Engaging knowledge

A THEORETICAL AND PRACTICAL FRAMEWORK

Inspired by children

Preface

Billund is the Capital of Children. Here children learn through play and are creative global citizens. This is the vision. CoC Playful Minds wishes to inform and inspire cultural institutions, civic organizations, children and young persons, parents, companies, researchers, artists, and in general, all citizens to create the Capital of Children together.

This second Research Journal from CoC Playful Minds encompasses how to engage citizens in knowledge making. The aim is to inspire to co-create knowledge of relevance for the Capital of Children, and especially transform and communicate deep, scientific knowledge in a participatory and aesthetic way that engages children, parents and other citizens.

The Research Journal consists of a desk research report developed by Professor Birgit Eriksson and Associate Professor Carsten Stage, both from the School of Communication and Culture at Aarhus University. They have focused on different engaging models and positions, e.g. what do we mean by participation, and how is it done? How can art and aesthetics communication create new insights and engage people to interact with knowledge, art and each other? How can knowledge and the production of knowledge become active bricks in a process of building new local communities in the Capital of Children? And more extensively, to create communities across borders and already established boundaries. What can we learn from different theoretical positions and concrete examples?

If CoC Playful Minds is to create products for children with children; new learning procedures together with children; and a city for children with children – then we need to know more about how to engage citizens in knowledge production and communicate this in a participatory way. This Research Journal unfolds a basic theoretical knowledge and inspires us with concrete examples of different ways to communicate and create knowledge with and for citizens. It is our task to translate and transform this into processes and perhaps exhibitions with and for children and the world around them.

As a knowledge driven organization CoC Playful Minds is happy to collaborate with different partners in order to build a strong knowledge base on issues of vital importance to CoC Playful Minds and to the Capital of Children. We wish to thank Birgit & Carsten for an inspiring and insightful process.

It is our hope that the citizens of Billund and beyond, as well as civic and cultural institutions and researchers will gain valuable knowledge and inspiration from reading this Research Journal on engaging knowledge drawn from art, aesthetics and science.

Billund, february 2020

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Content

Abstract

This report addresses the challenge of how to communicate research-based knowledge through aesthetic processes that engage citizens as participants. It presents and qualifies existing knowledge and models of aesthetic and participatory dissemination of research-based knowledge and discuss their relevance for CoC Playful Minds and the Capital of Children in Billund. The report begins by offering a short definition of 'science communication' as a field of research that "aims to improve our understanding of the best ways to communicate complex information, in particular to people who are outside the arena of scientific research" (Guenther and Joubert 2017, 1). A recurring discussion in science communication concerns how to involve citizens – or create 'public engagement in science'.

A key point of the report is that the idea of simply transferring scientific knowledge from scientists/ facilitators to citizens through various forms of strategic communication must be replaced by more participatory, informal and aesthetic approaches that prioritize the relevance for citizens. The report thus offers an alternative to the much debated 'deficit model' of science communication, where citizens are perceived as lacking knowledge and resources and passively awaiting more science/knowledge. This is done by outlining different exemplary cases of participatory and aesthetically informed science communication from Denmark and around the world, and by distinguishing between four levels of user engagement in participatory science communication: contribution, collaboration, co-creation and hosting.

Within this framework, the report describes the designs, modalities and values of a range of science communication projects, which may be of inspiration to CoC Playful Minds and the Capital of Children, and offers ideas as to how the different models of participatory engagement might be transferred to the context of Billund as well as for future partners and environments that could be involved in developing these local participatory projects.
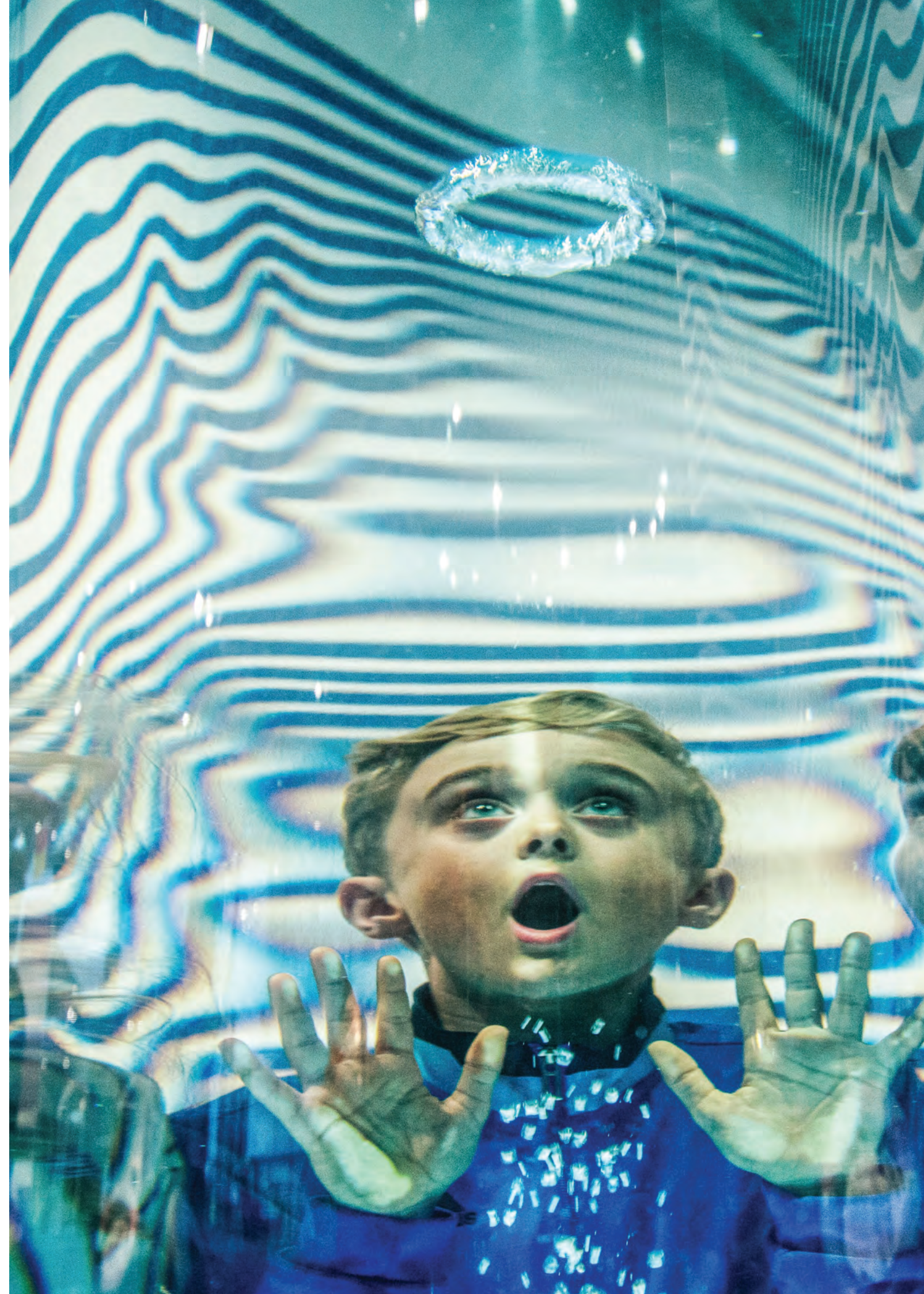
Introduction: Moving beyond 'the deficit model'

In an age of algorithms, information overload and fake news, scientific knowledge becomes an increasingly important part of democratic development and innovation due to its ability to ensure well-grounded approaches to complex social challenges. But for this to happen, science needs to inform and be informed by a range of agencies and publics outside traditional scientific institutions and education systems: e.g. politicians, NGOs, cultural institutions, artists, and, of course, the broad category of 'citizens'. This is easier said than done; a point underlined by the fact that an entire subdivision of communication studies, often referred to as 'science communication', has been developed over the last 50 years in order to offer approaches to tackle the specific problems and challenges of engaging broader publics in science. In other words, science communication as a field "aims to improve our understanding of the best ways to communicate complex information, in particular to people who are outside the arena of scientific research" (Gunther and Joubert 2017, 1), while science communication as a practice can be understood "as organized actions aiming to communicate scientific knowledge, methodology, processes or practices in settings where non-scientists are a recognised part of the audience" (Davies and Horst 2016, 4).

Science reaches broader publics in multiple ways and through different genres and outlets. This happens through 'science journalism', where scientific topics and results are communicated by journalists and/or through journalistic genres, and through 'popular science', where scientific problems and results are communicated to a broader public (e.g. in science museums or popularized books) by reducing the complexity and narrating in ways not accepted in academic

genres. It also takes place in 'research-based teaching' in the education system, where research informs the teaching of students (e.g. through textbooks or verbalized class teaching). Furthermore, one could add an array of media and genres like reports, folders and webpages where authorities provide the public with science-based knowledge on social issues.

A recurring discussion in science communication concerns how to more specifically involve citizens – or create 'public engagement in science'. One concern in regard to this challenge has been the prominence of the problematic 'deficit model' in early science communication research (Cortassa 2016), which affected the understanding in the field of the primary role of science communication in society. The deficit model presupposes that lacking interest in, or even hostility towards, science or complex knowledge is caused by a lack of 'science literacy' among citizens. If only they knew more about basic scientific topics, concepts and methods, they would support and show interest in science. A consequence of this line of thinking was that science communication reproduced the idea that educating "the public would improve their appreciation and diminish their reticence, and hence, a greater level of commitment to scientific and technological development could be expected" (Cortassa 2016, 448). As argued by Cortassa, this is a simplistic and convenient approach for science institutions and authorities as science is constructed as a universal good and public scepticism towards science as based on a lack of cognitive resources:

"Once the starting status of ignorance has been established, the task is to apply the correctives needed – to inject cognitive resources

"Scientific knowledge can be both more socially robust and integrate otherwise overlooked critical perspectives and voices by engaging more substantially with citizens during the research process."

– periodically assessing progress until the pursued levels of literacy are achieved. This therapeutic view assumes that to bridge the gap is sufficient to address the shortcomings of knowledge that people suffer, rescuing them from obscurantism" (ibid.).

Later research confirmed that the deficit model is not only simplistic but also wrong "as a growing body of empirical evidence contradicted the alleged positive correlation between the people's scientific literacy and their appraisal of science" (Cortassa 2016, 449). There seems to be no causal link between citizens' knowledge about a scientific problem and their support for science: "it is not always true that those who know more love more" (ibid.). An alternative to the deficit model is to focus more on citizens as people with complex resources and knowledge about specific cultural contexts, acknowledging the "labile nature of the boundaries between scientific and lay knowledge" and thereby re-examining the generic categories of expert and layperson (ibid.). As Cortassa states, "Instead of being regarded as passive recipients, people should be seen as fully competent agents who assume an active role in the relationship relying on their own expertise, skills, values and criteria" (ibid.).

We see this turn away from the deficit model as pivotal in any attempt to develop more participatory forms of science engagement and communication. However, it must be counterbalanced by an acknowledgement of the fact that when it comes to scientific knowledge production, its concepts and methods, scientists have a privileged position. The point of turning away from the deficit model in favour of participation is not that scientific knowledge is unimportant or that it is not produced in valuable ways by researchers; rather, it is:

1. That efforts to increase public engagement in science must also take into account the multiple forms of knowledge and competencies among citizens

2. That scientific research might itself be improved by engaging multiple perspectives and forms of knowledge that exist outside traditional academic institutions.

As argued by e.g. Helga Nowotny et al. and David Hess, scientific knowledge can be both more socially robust and integrate otherwise overlooked critical perspectives and voices by engaging more substantially with citizens during the research process (Nowotny, Scott, and Gibbons 2001, Hess 2016).

Recommendations

The move beyond the deficit model can be taken by:

•   **Avoiding framing citizens as lacking knowledge and resources**

•   **Approaching citizens as having resources and competences that can be used and activated in their engagement with science/knowledge in order to positively develop both the community and knowledge production**

Thinking with participation, aesthetics and relevance

PUBLIC ENGAGEMENT IN SCIENCE AS PARTICIPATION

The move away from the deficit model has taken place in a range of academic fields and social sectors – not least through research and projects dealing with 'participation'. The concept of participation has been used to understand actual changes, e.g. how media-users become more active producers of content on social media, and to describe an organizational or social goal of wanting to involve citizens more substantially in, for example, urban planning, museum exhibitions, policy decisions and health care. In relation to contemporary art and its institutions, we also encounter participation under headlines such as 'relational', 'dialogical' or 'participatory' art (Bourriaud 2002, Kester 2011, Bishop 2012, Bala 2018), and in art institutions and cultural policy we meet multiple experiments with new types of citizen and audience involvement (McSweeney and Kavanagh 2016).

But what does the fluffy concept of 'participation' mean?

According to Nico Carpentier, 'participation' first and foremost refers to the reallocation of power, or the ability to make decisions, from traditional institutions and authorities, to citizens or stakeholders not traditionally able to influence these decisions (Carpentier 2011). Participation equals citizen-power. Asking citizens (e.g. children) to co-decide the development of urban space instead of planning it from above would thus be an example of 'participation'.

Carpentier distinguishes between 'minimalist' and 'maximalist' approaches to the political role of participation in democracy: in the minimalist

(or representative) model "the societal decision-making remains centralized and participation remains limited (in space and time)", while "participation plays a more substantial and continuous role and does not remain restricted to the 'mere' election of representatives" in the maximalist model (Carpentier 2011, 17). From a maximalist point of view, citizens participate politically in society in a range of more complex and mundane ways – for example, by carrying out community or voluntary work, by taking part in discussions about society or by acting in ways that challenge established discourses and norms. As such, citizen participation takes place all the time, and not only when citizens engage in institutionalised politics. But how do we grasp the complexity of socially engaged participation if it is not a question of voting but rather embedded in a variety of complex social situations? While researchers dealing with participatory processes broadly agree that the main reason for developing participatory formats is its strengthening of democratic agency, some have also argued that we need to be aware of the different ways and scales through which people participate. Participatory processes do not only produce power transformations but can also have learning, community-building or affective experiences as key outcomes in their own right. And these outcomes may benefit from authorities or experts that secure resources, progress and implementation.

With an aim of synthesizing theories addressing participation, Christopher Kelty et al. argues for such a broad or multidimensional understanding. Building upon a broad study of cases and theories of participation mainly within information studies,

communication, and science and technology studies, they derive seven dimensions of participation:

1. The educative dividend

2. Access to decision making and goal-setting in addition to task completion

3. The control or ownership of resources produced by participation

4. Its voluntary character and the capacity for exit

5. The effectiveness of voice

6. The use of metrics for understanding or evaluating participation

7. The collective, affective experience of participation (Kelty et al. 2015)

With these seven dimensions, they highlight aspects of participation that are of relevance for anyone interested in creating, facilitating or analyzing participation also beyond the new media fields of their study.

Nina Simon's work on 'the participatory museum' is another example of a broad and pragmatic approach. Highly inspired by research on the effects of informal science education (Bonney et al. 2009), Simon offers a very influential model of types or scales of participation by presenting four different, and equally important, ways that guests and museums could relate to each other (Simon 2010). These types are based on:

- **Contribution**, where guests perform smaller actions (e.g. posting a comment on a board)

- **Collaboration**, where guests deliver the main content or structure of an exhibition (e.g. an exhibition made up of photos taken by users)

- **Co-creation**, where guests are part of the conceptualisation, planning and execution of activities

- **Hosting**, where the museum offers a platform for self-directed activities (e.g. a festival created by a group of citizens)

Following Simon, cultural participation is a way of securing the relevance and local importance of the institution, and it can produce a variety of overlapping effects such as educational effects or skills, social effects or connections, and regular institutional work.

Returning to science communication, Jack Stilgoe et al. argue that the future trend regarding public participation in science will focus more on engaging citizens to ensure responsible innovation, on multiple publics of engagement instead of one national public, on new spaces of engagement through digital media and informal events, and on open science and citizen science (Stilgoe, Lock, and Wilsdon 2014). These trends seem to focus on developing more substantial forms of science engagement and abandoning the idea of a cognitive science deficit among citizens. We argue that developing participatory formats of science communication resonates with this increasing desire to understand citizens as having particular resources for engaging with science.

Recommendations

Science communication can learn from the research in public engagement and participation by:

- Considering who should be engaged in the participatory knowledge production process and which form of participation to focus on

- Being clear about the intended values that the process should generate but also open to other values being produced by entering into a dialogue with participants and their resourcescommunity and knowledge production

- Tapping into the future agenda of science communication, focussing on developing informal, participatory and experimental environments where authority is distributed beyond policy makers and scientists, where science can be felt and understood in embodied ways, and where knowledge is actively produced and not only transferred in the process

"Participatory processes do not only produce power transformations but can also have learning, community-building or affective experiences as key outcomes in their own right."

THE AESTHETICS OF SCIENCE COMMUNICATION
In order to meet the call for more experimental, embodied, emotional and productive modes of science communication in Selin et al., we now turn to aesthetics. Back in 1750, Alexander Baumgarten defined aesthetics as the science of sensible cognition. With the idea of 'sensible cognition', he opposed the 18th century scepticism towards the senses brought forward by the rationalist philosophers, but also the empiricist argument that all knowledge is based on experience derived from the senses. Instead of reducing the knowledge of the senses to something felt but indefinable, he described aesthetics as the analogue of rational cognition. Through taste (in the broad sense), one can judge sensibly rather than intellectually, thereby grasping the particularity and beauty of specific phenomena.

Aesthetic judgement is not merely a cognitive process but engages emotionally (Schindler et al. 2017). Films, novels or theatre pieces can, for instance, be reviewed as "deeply moving" – thereby indicating not only that they affect us sentimentally and provoke sadness, compassion, solidarity or similar, but also that they affect us in a deeper sense (Menninghaus et al. 2018). Through intense and embodied experiences, they can move us to thoughts, feelings and states of mind different from the ones we had before.

This potential is also important for aesthetic theories in the Kantian tradition. In Kritik der Urteilskraft from 1790, Kant argued how aesthetic judgement is made inductively without any given rules or concepts. It is thus contrary to a determinate judgement that relies on general prescriptions, concepts and rules, and subsumes the particular under the general. Based on the aesthetic judgement of particular phenomena, Kant conceived of a certain ideal sociality in which we – free of particular interests and given concepts – can establish a public sphere of communication around beauty.

Even if one can be sceptical towards the idealism of Kant's aesthetics, two aspects of it are important for forms of science communication that aim at involving people trough aesthetic means. By engaging with aesthetics, science communication can both strengthen its social potential and provide an alternative to the determinate judgement.

The social potential is probably most explicit in performative arts like theatre and music. Here, art is not a stable object but "something that happens between bodies in singular (and singularly staged) situations" (Tygstrup 2017, 153). In contemporary culture, however, a performative turn is manifest also in literature and visual arts: poetry readings, gallery shows and various forms of participatory or socially engaged arts focus on the ability of the arts to generate different encounters and situations: "to crystallize into social events and intervene in the fabric of the social" (ibid., 154). Science communication can learn from this performative aesthetics by focusing less on the meaning or message in science and more on the knowledge and meaningfulness that is co-created around science – in situations where scientists and citizens are co-present.

The need for an alternative to the deductive move of determinate judgement from general rules to particular cases is more generally accepted in the 21st century than it was a couple of centuries ago. If aesthetic judgements can teach us how to induce from the particular to the general, they seem particularly useful in our contemporary culture of dynamic changes and mobility. When an artwork appeals to our senses, sparks our imagination, challenges our understanding and provides new perspectives, it has some highly relevant cognitive potentials. An artwork can catalyse knowledge production because the intention of the artist, while acknowledged, is not the final authority on the work's significance or meaning. An artwork is "a flexible enough 'thing in common' to allow for diverse forms of learning" (Sitzia 2018, 78). If, as claimed by various sociologists, our late modern culture is 'fluid', 'reflexive', 'individualized', 'globalized' and 'aestheticized', it demands the inductive and reflective judgements of the aesthetic field.

A striking characteristic of (modern) art is that it contains a great heterogeneity between works of art, genres, traditions, modes of perception and reception. It cannot be judged based on a general rule. It makes no sense to judge an impressionist painting by the criteria of conceptual art – or the other way around. What art provides, therefore, is a sensibility towards differences and an attentiveness to the specific logics and values of specific phenomena and life forms (Welsch 1997). Free from the obligations to communicate a specific content, the arts can also experiment with 'possible and alternative worlds' in form of narratives, images, installations, soundscapes, stagings etc. While this is not necessarily knowledge communication in a narrow sense, many artistic projects test the possibilities of literary, audio-visual, performative world-making, thereby challenging our sensible as well as rational knowledge and also contributing to both. Many of the most ambitious works of art (in all genres) also try to set forth the value criteria by which they want to be judged – sometimes succeeding in changing the rules and introducing new and influential concepts.

Knowledge communication that wants to learn from aesthetics can try to transfer this sensibility from artworks to other phenomena and issues, thereby challenging common beliefs, opening up towards other experiences and communities, learning to see with new eyes and doing justice to the heterogeneous (ibid.).

Recommendations

Knowledge communication can learn from aesthetics by:

- **Involving the knowledge of the senses/body, affecting participants emotionally and moving them in a deeper sense**

- **Enabling co-presence, social encounters and interaction around science**

- **Acknowledging plurality, in particular by including the sensitivity towards and cognition of a diversity of particular phenomena and practices, and enabling communication on change and diversity through the inductive invention of new concepts and 'rules'**
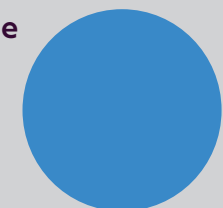
Learning from aesthetics also includes learning from contemporary arts. The ideal of turning citizens and users into 'participants' has played an important role in the arts since the 1990'es. Under headings like participatory, relational, social, dialogic and collaborative arts, artists and curators have experimented with art practices that transform the role of the 'recipient' and engage more directly in social communities. These artistic projects vary a lot. An important distinction is whether they take place within or outside the institutions. While the former tries to involve e.g. theatre or museum audiences in new forms of interaction, the latter often relates artistic practice to other forms of (activist) knowledge production, involving specific groups of citizens like migrants, young people or the residents of a specific neighborhood in the process.

Across the many heterogeneous practices, however, some characteristics are important (cf. Bishop 2006, 12; Kester 2011, 7-8):

1. The focus is on collective, collaborative approaches

2. This focus is often, but not always, accompanied by a criticism of the individual artist's authority and control, as collaborative creativity is linked to a more democratic and less hierarchical form of art production

3. Traditional text, image and object-based art works are replaced by artistic projects with an emphasis on participation, process and performativity

4. We find an ex- or implicit trust in empowerment – an idea that the experience of participating in the artistic project will strengthen the participants' individual and/or collective reflection and agency, and that this can reduce social challenges like alienation, isolation, desperation, apathy and powerlessness

The agenda for most participatory art practices is therefore not only that the audience engages in the artistic practice, but also that the artistic practice interacts with social life, e.g. by developing new forms of communication, participation and connective social action.

Beryl Graham, a media art scholar, has suggested that we describe artworks based on the participation they enable. Instead of focusing on an artwork's use of media he suggests asking what kind of behavior and actions it proposes, and analyzing its specific forms of interactivity, participation and connectivity (Graham 2010). The fact that participatory arts focus so strongly on what kind of impact they enable or promote rather than on the aesthetic aspects of the works, has of course also raised criticism – for mixing aesthetic, ethical and political agendas and for ignoring questions of artistic quality.

In the context of this report, the key question is rather whether and how the artistic practices can inspire new methods and formats in knowledge production and communication. After more than twenty years of participatory artistic projects in- and outside institutions, with audiences and citizens, with critical and affirmative agendas, and across the spectrum from contribution and collaboration to co-creation and hosting, we do not doubt that they can be a source of inspiration.
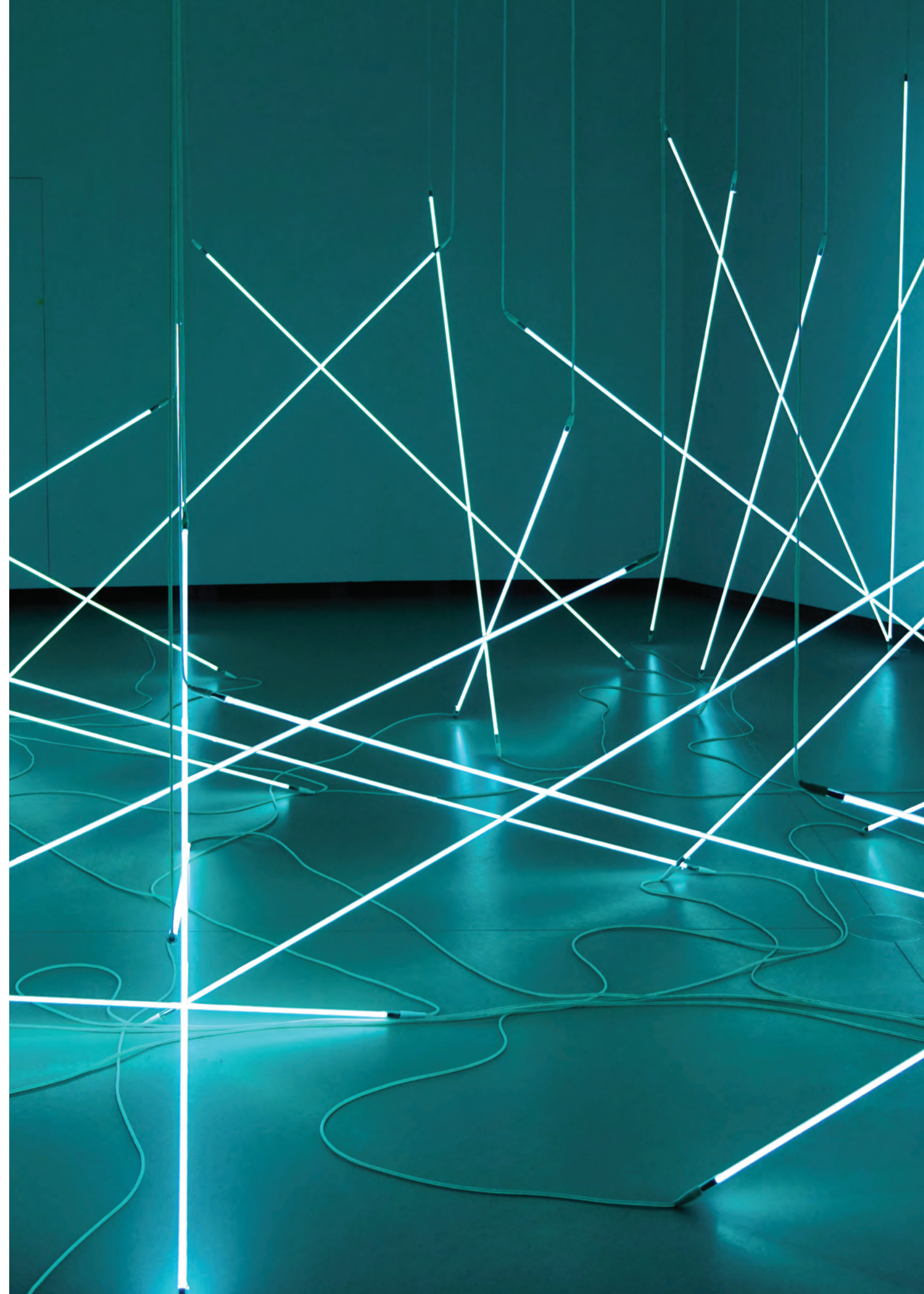
Recommendations

Because of their heterogeneity, it is difficult to withdraw general recommendations but science communication may be able to learn from participatory arts by:

- Exploring the heterogeneity by adopting the experimental attitude and trying various formats (e.g. in-/outside institutions, with audiences/citizens), for instance through the involvement of artists and/or curators

- Accepting the more messy aspects of collective, non-hierarchical, process-based and empowering projects

- Embracing the openness of artworks, including the potential of unforeseen results

BEING RELEVANT: LEARNING FROM MUSEUMS
Museums have a long tradition of working with aesthetic knowledge communication. Museums of e.g. art, science, cultural or natural history not only have a profound knowledge of science dissemination and informal learning – they also share a challenge encountered by much scientific knowledge communication, namely that their type of knowledge appeals to some audience groups but is unappealing or invisible to others.

Museum scholars John H. Falk and Lynn D. Dierking explain this by the fact that museums are normally spaces of "free-choice learning", which is "personally motivated and involves considerable choice on the part of the learner as to what to learn, as well as where, when, and with whom to learn" (Falk and Dierking 2018, 9). Free-choice learning is not restricted to museums but also occurs when surfing the internet, reading a newspaper, talking with friends, playing football etc. Common for these learning activities is that a degree of choice and control enables people to stay away from, for example, museums if these do not (or are not expected to) meet their interests or fulfil their needs.

This does not mean that 'learning from museums', which is the title of Falk and Dierking's book, is just a question of individual preferences. What and why someone learns also depends on the social and cultural context in which the learning occurs. This context includes sociocultural macrofactors like unequal levels of income, education and cultural capital, and microfactors like the specific communities of learning and "communities of practice" (Wenger 1998) of the potential museum visitor (families, friends, colleagues and other affinity groups). In addition to the personal and sociocultural factors that influence learning, Falk and Dierking add physical context (e.g. design of exhibits and whether people are accommodated in a way that makes them feel secure and at home in the museum) and time (their prior and subsequent experiences related to the museum visit).

All these factors are also important for Nina Simon, who has not only written extensively on citizen participation in museums and other cultural institutions but also on the experienced relevance of cultural institutions from a user perspective – most recently in The Art of Relevance (2016). More specifically than Falk and Dierking, Simon asks how museums can reduce the many good reasons people have for not going to museums – including not knowing about them and their offers, not feeling welcome and safe, seeing their knowledge as unfamiliar and hard to access, and feeling like an intimidated outsider compared to the well-educated insiders in the room. She broadens the focus from learning to relevance, understood as something that "unlocks meaning" and open doors "to experiences that matter to us, surprise us, and bring value into our lives" (Simon 2016, 25). By studying unequal resources, visibility, inclusion and ownership among diverse audience groups, she argues for more radical changes in museums (and other cultural institutions) wanting to share their content and knowledge with new groups.

One of Simon's key points is that relevance is inversely correlated with effort, and that institutions ought to ask themselves how much effort it requires for someone to experience a positive cognitive effect of their offer: "if it's difficult to visit and the value of the experience is hard to describe, why would anybody care to try?" (Simon 2016, 35). One way of creating relevance is to show people that someone just like them, for instance someone they know, is involved (Simon 2016, 162). Familiarity reduces the effort significantly, and this can be established through familiar persons, familiar places, familiar content or familiar forms of involvement.

The importance of familiarity entails that trying to appeal to everyone does not work. Instead of believing that what one does is or can be relevant to everyone, or that people do the work of manufacturing relevance on their own, one needs to ask who it is relevant for and acknowledge that people find relevance in various pursuits.

To familiarize oneself with those various pursuits – and more, to understand the assets, needs and interests of specific communities and establish links between these and the assets of the institution – is another way of creating relevance. It is also a way of connecting something novel to something familiar, and further of reversing the deficit-model: building on people's strengths instead of "filling needs or fixing weaknesses" (Simon 2016, 95). In addition to asking about their needs, e.g. their biggest concerns in the community, she suggests asking them what they are most proud of, what they love to do in their community, and what they have to offer (Simon 2016, 100). If people can contribute with stories, with knowledge, or with technical, cultural or social skills, it not only connects something familiar with something new but also gives ownership.

Recommendations

Knowledge communication can learn from the experiences of museums and other cultural institutions by:

- Considering that people stay away from institutions, programmes and offers not because they lack something but because they have other interests and affinities

- Defining the specific community/communities one wants to be relevant to, and getting to know their assets, needs and interests, e.g. by spending time with them, exploring their events and sites, and talking to their leaders

- Using one's own experience of being an outsider in their specific communities in order to develop collaborations and programmes that cloak something new in something familiar for them as well as for the institution (cf. Simon 2016, 99)

Cases and their relevance for CoC Playful Minds

After introducing the growing interest in the value of participation and aesthetics in science communication, we continue by describing different types and scales of participatory and aesthetically involving science communication from around the world. In the best practice examples we include, the role of science and scientists vary. In some examples, citizen participation is explicitly linked to the development or realization of a scientific process involving researchers; in other examples, scientific knowledge production and its methods implicitly inform processes or is communicated to citizens through a participatory process.

The structure in the following is highly inspired by Nina Simon (and Bonney et al. 2009), distinguishing between four levels of user engagement and power distribution in participatory science communication, based on contribution, collaboration, co-creation and hosting, and describing the design and effect of specific science communication projects within this framework. Before putting them to use, we

briefly outline how we understand the difference between these levels in relation to the challenge of public engagement in science.

In participatory science communication based on contribution, participants perform replaceable actions defined by facilitators in order to understand or produce scientific knowledge made by the facilitators. In the type based on collaboration, participants take decisions affecting the production of scientific knowledge, but the overall process is run and controlled by facilitators. In a type of engagement based on co-creation, participants work on more equal terms with facilitators and are involved in defining and often also analysing the scientific knowledge production process. Finally, participation in science communication through hosting implies that participants control the knowledge production process but use platforms and resources offered by facilitators. The four types or levels can be summarized in the following model (inspired by Bonney et al. 2009 and Simon 2016):

	Contribution	Collaboration	Co-creation	Hosting
Participants define problem and research questions			●	●
Participants are engaged in designing methods			○	●
Participants collect data	●	●	●	●
Participants analyse data		●	●	●
Participants draw conclusions			●	●
Participants disseminate results	○	○	○	●
Participants take decisions without including facilitators				●

Ill. ● : Participants are included; ○ : participants may be included

ENGAGEMENT THROUGH CONTRIBUTION: ZOONIVERSE.ORG

In science communication based on contribution, participants are involved in processes that are institutionally controlled and facilitated. Citizens are only expected to provide limited actions, ideas or objects and these can most often be delivered by other users without affecting the process negatively. The value in this kind of involvement is not that it moves substantial power from institutions/authorities to participants. The model, however, offers a range of rather accessible formats for mobilizing publics in relation to science, creating new relations among the participants and offering them opportunities for learning. The disadvantage – and critique – of the model is that it may 1) instrumentalize the free labour of citizens instead of including them as complex individuals with useful personal resources and 2) praise the value of minimal interaction with science through digital technologies.

Examples of participatory engagement based on contribution are many and it is probably the most common form of science communication in digitized science and art museums and in participatory art projects. The model of contribution also encompasses one of the most influential trends in current science communication: citizen science. Here, citizens voluntarily engage in the practical work of producing larger data sets for research, which would otherwise demand a significant financial resource. In that way, citizen science offers a valuable work force and the opportunity for citizen enthusiasts to engage in shedding light on scientific problems of their interest.

A key example of citizen science is the platform https://www.zooniverse.org/, where all citizens can sign up to participate in digitized research processes. One can either volunteer to help classify data, which is the most widely used category, test beta versions of research projects or serve as a moderator who mediates between volunteers and project owners. At present, the platform has 1.6 million registered volunteers and 70 research projects. It describes itself in following way:

"The Zooniverse is the world's largest and most popular platform for people-powered research. This research is made possible by volunteers — hundreds of thousands of people around the world who come together to assist professional researchers. Our goal is to enable research that would not be possible, or practical, otherwise. Zooniverse research results in new discoveries, datasets useful to the wider research community, and many publications".

Ill. Zooniverse.org https://www.zooniverse.org

On Zooniverse, volunteers do not only classify data but can also engage in discussion boards with other project workers or researchers. Furthermore, the platform has a page of publications based on data generated on Zooniverse, which creates very tangible metrics in terms of showing the scientific output based on the work of the volunteers.

A specific case example on the platform is the project "Sounds of New York" (SONYC), where researchers have collected enormous amounts of raw sound recordings from New York in order to understand better when, where and how sounds are experienced as problematic noise. Sound recordings are difficult and time-consuming to process for analysis; 726 volunteers on Zooniverse have helped classify the sounds on the recordings (as e.g. sirens, drilling) in order to be able to identify zones, rhythms and reasons for experienced sound pollution in the city – and ideally to understand patterns between e.g. traffic regulation and noise or noise and learning outcomes at local primary schools. The overall goal of the project is to inform future city policies so that they can support better quality of life in

large cities by targeting sound-related problems and experiences.

Ill. SONYC on Zooniverse.org. https://www.zooniverse.org/projects/anaelisa24/sounds-of-new-york-city-sonyc

Common objections against citizen science are that it reproduces the hierarchy between scientists and citizens by not reallocating power between them, and that citizen science tends to involve participants with higher educational backgrounds and those already interested in science rather than a wider (less convinced) public (Martin 2017). But according to Simon, a model of participation based on contribution is not less important or worthy than other models where participants have more direct influence on research. The contribution model must be understood on its own terms and based on the values of learning and science engagement that it produces – not on its low level of power transfer or limited ability to address people not interested in science.

In aesthetic terms, the zooniverse platform is not immersive or spectacular in any sense, but it nevertheless engages users in science through aesthetic registers. Importantly, it offers the singular volunteer an experience of being one of the very first people to face visual and auditory research material with a potential for revealing substantial and innovative knowledge about a specific topic (e.g. climate change, animal species, slavery). Sometimes this material has been hidden in archives for centuries – e.g. in a project on old anti-slavery manuscripts from the US (https://www.antislaverymanuscripts.org) – and thus has an authentic quality and historical aura. In the

case of SONYC, volunteers listen through sound bites from the city – an exercise of attentive listening and analysis with its own aesthetic quality and sense of auditive closeness (at a distance). The platform also highlights the experience of "surprises" among the volunteers and the potential for these surprises to lead to important academic discoveries. In that sense, their work is framed like a treasure hunt and linked to the intensity of moving towards a potential knowledge breakthrough. Last but not least, the platform focuses on defining, narrating and visualizing projects in a way that appeals immediately to the senses and to users' desire to engage in fostering positive change.

THE CONTRIBUTION MODEL IN COC
The contribution model and the citizen science method as an example of the model – which is based on engaging citizens in replaceable actions, could quite easily be translated into the context of Billund and related to creating knowledge about 'the good childhood'. The challenge would be to find a motivated group of local citizens willing to engage in investigating parts of (their) life in Billund. Could grandparents be teamed up with their grandchildren to map favourite places for play and creativity in the city – and perhaps also the places they think have a potential for future play and creativity? Could children help map the forms of play that they take part in and classify these forms in terms of how intense they were? Or could they help list and describe moments of happiness (or sadness) – or of experiences that made them feel creative (or trapped) – during a period of their life in order to provide a picture of when life feels good (and the opposite) as a child in Billund? Through setups like these, knowledge about childhood in Billund would be produced; simultaneously, the involved participants would learn about particular methods and maybe even get to know their collaborators and hometown better.

ENGAGEMENT THROUGH COLLABORATION: UNIVERSITY OF LOCAL KNOWLEDGE

In collaborative projects, citizens collect data. But unlike contributory projects, they also analyse the data and draw conclusions in collaboration with the researchers. Thereby, they are involved in more stages of the research process and develop broader methodological knowledge and research skills. Compared to contributory projects, collaborative projects often involve fewer participants, but their involvement is more multifaceted and their knowledge and skills may be shared with other citizens – not through practice but through communication: "When participants analyze data themselves, their eagerness and ability to share scientific results with their own communities increases" (Simon 2010, 186).

In a collaborative project, the participants influence the research process and results more than in contributory projects. The collaborative project is conceptualized and controlled by researchers/facilitators (and their institutions), but the participants' actions will influence both process and outcome. Whereas the participants in contributory projects are replaceable, their specific and diverse backgrounds and skills are key in the collaborative projects where they provide substantial and heterogeneous input and content to the project. In other words, the differences between people are important in this model, and supporting their specific communities may be an additional aim of the project.

An example where this is the case is the University of Local Knowledge (http://ulk.org.uk/). In the small community of Knowle West in the southwestern English city of Bristol, the 22,000 residents, most of whom live in social housing, face high unemployment, poverty, limited access to higher education (e.g. no high school) and stereotypical prejudices due to 'postcode discrimination' (Evans and Irish 2013, 79). This is the sociocultural context for The University of Local Knowledge (ULK), a digital and face-to-face collaboration, which since 2009 has had the aim of uncovering, sharing and giving value to the skills, talents and expertise that in spite of the

reputation exist within Knowle West. In the project, local residents have produced more than 900 short videos documenting their specific knowledge and skills. The videos have been assembled online in the ULK-website where they have been organized into courses across 12 departments.

Some of the departments and courses resemble those of ordinary universities, others reveal alternative ways of prioritizing and categorizing knowledge. ULK thus has departments of "Heritage and History" and "Science and Technology" but also of "Friends and Family" and "Activism, Policy and Volunteering". Equally, the courses and videos span topics from "Children's Pastimes in 1930 in Knowle West" and "Role of Religion in Boys Brigade" (in the course "Children's History") to more unconventional and/or personal topics like "Moving from Jamaica to Knowle West", "Making a Memory Book", "Collecting Cigarette Cards", "Making my Mixtape about Bristol" and "Being a Twin" (two videos with male twins of around 10 and 60 years of age). Users are invited to add and share their own knowledge and skills by uploading new short videos of themselves or by suggesting resources that are relevant to the courses.

Ill. Citizens involved in The University of Local Knowledge.
https://kwmc.org.uk/projects/ulk/

ULK is a long-term project developed in collaboration with Knowle West Media Centre, the Arnolfini Gallery in Bristol, artist Suzanne Lacy and residents of Knowle West. Apart from the videos, the project also includes conversations, meals, local seminars, screenings, and related public events.

ULK involves people in the production of new knowledge. By ironically imitating the organization of scientific disciplines, it criticizes the traditional, hierarchical understanding of knowledge and insists on the value of previously tacit lay knowledge and community-led learning.

ULK is, however, also based on scientific knowledge. Researchers from Bristol University developed the project website; further, The Knowle West Media Centre combines arts and participatory action research: "The research process is about trying out, expanding and refining that idea through dialogue and creative exchange, with a range of people, who are all involved as co-researchers rather than as 'researchers'" (https://kwmc.org.uk/about/research/). This collaborative approach leads to new knowledge when the expertise and cultures of Knowle West residents are made visible, explicit and linked to more traditional scientific knowledge, e.g. at four seminars, where:

"Individual experts in Knowle West who were willing to share their knowledge and/or interpretation of a subject in a public exchange were paired with academics who had an interest in discussing the same subjects. The seminars aimed to integrate different communities on equal footing around topics of common interest" (Evans and Irish 2013, 76). Find inspiration on University of Local Knowledge, e.g. a local citizen-expert sharing his knowledge about cars: https://www.ulk.org.uk/content/features-jowett-1933-kestral

Returning now to our four types of user engagement and power distribution in participatory science communication, ULK exemplifies the collaborative type. The citizens are irreplaceable and involved in more stages of the process, including conversations, discussions around themes, communal meals, and the making and screening of videos: the various approaches that simultaneously expanded the network of people involved and the knowledge gathered and generated.

Whereas collaborative projects often involve few participants, ULK has involved many of the local

residents. Contrary to the contributory model, the project is more collaborative when it provides a digital platform for the residents' own voices. Their particular and heterogeneous backgrounds and skills are key, and they provide substantial input to the project when they choose which part(s) of their 'local knowledge' they want to present and when they maybe produce and upload their own videos. In this way, they also work with an aesthetic form of communication that involves performativity, audio-visual representation of themselves (voice, gestures, physical appearance, ethnicity, gender, age etc.), their knowledge, their local environment (private homes, garages, dance halls, football pitches, gardens etc.) and sometimes also objects (like when a man plucks a pheasant or a woman makes a card). All these elements situate the knowledge, make it personal and authentic, and provide it with cognitive as well as emotional appeals. Another aesthetic dimension appears when the people watch and hear themselves on the videos – a mediated and alienating experience with self-reflective and social/dialogic potential.

An advantage of the collaborative type of citizen involvement is that it involves the participants in various and multifaceted aspects of the research process and often has significant outcomes for both individuals and communities. A challenge is that collaboration requires time and resources from the facilitators or project owners. Often, the participants are more in need of support than of deciding everything themselves, and the project will stop when it is no longer (satisfactorily) facilitated. It is, therefore, important int to be explicit about the period and conditions of the collaboration from the beginning.

THE COLLABORATIVE MODEL IN COC

The collaborative model could also be used in the context of Billund. ULK could be imitated by gathering videos of local expertise and skills on an online platform and organizing seminars, screenings, meals etc. But ULK could also be modified and developed in various ways.

Professional video artists could be invited to residencies in Billund and accommodated in private homes while they produced videos of topics that matched the local ones. The local and professional videos could be shown and discussed at screenings and seminars, and parents and children could attend joint workshops in both video-making and local skills/knowledge.

Or maybe one could build a permanent wall in a central square or pedestrian street in Billund, combining established scientific knowledge with the knowledge of the citizens. This was done at "Væggen" in Copenhagen (2010-17), a 10-meter long interactive screen where a 3D model of the city and archival material from The Museum of Copenhagen was combined with a continuous stream of photos, videos and comments uploaded to the installation by more than 9,000 different users (https://cphmuseum.kk.dk/artikel/nu-skal-vaeggen-videre). "Væggen" focused on Copenhagen's past, present and future, but one could easily choose other themes, e.g. by enabling citizens to suggest and vote on them every six months or by letting specific groups or communities decide both on the topics and the contribution from experts. Engaging citizens in more stages of the process would further make the wall more collaborative than the mainly contributory "Væggen" in Copenhagen.

Personal narratives and images could also be gathered in an analogue form, e.g. in magazines or walls of memories, of local knowledge or of dreams. The topics of these could again be broad or specific – for example, sports (with walls in the stadium and sports centres) or 'becoming a teenager' (with walls in schools, youth clubs and libraries). Collaborative projects could also take the form of a 'citizen stage', where local citizens in collaboration with professional directors and scenographers could produce performances that draw on scientific and personal knowledge of raising children, of friendships, of being boys and girls, of growing up etc. This happens currently at citizen stages all over Europe (including Aalborg in Denmark).

ENGAGEMENT THROUGH CO-CREATION: RECCORD

In a model based on co-creation, participants do not only produce replaceable contributions to science communication or collaborate on producing irreplaceable content to a science communication process; instead, participants work on more equal terms with facilitators/institutions and are involved to a greater extent in defining and developing scientific knowledge production. In that way, the level of institutional control decreases while the participants' ability to co-decide the process is strengthened (cf. Carpentier).

An example of this model would be the participatory research project Reccord, which evolved from 2015 to 2017. The project was carried out as 'research through exchange' and co-created by researchers from Aarhus University (Birgit Eriksson, Camilla Møhring Reestorff and Carsten Stage), 38 cultural centres across Europe, and two cultural centre organizations (European Network of Cultural Centres/ENCC and Kulturhusene i Danmark/KHiD). In the project, 20 fieldworkers (also referred to as 'recorders'), employed at cultural centres across Europe, were involved in producing empirical material about their own cultural centres, but, more importantly, they also carried out 10-day fieldwork trip to other cultural centres across Europe (referred to as 'hosts').

> **"In a model based on co-creation, participants work on more equal terms with facilitators/ institutions and are involved to a greater extent in defining and developing scientific knowledge production. In that way, the level of institutional control decreases while the participants' ability to co-decide the process is strengthened."**
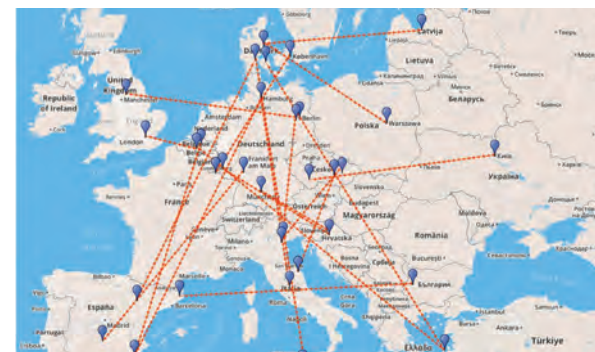
Ill. Map showing the European traveling routes of recorders (https://encc.eu/sites/default/files/2017-11/reccord_research_final_report.pdf)

Before the field trip, the 20 recorders visited Aarhus in June 2016 for a 'methods seminar' in order to introduce the methods of interviewing, observation, document analysis, participatory mapping and autoethnography, which were then deployed to study the participatory practices of the host centres. During the exchange, five types of qualitative data about 20 very diverse cultural centres were created: from Warsaw in Poland to Murcia in Spain, from a tiny centre on the island of Chios in Greece with 200 visitors a month and no employees to UFA in Berlin, Germany, with 20,000 monthly visitors and several hundred employees.

By inviting the recorders to become co-research-ers, a vast – and quite heterogeneous – amount of data was produced (e.g. 68 transcribed inter-views, more than 50 field notes/observations, 392 pages of documents, 26 mappings and more than 1000 photos – to mention just some of the material) (refs). The heterogeneity of the material would often be approached as a problem within traditional research practices, but focusing more on its content – and less on the very diverse ways of using the methods – the material gave a rich and multidimensional impression of the various cultural centres visited. The researchers at Aarhus University analysed the material with a particular focus on the types of centres and the different forms and effects of participation presented in the material (see below), and subsequently dis-cussed the results with the recorders in a Facebook group and co-organised a concluding

conference. Find inspiration from the final confer-ence involving co-analysis and co-presentation of results. Photos from the Reccord project (https://encc.eu/sites/default/files/2017-11/reccord_research_final_report.pdf).

The Reccord project developed through many different types of relationship: e.g. between researchers and recorders, recorders and hosts, and researchers and cultural centre organiza-tions. Not all of these relationships were partici-patory in the same way; however, if we focus on how the project was initiated, developed and disseminated in a relationship between research-ers and cultural centre organizations, this could clearly be described as based on a model of co-creation. The basic idea of merging exchange trips and a research process was introduced by the organizations to the researchers, who then entered into a dialogue and negotiation with these organizations about the specific processes, research goals and methods to be used. Throughout the process, the researchers were in constant dialogue with these organizations about the research. The organizations also played a crucial role in planning and executing the exchange trips and (together with some of the recorders) in setting up the final conference where all participants presented and discussed the results of the process.

Understood as science communication, the Reccord-project created scientifically based learning among both the recorders and the involved organizations. This happened through a process where the basic research questions and the overall development and execution of research was constantly co-created with the involved cultural centre organizations and revised during interactions with the recorders. They did not simply buy research or perform particular actions specified by researchers; rather, they affected the research agenda and design through dialogue with the researchers.

This kind of participatory model has many bene-fits as it embeds research and science communi-cation in the social context (here cultural centres)

where it will also be used and have an effect. The cultural centre organisations did not 'receive' research results controlled by traditional research institutions but learned about research results by co-creating them together with the three researchers. With the words of Helga Nowotny, research becomes more "socially robust" through such a co-creating process as it enters into a constant and dedicated dialogue with the context that it also investigates (Nowotny 2001). A downside to this way of doing and communicating research is that researchers lose control over the process – e.g. how data is collected and how scientific research problems are constituted – and thus cannot provide academic knowledge characterised by the same rigor and systematicity as usual. In that sense, research and science communication becomes "socially robust" by taking on a more experimental approach to academic knowledge, which is less focused on reliability and systematicity and more on producing research in ways that makes sense for and empowers the people and contexts being investigated.

THE CO-CREATION MODEL IN COC
If the model of co-creation was to be used to investigate 'the good childhood' in Billund, it would require that particular stakeholders were invited into the fundamental definition and planning of a particular process of knowledge production. And maybe it would even require that the goal of creating and communicating knowledge about 'the good childhood' through a conceptual focus on creativity and play was treated as dynamic and open to revisions. Young people living in Billund may find different questions – related to e.g. education, climate, sports, sexuality, integration – much more relevant to engage with and learn about.

A constructive approach would therefore be to invite or visit a specific group of youngsters living in Billund (e.g. a football or handball team, local scouts, a group of gaming enthusiasts or skaters) and begin with the questions: "What knowledge do we need in order to improve the life of your life in Billund?" and "How would you be able to

help produce this knowledge?". Through these questions, a focus could be defined which should then be investigated and revised continuously in a process involving CoC Playful Minds as resourceful facilitators and this group of co-creating youngsters. It might be beneficial if a group with a self-perceived problem, and thus a desire to act or create change, could be identified. Maybe a local group of youngsters is concerned with how to avoid bullying in schools in Billund and could conduct interviews with researchers, teachers, social workers and youngsters in order to understand how local dynamics can be changed for the better. Another approach would be to bring together two groups of youngsters – e.g. linked to the local Danish-speaking community and to the international community in Billund – in order for them to co-create a common question for investigation about (global) childhood. The co-creation of knowledge could end with a shared youth conference where participants play a crucial role in terms of presenting the produced knowledge to each other and to relevant stakeholders in the area.

ENGAGEMENT THROUGH HOSTING: FROM ACTIVISM TO ULK ART LABS AND TATE EXCHANGE
In hosted projects, "the institution turns over a portion of its facilities and/or resources to present programs developed and implemented by public groups or casual visitors" (Simon 2010, 187). For research or knowledge institutions, this would entail sharing spaces, tools and/or other resources with citizens or community groups interested in some kind of knowledge production/research agenda. In this type, the project is not owned or controlled by the institution but by the participants who use the institution for their own purposes. The institutional involvement is thus minimal (apart from setting rules for using the facilities and resources). Whereas the participants in the three other types gain scientific skills from their involvement, this is not necessarily the case in the hosted projects – or rather, the skills are not defined by the researcher or institution but by the participants themselves working to

realize their self-defined goals. Therefore, one may ask if this is knowledge communication. But it is definitely a form of knowledge production that can involve people who do not normally feel comfortable in the institution.

Projects based on hosting may be inspired by activist movements, which have occupied public institutions (e.g. universities) or squares, and organized alternative forms and communities of learning. An example is the Occupy Wall Street Library, also known as The People's Library or Fort Patti. It was founded in September 2011 by the Occupy Wall Street protesters in Zuccotti Park in New York and soon grew from a cardboard box with books to a tent (donated by Patti Smith and organized by a voluntary librarian) containing 5,554 books when Zuccotti Park was cleared in November 2011. Through donations and bottom up organization, the library enabled knowledge dissemination to and among occupiers and visitors. https://en.wikipedia.org/wiki/The_People%27s_Library

Hosting can also be inspired by cultural centres/community centres that have it as a central mission to be open to bottom-up citizen initiatives and to involve volunteers in organizing as well as decision-making. They offer open and flexible spaces and facilities for a variety of groups and socio-cultural activities, including informal learning (Eriksson et al. 2018).

Hosting can further be directed towards specific communities, such as when Tensta Konsthall in Stockholm (and other art institutions) host The Silent University, "a solidarity based knowledge exchange platform by displaced people and forced migrants" (http://thesilentuniversity.org/). The Silent University was initiated by Kurdish artist Ahmet Öğüt in 2012 involving migrants who have had professional lives and academic training in their home countries but cannot use their skills or training due to limitations related to their political and social status. The aim is to "address and reactivate the knowledge of the participants and make the exchange process mutually beneficial" and to "make apparent the systemic failure

and loss of skills and knowledge experienced through the silencing process of people seeking asylum" (ibid.). In Tensta, where the large majority of the residents come from refugee or immigrant backgrounds, the participants have developed a language café and a user-driven library, and organized lectures, discussions, workshops and publications.

In recent years, however, hosting has also been introduced as a strategy for gaining relevance in more traditional and prestigious art institutions. These include The National Gallery of Denmark in Copenhagen (SMK) – in this case through The ULK Art Labs (https://www.ulk.dk/). ULK (Unges Laboratorier for Kunst) is SMK's social and creative community for young people who want to develop new formats at SMK. Initiated in 2007 as an audience development project, ULK has developed into a more experimental and independent community – now with goals that include pushing boundaries, being democratic and critical, and always doing something that SMK cannot do on its own. Some of the projects are carried out inside the museum, others outside and in collaboration with external partners. The projects are developed in collaboration with the museum staff but always decided by ULK. See the ULK group hosted by The National Gallery of Denmark. https://www.ulk.dk/

In many of the art institutions, and in particular the more traditional ones, the hosting type may come close to collaboration. For the institutions, the motivation for hosting may sit uncomfortably between wanting to increase audience numbers, create a more multi-voiced space, and reinvent its knowledge production and communication. It is not always easy for institutions that build their reputation on traditions and expert knowledge to let citizens or communities with other backgrounds and preferences than their own have a say inside the walls. But increasingly they try to make space for more voices and perspectives.

Another example of this is Tate Exchange, a long-term project at Tate Modern, London, and Tate Liverpool. The project was launched in

September 2016 and the goal "to work with others in order to generate new perspectives, provoke debate, stimulate creativity and create new collaborations" (http://www.tate.org.uk/visit/tate-modern/tate-exchange). Tate Exchange is primarily a physical space and a platform – in London situated at Level 5 of the Blavatnik Building at Tate Modern, supplemented by Instagram and Twitter profiles, where one is invited to "join the conversation".

Each year, Tate Exchange hosts a lead artist and focuses on a new theme (so far exchange, production and movement). Importantly, it has more than sixty associates who in different ways have an interest in the impact and social value of art. These associates are involved in the production of the programme, which includes artist responses, workshops, activities and debates. The associates (in both cities) include Museum of Homelessness, Liverpool Pride, Children's Hospital, The Saturday Club, Digital Maker Collective, Valleys Kids, Feminist Library, Flourishing Lives, People United and Public Works. Through these, other institutions and communities can be involved as well. An example of this is Public Works, who hosted a 10-day long summer "School of Civic Action" at Roskilde Festival in Denmark. In the context of the festival, the summer school explored ideas around temporary use, instant city making, and new forms of living. Some of the results appeared at a week-long programme hosted by the School of Civic Action at Tate Exchange in London, July 2018.

Tate Exchange is an example of an institution that has shifted its focus from the traditional didactic and explicatory logic of the exhibition to a more open and flexible space for social encounters, public debates and co-created knowledge. They emphasize that they welcome a heterogeneous set of voices and communities: "Whether you are an observer, commentator, researcher, creator, hacker, tweeter or just curious, join international artists and organisations to explore the issues of our time. Drop in for a talk, join the conversation, enjoy a chance encounter and learn something new" (ibid.).

However, in order for them to provide hosting rather than collaboration, it is not only the visitors but also the museum itself that must be willing to learn something new – and let others decide what the activities and learning focus on. To involve associates with such diverse agendas and knowledge as those mentioned in the programming is one step towards this, and whether this can be labelled hosting depends on how willing Tate is to let them use the museum space and facilities for their own purposes – and this in turn will depend on how different these are from the museum's understanding of its own mission and way of working.

In the examples above, various sorts of institutions and organizations host individuals, communities and even other institutions and organizations, thereby enabling these to use the venues and facilities for their own purposes (within the limits of the host institution). Thereby the 'guests' also decide what knowledge and skills they want to develop and communicate. But as the projects in Tensta, SMK and Tate all demonstrate, this enables a production and dissemination of knowledge that is different from the art institutions' usual knowledge. How and to what extent the institutions integrate this knowledge varies. It may be at odds with the hosting institution – as is sometimes the case at SMK for instance (Springborg and Rung 2019) – but thereby it may also be more relevant for the 'guests' and their communities who might normally feel like outsiders in the institution.

THE HOSTING MODEL IN COC

If the model of hosting was to be used in Billund, it would require a flexible and accessible space without too many regulations – and an open invitation to use this for the local residents' own purposes. However, if such an invitation was distributed only to individual citizens, it would probably not be very successful. Maybe it would need to begin with the fundamental question: "Do we have groups of youngsters in Billund that really need a space?" In other words, it would be necessary to invite existing communities in Billund and consider their assets, needs and interests. Do they long for rehearsal facilities or stages for performance groups or bands, a café where various groups can socialize, a space for the film club, specific workshops, an exhibition space, a place to play board games, a place for intercultural dining or tandem language learning, a place for skating or something completely different? To find out, one would need, as argued by Simon, to spend time with them, talk to their leaders, explore their events and sites – and then let their ideas set the agenda.

Conclusions

Above, we have taken an inclusive approach to how to engage citizens in science. In the theories and cases presented, we have included scientific knowledge in the strict sense but also other forms of knowledge. Scientific and everyday, expert and lay knowledge have been combined in socially robust ways in our cases, and lay knowledge has been treated as a particular form of expertise.

Throughout the report, a key point has been to avoid framing citizens as lacking knowledge, interests and skills, and to approach them as having resources and competences. Research shows that these resources can be used and activated in citizens' engagement with science and knowledge – for the benefit of communities as well as science. Based on current research in public engagement in science, we have emphasized the need to develop informal, participatory and experimental environments, where authority and ownership is distributed, where science can be felt and understood in embodied and aesthetic ways, and where knowledge is actively produced and not only transferred in the process.

One can distinguish between two basic 'genres' of participatory science communication: firstly, 'science-based participatory engagement' where scientific knowledge in some way informs or is communicated to citizens through a participatory and aesthetic process; secondly, 'participatory engagement as science' where citizen participation is part of the development or realization of a scientific project and process. Both genres are present in our cases, but we have primarily focused on the second for three reasons: 1) it has a potential for acknowledging plurality and being sensitive towards a diversity of particular phenomena and local practices; 2) it allows for

knowledge production and communication that is less dependent on predefined and excluding concepts; and, 3) it can acknowledge people's assets, needs, interests and affinities and use these in productive ways. These characteristics enable it to be relevant to and engage with various communities.

How this is done, and how the knowledge and agendas of institutions and experts are balanced with the knowledge and interests of the participants, varies, and the four participatory models of contribution, collaboration, co-creation and hosting each have their own strengths and challenges. The model of contribution has the strength of offering accessible formats for involving a high number of citizens in participatory projects. This frequently used model, which provides free, voluntary work in a process controlled by the institution, can offer many people opportunities for learning. But the learning and the interaction with the institution, with science and with other participants often remains rather limited as the participants only complete pre-defined tasks.

Compared to contribution, the model of collaboration has the disadvantage of involving less participants but the advantage of allowing them to take part in more stages of the research process and develop their methodological (and collaborative) competences. By providing substantial and heterogeneous input to the project, the level of interaction and influence is higher than in the contributory model and the learning outcome more multifaceted.

In the model of co-creation, participants and institutions work on terms that are more equal than in the models above. The number of participants are

often lower than in collaborative projects (and much lower than in contributory projects) but the learning outcome is deeper as the participants are involved in all stages from setting goals to developing the project and disseminating the results. This process can generate new communities of learning with significant educative and affective outcomes.

Finally, in the model of hosting, participants use the spaces and facilities of the institutions for their own purposes. A disadvantage of this model is that the institutional control of the process as well as the influence on the learning outcome is minimal. These two characteristics, however, can also be an advantage as the participants who work to realize their self-defined goals define the educative content themselves. A particular strength of this model is that it can involve people who do not normally feel comfortable in the institution.

Through the four models, the level of institutional control gradually decreases while the participants' ability to set goals and co-decide the process increases. While this easily can disturb the institutionally defined aim and design of the project, and indeed also complicate the process, it has the potential of strengthening the learning outcome, the effectiveness of voice, and the collective, affective experience of participation. Common for all four models is that they combine something familiar with something new – thereby enabling the participants as well as the institutions or facilitators to learn something new. If science communication does not do this, and if it does not address specific communities with specific interests, it is easily conceived as locally irrelevant and will have minimal individual and social impact. Or to put it more simply: one needs to engage in citizens in order to engage them in science.

POTENTIAL FUTURE PARTNERSHIPS

When developing concrete participatory cultural projects, it will be relevant for CoC Playful Minds to collaborate with various national and international (research) environments depending on the concrete goal, or problem dealt with, in the

project. The interdisciplinary scope of the concept of participation implies that, depending on the aim and scope of a specific participatory project, different academic fields, persons and environments could be important collaborators for future Capital of Children-initiatives. Ideas for some of the most relevant ones are mentioned below:

- As already mentioned, participation – and participatory knowledge dissemination and production – has been crucial for the study of contemporary aesthetics, cultural institutions and cultural policy. Nationally, researchers and practitioners in this field have recently been organised in the network Take Part (Birgit Eriksson, AU) and in research groups at SDU (around e.g. Kirsten Drotner and Anne Scott Sørensen) and KU (around e.g. Dorte Skot-Hansen and Casper Hvenegaard Rasmussen). Universities in Leeds (e.g. Leila Jancovich), Manchester (e.g. Andrew Miles) and Leicester (e.g. Lisanne Gibson) have been important research hubs in the UK, and the work of Nina Simon (US) has been particularly influential for cross-national discussions on the topic (Simon 2010).

- A subdivision of research on cultural participation has focused on the health benefits of participating in culture. This has been an important agenda in the UK for decades (Crawford et al. 2015), and lately this interest has also gained ground in Denmark with larger projects on 'shared reading' in health institutions (Mette Steenberg, AU) and 'narrative medicine' (Anne-Marie Mai, SDU) and with the "Nordjysk Center for Kultur og Sundhed" (NOCKS) and the "Health, Media and Narrative" research unit at AU. This interest in health and culture resonates with a more general and increasing focus on patient involvement and participation in the health care sector (Mol 2008, Tritter and McCallum 2006).

- Since the mid-1990s the strengths and challenges of participation has also been a central topic in media studies and information

studies. Agenda-setting international researchers have been Henry Jenkins, Chris Kelty, Nico Carpentier and Jose Van Dijck.

- In the field of interaction design participation has also been crucial as a design principle focusing on the importance of user-driven processes (see e.g. The Center for Participatory IT and Martin Brynskov's work on smart cities, AU).

- The field of Science and Technology Studies has been interested in how e.g. new digital and sensor technologies make possible new forms of citizen participation and engagement in e.g. environmental challenges (see e.g. the research of Jennifer Gabrys and Noortje Marres). An interesting environment in this regard is "The Centre for Interdisciplinary Methodologies" at Warwick University.

- In Denmark, Jeppe Læssøe (AU), in the field of education and learning, has also explored participatory approaches to dealing with, and learning about, environmental changes among children and youngsters.

- The concept of participation has also been pivotal within development studies (Cornwall 2008, Cohen and Uphoff 2011/1980), experience economy (Boswijk, Thijssen, and Peelen 2007) and urban planning (Wolfrum and Brandis 2014). In Denmark, Per Mouritzen's research on participatory citizenship (AU), Silas Harreby's work on social movements and activism (RUC), John Pløgers work on urban eventalization (RUC), and researchers connected to "Performance design" at RUC, "Experience Economy" and "Aesthetics and Culture" at AU, and "Experience Design" at AAU are important contributors in these fields.

"One can distinguish between two basic 'genres' of participatory science communication: firstly, 'science-based participatory engagement' where scientific knowledge in some way informs or is communicated to citizens through a participatory and aesthetic process; secondly, 'participatory engagement as science' where citizen participation is part of the development or realization of a scientific project and process."

Works cited

Bala, Sruti. 2018. The Gestures of Participatory Art. Manchester: Manchester University Pres.

Bishop, Claire. 2012. Artificial Hells. London: Verso.

Bonney, Rick, Heidi Ballard, Rebecca Jordan, Ellen McCallie, Tina Phillips, Jennifer Shirk, and Candie C Wilderman. 2009. Public Participation in Scientific Research: Defining the Field and Assessing Its Potential for Informal Science Education. Washington.

Boswijk, Albert, Thomas Thijssen, and Ed Peelen. 2007. The Experience Economy. A New Perspective. Amsterdam: Pearson.

Bourriaud, Nicolas. 2002. Relational aesthetics. Dijon: Les Presse du Reel.

Carpentier, Nico. 2011. Media and participation: A site of ideological-democratic struggle. Bristol; Chicago: Intellect.

Cohen, John, and Norman Uphoff. 2011/1980. "Participation's place in rural development: seeking clarity through specificity." In The Participation Reader, edited by Andrea Cornwall. London Zed Books.

Cornwall, Andrea. 2008. "Unpacking 'Participation': models, meanings and practices." Community Development Journal 43 (3):269-283.

Cortassa, Carina. 2016. "In science communication, why does the idea of a public deficit always return? The eternal recurrence of the public defici." Public Understanding of Science 25 (4):447-459.

Crawford, Paul, Brian Brown, Charly Baker, Victoria Tischler, and Brian Abrams. 2015. Health Humanities. Basingstoke: Palgrave.

Davies, Sarah R, and Maja Horst. 2016. Science Communication. London: Palgrave.

Eriksson, Birgit, Camilla Møhring Reestorff, and Carsten Stage. 2018. "Forms and potential effects of citizen participation in European cultural centres." Participations: Journal of Audience & Reception Studies 15 (2):205-228.

Evans, Penny, Irish, Sharon 2013. "Structures of Participation in the "University of Local Knowledge"." International Journal of Progressive Education 9 (3):70-88.

Falk, John H., and Lynn D. Dierking. 2018. Learning from museums. Second edition ed, American Association for State and Local History book series. Lanham: Rowman & Littlefield.

Graham, Beryl 2010. "What kind of participative system? Critical vocabularies from new media art." In The 'do-it-yourself' artwork : participation from fluxus to new media. Rethinking art's histories, edited by Anna Dezeuze, 281-305. Manchester, UK: Manchester University Press.

Guenther, Lars, and Marina Joubert. 2017. "Science communication as a field of research: identifying trends, challenges and gaps by analysing research papers." Journal of Science Communication 16 (2):1-19.

Hess, David. 2016. Undone Science. London MIT Press.

Kelty, Christopher, Aaron Panofsky, Morgan Currie, Roderic Crooks, Seth Erickson, Patricia Garcia, Michael Wartenbe, and Stacy Wood. 2015. "Seven dimensions of contemporary participation disentangled." Journal of the Association for Information Science and Technology 66 (3):474-488. doi: 10.1002/asi.23202.

Kester, Grant. 2011. The one and the many. Durham: Duke University Press.

McSweeney, Kayte, and Jen Kavanagh, eds. 2016. Museum Participation: New Directions for Audience Collaboration. Edinburg & Boston: Museumsetc.

Menninghaus, Winfried, Valentin Wagner, Eugen Wassiliwizky, Ines Schindler, Julian Hanich, Thomas Jacobsen, and Stefan Koelsch. 2019. "What are aesthetic emotions?" Psychological review 126 (2):171-195. doi: 10.1037/rev0000135.

Mol, Annemarie. 2008. The logic of care. Health and the problem of patient choice. London, New York: Routledge.
Nowotny, Helga, Peter Scott, and Peter Gibbons. 2001. Re-Thinking Science. Knowledge and the Public in an Age of Uncertainty. Cambridge: Polity Press.

Schindler, Ines, Georg Hosoya, Winfried Menninghaus, Ursula Beermann, Valentin Wagner, Michael Eid, and Klaus R. Scherer. 2017. "Measuring aesthetic emotions: A review of the literature and a new assessment tool." PloS one 12 (6):e0178899. doi: 10.1371/journal.pone.0178899.

Selin, Cynthia, Kelly Campbell Rawlings, Jathan Allende, Gretchen Gano, Sarah Davies, and David Guston. 2017. "Experiments in engagement: Designing public engagement with science and technology for capacity building." Public Understanding of Science 26 (6):634-649.

Simon, Nina. 2010. The Participatory Museum. Santa Cruz: Museum 2.0.

Simon, Nina. 2016. The art of relevance. Santa Cruz, Calif.: Museum 2.0.

Sitzia, Emilie. 2018. "The ignorant art museum: beyond meaning-making." International Journal of Lifelong Education 37 (1):73-87. doi: 10.1080/02601370.2017.1373710.

Springborg, Louise; Rung, Mette Houlberg. 2019. "Deltagelse som forstyrrelse og forandring. ULK på Statens Museum for Kunst." In Kunst, kultur og deltagelse, edited by Eriksson, Birgit; Rung, Mette Houlberg; Sørensen, Anne Scott, 107-130. Aarhus: Aarhus Universitetsforlag.

Stilgoe, Jack, Simon Lock, and James Wilsdon. 2014. "Why should we promote public engagement with science?" Public Understanding of Science 23 (1):4-15.

Tritter, Jonathan Quetzal, and Alison McCallum. 2006. "The snakes and ladders of user involvement." Health Policy 76 (2):156-168.

Tygstrup, Frederik. 2017. "The work of art : from fetish to forum."Akademisk kvarter online Vol. 16 (2017).

Welsch, Wolfgang. 1997. Undoing.

aesthetics, Theory, culture & society. London: SAGE.

Wenger, Etienne. 1998. Communities of practice : learning, meaning, and identity, Learning in doing. Cambridge: Cambridge University Press.

Wolfrum, Sophie, and Nicolai Brandis. 2014. Performative Urbanism. Generating and Designing Urban Space. Berlin: Jovis Verlag.

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