

Evaluating the Motivations and Expectations of those Attending a Public Astronomy Event

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Summary

The focus on a one-way flow of information from scientists to members of the public has been criticised for presuming public ignorance and offering few opportunities for interaction and debate. In response to these criticisms, recent approaches have promoted dialogue, participation and engagement between scientists and members of the public.

However, it is not known to what extent members of the public prefer newer dialogic approaches to those with educational content. What do they value in a science outreach event? To explore this issue further, I investigated nine weekly public open evenings at the Institute of Astronomy at the University of Cambridge, UK. In this article I will describe the main features of these public events, outline my approach in exploring the participants' motivation to engage with astronomy, and detail my research findings.

Introduction

Until recently, what is now referred to as the “deficit model” has dominated thinking in relation to the way that scientists communicate with the wider population (Einseidel, 2007; Irwin & Wynne, 1996). The deficit model has been described as the assumption of “public ignorance” in matters of science and technology, and efforts by the scientific community have tended to focus on educating members of the public. Such an approach has also been described as “first-order” thinking. However, over the past 15–20 years, there have been calls to shift the emphasis towards “second-order” thinking, which supports a dialogic approach (Irwin, 2008). This approach promotes engagement with members of the public and other stakeholders as active participants alongside scientists.

It is therefore important to explore how science communication events are changing, and to what extent those who attend these events really want this change. In other words, what do members of the public who attend public events really value? To what extent do they desire educational or dialogic approaches to science engagement?

In order to explore this issue further, quantitative and qualitative data were collected

about a series of nine open evenings, held on a weekly basis, at the Institute of Astronomy (IoA) at the University of Cambridge.

General observations

The open evenings were held during the autumn and winter months. About 150–200 people attended each of these evenings, regardless of the weather¹. Each event typically consisted of a lecture given by a member of the research staff or a postgraduate student, followed by a Q&A session.

The lectures were on a variety of topics and intended to appeal to non-astronomers, although some lectures contained quite a lot of technical information. Some were marketed as child-friendly events and were labelled as such on the programme of lectures on the IoA website.

On clear evenings, the audience were led outside for an observing session led by members of the local astronomy group, Cambridge Astronomical Association (CAA), in which images from the group's telescopes were projected onto a large screen. The historical telescopes at the IoA were also opened up, and particular items of interest could be observed. Sometimes,

members of the IoA were on hand with binoculars and laser pointers to show objects of interest.

On cloudy evenings, the IoA staff invited the audience to stay for informal discussions with IoA staff over tea and biscuits. Not everyone stayed for this, but it offered an opportunity for those with a particular question to talk to an astronomer on a one-on-one basis.

Quantitative data: Who attends and why?

In order to get an idea of the demographic of the open evening audience, a one-page quantitative questionnaire was handed out to attendees upon arrival at the IoA. This contained questions relating to age, sex, level of general education, level of science education, distance travelled to the event and key motivational factors for their attendance. In total, there were 254 responses over the nine evenings. Those who had already filled in a questionnaire were asked not to complete any more on later visits.

The data showed a diverse range of ages for the attendees, with a higher ratio of males to females (a ratio of approximately 2:1).



Figure 1. On clear nights, members of the Cambridge Astronomical Association (CAA) deliver a short outdoor presentation of objects that are currently visible in the night sky. Credit: Alex Calverley

The latter feature is not surprising, since astronomy has been traditionally male-dominated both in academia and within amateur astronomy societies.

The majority of those who attended were local (from within the city of Cambridge) yet a large proportion (nearly 18%) had travelled over 30 kilometres. The overwhelming majority of those attending did so with others: only 15% attended alone. This may demonstrate that, like many science communication events, the open evenings are social activities. Interestingly, 48% of those questioned had attended the open evenings before (a group of “regulars” were easily spotted after observing a few of the open evenings).

It is worth noting that the attendees were well educated, with approximately 68% of all respondents having a university qualification. This is perhaps not surprising, as the city of Cambridge has a higher than average percentage of the population with an undergraduate degree or equivalent (41% versus 20% nationally). However, it does illustrate some of the challenges in engaging with citizens who have not studied academic subjects at degree level, or who decide not to study science subjects beyond the age of 16.

Furthermore, only about half of those with a degree were qualified in a scientific subject, suggesting that this event was as appealing to those with a background in subjects other than the sciences.

When asked why they attended the event, approximately a third of respondents stated that it was due to a general curiosity about astronomy. Nearly 20% stated that they wanted to look through the telescopes, and 16% stated that the subject of that evening’s lecture was one of the main draws. This could be interpreted as a desire on the part of the audiences to learn more about the scientific subject and to receive information from specialists in this field. To explore this issue in more detail, the opinions of members of the audience were explored.

Opinion research

In addition to gaining an understanding of the audience demographics, the audience reaction to this event was explored. A second questionnaire containing six open-ended questions was distributed using the SurveyMonkey online research tool. The attendees were asked:

1. What aspects of the evening were most/least rewarding for you and why?
2. What was it about this event that attracted you to come, and in what ways has it stimulated your interest in astronomy?
3. Some scientific events are educational with the scientists teaching and you learning. Other events focus on a two-way dialogue between scientists and “the public”. After attending this event, do you think it would be valuable to have a dialogue about astronomy — and if so, how would you like that to happen?

4. What do you consider to be a “science communication” event or place, and what makes you want to (or not want to) be a part of them?
5. Do you think that factors such as age, sex, or level of education influence how an audience responds to a science communication event, and in what way?
6. Please use the space below to add any more comments or thoughts.

The organisers of the open evenings agreed to place a link to this questionnaire on the IoA website, and it was advertised before the beginning of several lectures. In total, 33 attendees completed this questionnaire.

One criticism of this approach is that the respondents will not be random, as they represent a self-selected sample. However, self-selection in qualitative questionnaires is less problematic than with quantitative research, as the goal is to gather authentic views and experiences from the participants’ perspectives (Cresswell, 2009). Indeed, some researchers have argued that self selection in qualitative surveys can be desirable in some cases (Jensen & Holliman, 2009).

The survey revealed that the majority of these respondents attended in order to learn something new, or to put new knowledge into practice while observing the night sky on their own. This was true of both the lectures and the observation portion of the event. The following examples from the questionnaire data illustrate these points.

“Having someone explain and point out constellations etc. on a screen has encouraged me to look at the night sky and feel more confident in identifying what I see.”

“The talks have encouraged me to investigate the scientific aspect of astronomy. Before that, I was mainly interested in learning the names of the constellations.”

“I have always found astronomy fascinating, but without some teaching it is a hard discipline to undertake alone.”

These comments emphasise the importance of educational framing in this event; receiving new scientific information was essential to the respondents’ enjoyment of the event, and it was one of the main reasons why they attended. This was also highlighted to be an important factor for those who attended with their children.



Figure 2. Informal discussions between the organisers and attendees on a cloudy evening outside the auditorium at the Institute of Astronomy. Credit: Vickie Curtis

"I love the lectures. I come with my daughter who is interested in astronomy and the lectures have given me some basic understanding of astronomy."

"We were doing a home-schooling project on space with our children and thought it would add to their knowledge of the subject."

The importance of learning was more closely examined in the responses given to question 4. Interestingly, many respondents felt that an event involving some sort of lecture — an "open day", or some other situation that primarily involved the one-way transfer of information — would be the hallmark of a desirable event. Several respondents also went on to state that they were attracted to events where they could learn something new (ideally from working scientists) or be enlightened in some way.

"I like to receive information via a person using various methods: lecture, presentation, video. I'm not at all keen on 'hands-on' stuff. Very passive, I know — but that's just me!"

"I want to be enlightened. I like being taught, I like to find out interesting facts (although remembering them is another matter). For me, it widens my horizons and that can't be bad."

"I want to learn. If an event or place makes me think I can learn something, I would like to be a part of it."

The involvement of a respected academic institute and the participation of working scientists were also of importance to a number of respondents.

"A place where there are specialists who can share their knowledge, enthusiasm and answer questions. Enthusiastic experts who bring the subject to life."

"A science communication event usually involves an academic institution opening its doors to members of the public and presenting science in such a way which can be understood by people with a wide variety of academic experience or ability including people who have had very little education."

Thus, the concept of the general public looking to an expert for information is important to some of the people who attended this event.

Question 5 looked at factors that could affect how an audience member perceives and responds to a science communication event. Through this question, I was hoping to gain insights into the respondents' ideas with regards to certain factors (such as age, sex, and level of education) that might affect their perception of an event. One of the most important factors outlined in the responses was the level of education of those attending. Not only did respondents argue that the level of education affects a person's understanding of the scientific content of an event, but it could also influence an individual's decision to attend in the first place.

"It can influence understanding, but also more educated people are more open and confident to go to such events and feel they can learn something."

"An audience's level of education can determine how much they gain from an event as it is very easy for the speaker to use a scientific term or assume knowledge of a concept which some members of the audience do not understand."

"Some people may not even attend events believing that they will be far too intellectual for them."

The fact that these respondents argued that education levels could affect one's confidence in deciding to go to a science communication event may influence how individuals decide whether to attend themselves, and also if they would invite friends and family members to join them. However, it is also worth noting that several respondents argued that a lack of formal qualifications could be overcome by being interested and enthusiastic.

"What's really important is the level of interest in the audience and of inspiration on the part of the scientific communicator."

This finding indicates that the pool of self-selecting audience members could be extended with careful promotion of events, enthusiastic science communication practitioners and a willingness on the part of the audience members to try something new.

What about dialogue?

One of the key points of interest in the opinion research was to explore views on dialogic approaches for public astronomy events, and what form such engagement should take.

The phrasing of question 3 attempted to differentiate between a more "educational" framing of events, as opposed to those that required some sort of active participation from members of the audience. With this in mind, it is worth noting that the terminology associated with science communication and public engagement is broad and relatively new in some instances, and there does not appear to be a fixed definition of the terms involved within the literature (Holliman & Jensen, 2009; Davies et al., 2009). Given that this is the case within the research community, it would be unreasonable to expect that attendees at these astronomy events would immediately grasp what was meant by "dialogic approaches".

Nor should they necessarily be aware of the fact that different approaches to science communication exist and are currently being debated.

This was a difficult question for some of the respondents to answer and there were a number of people who responded with “not sure” or “don’t know”. Most of the respondents, however, (24 out of 33) attempted to answer this question, and some suggested ways in which more dialogic approaches could be introduced. Eleven respondents felt that more dialogue would be a good idea, in theory.

“I suppose a dialogue session is always beneficial, especially because there are so many doubts and questions about the astronomical world out there.”

“In principle it’s a great idea. Lots of the public have knowledge and experience, which would be good to share.”

“I think two-way dialogue could be interesting, but I don’t have any bright ideas about how it might work best.”

Interestingly, several respondents considered the regular Q&A session as an adequate opportunity for dialogue. For these respondents, the current format of the IoA open evenings was sufficient as there is always the opportunity to ask questions or to speak informally to the astronomers after the lecture.

“Dialogue and Q&A sessions are good because there are some hard concepts and a lot of jargon, so it is easy to confuse people and leave them with misconceptions if the communication is one-way.”

“There is always an opportunity for dialogue during question time or informally afterwards, so I think you’ve got that one covered.”

Seven respondents provided a possible way of introducing dialogic approaches within the overall scope of this event. A number of these involved small group seminars, in which a group would discuss a specialist topic, or some astronomy-related problem with an expert from the IoA. A panel discussion approach similar to the TV programme *BBC Question Time* was mentioned, as were informal one-to-one sessions between an astronomer and a member of the audi-

ence. One respondent suggested a social event at a local bar where interested members of the public could have an informal chat and a drink with experts and students. Such a suggestion has similarities with the successful *Café Scientifique* movement (Grand, 2009).

Interestingly, a number of respondents stated that some sort of learning would have to take place before any meaningful dialogue could occur. One of the respondents who suggested smaller seminar groups added the following caveat:

“It might work best if all concerned (especially the public) are asked to do homework and prepare questions prior to the workshop. It would involve much more commitment from the public than just showing up.”

The need for some background knowledge as a prerequisite for dialogue was expressed by other respondents.

“I know so little about astronomy that there’s not really any point in a two-way dialogue for me.”

“I think a lecture at the beginning makes sense, particularly because there are those of us in the audience who don’t really know enough to know which questions to ask, let alone to carry on a dialogue.”

This need for preparation before dialogue has been encountered by other researchers when investigating public engagement events. For example, Davies et al. (2009) found that those attending interactive events at the Dana Centre at the London Science Museum want and expect information to be presented, and when this is not given to them “they are frequently disappointed”. The concept and need for preparation before dialogue has been a feature of more formal dialogue activities in the UK, such as the *GM Nation?* consultation (Heller, 2003) and for nanotechnology engagement events (Chilvers, 2006). Of course, this requires a greater commitment of time on the part of members of the public, which may deter some.

The view that members of the public require some level of scientific literacy before dialogic approaches can be successful leads to questions about the nature of dialogue itself, and perceptions of expertise. What can dialogic approaches deliver, and can they

be framed to allow scientists and members of the public to genuinely learn from each other? This has important implications for all dialogic events, including those that form the basis of a consultation to inform science policy, and where there are societal or ethical implications.

Davies et al. (2009) examined dialogue events that had no bearing on public policy and found that these could exist in many different formats, from small discussion groups to more traditional question and answer sessions. Within such a context, there is a shift from the institution to the individual, and the focus is on much smaller outcomes. They go on to argue that dialogue events become opportunities for individual learning through social processes. In effect, these informal dialogue events provide opportunities to empower individuals, potentially increasing participation and ultimately becoming part of a gradual step-by-step change in “science and society” as a whole.

The interaction of specialists and individuals can bring an added social and cultural dimension to a public event, particularly if the chosen forum does not imply the superiority of one form of knowledge over another. While a member of the general public may not necessarily be able to contribute technical expertise, they can provide insight with regard to the societal impact of astronomy, how information may best be presented to other members of the public, and provide researchers with an alternative view of their work. One postgraduate student that I spoke to at the IoA said that sometimes a member of the audience can ask a question that frames their research in an alternative way that makes them revisit some of their own underlying assumptions. This echoes experiences from other areas in the sciences (Wilsdon et al., 2005). This was a sentiment also expressed by one of the respondents:

“I do believe that the public have an important role in helping scientists to present their thoughts and analyses clearly. There’s nothing quite like a dumb question from an audience to re-inspire a re-appraisal of a long-held and possibly fallacious point of view.”

In this way, scientists themselves can learn from participation in public engagement activities, but only if they show a willingness to engage and learn as part of this process (Holliman et al., 2009).

Conclusion

The quantitative survey showed that the IoA open evenings attracted people of all ages, most of whom are well-educated, and that many attended with friends or family. Almost half attend more than one event throughout the observing season. Many people were drawn to the event to learn something new, and to explore astronomy with practising astronomers. Nearly 18% of respondents had travelled large distances to attend the event, which may, perhaps, be due to the prestige associated with the University of Cambridge.

Meanwhile, the opinion data delved deeper and revealed a number of insights about respondents' perception of public engagement and dialogic approaches within the context of an astronomy event. It could be argued that a desire for dialogue is not a pressing concern among those who responded to the questionnaires and there was little evidence that participants felt excluded from discussions with the scientists at the IoA. In fact, many of the regular attendees were clearly on friendly terms with the organisers and with members of CAA (who have recruited new members through the open evenings).

The main appeal of this event, according to respondents, was the opportunity to learn something new from the lectures and to be inspired by observing the night sky. The enthusiasm and the accessibility of the scientists involved in running the event were valued by those attending. Several of the respondents to the second questionnaire argued that they were already having an informal dialogue with the IoA scientists through the Q&A sessions. This informal dialogue also took place on cloudy evenings over tea and biscuits.

This doesn't necessarily mean that there isn't a need to develop the idea of dialogue in astronomy outreach. There is clearly an interest among some of those who responded to the questionnaires, despite the fact that this may not be fully informed by an adequate appreciation of what dialogue means in this context, and what kind of events may be available. However, given that a number of astronomy outreach programmes are making use of new communication technologies, there may be the potential for some innovative approaches that increase the opportunity for dialogue and

active participation between astronomers and members of the public.

I am now embarking on a research project to explore online citizen science projects. Some of the most successful of these projects are found in the field of astronomy, for example: SETI@home, Stardust@home and the suite of GalaxyZoo projects. Digital technologies are providing opportunities for citizens to interact with scientists and to contribute to data analysis on a scale not previously seen. My research will aim to explore what motivates citizens, as well as scientists, to become involved in these types of activities, and to what extent online tools are shaping and adapting public engagement activities, and ultimately, the relationship between science and society.

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Notes

- ¹ http://www.ast.cam.ac.uk/public/public_observing/talks2012-13

Biography

Vickie Curtis is a PhD student at the Open University, UK. She is investigating how developments in communication technologies are influencing public engagement activities in the sciences.



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