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The Stem Cell NetWork: Communicating Social Science through a Spatial Installation[1]

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In 2004-2007 the Danish research project '*Creating Science: Crafting Stem Cell Research in a Moral Landscape*', investigated the cultural, social and ethical aspects of stem cell research funded by the Danish Social Science Research Council. Empirically, the project was inspired by the legalization of embryonic stem cell research which was decided upon by the Danish parliament in 2003 following scientific pressure and intense public discussion. Internationally, huge expectations had been connected to stem cell research which was seen to be a possible way to generate medical cures for diabetes, Parkinson's, spinal cord injuries and a number of other serious diseases, but the high expectations had also been coupled with wide-scale ethical discussions. A crucial issue in this regard was the fact that embryonic stem cell research was conducted on fertilized human eggs and that the eggs were destroyed in the process (Holland et al, 2001; Gottweis, 2002; Holm, 2002; Lee, 2001; Hauskeller, 2004; Nisbet, 2005). The Danish research project, however, took as a starting point that there were a number of other social and cultural issues which could be objects for discussion in connection with the introduction of stem cell research. These issues included questions of resource priorities, intellectual property rights, patient involvement and expectations management. Theoretically, the research project therefore started from a conviction that stem cell research doesn't fall from the sky as a fixed and ready-made entity, but is shaped by – and shapes – the social context in which it emerges. The project consisted of a number of different cross-disciplinary sub-projects which focused on the various aspects of the making of stem cell research.

[1] A version of this chapter has previously been published in French in the journal Questions de Communication, vol 17 (2010).

One of these subprojects was focused on the creation of public acceptability of embryonic stem cell research. It was conceived within the framework of critical Public Understanding of Science (PUS) and its focus on the need for democratic dialogue about scientific and technical change (Irwin, 1995, Irwin & Wynne 1996). The inspiration from this literature, however, also led the entire project group to consider its own contribution to public debate about emerging science in general and stem cell research in particular. In an effort to include more engaging and involving forms of research communication, the project group therefore chose to collaborate with a spatial designer, Birte Dalsgaard, to create an installation which would experiment with novel ways of communicating the research conducted within the framework of the project. The installation was created in 2005 as '*the Stem Cell NetWork – a Social Science Lab*'.

This chapter tells the story of this installation and reflects on how it engaged non-researchers in dialogue about research. First it discusses the theoretical inspiration and conceptual background for the installation. These included an effort to communicate research problematics rather than facts, a focus on meaning-making rather than comprehension of ready-made scientific knowledge, and the creation of curiosity and engagement through an open invitation to participation. Inspired by critical Public Understanding of Science, our aim was to find ways of engaging in dialogue with audiences about our research, since we expected this to be beneficial for both our audiences and ourselves. On the one hand, we thought the dialogical engagement would contribute to a democratic dialogue about emerging science and allow publics a new form of 'voice' in relation to science and technology. On the other hand, we also expected that we, as researchers, would learn from the engagement with non-researchers. Following the account of the conceptual framework underpinning the installation as an experiment in public engagement, the following section of the chapter outlines the process by which we designed the installation. The subsequent two sections describe the installation and the visitors' reactions to it.

In the concluding section, we discuss the lessons learned in relation to public participation in science communication. In particular, we focus on what it means to do dialogic science communication. A starting-point for the chapter is the premise that public sense-making about emerging science and technology is a process of negotiation and deliberation in a shifting landscape of statements and opinions (Horst, 2008). The creation of technical innovations and emerging scientific fields is not independent of this process, as public acceptability is one of many resources needed for an innovation to be successful. In the research project we studied these processes of meaning-making, but through the creation of the installation, we also actively invited citizens to take part in the process. In this way, we sought to 'open up' (Stirling, 2008) the processes of opinion-formation and invite citizens to take active part in these processes, at the same time as we were also studying the processes.

Conceptual framework for the installation

Theoretically, the idea to create an installation grew out of an increasing sense of unease with the gap between the theoretical insights of the tradition of critical Public Understanding of Science (PUS) and the practice of communicating those insights. Until the mid 1990's, science communication was primarily understood as a question of disseminating knowledge from experts to lay people within the terms of traditional PUS. Public scepticism towards science and technology was interpreted as a result of a deficit in public knowledge of, for instance, the facts about genetically modified organisms, nuclear power and mad cow disease (for an influential example, see Bodmer, 1985). The publication of "Misunderstanding Science?" (Irwin & Wynne, 1996), and related papers, changed the scholarly field of PUS. It moved the focus towards understanding the ways in which various publics make sense of science by drawing upon their own experiences, and

also towards how science can benefit from a constructive dialogue with these various publics. Subsequently, there has been a strong promotion of dialogic forms of science communication and experimentation with different forms of public engagement in the scholarly community of PUS (see for example Durant, 1999; Einsiedel & Eastlick, 2000; Michael, 2002; Wilsdon & Willis, 2004), and there has also been a proliferation of dialogue-based public engagement practices – particularly around emerging science and technology. However, when it comes to PUS knowledge itself, research communication has tended to use very monological formats, such as written or oral presentations of arguments in the medium of language. This had also been a personal experience before I engaged with this installation as I had very often found myself giving talks to non-PUS-researchers in which I (to my own distress) was talking about dialogue, but practising monologue. In this way, scholars of PUS have seemed to find it difficult to 'take their own medicine' and experiment with novel ways of entering into dialogue with their stakeholders about their own knowledge production.

On this basis, the collaboration between the spatial designer and the research group was born as an ambition to experiment with spatial and interactive communication. The collaboration was not guided by well-defined goals and success criteria. Rather, the ambition was to allow the experiment to develop in an explorative way which also had the potential to surprise the participants. We therefore agreed on a set of 'rules of engagement' which would serve as guiding principles for our ambitions (see also Horst & Michael, 2011). They were all based on insights and discussions within the academic discussions taking place within the field of PUS and the study of science communication more broadly (see also Cheng et al. 2008):

- The installation should *make the communication dialogic and interactive and this should be the prime focus.* The effort was to begin with dialogue, rather than treat it as an optional add-on to the dissemination of scientific knowledge. In many research communication efforts, there is an

expectation that publics should first let themselves be 'informed by the facts' before they are able to take part in a dialogue (for a criticism of this model, see Irwin 2001). In the context of the installation we aimed at avoiding this kind of entry barrier and make the invitation to engagement as unconditional of research-based knowledge as possible.

- The installation should seek to *communicate research-based problematics, rather than ready-made 'packages of knowledge'*. This ambition was based on the idea that it can be difficult to create dialogue and participation around a discussion of stable and uncontroversial facts. When a phenomenon is conceived of as a 'fact' it has become stabilised (Latour & Woolgar, 1979) in a way that might close off dialogue rather than open it up. If the objective is to engage researchers and their publics in dialogue with the aim that both parties learn from the encounter, the debate has to be focused on issues where researchers are open to input and suggestions, for instance research problems and questions. The project group consisted of eight researchers from different social scientific disciplines, each of which examined a social/cultural aspect of stem cell research in Denmark. The ambition with the installation was to focus on the central research problem of each of these aspects. It was crucial that the research communication was *not* conducted *after* the research process or viewed as an add-on appendage, but rather fully integrated in the research practice.
- The installation should *create engagement, irritation or curiosity rather than just understanding*. A central concern within the discussions of public engagement with science is whether dialogue is just another way of trying to get the public to consent to traditional scientific development (Hagendijk & Irwin, 2006; Levidow & Marris, 2001; Wynne, 2005). This specific installation was based on social science about stem cell research, and although we would try to enable visitors to understand different aspects of the issue of stem cell research, the primary aim was not to create a cognitive understanding of the social science forming the

basis of the installation. The idea with this specific exercise was to accept that publics should not always be guided towards a specific goal. Rather, the installation should be an open invitation to engage and interact in ways that seemed meaningful to the visitors themselves.

- The installation should be developed as an effort to c*ommunicate with more than words.* Language is a medium with which most researchers and scientists are very comfortable, but this comfort is not universally shared in society. As mentioned above, social science, in particular, is haunted by an almost exclusive focus upon words as the medium of communication. In contrast to this, the format of a spatial installation would allow spatial, kinaesthetic and tactile forms of communication, and the question was whether these forms of communication would inspire visitors and invite them to participate in other ways than the traditional use of language.
- The experiment should try to *engage the visitors both cognitively and emotionally*. The reason for this ambition was to create a form of research communication which acknowledged multiple intelligences and approaches other than the purely intellectual and linguistic form. This was based on an assumption that such an alternative form could appeal to a wider audience at the same time as overcoming some of the limitations connected to traditional forms of one-way research communication – both regarding what is communicated and to whom it is communicated.

Based upon these rules of engagement, the objective was to create a spatial installation which would communicate central points from the work of the research project on social and ethical aspects of stem cell research. Inspired by the work on the Social Construction of Technology (Bijker & Law, 2000; Bijker et al, 1986), the fundamental axiomatic assumption was that emerging science and technology, such as stem cell research, is developed in a complex social process in which it both shapes and is shaped by the contexts. Furthermore, it is assumed that it is a dynamic and continuing

process, which can be influenced by actors who have an interest in doing so. The objective was therefore to create an interactive installation, where visitors would be asked to participate in the meaning-making and opinion-formation (Habermas, 1991) around stem cell research, hereby simulating the social and cultural shaping processes of making stem cell research into reality.

A second important assumption of the research project was that any given phenomenon is configured differently in different contexts (Star & Griesemer, 1989). In the research project, each of the researchers worked with different cultural and social contexts for the understanding of stem cell research and these differences in contextualisation were crucial to the organisation and outcome of the interdisciplinary research group. It therefore became an objective to design the installation as a set of different spatial confinements, each of which could symbolise a particular aspect or problem in the research projects. By using the spatial setting to create different contextualisations of stem cell research, the idea was to let visitors experience the multi-contextuality of the subject.

The assumption that the social shaping process is dynamic and affected by material as well as social influences was inspired by the work of Bruno Latour and the wider framework of Actor-Network-Theory (see for instance Callon, 1986; Latour, 1987; Latour, 1996; Law & Hassard, 1999). It has been discussed elsewhere how the political debate about emerging technologies can be understood as a 'Laboratory of Public Opinion' (Horst, 2008). In this 'public laboratory', different actors propose various statements that are linked to each other in ways that, over time, make some statements appear more unavoidable and other statements less unavoidable. As the process evolves, these links serve as the basis for decisions about the (il)legitimacy of new technologies. In the same way, the objective of the installation was to let visitors experience this dynamic process of opinion formation by engaging them in decisions about a number of issues related to stem cell research. Furthermore, visitors' decisions should involve making a physical mark such as writing a comment

or casting a vote, which would leave traces for the subsequent visitors to see. The idea was that the installation would take shape from the decisions made by the visitors, so that the installation itself would represent the outcome of the debate taking place in it.

Design of the installation

Due to financial restrictions, it was impossible to create an installation, which could have been placed in the public sphere as we originally had imagined. We therefore had to settle for an 80 m2 test model, which would allow us to test some basic ideas about spatial research communication and the creation of interaction according to the rules of engagement mentioned above. The test model was built in a basement at Copenhagen Business School, where I worked at the time (for pictures and more information about the installation, see www.stamcellenetvaerket.dk). The conceptual work was done during the autumn of 2004 and the construction took place in January-March 2005. The actual construction work was done by a group of 4 people who usually work with art, theatre settings and other types of creative built environments. As mentioned, the funding for the creation of the installation was very limited, but with the help of these creative builders, its finish and aesthetics were acceptable for a test model. Our specific objectives for the creation of the installation were to investigate the following questions:

- Can the visitors make sense of the installation?
- Will the visitors choose to participate and engage with the installation?
- How will visitors make sense of the installation?

Crucial for Actor-Network-Theory is the concept of translation, which implies that a shift from one medium to another is never simply the same statement in a different form (Latour, 1987: 108-121).

Rather, any translation is always productive, because it always creates different or additional meanings. In making the installation, we were aware of this and sought to use it productively by engaging the researchers of the project group in conversations about their research and how it could be conceptualized in a way that could be translated into a physical installation (Research results have later been published in Danish, see Koch & Høyer, 2007). For this purpose, the designer developed a number of visual brainstorming tools which could be used in meetings about the installation and its content. During a series of such meetings in Autumn 2004 as well as the designer's visual and spatial interpretations of these meetings, the conceptual model for the installation slowly took shape.

It was decided to design the installation as a three-dimensional 'gaming board', where visitors could move between a series of small rooms. Each of these rooms was designed to illustrate an aspect, such as a central insight, axiom or problem, from the work of researchers in the research project. Together, the rooms illustrated the multi-contextuality of stem cell research and the point that it can be endowed with different meanings in different contexts (spaces). In each of the rooms, the topic of stem cell research was shaped in a particular way, which demonstrated certain problems and led to certain questions and forms of interaction. The rooms covered many contexts, such as the medical clinic for IVF (where the fertilized eggs used for stem cell research came from), the stem cell laboratory, legislation, economic markets, patients' everyday life, history, expectations about the future, moral horizons and public debate. Visitors could pass through these rooms in different, but not completely random, sequences.

[Map of installation]

Visitors could think of themselves as their own gaming piece in this three-dimensional gaming board. Throughout the installation they were confronted with a number of different problematics

and encountered different types of choices through physical meetings with different scenarios. They had to mark their choices or priorities in different physical ways which would change the appearance of the installation accordingly. As mentioned above, this represented an effort to demonstrate how the landscape of opinion formation changes character when people interact. If all visitors made choices that favoured the prohibition of embryonic stem cell research, then the appearance of the installation would make this visible, and subsequent visitors would meet this particular expression of preferences within the installation. More generally, the changing nature of the appearance of the installation also served to illustrate that social problems are dealt within, and shaped by social contexts. The installation was therefore not just a site for individual reflection and opinion formation; it also served to make it visible that opinion formation takes place in a social setting.

A tour of the installation

As can be seen on the map of the installation, visitors entered the installation through an introductory room where the walls were covered in pictures and explanations of the nature of stem cell research and the scientific expectations associated with it. When leaving this room, visitors entered a bright yellow room which we called '*the Baby Factory*'. The first thing that happened in this room was that visitors were told that they needed to spit twice into a plastic jug, and subsequently they were allowed to take a number of '*embryo nuggets*' out of a hole in a purple box. Visitors were given 1-3 of these nuggets which were peach-colored scone-sized lumps. The nuggets were a central artifact in the installation, basic to the ways in which visitors were asked to engage with the installation. Conceptually, they were based on the observation that the fertilized eggs created as part of IVF-treatment are a crucial material part of stem cell research. The hole in the

purple box was covered with slime which made it a bit awkward to get the nuggets out. The conceptual idea behind the spitting and the slime was that women in fertility clinics undergo a rather unpleasant and painful bodily experience when they are having IVF-treatment (Svendsen, 2007), and we wanted to convey some of this experience to the visitors. Additionally, we expected that the nuggets would be seen to be more valuable to visitors, when the process of acquiring them was connected to a certain 'cost' in the form of unpleasantness. Again, this was thought to reproduce some of the emotions experienced by people undergoing fertility treatment. For couples desperately trying to conceive a baby, a fertilized egg is very valuable and the fact that their creation is connected to bodily pain and unpleasantness serves to increase this sense of value.

Before leaving the room, visitors were asked to decide whether they wanted to donate one of more of their nuggets for stem cell research and sign in a book if they wanted to donate. Subsequently, visitors who chose to donate were asked to leave the room through a blue door and visitors who chose not to donate were asked to use a red door. Both doors were open but whereas the blue door was normal size, the red door was small and narrow, so that visitors had to squeeze to get through. The idea behind this feature was taken from the social scientific description of the donation process in the IVF clinic. The personnel in these clinics are seen as being very professional and ask for donations in a way which leaves it up to the couples to decide freely – a process which is also strictly regulated by law – but the nature of the question of donation is such that the infertile couples most often feel that somehow it is easier to donate than not to do it.

Both doors, however, led to the next roomwhich we called '*the Rule Machine*'. This room was designed on the basis of research on the legislation and regulation of stem cell research and the use of fertilized eggs (Hartlev, 2007). The room was chequered in red and blue and had a column in the middle. On the column it was explained that visitors had to decide what kind of protection they

wanted for their embryo nugget. There were five different options for protective suits which visitors could wrap their nugget in:

- a garbage bag symbolizing that the nugget could be used for everything including, for instance, soap production;
- a gym suit symbolizing that the nugget could be used for disease prevention but also things like research on human enhancement etc;
- a builder's suit symbolizing that the nugget could be used for research on disease prevention,
- an suit of armour symbolizing that the nugget could only be used for research on some forms of serious diseases;
- a cage with a lock which symbolized that the nugget could not be used for anything.

Each of the suits corresponded to one of five differently coloured exit doors and visitors were asked to choose the appropriate door. However, only one of these doors was a real door. When visitors opened the other doors they were met by a wall and a sign that read: "Sorry, you cannot choose this form of protection for your nugget. Our society has already decided how the nuggets should be protected – please use the yellow door where nuggets are allowed to be used for research on disease prevention." The conceptual idea behind this room was to let visitors consider regulation as an opportunity to 'protect' a phenomenon, which might be considered valuable. We wanted them, on the one hand, to think about how they would like the regulation to be, but, on the other hand, they should experience that regulation is not an individual matter. Once a society has decided upon a certain form of regulation, all citizens have to comply with that.

The next room that visitors would enter was white and called '*the Laboratory*'. Upon entering this room, visitors were asked to take separate routes depending on whether they had chosen to donate

their nuggets. The ones who had chosen not to donate were asked to proceed into the next part of the installation, whereas the ones who had chosen to donate were let into the laboratory room. This room was devised on the basis of our interactions with stem cell researchers in Denmark and the idea was to convey that research is not a straightforward linear process,whereby the donation of fertilized eggs automatically leads to the production of new cures for serious diseases. From the laboratory, visitors were led to the central room of the installation, which we called '*the Network*'. From this room visitors could enter five other rooms, which were designed in order to display various features of the social contexts of stem cell research.

One of the next rooms was called 'your home', and here visitors were asked to enter on their own. The central feature in this room was a hospital bed next to a wall painting of a homely setting. Visitors were asked to turn an hour-glass standing next to the bed and then lie down. When lying on the bed, visitors would naturally look up in the ceiling where they would see a sign saying: "You are now incurably ill. Take a moment to consider how it feels…. Your only hope is that someone else will come in and hereby save you before it is too late." Being too late referred to the fact that the hourglass might run out before someone else entered the room, and the idea was to convey the mixed sense of hope and dependency in relation to medical research, which is experienced by patients suffering from serious diseases such as Parkinson's disease and spinal cord injuries. The room was inspired by research on the hopes and expectations of patients and their rationales for participating in clinical trials (Huniche, 2007).

From the central Network room, visitors could also enter 'the Room of Expectations'. Here they were asked to write their hopes for the future on little green pieces of paper, and their fears on similar red ones, and then fasten these paper notes with pegs on green bamboo sticks coming out of the floor. The effect was that the room came to have a little 'wood' of red and green expectations

through which visitors had to move in order to get in. This room was inspired by a central and shared assumption in the research group, which has been formulated as a 'sociology of expectations' (Brown et al, 2000; Van Lente, 1993). Its central feature is to understand expectations as socially performative in the present:rather than primarily being occupied with whether expectations are justified in the future, the sociology of expectations focuses on the way in which various expectations influence the possibilities of acting and thinking in the present. By letting visitors formulate their own hopes and fears and making them visible among others' expectations, the idea was to make visitors aware that they were moving in a landscape of expectations, which could be both red (characterized by fear) and green (characterized by hope).

In the room called 'the Public Debate', visitors were given a little cube symbolizing 100 million Danish Crowns (approximately 13 million Euro), and told they had to decide whether to spend it on cancer treatment, hip operations, malaria prevention, obesity research or stem cell research. On one of the walls each of these five options had a column and the black cubes could be stacked on top of each other, so that the wall came to resemble a column diagram depicting resources spent on each of these areas, depending on how visitors chose to place their cube. On the remaining three walls and the floor, the surface consisted of black and white squares, 20 cm wide, on which visitors were asked to write statements arguing for their choices. There was also a set of grey mats which could be fastened on top of these squares. Hereby visitors could cover arguments left by previous visitors if they disagreed with them, or they could un-cover arguments previously hidden. The conceptual idea was to let the room display the dynamic process of public debate in which statements are made with reference to each other, but where subsequent participants always have the option of connecting to some statements and forgetting other ones (Horst, 2008). Simultaneously, the room was designed to demonstrate how public resources have to be prioritized between a number of

worthy causes – and that this prioritization takes place under the influence of public debate and statements about what is preferable and acceptable.

Visitors' reactions to the installation

As mentioned previously, the installation was built in a basement in Copenhagen Business School in Spring 2005. Sadly, the basement room had to be used for different purposes immediately after the construction, so the installation only existed for five days after it was finished. We did, however, document the work with the installation on the website www.stamcellenetvaerket.dk and also on a DVD. It should also be mentioned that we subsequently received funding to do a second installation which was presented to different types of publics (Horst & Michael 2011). During the five days, we presented the installation to as many interested stakeholders as possible and also interviewed visitors in fourfocus groups. The focus groups were composed differently in order to explore reactions from different types of visitors:

- Adult stakeholders working with science communication, some of whom knew each other
- Students from a high-school class, aged 17-18, well known to each other
- Second year students from the program in business and communication, well-known to each other
- Master level students from CBS and Copenhagen University, not familiar with each other

It should be noted that we had to conduct the focus group interviews ourselves and this naturally may have resulted in certain biases in the answers from participants. We did, however, also document their interaction with the installation with the help of a professional film-maker/video-artist. In particular, he put up a number of surveillance cameras, which made it possible to follow

the movements and discussions of the visitors inside the installation without being visibly present, although of course we had told the visitors about this before they entered.

The following discussion is therefore based on the surveillance video from inside the installation, recordings of the focus group discussions and individual answers to a small questionnaire that was distributed before the focus group discussion. The analysis of this material was made with the main aim of answering the three above-mentioned questions which summarized the core objective of our work with the installation: Can visitors make sense of the installation? Will they choose to participate and engage? And will they grasp some of the overall points about the social shaping of new technologies? Viewed in hindsight, our analysis of reception in the focus groups can be said to be slightly biased towards the more traditional Public Understanding of Science tradition, where the objective is centered on whether audiences understand/comprehend messages rather than how they make sense of something. This was probably an outcome of an explicit obligation to the funding agency and a wish to demonstrate that such an experiment with spatial social science communication would be valuable and productive. Nevertheless, it should be remembered that the creation of the installation was done as a playful experiment and the presentation to focus groups and other audiences was not primarily done with the aim of testing specific hypotheses.

Before moving on to a discussion of the outcomes and learning points from these different activities, it should also be noted that valuable experience came from the actual work of creating the installation. This learning occurred continuously and was experienced by the designer labouring to create a spatial installation and the research group aiming at translating complex social scientific knowledge into simple concepts which could be communicated to a larger audience in an unfamiliar way (Horst, forthcoming).

The first of our objectives was to investigate whether and how visitors could make sense of the installation. Initially it can be noted that we received a lot of positive comments about the installation. All visitors thought it was a fun and interesting way of engaging with the social science. Obviously, they knew we were the ones who had created the installation, and in so far as they may have had more negative thoughts about the installation, they may have chosen not to share them with us. However, from the surveillance tapes it is obvious that people were engaging in a lot of different ways with most elements.

In the focus group discussions, a number of specific elements were discussed because some visitors had found them a bit difficult to understand, but the general impression was that visitors had made sense of the overall content of the installation as well as most of the specific interactive elements. The focus group discussions also included a general discussion of the issue of stem cell research and most participants had a very nuanced and many-facetted understanding of the social, cultural and ethical implications of stem cell research. We cannot claim that this was solely the outcome of the installation, but visitors made many references to features in the installation when they talked about the issues, and it can be assumed that the installation contributed to visitors' meaning-making about these issues. In all focus groups most visitors agreed that the installation had helped them see nuances that they had not thought about before, but there were pronounced differences in the way visitors would present their own thinking on stem cell research. Some visitors had very clear ideas about the way stem cell research should be conducted and regulated, whereas most visitors said that the installation had made it more difficult for them to have a clear opinion about the issues. We have regarded it as a positive outcome that the installation gave visitors a more nuanced picture of the social, cultural and ethical aspects of stem cell research, because in general this would serve to improve the quality of the public discussions of such issues.

Our second objective was to make visitors interact with the installation, and we can safely say that there was a lot of interaction in and around the installation. Apart from a few of the high school students, visitors took a long time working their way through the installation and they interacted with almost all elements. In addition, there was quite a lot of interaction among the visitors inside the installation. It might be expected that people who knew each other would talk, but from the surveillance tapes we can see that also people who did not know each other would quickly fall into discussing the features of each room. Typically, they would first engage in a meta-discussion about how to 'read' the room and what they were expected to do. Although we had tried to make the rooms and interactions speak for themselves, we did have to leave instructions in the rooms explaining what visitors were supposed to do. We deliberatively formulated the instructions in the imperative in order to make them as simple as possible ("spit twice in the jug", "lie down on the bed", "write your arguments here"). At the same time , some rooms, particularly the Baby Factory and the Rule Machine, had rather a lot of this meta-text, and visitors spent a good deal of time orienting themselves and making sense of these instructions. This orientation time seemed to decrease as visitors moved through the installation, an observation which made us conclude that visitors gradually got used to the conceptual form of the installation and found it easier to understand the intentions of the design as they moved along.

The negative aspect of the amount of meta-text in the first rooms became obvious when talking to the visitors in the focus groups. Many of them said that they thought that we, as designers of the installation, were in favour of embryonic stem cell research. Since this was not the case – rather, as a research group we had aimed to be descriptive rather than normative – we inquired into this impression. We found that almost all of the visitors felt very emotionally moved by the experience of visiting the room called '*your Home*', where they were put in the situation of people suffering from serious diseases and hoping that, for instance, stem cell research would result in future

treatments. In our conceptual design, this room was thought to correspond in an opposite way to the room called '*the baby factory*', where we had tried to make visitors experience the hopes and fears of people in fertility treatment and the way in which the fertilized egg symbolizes something very valuable, which perhaps should *not* be used for stem cell research. Visitors, however, did not have the same strong emotional experience when engaging with this room, and, reflecting on this, we thought that the emotional engagement was hindered by the amount of cognitive work necessary for visitors to orient themselves in this room. From this observation we would suggest that there is a potential conflict between cognitive and emotional influences in this form of communication, or at least that it is important to balance these different influences, bearing in mind that emotional appeals may lead to greater engagement with the issue in focus.

After having decoded the meta-communication of each of the rooms, visitors would typically engage in discussions about the issue and their different preferences. Sometimes this would lead to a joint decision and at other times they would stop the conversation and start acting or reflecting individually again. Many of the discussions would lead to questions among the visitors about issues which the installation itself would not present any answers to. In the focus groups, a couple of visitors saidthat they would have preferred if more knowledge had been made available in the installation. They were all very clear that they did not want any of the existing elements removed or the general design changed, but they would "just have liked an option to seek more knowledge" about the issues as they moved along. In the light of this, we concluded that it would probably have been preferable to include a feature by which visitors could look in a specific place for more facts or explanation. We would suggest however, that this feature should be made available on demand so that visitors actively had to seek this out – because this would also convey the notion that knowledge is not always readily available; rather it is something people actively have to pursue if they experience a need for this. However, it was quite clear from the focus group discussions that

there were differences between people in terms of how much they enjoyed and preferred the cognitive vis-à-vis the emotional elements of the installation. These differences were particularly pronounced in the group of adult stakeholders working with science communication, where some visitors clearly thought that the installation needed more 'facts', whereas others thought that the absence of 'facts' was the best feature of the installation.

It should be mentioned in this context that when visitors asked for more facts and knowledge, they did not mean social science knowledge, but rather knowledge about the science of stem cell research. In addition, most visitors did not really catch onto the idea that the installation was an effort to communicate social science. One explanation for this is probably that science communication is a widely known phenomenon and research communication is not often taken to mean communication of social science or humanities. When asked to visit an installation about stem cell research, people naturally would think that the science embedded in the installation is connected to this topic and not to social scientific studies of the social, cultural and ethical aspects of this phenomenon, despite our efforts to explain this. We would, however, argue that visitors did in fact *experience* the social science embedded in the installation, although they may not have been cognitively aware of this. Simply by their act of engaging with the installation they were enacting the social scientific point about opinion formation as a process in a social setting.

In relation to this point it should be stressed that the focus group methodology suffered from the bias that experiences had to be converted into language in order to be made visible in the discussions. We expected that this would give precedence to cognitive experiences and reflections. In order to inquire into visitors' emotional experiences of the installation, we posed two questions to focus group participants individually and asked them to answer by choosing one out of a set of four pictures, and subsequently write a few words about why they had chosen that particular picture. The

first question was about their image of the installation and the two sets of pictures showed four different chairs and four different flowers. Visitors chose rather differently, but a large number of the answers revolve around an experience of diversity, many layers and a sense of 'simple, but yet complex'. The second question was about how the visitors felt when inside the installation, and the pictures accompanying this question were animals and cakes. These answers were also diverse but a majority of them mention a sense of insecurity and confusion in the face of 'big questions'. Despite the fact that visitors generally expressed a rather positive evaluation of the installation as a communicative form, these answers point to the fact that they did not necessarily feel comfortable when engaging with the installation. In the focus group discussions, this was discussed as a productive tension and considered very valuable. Many of the visitors would stress the feeling of "being confused at a higher level", and we would interpret these statements as an indicator that visitors have grasped some of the complexity connected to the social shaping of stem cell research.

Despite these considerations we would conclude that the third of our objectives were only partly met because it is hard to say that visitors came to understand the social science embedded in the installation through their visit. However, in the focus groups people were very happy about discussing the social shaping of stem cell research and some of them made connections to, or asked for explanations of, various elements in the installation. These experiences suggest that the most valuable way of using such an installation for the communication of research is by combining the visit to the installation with a subsequent discussion with researchers or communicators about its content and how it relates to social science. This also underscores the general ambition of the installation: to stimulate dialogue and invite people to interact, contribute and make sense, according to their own preferences and backgrounds. While the installation does not necessarily convey very precise 'understandings', it is excellent as an artifact that allows audiences to explore meaning-making in collaboration with the researchers. Despite the fact that the focus groups were

designed to answer more narrow questions about whether the visitors could make sense of the installation and succeed in getting them to engage, the actual focus group discussions also served to explore meaning-making in relation to the issues in a highly dialogic fashion.

Conclusion

Working with this installation was a valuable experience. First of all, it was challenging and stimulating to try to translate complex social scientific knowledge into concepts that were so simple that they could be communicated spatially. Secondly, it was fun to see the installation built and to use it as a way of communicating with non-social scientists in ways which were both engaging and informative. Thirdly, we take the various outcomes to indicate that it is also a success in terms of pointing to spatial research communication as a new and valuable form of research communication when it comes to social science, in general, and research-based knowledge about the public acceptability of emerging science and technology, in particular.

The last of these points should not be interpreted to mean that all research communication should now be done in similar ways. Rather, alternative forms and media should be seen as an addition to more traditional forms of communication and they should be used for particular effortswhere they have a specific advantage. One such advantage might be that they can tap into emotional registers and let visitors experience, and become co-creators of meanings produced through their engagement in the installations rather than being told what the message is. Precisely for this reason, however, our work with the installation demonstrates that these experiences should not stand alone. Many visitors clearly wanted to consider the issues in a more traditional form of deliberation as we did in the focus group discussions. It is reasonable to suggest that the curiosity created by the

experience of (the message of) complexity and multi-contextuality in the installation was a very fertile ground for the subsequent discussions about the social, cultural and ethical aspects of stem cell research in the focus groups. By invoking curiosity, confusion and a sense of complexity through the engagement with the installation, visitors' thoughts may have been opened up in a way that was very productive for the subsequent discussion of the issues.

However, as the work with the installation has demonstrated, it can be difficult to find ways of evaluating the effects of emotional influences and the creation of engagement through the stimulation of curiosity and confusion. This is particularly a problem, if effects are conceived in the manner of traditional Public Understanding of Science as a question of understanding/comprehension. Although the creation of this installation was done from a framework that stresses interpretation, dialogue and meaning-making, we were also under obligation from the funders to investigate the effects of the installation more traditionally. This probably led our focus group analysis to focus less on the complex ways in which visitors made sense of the installation and more on whether they understood the communication format of the installation itself. A conclusion could be that although we cannot use this type of experiment with spatial installations to argue that emotional influences are better at creating engagement than cognitive inputs, it would be valuable to keep experimenting with these different influences. Furthermore, the installation serves as a particular proposition about the future debate about stem cell research, and in this way it has been part (albeit to a limited audience) of the public debate about science, much in the same way as newspaper articles and other public statements about science.

The work with the installation demonstrated that it is important for any kind of dialogue between science and the rest of society that research communicators think about the kinds of messages they

put forward. In order for visitors to be able to engage with the installation, it needs to have a particular set of messages to interact with. To strive for dialogic research communication is therefore not a question of not having messages, but rather of allowing your communication partners to disagree and formulate their own responses to the messages put forward. The installation was an invitation for visitors to engage – it presented a number of different statements in either words, images or spatial arrangements, but it subsequently allowed visitors to act on the basis of their own preferences, experiences and interpretative frameworks. In this way, the "messages" of the installation represented an invitation to discussion and shared meaning-making, hereby demonstrating that public sense-making about emerging science and technology is a process of negotiation and deliberation in a shifting landscape of statements and opinions.

In a similar vein, it should also be stressed that there is a need for the further development of frameworks for science/research communication that focus on how to engage citizens in dialogue about emerging science and technology. Rather than focusing primarily on the communication of natural science which is the focus in the many science centers and most other science engagement exercises, it should be acknowledged that social science has valuable input and that this ought to be integrated in the efforts to do 'research communication'. Based on ourexperiences with the Stem Cell Network, it can be argued that a fruitful social dialogue about science and technology is based on as many inputs as possible and conducted with respect for the ways in which different actors react and express themselves. It is by being open to other formats, expressions and opinions than our own, that we really learn about the life we live in common in our joint society.

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