Network for Information and Digital Access

The impact of Science Literacy delivery methods - what works?

Gaps in impact assessment methodology

GROUP 1. Events, meetings, performances

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Mechanism	**Subject and keywords**	**Gaps in the impact assessment (IA) methodology Lack of (or insufficient):**	**Possible methodological improvement(s) /Recommendations / Directions for future research**	**Challenges**	**Reference**
1. Exhibitions	Health promotion [Healthcare and Medicine]	- **systematic assessment** of purpose and effects, especially health-related outcomes, of health in museum and science centre exhibitions - **structured evaluations** that can provide insights into potential health-related outcomes (the available ones often focus on traditional visitor study themes related to the use of each exhibit element, e.g. number of visits, time spent, qualitative assessments of the exhibit quality or overall ratings of the exhibitions) - **specified methodologies** to give solidity to the results and overcome some limitations (e.g. bias related to overreporting relating to social desirability, self-reported outcomes to museum staff and evaluators) and **transparency of methods used and the conclusions drawn**	- more carefully crafted studies regarding outcomes of health-related exhibitions and their potential for promoting health - long term follow-up studies - direct measurements (e.g. using accelerometers)	- informal nature of the exhibition setting may pose challenges to recruiting participants, especially for follow-up studies - lack of staff resources available for evaluation studies	**Museums and science centres for health: from scientific literacy to health promotion** Christensen et al. 2015
1. Exhibitions	Science education [Social science]	- **inclusion of pre- and post- visit activities at school**. Weak prior knowledge can result in increases in misconceptions; however, if changes in understanding are measured across the whole learning period, it is difficult to isolate the contribution of science-communication venues (SCV) visits to students' learning, compared with the contribution of pre- and post-visit activity	- exploration of the effects of different designs on guided exploratory learning - evaluation of the effectiveness of educational activities by studying the presence and quality of the learning processes visitors are engaged in - study the presence and quality of different explorative processes involving practical experiences, testing and observation and explorative conversations and writing during SCV visits with different	- concept learning normally takes time, and to measure changes in conceptual understanding after a few hours of exhibition guiding, task completion and playful interaction is demanding and inappropriate	**Exhibitions as learning environments: a review of empirical research on students' science learning at Natural History Museums, Science Museums and Science Centres**

			types of educational activities (this process perspective may facilitate the documentation of fruitful learning processes that are going on at SCVs, even when high scores on tests on concept learning are irrelevant or hard to achieve) - quality of different types of physical exploration in relation to science concept learning		Hauan and Kolstø 2014
2. Expo					**NO REVIEWS**
3. Festivals	Science (general), environmental studies, genetics [Interdisciplinary science, biology]	- **theoretically and methodologically sound research and evaluative efforts on the reach, outcomes** (e.g. knowledge and attitudes) **and impact of public engagement practices on participants**. To better understand science festivals and their potential outcomes, it would also be important to understand who attends these events (e.g. backgrounds, cultural experiences, political ideologies, religious beliefs, and types and levels of knowledge) (Rose et al. 2017) - **clear and specific goals of public engagement events** - **(or limited) peer-reviewed research has addressed or evaluated public engagement efforts** occurring at these events (Rose et al. 2017) - **(or limited) validity and over-reliance of visitors' responses to science festivals**, e.g. closed-ended do not allow for a detailed understanding of processes of visitor reception of science festival events (Jensen and Buckley 2014); visitors may have adapted their answers in an attempt to please the interviewer	- support and tools appear to be needed to improve both event organisers practice and the science festival experience for audiences (Fogg- Rogers 2017). Evaluation mechanisms are essential for data-driven decision-making about the future of science festivals and their role in public engagement with science (Rose et al. 2017) - in selecting evaluation methods, care must be taken to assess the reliability and validity of the tests used, but also the feasibility of sampling and data analysis (Fogg-Rogers 2017). Some methods of evaluation may be in fact more rigorous and it may not be possible to apply them within the time and funding constraints of many festival environments - evaluation and reflective practice methods need to be quick and easy to conduct, adapted for each audience and situation, and practitioners will need to take both rigour and feasibility of methods into account (Fogg-Rogers 2017)	- science festivals can intercept audiences depending on the location of the venue (e.g. bar, library, farm), time of the year, weather conditions (Sardo and Grand 2015; Fogg-Rogers 2017) and duration of the event - festival celebrations are inevitably ephemeral: they may refresh content, change partners and venues, and reinvent their structures from year to year (Wiehe 2014) - the time-limited experience of science festivals might not be sufficient for people to see everything presented in the festival - the evaluation of science festivals can be time-	http://www.nida-net.org/en-gb/activities/connectwithscience/research/reports-and-bibliographies/festivals/

		(Herbolzheimer and Featherstone 2014); survey methods that allow individuals to self-select into a study, such as feedback forms or comment boxes, may oversample those who felt they experienced an extreme effect from engagement activities (Rose et al. 2017)	- the informality of the events and venues in festivals should be reflected in the use of unobtrusive and minimally disruptive evaluation methods (Grand and Sardo 2017) - combined use of different methods can help with the triangulation of data (e.g. Jensen and Buckley, 2014; Sardo and Grand 2016; Fogg-Rogers 2017; Fogg-Rogers et al. 2017) - pre-visit and post-visit data on the same visitors might allow comparison and direct measures of impact instead of on-site survey data collected from visitors at only one point in time (Jensen and Buckley 2014) [See paragraph 4.6 of the working paper for more detailed suggestions about methodologies] - future research should consider the longer-term impact of science festivals, which hold the key to understanding informal science engagement's role in people's lives and can help assess the relative contribution of informal science engagement to the development of a healthy relationship between science and society (Jensen and Buckley, 2014)	consuming, can distract the participants from the festival experience (Fogg-Rogers 2017) and not being always straightforward, given the subtle interplay of objectives, communication medium, and audiences (Grand and Sardo 2017) - the potential impacts of a specific engagement activity are highly dependent on the context in which it occurs, including the audience (potential and actual) and the stated goals of the event - the variegated context of science festivals raises a number of methodological challenges such as: collecting data from a transitory visitor population in a crowded informal context; designing survey questions that can accommodate feedback on a broad range of public engagement activities; and analysing the diversity of feedback on these multi-faceted experiences (e.g. not all respondents may have	

				been exposed to the same experience) in a way that allows common patterns to emerge (Jensen and Buckley 2014) - possibility of bias within the results of a study when participants may have already been interested in or knowledgeable about the topic addressed in the event or when efforts are based on participant self-reports after the event or inferred based on event-generated reports or recommendations (Rose et al. 2017) (participants who completed the survey may be the most opinionated or literate and may not be a true reflection of the entire population (Fogg-Rogers et al. 2017)) - at multi-venue events people can be over-sampled, as evaluators in one location cannot easily know to whom evaluators at another have spoken. This can be mitigated by, for example, giving interviewees a small sticker to attach to their clothing; a simple signal that they have been	

				interviewed (Grand and Sardo 2017) - 'each group and individual hold different beliefs about the role of science in their lives and requires different methods of learning, understanding, and engaging with science. As such, public engagement activity organizers must approach each group differently to achieve a specific goal. Without appropriate knowledge of the attending audiences, organizers are in 'danger of aiming at everybody and reaching nobody'' (Rose et al. 2017)	
4. Movies	Health, health education [Healthcare and Medicine, Social science]	- **control group and bigger sample** to validate the results of many studies - **data on the film application methodology** that enable to reproduce and validate previous studies (e.g. screening frequency, procedures or techniques for obtaining data, the ambiguity or lack of specific objectives, the way of measuring the results of this teaching resource) - **studies that focus on the main objective of knowledge acquisition**, but instead focus on complex and difficult aspects to measure, like the acquisition of attitudes and values	- development of checklists to evaluate the quality of the different cinematic teaching methodologies - identifying which specific attitudes are intended to modify - quantify the increase in learning, either by an increase of knowledge or an increase in their values, beyond the subjective perception of students and lecturers		**Use of commercial films as a teaching resource for health sciences students** Díaz Membrives, Icart Isern, and López Matheu 2016

5. Picnics					**NO REVIEWS**
6. Science Fairs					**NO GAPS IDENTIFIED**
7. Seminars					**NO REVIEWS**
8. Talks					**n.d.**
9. TED Talks					**NO REVIEWS**
10. Theatre					**NO GAPS IDENTIFIED**
11. Workshops					**NO GAPS IDENTIFIED**

Bibliography

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