PARCOS
Participatory Communication of Science

DELIVERABLE D5.6
CASE STUDY 3 PARTICIPATORY STORIES

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SUMMARY

In the process of urban planning, environmental data may play an important role. This data can be used to evidence the negative and positive impacts on nature, but it relies on the capability and willingness of people to make sense of it. This deliverable illustrates the outcome of conducting the Finnish ParCos case study, in which school youth participated in a science story about water quality in their local lake. The case study explored the use of an existing data-driven storytelling method, called data comic, to curate the data, this was combined with data drama, to improve the sense-making of data. We describe the event, how it was planned and conducted and what were the outcomes. We reflect on the lessons learned for ParCos and the various tools that helped to inform the creation of the event.

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1 INTRODUCTION

Deliverable 5.6. (D5.6) provides an overview of the outputs of Case Study 3 in the ParCos project, which is led by LUT in Finland. The deliverable describes the actions taken to complete Task 5.3 in Work Package 5 (WP) – Case Studies and Communications of the ParCos Project. This report explains how the three case studies worked together and the design and the results of the Finland case study are explained in more detail, including how the various ParCos tool were used for this. For this we build on the results of stage 1 of the case studies, described in the previous deliverable 5.3, “data and content report”, published in April 2021 (month 16 of the project). Here, we will describe the enactment of the data drama event which built on the Veden Armoilla pilot online event previously reported in D5.3.

1.1 PURPOSE OF THE CASE STUDIES

This deliverable sits within WP5 ‘Case Studies and Communications’ which is being conducted over a 30-month period (June 2020 to November 2022). There are 3 case studies within the ParCos project in three different countries – Belgium, Finland and the UK.

As shown on Figure 1, ParCos is developing participatory design models, methods and tools which are being tested within three case studies in Belgium, Finland and the UK. Each case study has a different focus, in terms of the science topics and the group of participants it is working with, but the learning is then brought together and feeds into the creation of the ParCos models, methods and tools.

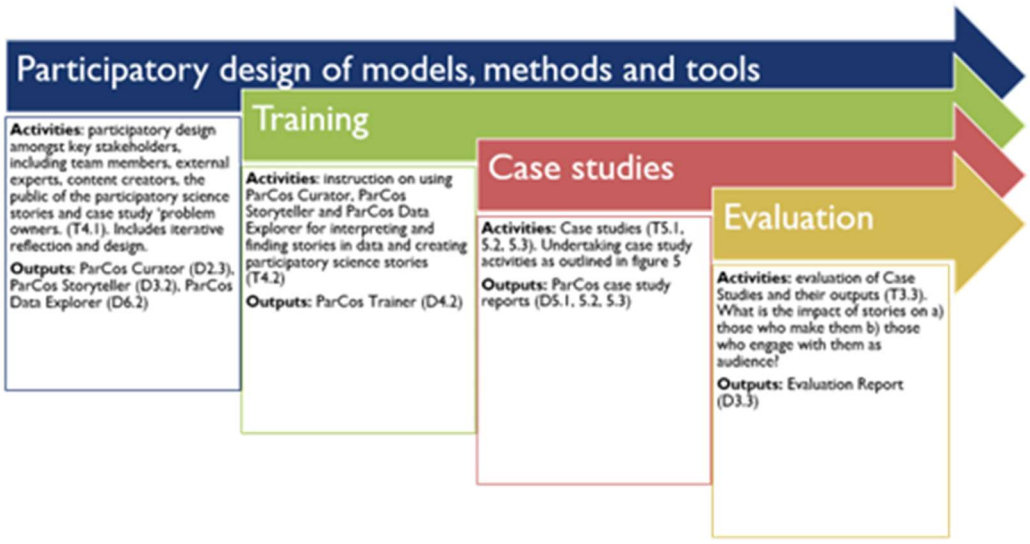

Figure 1: Overview of the ParCos Methodology

A brief summary of the three case studies, as they were initially conceptualized, is provided below:

Case Study 1: (1) design explorations based on weather or astronomical data to guide innovative storytelling in broadcasting (Belgium) to reach a diverse audience and (2) design explorations to implement participatory storytelling techniques in online news outputs.

Case Study 2: local communities, collecting and using data to address issues of importance to them, and communicating findings in personalised, intelligent, and accessible ways including using immersive technologies (UK)

Case Study 3: science in schools, looking at how schoolchildren can use the research data generated by universities and contextualise it to their own context and use through and share with others through documentaries (Finland)

The purpose of this deliverable is to report on the Finnish Case study, and it is a follow-up document to deliverable D5.3. that was specifically about stage 1 of the case study, using the right scientific methods for data collection depending on the local context.

In this deliverable (stage 2) the case study is further elaborated, applying the principles of the trainer package (prepared in WP 4) for creating participatory science stories to reach a diverse audience. We also provide more information about how the case study was ultimately realised and the implications for ParCos by relating the outcomes to some of the ParCos tools and approaches.

2 INTRODUCTION TO FINNISH CASE STUDY

This section briefly introduces some of the key theories behind the Finnish case study and the creation of the Data Drama approach for participatory science communication.

2.1 DATA STORYTELLING

The aim of ParCos is to produce participatory science stories. The term data storytelling is generally used to relate a particular perspective and interpretation of data towards the audience. The appearance of the story may differ, but it often comprises a data visualization with an accompanying explanation. In ParCos, a participatory story is one in which the audience has some level of agency over the form of the story and the direction it takes. Deliverable 3.3 describes the Parcos storyteller, which is a tool to help people to define participatory, data-driven, science stories. According to the storyteller there are different levels of agency within the story in terms of the data used to evidence it. At the bottom end is consuming a data storyline, which is a fairly passive activity. At the highest end is adding an entirely new data storyline into a story. The aim of the Finnish case study was to create a participatory story that was suitable to be used with youth, in an informal learning setting, to involve them more deeply with interpreting and communicating science.

2.2 ARTS-BASED APPROACHES

Arts-based approaches are utilized within ParCos to help individual perspectives around science stories to emerge but to be open to critical reflection. Arts-based approaches help to challenge basic assumptions and they can be used individually but are often used in collaborative settings. They also allow the exploration of problems from different perspectives via an aesthetic distancing that means the problem can be thought about as though from someone else’s point of view. This reduces conflict in collaborative problem solving and exploration of alternative views around science. D3.5 has delivered the arts-based guidebook that has support ParCos activities.

2.3 DATA COMIC

A comic is a form of sequential art which is not only lightweight entertainment, but which has also been used to tackle serious subjects. The visualization of a comic strip form can be used to transport readers into the story and travel through a fictional world. Thus, HCI has accepted comics in various research contexts (Sturdee & Lindley, 2019) such as explaining ongoing work with technology and research through design (Dykes et al.,2016), data-driven storytelling (Bach et al., 2017), and provocation (Wang et al., 2019). Data, such as citizen science data, or other open data sets can be a valuable and useful resource for evidencing science stories and providing the data along with the story makes participants more active and able to critique the story for themselves or offer their own local knowledge that may help in its interpretation. But data can be difficult to understand for those who lack data literacy skills. To make sure adequate participant engagement within participatory science stories, we may in some circumstances need to represent this data in fun, interesting and simple ways to lower the barriers of participation. Data comic combines the language and storytelling concept with comic visualization which explains the data insight and makes visualization process simple (Adams & Owens, 2021).

3 DEVELOPING THE DATA DRAMA

Based on the initial pilot, the theme for the Finnish case study was exploration of water quality data that had been collected over 5 decades, about a Finnish lake in Lahti city, called Vesijärvi. This water data had provided the municipality with information over the years that it had used for devising strategies to improve the water. This had been supported by local scientists who helped to interpret the data for the municipality and help them to come up with these solutions, as well as supporting them to understand the impact, via the continuous monitoring and interpretation of results. While such actions have led to a marked improvement in the water quality, the ongoing monitoring is important in order to address any new emerging issues. These practices may also inform similar strategies in other lakes. Involving local communities and especially youth in stories about the lake are an important part of awareness about lake health into the future, especially as pollution is often difficult to spot especially in early stages.

The purpose of our data drama was therefore to support local youth to understand the impact of water pollution by using the story of the local lake Vesijärvi which got polluted in the past and then restoration program was performed. To validate the story, we used the lake data that had been collected since the 1970’s, during which time different parts of the lake had been monitored - at different depths - to test for levels of phosphorous and chlorophyll, as well as testing other minerals, water temperature and so forth.

The case study event was part of a larger event organized with the Lahti schools on that day, in which students chose a workshop to participate in based on a brief description of the event. All of the workshops had the common theme related to water quality, but explored it using different scientific perspectives, for example some workshops focused on crisis management, others on actually doing water testing and so on. Therefore, the recruitment to the event happened as part of the larger event. All of the workshops were 2 hours long.

The ParCos case study event took place in SDO Theatrum Olga, Lahti, Finland, with the title Veden Armoilla ‘at the mercy of water’. Theatrum Olga is an educational space following principles of phenomenon-based learning through convention of various arts-based methods. The data drama involved high school (recruited as part of that one-day workshop series), vocational school students (who were learning arts-based approaches for their own practice at Theatrum Olga), teachers, art-educators (who accompanies the high school students) and ParCos researchers. The workshop space was decorated as a future water laboratory. Staging and props were used to make this happen. To support it we also had a drama pretext about one main character called Näkkitär. We created some supporting videos about this character. This video was played before starting the event to create the atmosphere. The main intention of the drama framing was to make the whole process feel more immersive and also to fit with the theme of the lake data. The vocational school students co-created the drama space and the characters. They were trained to deliver the data activities to the participants (High School teenagers) and played the role of facilitators. They also got support from the researchers when needed. The whole workshop was video captured by a professional video documentarist. The video was analyzed after the event. The event preparation and background work started in Spring 2021 (the live-streamed testbed during March which was reported in D5.3). In August 2021 the co-creation began with 10 Theatrum Olga students, make-up artist & hairdresser, costume designer and drama teacher.

We organized ourselves into a data team and a drama team to both develop and work within the event. Activities of both teams are described below.

3.1 Data team & Design pattern of the data comic card games

The main task of the data team was to make the lake data understandable in a short time frame and linking this experience of data sensemaking to an overarching narrative. Our idea was to use the data drama as a supporting method in data sensemaking. In that case our first goal was to embed the data we had about the lake into the data drama. We had a feeling that

traditional screen-based approaches that are commonly used to explore data would not fit in our overall context. Instead, we came up with the idea of creating tangible card games that participants could pick up and discuss. We created two interactive card games h a) Speed data-ing and b) Hauki Byte (Figure 2). Both games were designed based on the concept of data comics to help participants to understand two different elements in water: phosphorous and chlorophyll. The purpose of speed Data-ing is to allow people to understand key facts about data sets very rapidly. Examples of key facts could include when and where data has been collected, and the relevance of the data to the problem being investigated. In this example of speed data-ing, the key information on the cards were a) basic introduction of the element as a comic character; b) their levels and impacts in lake water; and c) causes of fluctuations in their level. Hauki Byte is based on a US television show card game where they start playing the game with a random card and the player has to guess if the next card (facing downwards) will be higher or lower. The goal of hauki bytes with data is to help people to identify trends in data more easily and to understand which interventions may influence trends and when they have been used. We used the same strategy here focusing on water data about a Finnish lake and using the phosphorous level as the value to guess, from one decade to the next. The Hauki is a freshwater pike that is common in Finnish lakes.

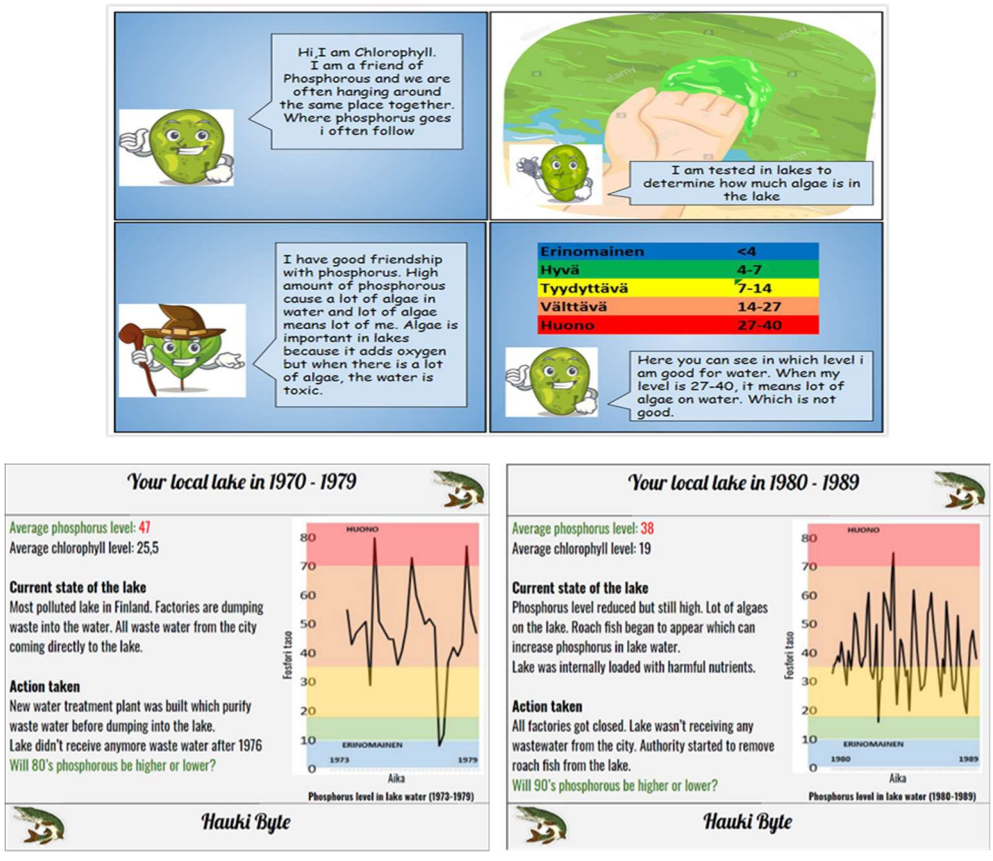

Figure 2: Speed data-ing(left), Hauki byte(right)

Both of the card games have different rules. Speed data-ing has two cards containing data comics regarding two water elements (Phosphorous and Chlorophyll) (see Figure 2). Participants get a certain amount of time to read the data comic and learn about the

elements. In Hauki Byte there are 5 cards in total. The timeline of each card is a decade, meaning that each card contains information of 10 years. We had data about the lake water from 1970-2020. So, five card timelines were divided as 1970-1979, 1980-1989, 1990-1999, 2000-2009, 2010-2019. Each card contains the level of Phosphorous and Chlorophyll in the water, the state of the lake during that decade, actions taken by the authority to improve the condition, and a visual representation of the phosphorous level (Graph). By this time students would already have ideas about Phosphorous and Chlorophyll from the first game (Speed data-ing). The game rule was to look at the first card (1970-1979) and guess the level of Phosphorous in the next card (1980-1989) based on the action taken by the authority. There were two possible ways to do it. Either by looking at the cards and using the knowledge they learned from the Speed data-ing or by looking at external information sources. Comic visualization was collected from the internet or created from the water data we got from the expert. Expert help was also used to understand the raw water data, learn the history of the lake and the actions that had affected the water quality.

The data comic strip used in this research was designed based on the design pattern of Benjamin Bach. In his paper, he facilitated comic creation from data by introducing some design patterns. The narrative power of comics comes from the combination of pictures and words. In data comic, pictures are the visual evidence of the data. Data comic combines both word and picture for better understanding. This combination can be a) paragraph with the picture, b) putting text into the picture or c) picture into text (Bach et al., 2018) (see Figure 3). We used the second combination, putting text into the picture for our data comics. According to (Consolvo et al., 2006) we selected the temporal pattern for the Hauki bytes comic panels, with each panel representing a decade's worth of data. This pattern is designed to highlight a temporal change in the data. We combined this with a narrative pattern where we explained the history, made a connection between the reader and the data, and lastly ended up with a question & answer for the subsequent card which involves the reader with the story (see Figure 4). Speed data-ing was intended to give background information that is needed to interpret the data sets in hauki bytes.

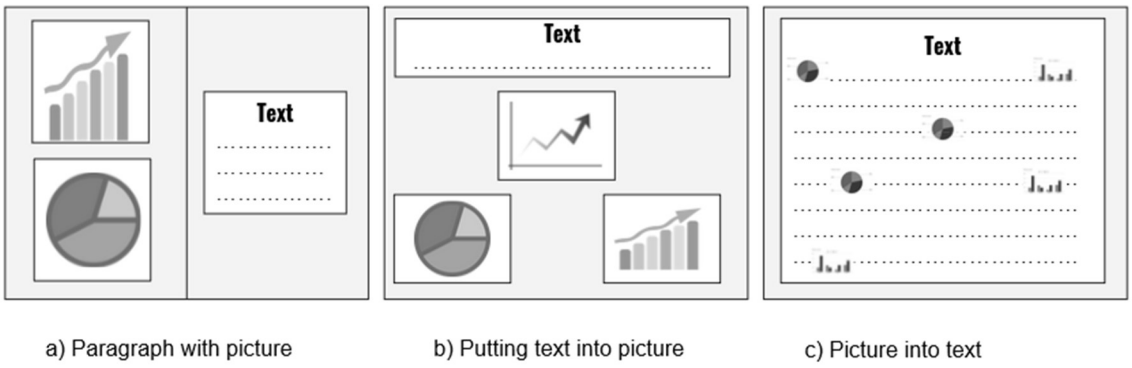

Figure 3: Combination of words and pictures

The comic panels in these cards reflect the expose pattern under narrative pattern which introduces data context, problems, questions, demonstrating importance (see Figure 3).

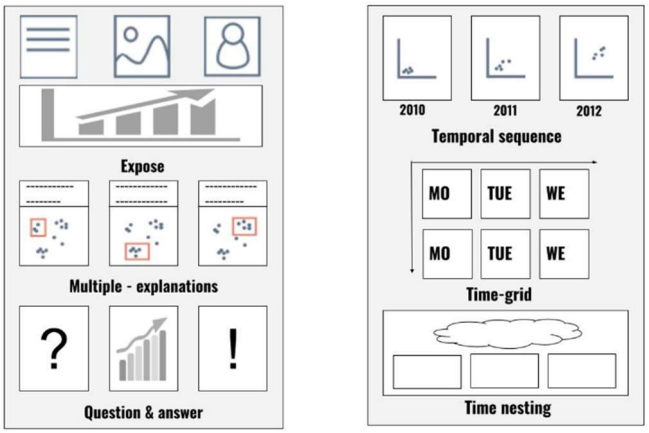

Figure 4: Data comic patterns. Narrative pattern (left), Temporal pattern (right).

To create a meaningful story, the sequence and connection between comic panels are very important. In the original data comic technique, the panels are generally ordered on a 2D canvas which can be a paper, screen, slide, etc. (Consolvo, S. et al. 2006). However, we made a key change in order to use these within the case study. We prepared each panel as a separate card. We introduced a simple game mechanic and flow of activities to encourage viewing the cards in an intended, coherent, linear order (in temporal order by decade) but this also meant that participants could pick up cards and look at them in any order or compare different decade against each other more easily (for example the first and last). There were two reasons: first, having separate cards made it easier for several people to engage with the comic at the same time. Second, we wanted to encourage critical thinking and to give the impression that the data and interpretations were somehow not fixed and did not necessarily tell the whole story.

3.2 DRAMA TEAM

The main task of the Drama team was to create a dramaturgical and pedagogical script to convert raw data we collected into a drama. In the drama script some fictional scenes were sequenced with the help of students which may be relevant in order ´to face change and to create capacity for building resilient futures`. We introduced different roles in the drama such as different aged citizens, politicians, environmental researchers, professionals, creatures - including fishes, birds, insects as well as water plants and plants around lake. The scenes were created through five different types of arts-based method drawn from drama education:

1. We used theater games which we framed in environmental focus so that everyone can have equal access to explore the water data. It’s called evocative encountering.

2. We used the theater space for floating within and around, exploring the space by finding unused areas and redefining them. For example, we turned the theater costume laundry room into a land of water secrets by using lights, tent materials, sound and theatre props.

3. Thoughts and ideas about the lakes were presented through sketches. There are thousands of lakes in Finland and majority of the locals have their own experience. This method allowed

links to be made to the students own local environment as we simultaneously considered water issues on a global level through the making of a kind of explorative manifesto in the form of a short video.

4. “What does data actually mean to me in this context?” This question was important for the drama team as they were not sure what the water data meant to us personally and professionally. We proposed sketching to answer this question which made the learning process collaborative. Researchers joined with the students to understand what the data might mean. Instead of presenting the conclusion as seminar presentation form, findings were shared in an organic way with each other.

5. Building scenes through drama education and theatre form. During the event different groups were introduced to perform different drama and theater forms to interpret the water data. It helped to modify and clarify the understanding of water data.

The fictional scenes formed part of an overarching narrative which centered on the mythical figure of Näkkitär- drawn from Finnish Folklore, Arts and Cultural Studies, and acted by Pihla Karhu of Theatrum Olga. According to the story, Näkkitär travelled from the future to the present day. Her friend Raven Etiäinen (a disembodied bird figure on a lap-top placed dramatically in the setting of the glowing Water Laboratory created in Theatrum Olga) told her that lake Vesijärvi and all that lived with it, on it, in it and with it, might be lost. They suggested her to take two samples of water from the future to the present and meet these young people. They understood about the new, powerful and mysterious thing called data. If Näkkitär could come to know what they understood about Vesijärvi data Raven Etiäinen believed she would no doubt have the power to stop everything being lost. The drama was scripted with some playful tasks in order to engage participant’s imagination in a way so that they will get curious to know more about the ‘other worlds’ of ‘Data’ and of ‘Näkkitär’ that we were inviting them to step in to (Owens, 2014).

4 WORKSHOP

This section summarizes the workshop we conducted. All participants entered the place which we turned into a mini amphitheater. First, they were introduced to the data we collected in hard copy form. The form was a long roll of paper full of numbers. This was done to let participants realize how hard it is to understand raw data. Participants had a short introduction with the drama team and data team. Näkkitär (the methodological character) had her sitting place on the stage. After the introduction session she (Näkkitär) started to interact with the audience. She was unbale to speak based on the drama story. So, she performed some acts basically hand theater where she asked participants to take paint brushes, paints from a large bag shaped like a lake fish (a hauki). According to the drama participants, the task was to help Näkkitär to find the answer why the lake water in future got polluted. She thought the answer might come from the history of the lake but all she had was

data in the form of card games which she couldn’t understand. Therefore, she asked the help of these young people to analyze these data through card games.

Figure 5. Examples of prop making before the event (top left and bottom middle) as well as the participants expressing their imagined future through painting onto a large canvas (bottom left and right).

Figure 6. Students engaging with data cards.

Figure 7. Näkkitär at different moments throughout the event.

Then the participants were given the card games “Hauki byte” and “Speed data-ing”. They were asked to play the games in groups which we created during the introduction session.

After finishing the game, they had to ideate some solutions for Näkkitär. The goal of the workshop was to teach teenagers about lake water pollution and familiarize them with the history of a local lake, Vesijärvi, near Lahti in southern Finland which got polluted in the 1960s, and a restoration program that started in the 1970s. The main idea was to tell the lake story in an interactive and interesting way through the data comic card games and raise awareness among the young people about water pollution. The last task of the workshop was to ideate a solution for Näkkitär where student sketched their thoughts about what might happen in future and presented it to Näkkitär. Figures 5, 6 and 7 show different aspects of the event.

5 OUTCOMES OF THE CASE STUDY

These findings have been previously reported in a CHI Paper (Hasan et al., 2022) and are replicated here. In total 10 students participated in the workshop and 12 youth education students from Theatrum Olga agreed to facilitate the whole workshop process. We succeeded to perform a face-to-face workshop but due to the covid restrictions, it was not possible to increase the number of participants. Yet it was enough to yield rich qualitative data to inform our research question.

5.1 ASSESSING THE IMPACT OF COMIC VISUALIZATION AND CARD GAME THROUGH ONLINE SURVEYS

We performed surveys with the participants and students who acted as facilitators during the event in order to analyze the effects of data drama and card games. We analyzed the open-ended survey with inductive thematic analysis (Braun & Clarke, 2012). We followed the six-phase process of thematic analysis. First, we coded all the answers we got form the survey and generated themes informed by our research question. We ended up with four different themes. They are explained as follows:

Sensemaking. The main goal of using the comic visualization was to curate the raw data in a way that was easier to understand. 10 out of 10 facilitators responded that the technique was effective and helped students understand the concept. Our goal of engaging citizens with the physical environment through relevant data was accomplished. We quoted some of the responses from the survey below:

“My opinion of the game surprised me positively, as it allowed me to learn and bring out the interest of the group and it was not very difficult for anything other than the initial awkwardness.”

“I learned a lot about the water lake and what things affect our water and how they relate to each other.”

“I learned different ways to express information, which is for example but diagrams, how to make it clearer and can express it in different ways and practical terms. I also learned something about the health of the lake and the dangers to its health.”

Interesting and easy way of visualization. Reading texts or looking at datasheets is boring and also complex. Another objective of using the data comic and data drama was to make the whole process interesting and fun. According to the participant responses the whole process was enjoyable and something different which they had never experienced before. All facilitators agreed it was an easy method of learning about the elements in water and 80% facilitator agreed that this process made the understanding of lake history easier. Some quotes from the survey given below:

“The game was certainly a fun and different way for participants to learn and internalize things. I also learned a lot about this format and how it is utilized in teaching. Also, as a facilitator, I learned a lot about the topic and things stayed in my mind, I think the participants did too.”

“I liked the simplicity of card games the most. For simplicity, the cards are easy to use in different ways”

“I liked the pictures of the cards the most.”

“I liked the illustration most informative”

Interactive. Apart from the comic visualization and data drama which focused more on making the data visualization simpler, goal of introducing the card game was to involve participants in discussions and ideating solutions as a team. Participants responded that the game made them have a conversation and motivated the teamwork.

“About teamwork and how everyone got involved and participated well”

“[the card games] work well to prompt a conversation”

Design issues. The survey also helped us to identify some of the drawbacks of our technique. Some participants mentioned in their answer that they had issues understanding the concept and gathering information they needed to come up with a solution. After analyzing the responses, we noticed that the overall concept of understanding the data we curated and guessing the future based on data was complex for teenagers.

“Evaluating what will happen in the future was difficult”

“We could have reviewed more in-depth information about what phosphorous and chlorophyll are, where else you can find them etc. Now they remained only as chemical names. Lake history cards were all similar to each other, which makes sense, but made them boring in the long run. "

5.2 ASSESSING GAME ACTIVITIES THROUGH ANALYZING WORKSHOP VIDEO

The results of the survey mainly focused on demonstrating the effectiveness of comic visualization in card games. To understand how participants were engaging with the game activities within the broader context of the arts-based approach and data drama, we analyzed the video captured during the workshop activities. For analysis, we used a three-stage qualitative analysis process with an aim of generating an evidence-based description of the

workshop process and guidelines for coding video material. For initial codes, we used codes for the process, data comic literature, and teamwork codes as interpreted from Dickinson & McIntyre. Based on the analysis, the game process had three distinct stages (see Figure 8). The first stage was understanding the concepts of water elements by playing speed data-ing. In this stage, the framing allowed participants to turn from students into communicators where they needed to explain the quantitative data to the mythological character (Näkkitär) by selecting physical tokens (cards of speed data-ing).

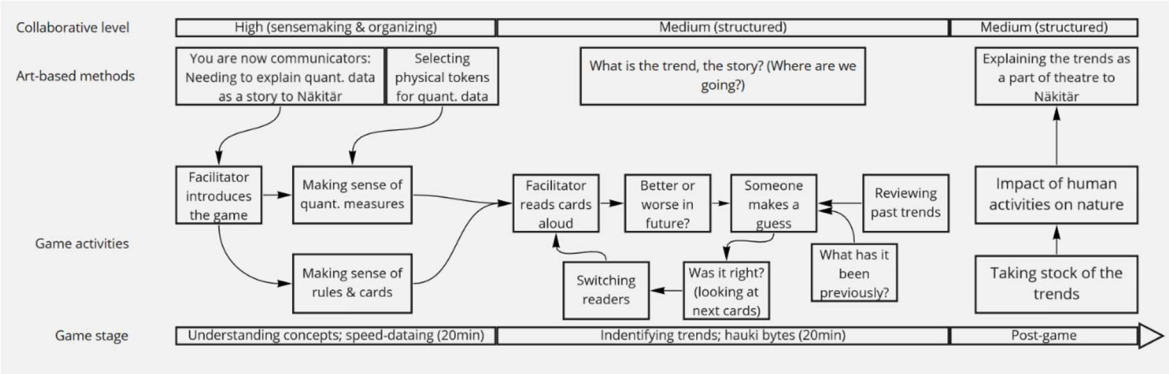

Figure 8: Video analysis of the workshop

Facilitators played their part by guiding students through the games. After making sense of the first data comic card game, participants went to the second stage. According to the analysis of the video, the collaboration level was high in this stage. In the second stage, participants played Hauki bytes. The facilitators helped participants to read the cards and based on this they needed to guess the future (in other words, the next decade). The process went on until they finished playing all the cards. We label this stage as ‘identifying trends’ as that was the game purpose and collaboration level was medium. Finally, in the post-game stage participants used their knowledge gathered through the games and explained to the mythological character (Näkkitär) what they had discovered, as a part of the ongoing drama. In the last stage of analysis, analytical coding, we distill the key characteristics and advantages of the data comics workshop through the lens of our research question. They are listed as follows.

Art-based methods added real stakes to game activities. Because of the story and art-based approach, participants engaged themselves more with the game.

Art-based method framing turned participants from students to communicators. Participants were tasked to explain the data we curated to a mythological character. It was a part of the learning process where participants turned themselves into communicators, as opposed to being passive recipients of data.

In the end, students identified trends and placed them in the context of human activities. At the end of the game, students understood the history of the lake and related their learning to a real-life context.

Student-driven setup, facilitation, and preparation were important parts of the process. The first stage with speed data-ing was more collaborative and student-driven. Once the groups felt that they were ready and had understood the concepts, the sensemaking and game activities in the middle were quicker and more mechanical. However, the game and the story context added stakes to the process: Had there not been the cards and the narrative, the students might not have taken similar efforts to prepare.

6 INSIGHTS FOR PRACTITIONERS

Based on our experience in conducting this workshop and analyzing the process, we identify the following points:

1. Most important lesson we learned is the combination of arts-based framing alongside card games. None of this approach would work on its own. Comic visualization helped participants to understand the data quickly, but arts-based approach was crucial to support collaborative aspects of sensemaking, relating the data to own experience and coming up with ideas.

2. Data comic is a great tool to increase engagement and to quickly convey information. But it needs to be done by someone. In our case first by the water experts, then the researchers curated the data and created the games, after that the facilitators learned how to use the games with the participants. In each stage, the level of expertise and time required to engage with and understand the information was reduced. This implies that in a co-design scenario where many are already data and/or domain experts some of this effort may be unnecessary but if participants are neither data experts nor domain experts it is highly effective to convey information efficiently to inspire collaborative ideation.

7 CONCLUSIONS ABOUT THE CASE STUDY

Data is important, and it can be a useful resource in co-design for understanding the problem domain and make solutions. But the problem is how to make sense of this data to non-experts. Data comic is one of the approaches which makes this data sensemaking process easier. On the other hand, data drama lowers the barriers for data engagement. In our case study where we tried to make sense of water data to teenagers, data drama and data comic helped participants to understand what the situation is now and what happened in the past which helped them to predict what might happen in the future.

8 LESSONS LEARNED FOR PARCOS

This section presents some lessons learned through the process of designing, conducting and evaluating the case study. First, this case study has formed a part of D3.6 in which the goal was to measure success or failure against different quality markers for participatory science stories. The outcomes of this detailed analysis can be found from that deliverable. Next, a number of approaches for curating data within participatory science stories were proposed

by the ParCos curator cards, and these can be found in D2.3. The suggestions included presenting data in a comic strip form, building a chronological timeline of events from a dataset, and the use of roleplay. The ParCos curator principles were used to curate data for this case study and were demonstrated to be an engaging and informative way of presenting the data, as evidenced through the evaluation presented in this case study. The arts-based methods described in the arts-based guidebook (D3.5) have been used for designing the drama pre-text. A detailed description of all available methods can be found within the guidebook:https://hackmd.io/@art-based-methods-guidebook/HJMVIhHFL/%2FjcW-JYxQQz6noMxXwp0uAw

D3.3 delivers the ParCos storyteller which identifies the level of participation in storytelling (Figure 9). From this we can assess that the case study of Finland was at level C, such that participants interpreted data in order to progress the drama that they were immersed in. While it would in theory have been possible for them to add data to the storyline, for example expanding the attributes of the lake data that were being investigated, or even to add their own data storyline, the time-pressured nature of the event meant this was impractical.

Overall, the ParCos case study has demonstrated one possible approach for participatory science stories using data comics and data drama to engage youth in science. The approach has been informed by the various ParCos tools, and the process of designing the event and analyzing the event has also provided useful insight into these tools. In particular, the event has demonstrated in several ways how arts-based methods can be used for participatory science storytelling, even if the methods are not structured into such an elaborate and staged event every time.

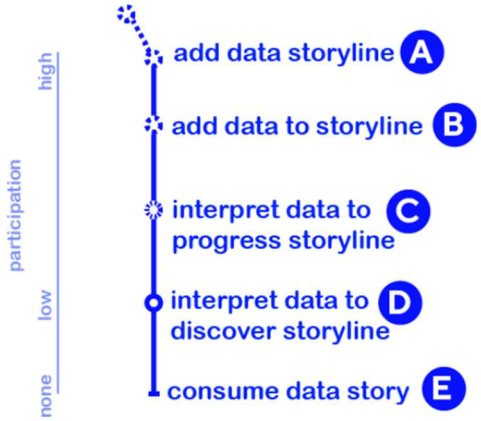

Figure 9: Levels of participation in storytelling (replicated from D3.3)

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