisting with fact-checking and steering, the advisory board helped us find examples of excellence in the region to spotlight in the exhibition. These interactions were also the beginning of long-lasting partnerships with local businesses and universities.

As well as experts in the field, Life also reached out to current visitors for feedback during the development process to ensure the exhibition would be relevant and engaging. In particular, the surveys and focus groups asked for visitor opinions on content, text type, and exhibition look and feel. As a direct result of these surveys, we developed *Space Zone*'s two intimate, immersive spaces, which were not part of the initial brief: Mission Control and International Space Station.

Results and Limitations

Floor staff and exhibition explainers have anecdotally reported that *Space Zone* is very well received by visitors and school groups. Visitors to the exhibition are observed interacting enthusiastically with hands-on exhibits and taking the time to read or listen to local case studies. Some have been observed expressing delight at discovering that case studies and scientists live or work very close to their neighbourhood.

Formal visitor research is essential to evaluate the success of the techniques described above and their impact on visitors. Exit surveys and interviews were prepared to understand visitor perceptions, takeaways and learning. Unfortunately, due to Covid-19, no quantitative work or summative evaluation has yet been carried out on *Space Zone*.

Before the temporary closure of Life Science Centre, we were able to complete three semi-structured, in-depth interviews

with one headteacher (male), one local woman, and one mother accompanying two children under the age of 10. The interviewees were approached as they were about to leave the exhibition, and the interviewer took notes but did not record the interactions. Overall, the three people interviewed enjoyed their visit, thought that the content was interesting and educational, and appreciated the exhibition's local flavour. Some relevant comments include:

Interview 1: Local woman

- Surprised and pleased to discover the variety and number of space-related activities and opportunities in North East England.
- Happy to see people "like me" represented in the case studies of local space experts.
- Learned some unexpected facts about space.

Interview 2: Mother (with two children)

- Happy that there were opportunities in North East England for her children (and commented that this was not the case when she was young).
- Surprised at the variety of space applications currently in use on Earth.
- Felt the content was at a "good level" and could be understood by family groups.

Interview 3: Headteacher

- Especially positive about the exhibition's local connection, felt this was a powerful message for his pupils.
- Felt the case studies would provide positive role models for his pupils.
- Appreciated the exhibition's future-focused approach and felt it would inspire his pupils to aspire to future STEM roles.
- Especially liked that his pupils could see and try out STEM skills. He commented that many young people do not actually know what a scientist does and that it was important for them to see that "it is not all about white coats."

While being homogeneously positive, these interviews only represent a small sample of the 300,000 visitors that come through the doors at the Life Science Centre every year. A quantitative study with greater sample size is required to truly understand the impact of *Space Zone*.

Discussion

No single exhibition can change the world. However, our visitor feedback shows the potential for impact on our visitors' science capital through the four elements identified by the framework: knowledge of science, attitudes towards science, people in your network, and everyday engagement in science (DeWitt et al., 2014).

While the above results only represent three types of visitors and cannot be thought of as representing all of our visitors or the overall success of the exhibition, they do show that our aims have not gone unnoticed. All the visitors interviewed, as well as the groups they were accompanying, shared positive feedback. They had not disengaged during their visit, neither because of lack of interest nor because they felt excluded or unrepresented. This is precisely the type of effect we hoped to create, as it indicates that mindful exhibition development can positively impact visitor attitudes of science. These types of interactions may equally contribute to visitors' science capital by showing visitors that scientists are, in fact, part of their network (in this case, their community), something the *Children's Commission (2018)* report thought young people might be lacking. We hope that humanising scientists in this way will help to change the attitudes of visitors who believe that science is "not for them." Though this will require further evaluation, the headteacher's comments regarding trying out STEM skills and seeing "what scientists actually do" provides optimism that this might be the case.

Our results, though limited, also indicate that visitors have identified the core of the exhibition's narrative and its focus on North East England's contribution to space science and the space industry. The interviewees' comments show that they left the exhibition with a greater understanding of the region's rich breadth of opportunities.

We must note here the important caveat that, with the exception of school groups, many visitors to science centres and museums already have a certain level of cultural confidence and cultural capital (Wildhagen, 2010). However, we hope that by adding an inclusive and relevant exhibition to the cultural landscape, we contribute to changing people's attitudes to science centres and STEM.

Conclusion

This article looked at how space science could be presented in an exhibition setting to empower visitors to overcome challenges to aspirations and STEM engagement. This was achieved by responding to existing research about the community, using the science capital framework for guidance and involving the local community in reflection and decision making.

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Biography

Sarah de Launey is an exhibition developer at Life Science Centre. She is also a Pint of Science Festival coordinator and the president of La Fiole, a Paris-based association for art-science and game-science collaborations.