**Informal science learning for older adults**

**Introduction**

Recent years have seen rapid growth in informal science learning, defined as activities outside the formal education system which seek to raise awareness of, interest in, and engagement with, science, technology, engineering and maths (STEM) (Lloyd et al. 2012). For instance, around the world many towns and cities, plus multiple funding bodies and research institutions now host annual science festivals and/or citizen science events. Whilst more research is needed, evidence suggests that such learning can support improved performance in formal science education, build confidence in undertaking science related tasks, contribute to an individual’s understanding of science and encourage a more positive attitude towards science (Falk et al. 2012).

In compiling this evidence, attention has focused on the experiences of children and families. Older adults’ experiences appear, in comparison, critically understudied yet this population may present distinct learning needs, capacities, interests and challenges (Bell et al. 2009) which could warrant special accommodations or tailored learning. For example, approximately 40% of those aged 65 years and over are estimated to have a limiting longstanding illness (Age UK 2016), over a third have never been online (Age UK 2016) and all will be in a qualitatively different lifestage to children and young adults. Ageing ‘Baby Boomers’, holding different expectations and seeking different experiences than previous generations of older people (Dannefer and Shura 2009), may bring new and different expectations and experiences to learning whilst all older adults will bring “rich histories and knowledge” which could be built on and from which individuals may be able to draw analogies that help open up new concepts (Bell et al. 2009, 196).

Informal and formal learning are popular pursuits amongst older adults. In the UK, the 2015 Adult Participation in Learning Survey found that some 20% of those aged 65 to 74, and 12% of those aged 75 and over, were participating in learning (National Institute of Adult Continuing Education 2015). Amongst older adults such participation has been associated with improved personal wellbeing (Jenkins and Mostafa 2012), wider community wellbeing (Merriam and Kee 2014), active ageing (Boulton-Lewis 2010) and better health (Narushima 2008). Older adults themselves report that participation builds confidence, provides opportunities to meet new people and acquire new knowledge (BIS 2012).

The paucity of information on older adults and informal science learning seems at least partly due to a general neglect of this population in the design and provision of such learning - there simply aren’t the cases/examples to study (Bell et al. 2009). Out of over 500 public events occurring in British Science Week (2016), a 10 day programme of events aimed at celebrating STEM subjects, coordinated by the British Science Association and funded by the Department for Business, Innovation and Skills, just one was created specifically for older adults. Hosted by the University of Portsmouth, this ‘Study Day’ was intended to provide older residents with an opportunity to meet research active scientists and learn more about science (British Science Week 2016).

Responding to these issues, we sought to develop, deliver and evaluate a targeted approach for involving older adults in informal science learning, and in doing so, gain insights into older adults’ informal science learning needs, interests and experiences. Working within certain time and cost constraints, we chose to develop and trial a ‘science festival style event’ for older adults. Working on a large, health-related research project, Mobility, Mood and Place (MMP), funded by Research Councils UK, investigating relationships between ageing, mobility, health, emotions and the built environment, we felt strongly positioned to ‘fill’ an event with ‘content’ that would be of interest to older adults. Ward et al. (2008) found that a large proportion of the audiences at public engagement events providing health-related information were older adults.

This commentary reports on the processes involved in creating and promoting the event and the overall experience of delivering it in two different settings: a) as a stand-alone event and b) as a programmed event at Edinburgh International Science Festival. We begin with a brief introduction to science festivals. Importantly, similar to patterns found across informal science learning, we reflect on their apparent proclivity to overlook older adults. We then outline our event. To close, we reflect on where the event succeeded, how it could have been improved and consider its performance as a vehicle for older adults’ learning. This evaluation is based on our own reflections and systematically collected audience feedback. To support the development of better programmes and experiences, woven into this discussion are a number of recommendations for involving older adults in informal science learning.

**Science festivals**

Science festivals are a rapidly growing, international phenomenon (Bultitude, McDonald, and Custead 2011). Found in many regions, they are particularly common in Europe, especially the UK (Bultitude, McDonald, and Custead 2011, Fogg-Rogers et al. 2015). Internationally, evidence suggests that some 5.6 million people are reached by science festivals annually (Bultitude, McDonald, and Custead 2011) whilst in the UK a 2014 public attitudes to science survey found that almost 3% of those polled had attended a science festival in the previous year (Ipsos MORI 2014).

For the purposes of our work, we defined science festivals, and consequently ‘science festival style events’, as time-limited events that seek to a) celebrate STEM subjects b) engage non-specialist audiences in scientific content (Bultitude, McDonald, and Custead 2011, 167, Fogg-Rogers et al. 2015, Jensen and Buckley 2014) and c) typically facilitate nonformal learning (Fogg-Rogers et al. 2015), where nonformal learning is defined as intentional learning, from the learner’s standpoint, which occurs in a nonformal manner without, for instance, accreditation (Fogg-Rogers et al. 2015, 5).

Although the details often differ on matters such as size, composition, funding arrangements and length (Fogg-Rogers et al. 2015, Bultitude, McDonald, and Custead 2011), on key points similarities between science festivals are evident. Of note, they tend to adopt a first-order approach to communicating science (Jensen and Buckley 2014). Here, knowledgeable scientists seek to inform and educate less knowledgeable publics (Irwin 2009). The public is invited to learn more about scientific perspectives but scientists do not in turn seek to learn more about public perspectives (Jensen and Buckley 2014, Irwin 2009). Festivals have sometimes been criticised for promoting this one-way flow of information (Fogg-Rogers et al. 2015); however, research into audience preferences has found that visitors, particularly older visitors (Fogg-Rogers et al. 2015), value and enjoy first order engagement (Fogg-Rogers et al. 2015, Ward, Howdle, and Hamer 2008, Bultitude, McDonald, and Custead 2011, Sardo and Grand 2016).

Another noteworthy similarity concerns the audiences that festivals target. An international review found that 95% of festivals targeted families with children and 87% targeted school pupils (Bultitude, McDonald, and Custead 2011) whilst European research found that pre-school children and school pupils were the most commonly targeted groups for science communication events (European Science Events Association 2005). There is no evidence of an equivalent, or indeed any obvious, concern for older audiences. In fact, the physical settings sometimes selected for science festivals indicate that older adults might not even be on the radar when these events are designed and delivered. Posing challenges to some older people, where a festival is laid out across a park, field or university campus attendees can, for instance, be required to travel not insubstantial distances between activities and/or be asked to traverse such items as uneven ground and steps whilst the cramped venues with insufficient seating that Sardo and Grand (2016) identified at a large UK festival could prove especially troublesome for older adults who, owing to health conditions or physical impairments, might be unable to sit on the floor or stand. In the absence of relevant research we can only speculate as to why there seems this apparent blind spot when it comes to older adults. Perhaps festival organisers do not view, or do not wish to view, older adults as a ‘discrete’ target audience. Influencing any such outlook might be concerns about ‘inclusivity’ and/or uncertainty about the validity or appropriateness of treating older adults as a separate group. Conversely, perhaps festival organisers do identify older adults as a discrete group but, possibly because they assume this age group will be uninterested in science festivals, or their particular lifestage may be thought unsuited to a festival’s core aims, which might be to inspire the next generation of scientists or encourage pupil participation in STEM subjects (see The Big Bang Fair 2015), they choose to attend to other groups. Of course, with older adults spending an increasing amount of time caring for grandchildren (Geurts et al. 2015), targeting this population might very well be an effective way to connect with ‘the next generation of scientists’.

**Creating a science festival event for older adults**

We set out to create a free-to-attend science festival style event that presented ‘content’ linked to the aforementioned MMP project and that incorporated several different learning formats and engagement techniques in order to gain insights into what worked. It was felt that a range of activities would ensure a broad appeal and enable visitors to ‘drop in’ to sample individual activities of interest. We sought to incorporate traditional first-order engagement techniques that have proved popular with older audiences (Fogg-Rogers et al. 2015), ‘hands-on’ activities which have proved popular with families and younger audiences (Jensen and Buckley 2014) and, conscious that their use has been encouraged, ‘second-order’ engagement techniques (House of Lords Select Committee on Science and Technology 2000) which seek “an exchange of perspectives and knowledge” between scientists and publics (Jensen and Buckley 2014, 559). With these concerns in mind, we devised a 1.5 hour event featuring expert talks, opportunities for one-to-one conversations with researchers, hands-on and interactive activities.

Five short (5 to 10 minute) talks were delivered by researchers on the MMP project. These talks provided bite-sized chunks of information on the project’s interests, methods and findings, and were followed by a short question, answer and discussion session. Before the talks there were opportunities for audience members to take part in four interactive activities again linked to the MMP project. First, audience members were invited to try on an electroencephalogram (EEG) headset, used within the project, which measures electrical brain activity. Second, with a researcher on hand to provide explanations, historic City of Edinburgh maps used within the project were displayed. Third, novel suggestions for age-friendly environments, captured in architectural models and drawings and produced for the project, were presented with audience members encouraged to discuss and critique their content. Finally, an exhibition displayed submissions to a photography competition that we operated in the three week run-up to the standalone event. Members of the public were invited to send in photos, along with an accompanying caption, of places which made them feel happy. To encourage participation we linked our competition to a photography competition run by the national charity Age Scotland, a partner on the MMP project. There were 27 entries to our competition. A winning photograph (submitted by an 87 year old) and two runners up, selected by a panel of judges, each received book tokens.

The standalone version of the event ran on 20th March 2015, chosen to coincide with the UN’s International Day of Happiness. We hoped that by connecting to this relevant, visible event the profile of our event would be raised. Discovering, in the planning stages, that the standalone event also sat within Brain Awareness Week, a global campaign to increase public awareness of the progress and benefits of brain research, we sought, given our work with EEG, to link to this initiative hoping again to further raise the profile of our event. Three weeks later we ran the event as part of Edinburgh International Science Festival (EISF). Founded in 1989, the EISF comprises two weeks of free and paid-for activities and events, delivered by multiple institutions and organisations, at traditional and non-traditional science communication venues across Edinburgh (Edinburgh International Science Festival 2016).

We held the standalone event at a large, centrally located, historic concert hall at the University of Edinburgh and the festival event in a large meeting room in a modern, centrally located, University building. We investigated the access arrangements at both venues through in-person visits and discussions with venue staff. As an historic building, we had some reservations about the accessibility of the concert venue but, noting that it was regularly frequented by older audiences attending lunchtime recitals, we assumed it would be suitable for our target audience. This approach provided an opportunity to explore the merits, as settings for informal learning, of quite different venues.

We wished to target our events at older adults, although not to the exclusion of younger audiences. On engaging with the EISF, however, we learnt that it was not possible to target a particular sub-set of the adult population. Events could only be framed as being for ‘adults’, defined as visitors aged 14 years plus, or for ‘families’ (Edinburgh International Science Festival 2015). Consequently, our event was promoted as being for ‘adults’. For the standalone version of our event we promoted it as being “of particular interest to older people” but noted that it was “open to everyone” (OPENspace Research Centre 2015). In proceeding with both versions of the event there was an opportunity to consider the possible effects of these different approaches.

We promoted the standalone version of the event with colourful posters and flyers distributed across Edinburgh and through a number of older people’s organisations. Noting that the festival version of the event would benefit from the EISF’s huge promotional campaign, we concentrated on promoting the standalone event. Social media was used to highlight both events. 23 event-related Tweets were posted. These were viewed almost 16,000 times and led to around 250 interactions (favourites, shares etc.). However, only one audience member reported that they became aware of our events through social media. In our case, social media helped highlight our events and stimulate conversation about them in certain circles, proving particularly effective as a means for engaging with the media. The Scottish press covered the photo competition with several outlets, including the national broadcaster STV, posting stories. Social media did not, however, appear to encourage audience attendance.

**Successes, lessons and recommendations**

Almost 50 people registered to attend our standalone event whilst 40 registered to attend the festival event, which sold out via the EISF website. That a total of 90 people registered to attend the two events suggests, we believe, an appetite for the kind of informal science learning experience we provided. Ultimately, 38 people attended the former and 18 the latter event. Unusually good weather, and free attendance, which meant there would be no financial penalty for non-attendance, helped explain the discrepancy between the numbers registering and the numbers attending.

Many of those who attended our events were older adults. Over half of those who completed evaluation forms (n=38) were aged 65 years or over (n=21). These forms, distributed at both versions of the event, explored such issues as the usefulness of the events, whether they were enjoyable, the varied engagement techniques employed, how individuals would use the information presented, whether they would attend similar events in the future and where they had travelled from.

Those aged 65 years and over, and younger members of the audience, were very positive about the events with over 90% rating them as very or quite enjoyable and over 80% rating them as very or quite useful. Individuals reported that they would share what they had learnt with others, use what they had learnt to lobby local authorities for local environmental improvements, to impress upon councillors the importance of good quality environments, to think about how to help older friends and relatives and to try to include more health-promoting behaviours in their daily lives. Suggesting an appetite for the kind of event we provided, some 80% of this age group reported that they would attend a similar event again. Further evidence of this appetite was indicated, we believe, by the distances some older audience members had travelled. Whilst many had journeyed from within Edinburgh, others had travelled from further afield including St Andrews (84 km from Edinburgh), Glasgow (67 km) and Dunfermline (29 km).

 Older audience members engaged with all aspects of the events with several commenting positively on the overall mix of activities and talks and how the events differed from the kind of things they had visited before. They engaged in numerous one-to-one conversations with researchers with the evaluation forms indicating that these discussions were valued. These conversations appeared particularly useful for those who were reluctant to ask questions in public affording a private space in which their queries could be addressed. There was greater participation in the interactive activities in the standalone event. Here, a larger venue provided more space for the activities providing more opportunities for more people to take part. Overall, the talks appeared to secure the widest participation with the associated question and answer sessions seeing several older adults ask questions. Indeed, amongst the audience, older adults appeared to be the most likely to ask questions. The evaluation forms revealed that, for some older adults, the talks and associated question and answer sessions were particularly favoured. Pertinent here, much of our older audience had previously attended lectures and talks at the University indicating, perhaps, a predisposition to this kind of engagement whilst also highlighting that, despite efforts to engage new audiences, our events tended to attract the ‘familiar faces’. These experiences suggest that traditional first-order engagement has a clear role to play in informal learning for older adults but, and importantly, so too do less traditional first-order techniques like interactive activities.

 Based on audience member feedback and our own observations, spacious accommodation providing good acoustics, step-free access, conveniently located accessible toilets, supportive, moveable seating with ample leg room, laid out on the flat rather than tiered, plus, depending on the nature of an event, audio-visual equipment matched to the particular dynamics of the space, are key to creating a comfortable and conducive setting for informal learning for older adults. Some of these items were absent or not represented as well as they might have been in the concert hall and this impaired the ability of some older adults to participate fully in our events. Highlighting the all to pervasive problem of disablist spatial organisation (Freund 2001, Kitchin 1999), finding venues that *fully* address these criteria can be difficult, especially when the options are limited to older and/or historic buildings. Particularly in these cases, it is essential to critically investigate a venue’s accommodation and facilities and, where possible, to do this in person. Lastly, but importantly, one should never assume that a venue will work for a given event or target audience because it has previously hosted a similar event and/or similar audience. This is a key lesson that we will take away from this experience.

 Connecting to EISF delivered labour and cost savings reducing the number of tasks we had to undertake to support the festival event, particularly in terms of marketing and ticketing. The event was included in the EISF brochure and website bringing it to the attention of a large audience whilst places were reserved using EISF’s online and telephone booking system. Less positively, in connecting to EISF we had to conform to its approach to targeting audiences. Importantly, and as mentioned, we were unable to specifically target older adults. In our standalone event where we were able to target this population the size of the older audience, and the distances this audience had travelled, were greater. We believe this was at least partly due to the event’s direct appeal to older adults. Given this, we question if science festivals should do more to target this demographic.

In conclusion, the number of older adults who booked places at and attended our events, the distances some travelled and the generally positive feedback we collected indicates that there is an appetite for informal science learning amongst older audiences and that a science festival style event, of the type we provided, might be an appealing and appropriate vehicle for such learning. We discovered that in delivering learning for this age group the choice of venue is critical. Further, traditional first order public engagement has an important role to play but so too might less traditional approaches such as interactive activities. Lastly, connecting to an established science festival can bring valuable administrative and marketing support but their frequent focus on particular target audiences might make them less appropriate for engaging with other groups. Overall, we recommend that more informal science learning should be developed with older audiences in mind.

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