

Design skills for environmental risk communication: design in and design of an interdisciplinary workshop

Article

Published Version

Creative Commons: Attribution 4.0 (CC-BY)

Open access

Lickiss, M. D. and Cumiskey, L. (2019) Design skills for environmental risk communication: design in and design of an interdisciplinary workshop. *The Design Journal*, 22 (1). pp. 1373-1385. ISSN 1460-6925 doi: <https://doi.org/10.1080/14606925.2019.1594963> Available at <https://centaur.reading.ac.uk/80121/>

It is advisable to refer to the publisher's version if you intend to cite from the work. See [Guidance on citing](#).

To link to this article DOI: <http://dx.doi.org/10.1080/14606925.2019.1594963>

Publisher: Taylor & Francis

All outputs in CentAUR are protected by Intellectual Property Rights law, including copyright law. Copyright and IPR is retained by the creators or other copyright holders. Terms and conditions for use of this material are defined in the [End User Agreement](#).

www.reading.ac.uk/centaur

Design skills for environmental risk communication. Design in and design of an interdisciplinary workshop

Matthew David Lickiss & Lydia Cumiskey

To cite this article: Matthew David Lickiss & Lydia Cumiskey (2019) Design skills for environmental risk communication. Design in and design of an interdisciplinary workshop, *The Design Journal*, 22:sup1, 1373-1385, DOI: [10.1080/14606925.2019.1594963](https://doi.org/10.1080/14606925.2019.1594963)

To link to this article: <https://doi.org/10.1080/14606925.2019.1594963>



© 2019 The Author(s). Published by Informa UK Limited, trading as Taylor & Francis Group.



Published online: 31 May 2019.



Submit your article to this journal 



Article views: 27



View Crossmark data 

Design skills for environmental risk communication. Design in and design of an interdisciplinary workshop

Matthew David Lickiss^{a*}, Lydia Cumiskey^b

^aUniversity of Reading, United Kingdom

^bWater Youth Network, United Kingdom

*Corresponding author e-mail: m.lickiss@reading.ac.uk

Abstract: Effective environmental risk management and risk reduction requires an inherently interdisciplinary and cross-sector approach to communication design. The challenging global impact of this area can only be addressed by increasing skills capacity in communication design across disciplines, a challenge which itself requires the design and delivery of new expert training. This paper reports on the design of and findings from an interdisciplinary, problem-based workshop to build risk communication skills, held at the World Bank's Understanding Risk 2018 conference, Mexico City. The workshop combined high competence interdisciplinary participants (including designers) with detailed real-world scenarios in a 24-hour 'pressure cooker' working environment, designed by a team of interdisciplinary young professionals. The results show engagement from participants across the disciplines involved, who produced outcomes with a community education and user-centred focus. The workshop highlighted that more direct, critical, engagement from the design community is needed in educating about, and delivering, environmental risk communication.

Keywords: risk communication, interdisciplinary, workshop design, problem-based learning

1. Risk, disaster, and communication

Environmental hazards across the world have deep impacts on the lives of millions of people. These hazards and the risks they present are many, varied, and may be interlinked: including floods, droughts, landslides, earthquakes, and hurricanes. The economic impacts from single events can be measured in billions of USD each (NOAA NCEI, 2018) – with this monetary value translating into deaths, injury, loss of livelihood and destruction of critical infrastructure. While such events may be popularly termed 'natural disasters', this terminology should be contextualised with the view that while *hazards* such as earthquakes are natural, hazards only become *disasters* when they intersect with humans and human development (see Wisner et al, 2003 for an overview of such discussions, Ras, 2017 as an example of contemporary opinion from the United Nations Development Programme).

With environmental risks and hazards being disasters in the human context, effective communication is key. In the face of risk, people with a range of critical information need to communicate with others to make a range of critical decisions. The affected audiences' relationship with risk, including their own experiences, feelings and values, cultural beliefs, access to information and levels of trust can influence the effectiveness of a risk communication strategy (Eiser et al. 2012). Disaster Risk Management (DRM) and Disaster Risk Reduction (DRR) are inherently interdisciplinary and cross-sector activities and recognise effective risk communication as essential parts of the DRM/DRR process. For example, The United Nations Office for Disaster Risk Reduction offers communication guidelines at both general (UNISDR, 2017) and specific levels (UNISDR, Childs, Witschi, 2014). Risk communication strategies can range from extensive campaigns e.g. "floods destroy" in England, to focused activities such as interactive games e.g. Stop Disasters Game by UNISDR. Wider concepts such as CERC – Crisis and Emergency Risk Communication situate communication within a broader risk perspective (Reynolds, Seeger 2005), and specific calls have been made to advance risk communication by maintaining cross-sector and cross-discipline research (Bostrom, 2014).

The complexities of DRM, DRR, and risk communication mean that no one individual, from one discipline, can accomplish the whole task effectively. Scientists and engineers may have the data, forecasts, and technologies to help warn of, reduce the impact of, and speed up recovery from hazards. However, these inputs may be of limited effectiveness if they are not communicated in a clear and relevant manner, enabling people to interpret the information, make decisions, and take action. Communication needs to occur between many different actors, with different levels of expertise and decision-making autonomy, with interactions between researchers, governments, aid organisations, business, and the general population. The focus on interdisciplinary and cross-sector learning to improve risk communications design in this paper is not one of idealism or fashion – it is an acceptance of a global reality. While there are concerns around interdisciplinary studies (summarised Benson 1982), the interdisciplinarity within the DRM/DDR sector is already inherent, and, as shown above, already recognises communication as essential.

From a design standpoint what might be entailed in designing communication translates to a range of design sub-disciplines. These sub-disciplines are relevant in their capacities to communicate, filling a spectrum of design problems from awareness raising to the detailed communication of technical data. Skills are needed in (but not limited to) graphic design (more specifically visual communication design, Frascara, 2004), information design (especially data visualisation, information graphics, and form design), user experience, user centred design, co-design, and service design, all delivered across a range of mediums and scales.

While there is a large amount of research into risk communication (with a focus on DRM/DRR, see overview Bradley, McFarland, Clarke, 2014, Eiser et al. 2012), and while much of that communication involves visual communication (e.g., documents, apps, web-sites, forms, charts, diagrams, and data visualisations) there is comparatively little critical engagement from trained graphic/communication designers. That is not to say that such engagement is wholly absent (Jaenichen's work being a strong example, e.g., Jaenichen, 2017, Jaenichen, Schandler, 2017), but that it appears to be under-represented, compared to, e.g., design for medicine (see Wellcome Collection, 2017 as an example of high-profile public engagement in this area). Research, such as Cheong et al.'s (2016) study into graphical variations in wildfire uncertainty visualisation, or Pappenberger et al.'s (2013) sketching elicitation exercise on inter-expert flood uncertainty communication methods, relates very closely to communication design, but without reference or direct expertise to the domain. Spiegelhalter, Pearson, and Short's prominent paper (2011) likewise makes clear and direct use of illustrations showing the graphic communication of uncertainty, with little engagement with the graphic

communication itself. For design to have the greatest impact in affecting clear communication, it needs to be integrated as a key part of the DRM/DDR process – not be seen as an afterthought to ‘decorate’ messages.

Risk communication is an area of interest to a range of disciplines, including health/medicine (e.g., Reyna, Brainerd, 2007) finance (eg., Beretta, Bozzolan, 2004), geoscience (e.g., MacEachren et al 2005) and DRM/DRR specifically as outlined in this article. Where this article uses the term interdisciplinary, it is not referring to linking the multiple disciplines to which risk communication research is relevant, but to linking the multiple disciplines which must work together to communicate risk(s) pertinent in very specific environmental hazard DRM/DRR scenarios. From a communication design perspective, risk communication is of interest as its recipients often need to interpret scientific information to make critical decisions. This means that understanding and interpretation of the information is key, in situations where context (Gigerenzer et al. 2005), trust (Kasperson, 2014; Eiser et al. 2012), and the not always obvious processes of human decisions making are prominent. This idea of decision making is again an area of considerable interdisciplinary and cross-sector interest, including the popular sphere, with books such as Kahneman’s *Thinking, Fast and Slow* (2011) and *Nudge* (Thaler, Sunstein, 2008) having considerable reach. Therefore, further engagement of the design community as part of interdisciplinary teams is needed to design risk communication strategies for natural hazards.

2. Interdisciplinary risk communication workshop context

The Water Youth Network and Global Facility for Disaster Reduction and Recovery (GFDRR) organised the Interdisciplinary Pressure Cooker Event on Risk Communication at the World Bank Understanding Risk Forum 2018 in Mexico City on May 14th and 15th, 2018. The workshop was supported by the NERC, FM Global and NASA. In the pressure cooker workshop interdisciplinary teams were given one of two real world multi-hazard case studies from Mexico, and were required to design a risk communication strategy for a specific scenario within the case studies. Running for 24 hours (and termed a ‘pressure cooker’), from a 9am start to a 9am presentation the next morning, the workshop combined problem-based learning with a hackathon focus in an interdisciplinary context.

Effective environmental risk communication requires not only designers to have the hard skills for risk communication and to be interdisciplinary collaborators, but concomitantly to impart awareness of the essential role of design and its processes to those in the other disciplines. Shared awareness of collaborators’ working methods among those involved in interdisciplinary communication challenges is fundamental to training and increasing capacity (‘Risk Communication: It’s a Process NOT a Product’, NOAA 2016, p8).

The aim of the workshop was therefore to build skills and understanding across design, communication, social science, environmental science, risk/climate modelling and engineering, and community engagement. These fields have both academic and professional engagement – scientists might work at a university, or at a government or private organisation, needing to communicate across sectors as well as disciplines. In addition, environmental risks often take place in a multi-hazard context: floods and earthquakes can be a factor in the same region and interact with a range of social risks as well as environmental factors. The recipients of risk communication in these contexts may be varied: from government officials to marginalised groups with low levels of education. As a result, understanding of how to communicate with end users – their needs, motivations, and capabilities – can be as important as the science itself.

From a design education perspective there are several challenges here: teaching effective communication design processes, teaching effective interdisciplinary methods both to designers and those working with designers, and learning how best to create and deliver skills training in these areas. In order to increase capacity in this area, skills are needed in the design and teaching of interdisciplinary workshops, not just in the subject specialisms they bring together.

The pressure cooker environment combined problem-based learning (PBL) with intensive hackathon collocation (Trainer et al., 2016). From its origins in medical teaching in the 1960s (Barrows, Tamblyn 1980) PBL has become a popular pedagogic method across a range of disciplines (Graff, Kolmos, 2003). Its focus is on developing applied transferable problem-based skills and understanding in groups, rather than rote learning in isolation. Aside from the term PBL, such problem-solving based education has clear links to the everyday practice of, and educational methods used in, design; with parallels to in-studio engagement with problems to solve. While a PBL approach may lack novelty (or even be seen as redundant) in a design context, the number of disciplines represented in this workshop (detailed below) can be seen as exceptional in a learning context. Hackathons, originating in software development, bring together participants to 'collaborate intensively over a short period of time' to explore problems (Briscoe, Mulligan, 2014).

3. Participants, scenarios, and structure

The high-profile sponsors and setting for the workshop, combined with travel funding for many participants, resulted in recruitment of a wide range of participants from across the world, across sectors, and across disciplines. The workshop was a 'youth' event in a World Bank context, primarily aimed at 25–35 year olds. 440 applications were received from 74 countries. Water Youth Network reviewers scored applicants on experience and motivation, before final selection with input from the funding organisations FM Global, Natural Environment Research Council (NERC), and NASA. 35 participants were selected from across six disciplines: social science, community engagement, environmental science, engineering and modelling, communication, and design. Only 19 of the 440 applicants described their background role as being 'design/communication specialist', resulting in a small pool from which to draw participants with these skills. The chosen participants were formed into five teams, with each discipline represented in the teams. In addition to ensuring representative disciplinary depth, a balance of gender and regional diversity was sought. As would be expected, many of the participants were masters and doctoral students, early career researchers, and early career practitioners working in industry, public sector, NGO, and charity organisations.

With teams of high-skill participants across varied specialisations, suitable problems and input material needed to be designed to provide sufficient depth and challenge to sustain 24 hours of work. A body of experienced professionals, themselves from a range of disciplines and sectors including civil engineering, geoscience, meteorology, public media, and design, fed in to the organisation, material preparation, and running of the event. Most of these professionals also contributed to running the workshop, providing formative feedback, and/or judging the final outcomes. Design input at this stage included experiences from postgraduate design teaching and organising design teaching and research workshops in environmental risk uncertainty communication/understanding. Local specialists from Iztapalapa Civil Protection Department and researchers were consulted in drawing up the case studies, which focused on Iztapalapa – one of Mexico City's (CDMX) 16 municipalities, and Dzilam de Bravo – a coastal municipality in Yucatan state.

Both case studies combined multiple hydro-meteorological and geological hazards (e.g., flooding and earthquakes) with problems of socio-economic marginalisation. Case-study information was presented to participants in written reports (~7500 and ~ 6000 words respectively), including maps, diagrams, charts and statistics. This information was distributed as hard copy and made available via Google Docs – participants had brought their own laptops and had access to venue Wi-Fi). Additional data was available online, from sources including NASA. The information from local experts was supplemented by video interviews with local residents (subtitled into English). Participants were also briefed by presentations from the event organiser and local experts. Participants were not told what the case studies were in advance and were deliberately given a large amount of information, meaning they would have to share their expertise and work as a team to understand the situation. Participants were provided with a range of pens, papers, flip charts, and post-it notes.

The two scenarios, Iztapalapa and Dzilam de Bravo, were sub-divided into five briefs with target audiences and more specific problems to address, with each team being allocated one brief. These briefs were:

1. Iztapalapa – households at risk of flooding
2. Iztapalapa – households at risk of building fracturing
3. Iztapalapa – households facing resettlement
4. Dzilam de Bravo – households dependent on fishing
5. Dzilam de Bravo – communicating risk to schoolchildren

All teams were given the same information and briefing documents about their scenario context. Since the environmental and social hazards overlapped in many cases and had knock-on effects, it was important that the groups had all of the information – practically so that they could make links, pedagogically so they had to decide which information was relevant to their users. All of the briefs started with the set phrase:

Your team has been hired by local government office in **[region]** for a research consultancy to come up with a risk communication strategy including outputs targeted at **[brief specific group/hazard]** of **[region]**. As a part of your communication strategy you will need to develop an output tailored specifically for a selected vulnerable sub-target group.

The final submission from each team's risk communication strategy was to be presented via a 10 minute presentation 24 hours after the 9am workshop start, accompanied by a written report due at 4am. No limitations were placed on how the presentation should be conveyed. A creative networking event was run the evening before, so that participants had a chance to get to know each other, and gain insights into how other disciplines perceived risk communication. (Full details of the creative networking event and more details of the workshop logistics, links to case study materials and resulting risk communication strategies and feedback overall can be found in Water Youth Network, 2018. The overview here gives details of structure relevant to the present paper with specific relevance to design.)

As the participants had been given a large amount of content and a continuous 24-hour period to work in, a process was developed to give structure to the workshop. The process had three steps, each of which comprised of a number of tasks, which were intended to help the teams focus their response within the 24 hour exercise, as follows:

1. Understand the risk context and audience at risk:
 - Review case study material,
 - Understand the audience by developing audience profiles for the target users,

- Agree on one vulnerable sub-target group within households.

2. Identify the expected outcomes and impact of the proposed risk communication strategy

- Outline long term changes to influence.
- Outline the smaller changes that need to happen for the big changes to occur.
- Be specific about the expected changes in knowledge, attitudes and practices/actions.

3. Detailed development of a risk communication strategy

- List possible communication outputs
- Think about how these connect to the audience profile and the expected behaviour change
- Decide on the most appropriate output and develop relevant materials.

A workshop such as this will always have elements that are artificial compared to a full design process, but the process above seeks to emphasise understanding of the problem via information and users to determine the strategy objectives (Frascara, 2014, p101–108). The risk communication strategies the participants were asked to design were (mostly) in response to potentially destructive, disruptive, physical environmental events, (described and analysed by numerical data). However, audience and user needs, and the changes in knowledge and actions required, were at the heart of the process. While overall a risk communication strategy could be seen as a task in information service design, people are key (see Oven, Predan, 2013 on design as an instrument for change within large and complex organisations/systems).

To help move the teams through the 24 hour working session, each team was allocated a mentor, assigned from the event organisers. The role of the mentors was to challenge the teams' thinking (following the 'ignorant schoolmaster' role of Predan, Oven, 2017), ensuring they were broadly on track with the process, and provide logistical support. The mentors came from a mix of disciplines relevant to the workshop (such as environmental science and communication design). All had prior professional engagement in the practice and/or research of environmental hazard risk communication. Observers, again from the organisers, monitored the teams' working methods throughout the day to see how they approached the challenges and observe interdisciplinary interaction.

Groups of specialists – both in terms of local knowledge and subject specific expertise – were brought in at two points (late afternoon and early evening) to give critical feedback to the teams. The teams had to quickly pitch their progress on their proposed solution, allowing the experts to critique, expand, and challenge members' thinking with insights from a range of disciplines. This engagement with a rotation of experts throughout the workshop, combined with a broad but flexible structure, gave context (including the experts' insights from experience of working with risk information users). It was important to maintain a balance between avoiding over structuring (see Cooley, 1999 on user centred information design skills development).

The teams' risk communication strategies were judged on:

- Decision-making process
- Identification of expected outcomes and impact
- Appropriateness of output for target audience(s) and aims (outcomes and impact)
- Originality, creativity and innovation in risk communication
- Clarity of documentation and presentation

- Applicability of the risk communication strategy.

Judgements were made on the final presentation, the accompanying documentation, and observations from team mentors and workshop observers. A prize was awarded for the best outcome (assessed by an interdisciplinary and cross-sector panel of judges, including representative from local governance, NERC, BBC (Robinson, 2018), and NASA) and also for the team with the best interdisciplinary collaboration.

4. Communication strategies developed

The five risk communication strategies developed by the teams were as follows:

1) Iztapalapa – households at risk of flooding

‘Water Ambassador Programme’, a scheme targeted at primary school children through existing community outreach methods, alongside an existing municipal programme to install water catchment tanks on houses. Alongside educational and awareness raising activities, the ambassadors could become ‘Guardians of the Drains’ to help ensure that local drainage systems were not obstructed.

2) Iztapalapa – households at risk of building fracturing

The strategy targeted young mothers as a way to reach further vulnerable subgroups of *ni-nis* (youths not in education or work), children, and the elderly. Women would receive training to become agents of change as community ambassadors, who would then help to co-design further community engagement activities. Initial activities would include direct instruction on how to repair and prevent building cracking, moving on to community mapping of the risk in their area, and finally community awareness of the contribution of street garbage to flooding (which worsens fractures and subsidence).

3) Iztapalapa – households facing resettlement

This strategy targeted economically inactive women (at most informally employed) within households facing resettlement to open up iterative dialogues around the resettlement process. A focus on discussions with those affected would lead into town hall meetings, extending into trips to proposed resettlement sites and analysis of potential risks at new sites compared to their current locations.

4) Dzilam de Bravo – households dependent on fishing

This team focused on women as key influencers within households dependent on fishing, to bring about a community led strategy. Female community champions would engage with community, church and sports groups to extend awareness of risks, facilitate dialogue and empower communities. Engagement would include social media, children’s activities, and community mapping visualisation.

5) *Dzilam de Bravo* – communicating risk to schoolchildren

This team developed a teacher’s guide to risk communication tailored for children aged 9–12 years. The children would then disseminate the information to their families, leading to greater risk awareness and hazard preparedness at household and community levels. The team designed educational ways to integrate risk communication into lessons across a range of subjects, e.g., making neighbourhood flood maps as a geography lesson.

Team 5, communication risk to school children in *Dzilam de Bravo*, were judged overall winners, in line with the criteria in the previous section. Team 2, households at risk of fracturing in Iztapalapa, was given the prize for best interdisciplinary collaboration.

A field trip to Iztapalapa took place the day after the presentations. The trip visited the areas directly relevant to the Iztapalapa case study, exploring a range of contexts – from the municipal police control room, to the home of a local woman (see Water Youth Network, 2018 for further details.) For logistical reasons, it was not possible to run the field trip during the pressure cooker itself.

5. Discussion

5.1 Design of the workshop

All of the resulting risk communication strategies developed by the participants involved direct community engagement and some form of bottom-up approach. All the strategies specifically targeted women and/or children as key influencers within their target user groups. Dialogue, education, and co-design were recurring themes. There was a focus on communicating the skills and information required to those at risk to allow them to make their own informed decisions about how to react to the risk in their lives, rather than imposing mandates. Such ideas of self agency and empowerment map on to Kasperson's concerns over the 'erosion of social trust' which may be prominent in such communities:

'In such cases, communication and deliberation need to proceed hand in hand. Communication in situations of high social distrust is fundamentally different than the one-way and top-down communication that still remains the norm for most of the public and private sectors.' (Kasperson, 2014, p1236)

While these themes of co-design and driving change through women and/or children were very strong in the risk communication strategies, these methods were not presented to participants as the ideal approach. Participants were strongly encouraged to think about users and to develop user personas (both by the overall structure of the event, and from the insights of the team mentors) but the specific focus on women, children and co-design appears to have emerged from the participants themselves and their past experiences.

It was the view of the judges and organisers that relatively little attention had been paid the scientific data and processes behind some of the environmental hazards. This is especially notable given that every team contained at least one participant with an environmental science background. Some participants suggested afterwards that this may have been due to the focus on risk *communication*, rather than risk management, foregrounding social rather than hard science outcomes. While this may be true, it indicates an area for further development, to push the next generation of interdisciplinary risk communication to engage with both sides of the challenge. Within the pressure cooker context it appears the easiest way to deal with the challenge of communicating physical science was to side-step the problem. The three step process that structured the workshop (outlined above) may also have contributed to the side-lining of scientific issues in the final outcomes, as it does not science directly. While some participants were domain experts in understanding this science already, more of a focus could have been placed on transforming this information from an information design perspective (Neurath, Kinross, 2008).

5.2 Design in the workshop

In addition to the limited attention to physical science, the role of visual design in the final outcomes was also limited. Here the working situation and time frame may have been a contributing factor. Evidence of graphic design and communication design, was visible in logos, icons, limited publicity materials, and basic diagramming in many cases but not in developed thinking about the use of design to better represent and communicate risk. Communication design was being used at a surface level to gain attention and give identity. While designers were placed in each team (and a number of non-designers had creative and/or design related hobbies) this strand struggled to emerge in the outputs, mirroring concerns over the depth of physical science engagement. It may be that the value of physical science and design to the project needed to be more clearly signposted. As it was, the interdisciplinary appears to have 'averaged' to the social – with science participants feeling they were focusing on communication, while conversely the communication and design expertise of the teams less evident than might have been anticipated.

Participants from across all disciplines appeared willing and eager to engage with user needs. To some extent this may be a result of self-selection, by participants willing to apply for such an interdisciplinary event. However, this was an area where more direct instruction could have been provided. The teams ran into problems conceptualising the specific vs. the general in creating personas. Anecdotally, these problems mirrored experiences of teaching UX methods to graphic communication students from one of the team mentors.

While great efforts were made to include as much real-world material as possible, no representatives the general populaces affected (i.e. 'end users') were at the event (except for those in positions of authority in local government or academic research). While the experts could represent the views of these people, there is clearly a difference between this and being able to co-design and test proposed solutions with end users. One solution to this would have been to hold the field trip before the event. Due to the considerable logistical challenges in organising an event such as this to start with, this was not practical.

The lack of direct user testing can be seen as weakness from a design process perspective. However, overall the realism of the material provided was praised by participants, for example:

"The coaches were great at keeping us on track and the paperwork was enough to guide us without limiting us. The case studies were well chosen and REAL, it felt like we might be able to make a real difference – much better than working on theoretical situations." (Katie Smith, quoted in Water Youth Network] 2018, where further feedback and quotations are cited)

The case studies contrasted with more fantastic scenarios, such as the US CDC's Zombie preparedness initiative public engagement campaign (including resources for school children) (CDC, 2017, campaign originally run in 2011). Although the Zombie campaign was an imaginative and popular cross-media exercise, it was difficult to identify marked changes in behaviour by those who engaged with it and later studies conducted with the material indicated no long term change in participant behaviour around risk preparedness (Kruvant, Silver, 2013, Kruvant, Bryant 2015, Fraustino, Ma, 2015). While the Zombie campaign was focused on public engagement, not building capacity for practitioner skills, the follow up research listed above highlights the dangers of fictional scenarios, and especially the use of humour. That said, while the workshop's realistic case studies were positively received by participants, and they indicated they would change their working methods as a result of participation, no follow-up research is yet available to confirm this has been the case. Additional learning and insights into how to address co-design and user engagement, even

with logistical challenges such as those we encountered, could be drawn from the design community when developing such event.

5.3 Building a sustainable community of interdisciplinary risk communication professionals

Participants were interviewed and surveyed for feedback after the workshop. 29 of 31 respondents had found the workshop 'very' or 'extremely' useful for developing skills to interact across disciplines, while 30 of 32 responses said there was a 'high' or 'very high' likelihood of them applying learning from the event (Water Youth Network, 2018).

In addition to learning interdisciplinary skills, personal interdisciplinary links between both participants and organisers are one of the workshop's outcomes. As of late October 2018 the participant and organiser Whatsapp group is still active, with 47 members, who often meet each other at additional events. It is hoped that the detailed case study material will be made available in the future once suitable easy-access methods have been found, to allow it to be used to further learning elsewhere. Experiences from the workshop are being fed in to teaching in the Department of Typography & Graphic Communication, University of Reading, with plans to extend this to teaching in other departments in 2019, to maintain the interdisciplinary values. In addition, connections made at the workshop have led to research-led teaching opportunities for students at the Department with the Environment Agency and Met Office. The Water Youth Network has integrated event participants into their DRR team and intends to run another workshop at Understanding Risk 2020, following the success and positive reception of the 2018 workshop from participants, conference organisers, and funders.

6. Conclusion

The successful delivery of the interdisciplinary risk communication workshop at Understanding Risk 2018 paves the way for more interactive problem-based learning methods to develop solutions to real-world risk communication challenges. The workshop resulted in effective cross-disciplinary learning, but would have benefited from more high quality applications from young designers. In addition, the outcomes (and associated learning) could have been strengthened by a more direct process/structural focus on transforming and critically applying scientific information through design.

The workshop highlighted the importance of using real case studies and a need to keep people (end users) at the heart of risk communication design processes and resulting strategies. Although the design community were involved as participants in the event, the resulting solutions did not maximise their potential valuable input. Both seen from this event, and more generally from within the field of risk communication, more intense interaction is required between design communities e.g. graphic design, information design, user-centred design, and other disciplines focusing on managing natural hazards and the associated risks. Workshops such as the one described offer excellent opportunities to test this interdisciplinary exchange, to develop it, and to promote such interaction to the next generation of professionals working on risk communication challenges.

There is ongoing interest amongst participants, organisers and supporters to continue such events in the future and sustain an active community on risk communication. Through this article the event organisers welcome collaboration and further learning exchange opportunities between the DRM/DRR community and design disciplines, and to encourage young design students and professionals to participate in DRM/DRR led activities.

The pressure cooker environment combined problem-based learning (PBL) with intensive hackathon collocation (Trainer et al., 2016). From its origins in medical teaching in the 1960s (Barrows, Tamblyn 1980) PBL has become a popular pedagogic method across a range of disciplines (Graff, Kolmos, 2003). Its focus is on developing applied transferable problem-based skills and understanding in groups, rather than rote learning in isolation. Aside from the term PBL, such problem-solving based education has clear links to the everyday practice of, and educational methods used in, design; with parallels to in-studio engagement with problems to solve. While a PBL approach may lack novelty (or even be seen as redundant) in a design context, the number of disciplines represented in this workshop (detailed below) can be seen as exceptional in a learning context. Hackathons, originating in software development, bring together participants to 'collaborate intensively over a short period of time' to explore problems (Briscoe, Mulligan, 2014).

References

Barrows, H. S., & Tamblyn, R. M. (1980). *Problem-Based Learning An Approach to Medical Education*, Springer Series of Medical Education Volume 1, Springer Publishing Company, Inc.

Briscoe, H., & Mulligan, C. (2014). *Digital Innovation: The Hackathon Phenomenon*. Retrieved 24/07/18 from www.creativeworkslondon.org.uk/wpcontent/uploads/2013/11/Digital-Innovation-TheHackathon-Phenomenon1.pdf

Benson, T. C. (1982). Five arguments against interdisciplinary studies, *Issues in Integrative Studies*, no1, pp. 38–48.

Beretta, S., Bozzolan, S. (2004). A Framework for the Analysis of Firm Risk Communication, *The International Journal of Accounting*, Vol 39, issue 3, pp. 265–288.

Bostrom, A. (2014). Progress in risk communication since the 1989 NRC report: response to Four questions for risk communication by Roger Kasperson, *Journal of Risk Research*, vol17, issue 10, pp. 1259–1264.

CDC (Centers for Disease Control and Prevention). (2017). *Zombie Preparedness*. Retrieved, 24/07/18, from www.cdc.gov/phpr/zombie/index.htm

Cheong, L., Bleisch, S., Kealy, A., Tolhurst, K., Wilkening, T., & Duckham, M. (2016). Evaluating the impact of visualization of wildfire hazard upon decision-making under uncertainty, *International Journal of Geographical Information Science*, Vol 30, Issue 7, pp. 1377–1404

Cooley, M. (1999). Human-Centered Design, in Jacobson, R., (ed), *Information Design*, MIT Press, pp. 59–81.

Eiser, J. R., Bostrom, A., Burton, I., Johnston, D. M., McClure, J., Paton, D., Pligt, V., & White, M. P. (2012). Risk interpretation and action: A conceptual framework for responses to natural hazards. *International Journal of Disaster Risk Reduction*, 1, pp. 5–16.

Frascara, J. (2004). *Communication Design: Principles, Methods, and Practice*, Allworth Press

Fraustino, J. D., & Ling, M. (2015). CDCs Use of Social Media and Humor in a Risk Campaign—“Preparedness 101: Zombie Apocalypse”, *Journal of Applied Communication Research*, vol 43 issue 2, pp. 222–241.

Graaf, De E., and Kolmos, A. (2003). Characteristics of Problem-Based Learning, *International Journal of Engineering Education*, Vol. 19, No. 5, pp. 657–662.

Gigerenzer G., Hertwig R., van den Broek E., Fasolo B., & Katsikopoulos K., V. (2005). “A 30% chance of rain tomorrow”: how does the public understand probabilistic weather forecasts? *Risk Analysis*, 25, 3: pp. 623–629.

Jaenichen, C. (2017b). The role of visual communication and cognition in everyday decision-making, *Institute of Electrical and Electronics Engineers Computer Graphics and Applications (IEEE CG&A)*, 37(6), pp. 10–18.

Jaenichen, C., and Schandler, S. (2017). Visual Standards for Southern California Tsunami Evacuation Information: Applications of Information Design in Disaster Risk Management in Marcus, A., Wang, W., (Eds.) *Design, User Experience, and Usability: Understanding Users and Contexts*, 6th International Conference, DUXU 2017, Vancouver, Canada, July 9–14, 2017, Proceedings, Part III, Springer International Publishing, pp. 645–663.

Kasperson, R. (2014). Four questions for risk communication, *Journal of risk research*, vol 17, issue 10, pp. 1233–1239.

Kahneman, D. (2011). *Thinking, Fast and Slow*, Farrar, Straus and Giroux.

Kruvand, M., and Silver, M. (2013). Zombies Gone Viral: How a Fictional Zombie Invasion Helped CDC Promote Emergency Preparedness, *Case Studies in Strategic Communication*, Vol 2, pp. 35–60.

Kruvand, M., and Bryant, F. (2015). Zombie Apocalypse: Can the Undead Teach the Living How to Survive an Emergency?, *Public Health Reports*, vol 130, pp. 655–663.

MacEachren A. M., Robinson A., Hopper S., Gardner S., Murray R., Gahegan M., & Hetzler E. (2005). Visualizing Geospatial Information Uncertainty: What We Know and What We Need to Know, *Cartography and Geographic Information Science*, 32, 3: pp.139–160.

NOAA NCEI (National Oceanic and Atmospheric Administration, National Centers for Environmental Information). (2018). *U.S. Billion-Dollar Weather and Climate Disasters*. Retrieved 22/10/18 from <https://www.ncdc.noaa.gov/billions/>

NOAA (National Oceanic and Atmospheric Administration). (2016). *Risk Communication and Behavior: Best Practices and Research Findings*. Retrieved, 22/10/18, from www.performance.noaa.gov/wp-content/uploads/Risk-Communication-and-Behavior-Best-Practices-and-Research-Findings-July-2016.pdf

Neurath, M., and Kinross, R. (2008). *Transformer: Principles of Making Isotype Charts*, Hyphen Press.

Oven, P. C., Predan, B. (2013). *Designing an Agenda, Or, How to Avoid Solving Problems that Arent*, Pekinpa Association and the Regional Development Agency of the Ljubljana Urban Region.

Pappenberger, F. , Stephens, E. , Thielen, J. , Salamon, P. , Demeritt, D. , Andel, S. J., Wetterhall, F. & Alfieri, L. (2013). Visualizing probabilistic flood forecast information: expert preferences and perceptions of best practice in uncertainty communication, *Hydrological Process.*, 27: pp.132–146.

Predan, B., & Oven, P. C. (2017). Information design as a (re)volutionary tool, in Black, A., Luna, P., Lund, O., Walker, S. (Eds.). *Information Design research and practice*, Routledge, pp.643–653.

Ras., M. (2017). Natural disasters dont exist but natural hazards do, UNDP United Nations Development Programme. Retrieved, 22/10/18, from www.undp.org/content/undp/en/home/blog/2017/5/18/Natural-disasters-don-t-exist-but-natural-hazards-do.html accessed

Reyna, V. F., & Brainerd, C. J. (2007). The importance of mathematics in health and human judgment: Numeracy, risk communication, and medical decision making, *Learning and Individual Differences*, Vol 17, issue 2, pp.147–159.

Reynolds, B., & Seeger, M. W. (2005). Crisis and Emergency Risk Communication as a Integrative Model, *Journal of Health Communication*, 10, p43–55.

Robinson, L. (2018). Missing: A cutting-edge hub for risk communication for action, BBC Media Action Insight Blog, BBC. Retreived, 29/10/18, from www.bbc.co.uk/blogs/mediaactioninsight/entries/1aefac0e-749c-4927-afca-5ebe82ec7fca

Spiegelhalter, D., Pearson, M., & Short, I. (2011). Visualizing Uncertainty About the Future, *Science*, Vol 333, Issue 6048, pp. 1393–1400.

Trainer, E. H., Kalyanasundaram, A., Chaihirunkarn, C., & Herbsleb, J. D. (2016). How to Hackathon: Socio-technical Tradeoffs in Brief, Intensive Collocation, In *Proceedings of the 19th ACM Conference on Computer-Supported Cooperative Work & Social Computing* (CSCW 16). ACM, pp. 1118–1130.

Thaler, R. H., & Sunstein, C. R. (2008). *Nudge: Improving Decisions About Health, Wealth, and Happiness*, Yale University Press.

UNISDR (United Nations Office for Disaster Risk Reduction), Childs, D., & Witschi, A. (2014). *Guidelines for Communicating Disaster Risk Reduction Information (In the Caribbean)*, UNISDR and ECHO. Retrieved, 22/10/18, from www.unisdr.org/we/inform/publications/53901

UNISDR (United Nations Office for Disaster Risk Reduction). (2017). Public Communication for Disaster Risk Reduction, part of *Words into Action Guidelines: National Disaster Risk Assessment Special Topics*, Retrieved, 22/10/18, from [www.preventionweb.net/files/52828_apubliccommunication\[1\].pdf](http://www.preventionweb.net/files/52828_apubliccommunication[1].pdf)

Water Youth Network. (2018). Interdisciplinary Pressure Cooker Event on Risk Communication Evaluation Report. Retrieved 22/10/18 from http://www.wateryouthnetwork.org/wp-content/uploads/2018/11/UR2018-Risk-Communication-Pressure-Cooker-Report_FINAL_2018.pdf

Wellcome Collection, (2017). *Can Graphic Design Save Your Life?*, [exhibition], Wellcome Collection, London.

Wisner, B., Blaikie, P., Cannon, T., & Davis, I. (2003 2nd ed). *At Risk: Natural hazards, peoples vulnerability and disasters*, Routledge.

About the Authors:

Matthew Lickiss is Lecturer in Typography & Graphic Communication at the University of Reading. Specializing in information design, his main research interests are the communication of environmental risk and uncertainty, and multimodality in document theory.

Lydia Cumiskey is a PhD researcher on integrated flood risk management at the Flood Hazard Research Centre, Middlesex University and the former coordinator (now member) of the Disaster Risk Reduction team at the Water Youth Network.

Acknowledgements: The authors would like to thank everyone who enabled the success of the Pressure Cooker event, including the team of Water Youth Network organisers, the Global Facility for Disaster Reduction and Recovery, the funders – UK National Environmental Research Council (NERC), FM Global and NASA, the core mentors, the local case study specialists, the topic-specific specialists and most importantly the proactive participants. [Without their support and commitment this reflective piece could not be written.]