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Paper 01

Developing inclusive informal science education practice: Useful concepts from research

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## Introduction

How can we understand what inclusive informal science education might look like in practice? This research brief provides a short overview of what we do know about inclusive informal science learning from research and covers some of the limitations of that research. Starting with some key issues to consider in terms of informal learning research, this paper outlines some practical points, and briefly reviews the relatively small amount of research that is specifically about inclusive informal science learning<sup>1</sup>. The focus of this paper is on conceptual inclusion and a few, specific social positions, notably gender, ethnicity and, to a lesser extent, social class. What this means is that I have not included research about physical inclusion, for example, research on the needs of visually impaired people or British Sign Language users<sup>2</sup>.

While a great deal of academic research has described, analysed and discussed the benefits of learning and engaging with science, the tendency within such research has been, understandably, to concentrate on those audiences, visitors and participants who are already involved. In other words, we know a lot about the people we already work with. This sampling bias is not unproblematic. Large scale descriptive data suggests that the people who usually visit informal science learning environments such as science centres, aquaria or science festivals are from the more enfranchised groups of society. This means that in the UK 'visitors', 'audiences' or 'participants' are typically white, middle class and live in cities, who visits in school or family groups (Department for Culture Media and Sport, 2011; Ecsite-UK, 2008; OECD, 2012).

These large scale statistics have two important implications, first, that informal science education is not currently inclusive of a diverse range of people and second, that we might not want to rely on research with existing visitors to develop more inclusive practice. As Ash and Lombana have argued, "relying so heavily on only a narrow slice of visitor representation for normative purposes is misleading at best, and inaccurate at worst" (2011, p. 3). In other words, knowing what those who participate do and get out of visiting museums may tell us less than we think about 'non-participants', 'non-visitors' and the publics who do not 'engage' with science. As a result, little is known about the

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<sup>1</sup> Please note, by small I mean, there is really very little, which suggests a research and practice gap. It is also worth noting that the majority of this work has been carried out in the North American context. A brief list for further research would include the work of Doris Ash, Jrene Rahm, Glen Aikenhead, Cecelia Garibay, Kevin Crowley, Toni Dancu, Sandra Trienekens. Angela Calabrese Barton's work on after-school clubs could be included here too, as could some work from Lynn Dierking and my research. If we look beyond a focus on science we can include the work of people like Richard Sandell and Bernadette Lynch amongst others. More broadly, work on cultural participation, social inclusion and exclusion, science and technology studies, science education and education in general provides helpful concepts that inform aspects of Enterprising Science and will be reviewed elsewhere.

<sup>2</sup> The Helen Hamlyn foundation does some particularly interesting work into such issues: <http://www.hhc.rca.ac.uk/>.

influences on non-participation in informal science learning and engagement or on the informal learning experiences of people from marginalised social groups.

### **Issues to think about in practice**

Two 'take home' points from the research reviewed below are worth thinking about from the start:

1. That informal science learning is not currently equitable, but that issues arise for visitors, audiences or participants in relation to their gender, ethnicity, class and age as well as the overlaps between these social positions<sup>3</sup>. We might want to think about the different experiences of white, working-class, urban families or female students from East African backgrounds.

These issues are not specific to informal science learning, but can be found in informal learning and cultural participation more generally (Bennett et al., 2009; Sandell, 2002), as well as in education (Archer, 2008; DeWitt et al., 2010; Reay, 1998). Such issues are, in some senses, not surprising, given the inequitable society we live within. At the same time, however, informal science learning institutions are well-positioned to re-evaluate their public offers and make a difference to these inequities. In this sense rethinking informal science education as inclusive can be thought of as an emancipatory project about social change, which leads to the next point.

2. That informal science learning environments can become more equitable by building on research, research findings, inclusive design principles and by paying attention to equity issues.

For example, Dancu's (2010) research demonstrates that by attending to gender issues in the prototyping phase of project development, exhibits can be created that are more appealing to boys and girls. Similarly, my research (2012b) suggests that improving access in terms of language issues, better staff support and enabling participants to draw on their own backgrounds can help to make informal science learning opportunities more relevant for people from socio-economically disadvantages, minority ethnic backgrounds.

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<sup>3</sup> What I mean by overlaps in social positions, is that a person can be more than one 'social position' at a time, and this can make things especially difficult, as scholars researching the experiences of black women have argued. Research that examines these overlaps is sometimes called 'intersectional' research.

In other words, it is possible to rethink and redesign informal science education environments, like science centre interactives or museum exhibits, to be more accessible for a broader range of people.

This second point includes a mixture of practical tips and conceptual issues. In terms of practical tips, the following points stand out from research<sup>4</sup>:

- Well-trained staff who can facilitate the visits of individuals and families from outside the 'traditional' audiences appear to be able improve the museum experiences of minority ethnic visitors (Ash & Lombana, 2011; Dawson, 2012b; Garibay, 2009). Put another way, it is important to train staff to understand, value and respect a diverse range of visitors and their backgrounds.
- Representation is an issue both in terms of the languages and images used (in other words, are you using boys or girls names, are those names Western, English, is translation of labels, hand-outs or staff speech available) as well as the people involved in the stories, examples or histories being told.
- Certain design features can be used to help an exhibit, interactive or programme appeal equally to girls and boys, for example, a focus on non-competitive games.

Conceptual issues that arise from this research revolve around what it means to make a 'thing' inclusive. One frequently discussed problem about tailoring a class, institution, event or exhibit to a particular group is that it would then exclude various other people (Siegel, 2002). Proponents of this position argue that a balanced approach is more universal in appeal and can therefore cater to more people. Critics of this view argue instead that the claim of 'universal appeal' has been used to uphold Euro-centric, Western views, particularly in science education<sup>5</sup> (Brickhouse, 1994; Lewis & Aikenhead, 2001; Snively & Corsiglia, 2001). Research suggests that a 'one size fits all' approach to designing science learning environments has disadvantaged learners outside socially dominant groups (Brown, 2006; Calabrese Barton, 1998; Dawson, 2012b; Lemke, 1990).

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<sup>4</sup> This is certainly not an exhaustive list, and one aim for this project is to be able to add to this list in terms of the development of well-researched, equitable practices for informal science learning.

<sup>5</sup> Although the same argument is made in several other fields, for a more in-depth argument the work of Iris Young, Nancy Fraser and Axel Honneth is plays an important role in such debates for the differences between redistributive and relational social justice in terms of equity and inclusion.

Some researchers argue instead that active recognition of the differences between groups, as well as the problems with maintaining Euro-centric, Western perspectives in science education, can be used to recreate learning opportunities that are more inclusive, more appealing and more interesting for everyone (Aikenhead, 2002; Dawson, 2012a). While there is insufficient evidence to claim that this would definitely be the case in practice for inclusive informal science learning, Dancu's (2010) research found this was the case in her work on gender equity<sup>6</sup>. Her work suggests an open approach to the potential benefits and disadvantages of tailoring informal science learning opportunities may be valuable if inclusive aims are to be met. This kind of approach has been called universal design. Universal design has been used to think about how to make any designed object or event accessible for a broad range of people and draws on social models of disability, difference and exclusion (Dancu, 2010, <http://www.hhc.rca.ac.uk/>; Sandell, 2002).

### **Inclusive informal science learning: Research on gender issues**

Research on the issue of inclusive informal science learning has included work on gender bias from parents and in exhibit design that favours boys (Borun, 1999; Crowley, 1999; Crowley, Callanan, Tenenbaum, & Allen, 2001), as well as research exploring how to develop universal design principles with a focus on gender equity at the Exploratorium, a US science centre (Dancu, 2010). Notably, not all of this research followed an intersectional approach, which means the role of class or ethnicity in relation to these gender differences was unclear. Nonetheless, the findings of this research suggest that during visits to informal science learning environments parents use more technical and scientific language with boys rather than girls and that some exhibits are designed in ways that attract boys more than girls.

In response, Dancu (2010) suggests gender equity can be achieved through incorporating features that girls find appealing into exhibits and suggests those involved in developing informal science environments, exhibits and programmes develop design protocols to build gender equity into their work. She systematically analysed the benefits of the following; including larger, more colourful exhibit labels, text suggesting visitors create 'sculptures' rather than 'machines', interactives that were not win/lose games, pictures of real world comparisons, exhibits with more opportunities for interacting with other people,

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<sup>6</sup> A great deal of research has been carried out on multicultural science education, particularly in the Canadian context, and seems to support the idea that a multi-cultural approach does not 'harm' majority students while it can benefit First Nation Peoples, see, for instance, the work of Glen Aikenhead.

gender neutral languages and pictures<sup>7</sup> and colours testing with young female visitors before design. Interestingly the analysis found that the addition of 'female-friendly' design features increased participation from boys and girls, it did not, as is sometimes suggested, decrease the appeal of exhibits for boys.

### **Inclusive informal science learning: Research on ethnicity**

Research on the role of ethnicity in access to and interest in informal science learning, particularly for visitors, audiences or participants with minority ethnic backgrounds, has found that ethnicity is as important as class<sup>8</sup>, gender, age and location (Bell, Lewenstein, Shouse, & Feder, 2009; Fenichel & Schweingruber, 2010). Researchers including Doris Ash, Jrene Rahm and Cecelia Garibay have focused on the experiences of participants from minority ethnic backgrounds involved in informal science learning projects (Ash, 2004; Garibay, 2009; Rahm, 2010). Their research suggests that American families from Latin-American backgrounds find science museums unwelcoming, expensive, difficult in terms of the language used and find the activities provided unimportant and irrelevant. None the less, these same families are eager to find educational activities for their children (Garibay, 2009). In particular, additional staff support for both language issues and way-finding was found to significantly help Latin-American families access the science content of informal science learning environments, and helped them to feel 'at home' and welcomed (Ash & Lombana, 2011). Furthermore, this research suggests that if facilitated by staff and involved in programmes designed to meet their needs, participants from minority ethnic backgrounds can find informal science learning opportunities beneficial (Rahm & Ash, 2008).

Closer to home, my work with adults from minority ethnic groups, from socio-economically disadvantaged backgrounds, living in central London, suggests that although informal science learning environments were seen as off-putting, irrelevant and 'not for us' by participants, certain embedded features of such environments could be changed to improve inclusivity (Dawson, 2012b). Participants pointed towards Euro-centric, Western

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<sup>7</sup> In this case, the same number of boys and girls names, the same number of male and female images and the same number of male and female examples as well as neutral language where possible, and on some labels more pictures of girls, in particular, girls using the exhibit, in order to signal that girls were welcome to get involved.

<sup>8</sup> There is little research explicitly about class in relation to informal science learning, but a great deal of research about class in terms of educational equity in schools and university, as well as the 'classic' work of researchers such as Pierre Bourdieu in relation to museums and art galleries. Such research suggests educational and cultural participation, as well as 'success' are strongly marked by classed inequalities.

concepts, stories, characters and objects as lacking relevance from their perspective<sup>9</sup>. Science was understood as a school subject, too difficult and too boring to pursue. In practice English-based dominant language use was felt to be exclusive and problematic, little space was made for participants to develop their own interpretations of exhibits or workshops and interactions with staff members were, at times, problematic<sup>10</sup>.

Notably, all these issues can be turned around to create relevant, interesting informal science learning opportunities, with exhibits designed to maximise participants' abilities to relate exhibit content to their lives. Cross-cultural meaning making opportunities that enable visitors to draw on the own backgrounds, own cultural heritage, languages and experiences in order to connect meaningfully with exhibits can happen, and with more research and careful development, museums could learn to better support such opportunities. In particular continuing professional development (CPD) for museum staff<sup>11</sup> could play a transformative role in helping staff better design, support and scaffold cross-cultural meaning making opportunities. For example, more positive experiences with museum staff occurred where staff members were patient, helped participants to build their own understanding of objects or exhibits by listening to their questions, supporting within-group translation and letting participants choose what they wanted to do (Dawson, 2012b) .

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<sup>9</sup> The classic example given by participants was the emphasis on Florence Nightingale with almost nothing about Mary Seacole in the way the development of science and medicine were represented in public stories about science in museums.

<sup>10</sup> For example, one staff workshop facilitator consistently treated middle-aged Somali women as though they were unruly students, which they found very off-putting. However, issues of this type may be easily resolved through training and more experience working with diverse groups of visitors.

<sup>11</sup> I am not suggesting CPD is a panacea, rather that it represents one of the most accessible leverage points in the system that we could address relatively easily. It would be naïve to suggest that CPD would 'solve' the complex and ever-changing issues involved in social exclusion from science and informal science education. A more holistic approach where institutions significantly changed their practices, developed capacity building projects that involved long-term relationship building rather than short-term tokenism, and actively sought to redress inequities would be more impactful. If, however, we see equity as a process, starting with CPD may be valuable in terms of building interest in staff, since staff are the building blocks of institutions and best placed to bring about institutional change.

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