

How do we communicate with the Baltic Sea's future?

Understanding the role of youth in science communication from a practitioner's perspective

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Abstract

There is an increased recognition towards the need to engage multitudinous social groups in conversations and action about the environment. Amongst the objectives of environmental communication research is to study the implications behind who communicates, to whom, through what practices, intention, and perceived impact. This thesis explored the perspectives of science communication practitioners towards youth, and their approaches to youth-focused communication. The Baltic Sea was chosen as an area of study. Young people in this region should have opportunities to boost their climate literacy and build competencies in the context of the region's cross-cutting environmental challenges. An interpretative phenomenological analysis was conducted to uncover practitioners' views on three approaches: one-way, two-way, and multidirectional communication within the youth setting. This thesis found that practitioners are motivated to seek out young people to involve in Baltic Sea-topics, having cited platforms such as schools and social media that helped them reach this social group. In their narrations, the practitioners made it evident that they aspire to give youth their own agency to propose science communication activities that meet their needs. This led them to favour approaches to communication with elements of interaction. The practitioners saw value in diversifying their environmental communication work through the inputs of youth. Inclusive and relevant science communication that positioned young people as equals rather than passive recipients was hoped to incentivise them to get engaged and stay engaged in environmental topics for as long as possible. Youth were seen as the future inhabitants of the Baltic Sea Region who could be equipped with skills and knowledge already now to learn how to contribute to the future of the Baltic Sea's environmental wellbeing. When the time comes to taking over the mantle from the current generation, this future generation was aspired to be prepared to become the next decision-makers, researchers, and stewards of the sea. Such large hopes appeared to drive practitioners' motivations to facilitate youth-focused science communication. Against this background, the emphasis on twoway and multidirectional approaches was understandable, with consideration towards the perceived benefits for youth to learn through doing "real" things that maintain their engagement and create room for their continued involvement.

Keywords: Baltic Sea, environmental communication, IPA, science communication models, science communication practice, perceptions, youth

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Abbreviations

AbbreviationDescriptionBSRBaltic Sea RegionIPAInterpretative Phenomenological Analysis

1. Introduction

1.1 Problem Formulation

"If we are to rewild the sea for the good of all, then we should involve as many people as possible in this great and worthwhile adventure" (Charles Clover, 2022).

Recognition for the need to meaningfully engage multitudinous social groups to tackle environmental conservation challenges is increasing (Jefferson et al., 2015). The field of environmental communication emphasizes the role of communication in promoting and shaping public understanding of environmental challenges and actions to address them (Cox and Pezzullo, 2018). Environmental communication and action are deeply intertwined, the extent to which communicating about environmental issues can be considered a vital form of environmental action in itself (Irwin et al., 2018). However, environmental communicates, to whom, through what forums and practices, with what intention, and what impact, are amongst the objectives of environmental communication research (Ojala and Lakew, 2017; Cox and Pezzullo, 2018).

Environmental communication engages a variety of actors and publics who play a role in creating, shaping, and sharing environmental issues and the ways problems are represented (Irwin et al., 2018). Communication about our society's inherent and multifaceted environmental issues takes place in the public sphere, where different subgroups of populations engage with one another about topics of shared concern (Brossard and Lewenstein, 2009; Cox and Pezzullo, 2018; Alinejad and Van Dijck, 2023). Doing so should be accessible for all individuals within the public sphere through the choice of language and formats used for communication – this is to ensure everyone has the opportunity to acquire at least a baseline understanding of problems and policies that address them, which may influence their daily lives (Brossard and Lewenstein, 2009). The degree to which environmental communication is accessible and inclusive for diverse publics is indicative of the health of the public sphere (Cox and Pezzullo, 2018; Alinejad and Van Dijck, 2023).

A group of interest for research within the public sphere is youth (Nelms et al., 2015; Andersson and Öhman, 2016; Ojala and Lakew, 2017; Marquardt et al., 2024). In the coming five years, the number of young people between ages 15-24 is projected to exceed 1.3 billion, making this the largest youth population in history (Nelms et al., 2015; United Nations, 2025). It is generally agreed upon that these are the people who will be subjected to bearing the heaviest consequences of today's decisions around climate and environmental issues. In view of this, ensuring that they have opportunities to engage in environmental communication

is vital. Over the past decade, their environmental awareness, perspectives, and approaches to communication about environmental challenges in contexts such as school or online, have been subjects of study (Andersson and Öhman, 2016; Alinejad and Van Dijck, 2023). Researching what practices can promote environmental knowledge and engagement amongst them has also been carried out (Ojala and Lakew, 2017; Alinejad and Van Dijck, 2023). These past studies primarily focused on how youth themselves encounter and respond to environmental issues. However, the agency of this social group is only one of the puzzle pieces that make up all those who can prepare them to exist in a future riddled with environmental challenges. Another valuable piece to the puzzle could be attributed to those who can involve them in environmental communication through various communication materials and engagement activities: science communication practitioners.

Bridging the gap between scientists and publics is often the work of science communication practitioners, who are tasked to engage the public in scientific endeavours while upholding the values of the scientific community (Burns et al., 2003; Horst, 2013; Brown and Scholl, 2014). They can do this through various approaches, such as one-way information delivery, two-way dialogues with the public, or multidirectional participatory means (Metcalfe, 2019). Research about the practice of science communication has been consistently interested in the range of approaches to communication – that is, how and why practitioners apply different forms of communication in different circumstances, and what perceptions are embedded within their varied approaches (Irwin et al., 2018).

As a contribution to this field of research, my thesis is interested in science communication practitioners' perception of communication, with regards to oneway, two-way, and multidirectional communication. Specifically, I aim to explore practitioners' perspectives towards youth-focused communication. My focus on youth engagement derives from a general interest in this group as an increasingly important audience. Brossard and Lewenstein (2009) and Brown and Scholl (2014) have previously revealed that perceptions of audience interests are amongst the drivers behind how practitioners select how to translate scientific research – therefore, gaining insight into existing perceptions about particular groups can help explain why certain choices of language and formats are more prevalently used in communication than others. Exploring how practitioners perceive the role youth can play in science communication becomes important if one is to understand why different science engagement materials and activities are made available for them.

By exploring practitioners' experiences of applying science communication in practice, specifically in youth-focused contexts, I hope to make a contribution to deepening existing concepts. The findings of this thesis can help practitioners and young people describe and relate their youth-focused science communication experiences to theoretical underpinnings of science communication. It can lend an insight into what understandings of youth-focused science communication guides its practice, give implications about practitioners' relations to both youth and different communication processes, and help practitioners contemplate over likely outcomes of communication initiatives of various kinds.

1.2 Aim and Research Questions

The aim of this thesis is to understand science communication practitioners' perceptions of how to communicate with youth about the Baltic Sea's environmental challenges. I seek to do this by researching two things: practitioners' perceptions of communication, and their perceptions of youth. To address the aim, the following research question is posed:

RQ: *How do science communication practitioners perceive the role youth can play in science communication?*

This thesis applies phenomenological inquiry to uncover meaning in the lived experiences of practitioners of Baltic Sea-related environmental communication who provide science communication materials or engagement activities for youth. My focus is on practitioners' "lived through" experiences of working with youth. This perspective helps to gain a deeper reflection into practitioners' underlying motivations for how they communicate about the Baltic Sea's environmental challenges for youth and helps articulate practitioners' perceptions of youth. The method of inquiry is interpretative phenomenological analysis on the data elicited through narrative interviews with five practitioners of environmental communication based in the Baltic Sea Region.

2. Literature Review

2.1 Science Communication

Science communication is a contested concept that often means different things to different individuals. Some may attribute the term to a room for scientists to share their research with laypeople; to others, it may be a synonym for public awareness and understanding of science, or even science literacy (Burns et al., 2003). Perceptions of the goals of science communication may vary just as well; Burns et al. (2003) for instance states it should produce awareness, enjoyment, interest, opinions, or understanding of science, by using appropriate skills, activities, media, and dialogue. Trench and Bucchi (2010) reflect over the themes of trust, the role of non-experts in knowledge production, and the process of knowledge transformation when discussing science communication.

Because approaches to science communication can considerably vary - from simply "translating" scientific information for laypeople, to co-creating scientific knowledge with the public – research has given rise to theoretical models to represent how science can be communicated (Brossard and Lewenstein, 2009; Secko et al., 2013; Irwin et al., 2018; Metcalfe, 2019). These models provide a theoretical base for how science has been, could be, should be, and is, communicated historically and currently (Secko et al., 2013; Metcalfe, 2019).

Theory differentiates between "traditional" one-way forms of communication, and "non-traditional" two-way and multidirectional forms of communication (Bucchi and Trench, 2008; Brossard Lewenstein, 2009; Secko et al., 2013; Metcalfe, 2019). Models within the former category focus on information delivery, while models within the latter focus on various forms of public engagement (Brossard and Lewenstein, 2009; Secko et al., 2013; Metcalfe, 2019). This distinction is consistent across numerous academic studies, regardless of how many models are proposed within these two forms of communication. For example, Brossard and Lewenstein (2009) established two models about information delivery (deficit model, contextual model) and two models about public engagement (lay expertise model, public engagement model). Secko et al. (2013) similarly proposed two information delivery-focused models (science literacy model, contextual model) and another two models focused on public engagement (lay expertise model, public participation model). The nuanced differences in how the models are named imply nuanced differences in their focus, but they are overall similar. Metcalfe's (2019) framework sorted these nuances into three models that Bucchi and Trench (2008) described as the dominant versions in science communication: deficit, dialogue, and participatory model. These are described in detail in Section 3.1.

The science communication models' prevalence and applications in practice have been a topic of inquiry for several researchers. In an academic context in the United States, Brossard and Lewenstein (2009) conducted a study that explored whether the science communication models that were prominent in public communication literature at the time captured the reality of local practice, or whether the models needed to be refined. The researchers selected genomics projects that had a public outreach component for analysis. Their findings indicated that theories alone do not capture reality's complexity. The outreach projects they studied had characteristics that made them fit into several of the theoretical models; there was a tendency within the projects to borrow parts of the different science communication models, without fully leaning into any one model. Even projects that clearly fit into a specific model overlapped with a secondary model, or more. For example, projects that primarily favoured a public engagement approach still used an information delivery approach as a backbone. In addition to these findings, the conclusion of the research emphasized the need for defining the target group for one's science communication efforts. This is because not all groups of the public may want to be involved in all types of science engagement activities. Various publics respond differently to various forms of communication, meaning some models may suit the needs of certain social groups more than others. Therefore, science communication models should be applied pragmatically according to the needs and contexts of different publics.

In an Australian setting, a similar study by Metcalfe (2019) explored to what extent the different theoretical models of science communication aligned with several science engagement activities in practice. The researcher analysed a national audit of largely diverse science engagement activities spanning through one year, from universities, research centres, science centres, museums, zoos, to community groups, NGOs and consultancies. Findings from this broad Australian context reflected Brossard and Lewenstein's (2009) results from the United States. Most activities featured information delivery approaches in combination with public engagement approaches. Additionally, respondents in her study similarly highlighted that defining the target groups for one's science communication efforts will have implications towards what type of science engagement activity is to be carried out.

The studies above insinuate two things that inform this thesis. Firstly, that theoretical models may coexist in practice. They do not need to be distinct and mutually exclusive, and practitioners may combine elements from different models, thus simultaneously offering one-way and two-way communication. Second, that science communication can benefit from a clear understanding of which social groups are participating in a given communication situation. Doing so can guide practitioners to select models that may result in accessible and relevant science communication materials and engagement activities.

2.2 Perceptions about Communication and Youth

If this thesis is to explore how communication practitioners in the Baltic Sea Region perceive the role youth can play in science communication, then it is important to examine how previous research theorized about two things: how youth has been perceived, and how practitioners' perceptions of a social group - such as youth – can affect their approaches to communicate with a specific social group.

Jefferson et al. (2015) describes perceptions to be an umbrella term that encompasses social values, attitudes, behaviours, knowledge, and interest. Brown and Scholl (2014) claimed that practitioners' perceptions of the social groups they are communicating with has implications for how they transform scientific information for a given group. These perceptions, besides possibly rooting from preconceptions, often emerge from experiences of engaging with certain social groups. According to Pringle et al. (2011), unless we understand meanings that people form through experiences, we cannot alter the way in which things are being done. Although it is not the purpose of this thesis to propose behaviour changes, gaining insight into what meaning-making processes take place during communicator–youth interactions can help explain why certain models of communication are more frequently used in youth-focused environmental communication than others.

Brown and Scholl (2014) and Pinto et al. (2017) aimed to explore what interests and values science communicators attributed to the public, and how these perceptions may have guided their selection, production and content of science communication materials and engagement activities. They found that practitioners have indeed made distinct assumptions about their target groups which most often led them to cater to these assumptions in their approaches to science communication. As such, the topic selection for communication and in what formats these topics were made available to the public, were governed by what perceptions practitioners had about their target groups, regardless of whether they targeted a wide group of people or niche groups. Additionally, both Brown and Scholl (2014) and another study by Dudo and Besley (2016) found various personal values and motivations of science communicators, such as scientific accuracy, fixing misconceptions, inspiring interest, sparking excitement or a need to care about hot topics. Brown and Scholl (2014) found that these values and motivations combined with the practitioners' perceptions of the public's interests and values to determine what kinds of science communication materials and engagement activities were made available to them.

Against this background, it is then useful to examine what previous research has found about how youth has been perceived in environmental communication, in Western settings. Ojala and Lakew (2017) synthetised a number of perceptions from other researchers, and their list is as follows. Firstly, young people have been perceived to be the future – not only as members of the public, but as future leaders, researchers, policymakers, and other occupational roles that have an influence on the future from an environmental perspective. Young people are also perceived to be subjected to negative future environmental outcomes. Research indicates that youth will likely deal with the burdens of climate change to a greater extent than other generations. In light of this, they are also perceived to be more prone to negative psychological consequences of the climate crisis. Their inclusion in environmental matters is therefore considered to be the ethical thing to do. Several researchers believe that due to their age, young people's identities, worldviews, and values are not yet internalized to the same extent as adults, and they are therefore perceived to be more open-minded in their approaches to respond to environmental issues. They are also considered a unique social group based on their accessibility – they can be reached with information through their educational system and be subjected to environmental communication easier compared with adults.

Overall, previous research has indicated what types of perceptions of youth exist, and implied that practitioners' personal motivations and perceptions of publics have affected their approaches to communicate towards given social groups. These studies inform this thesis as I set out to explore whether similar perceptions of youth are present amongst practitioners in the Baltic Sea Region and whether these perceptions contribute to what roles the practitioners attribute to youth in science communication.

2.3 Geographical Scope for Study: The Baltic Sea

The Baltic Sea is an example of a context where scientific developments have implications for individuals and society at large. The Baltic Sea Region (BSR) encompasses eight EU member states and is home to 85 million people living at the shores of the sea (European Commission, 2025). It is therefore a region with an international population of both youth and science communicators who may engage in various forms of environmental communication.

The Baltic Sea is facing numerous environmental challenges. It is one of the world's most polluted inland seas and it is exposed to multiple sources of pollution from various activities the Baltic Sea Region (Swedish Society for Nature Conservation, 2021). Among the main issues threatening the health of the sea's ecosystems are eutrophication, hazardous substances, and sea-based activities, as detailed by HELCOM (2021). Eutrophication leads to high concentration of nutrients partially from agricultural run-off, algal blooms, and unsustainable oxygen levels. Hazardous substances and litter pose harm to marine life, deteriorate the quality of seafood, and pose risk to human and marine life from

radioactivity. Sea-based activities lead to disturbances to biodiversity, disturbed seabed habitats, decreased viability of species' populations, and underwater noise.

In this context, the level of youth access, inclusion and participation is relevant to assess. Cooperation in the Baltic Sea Region which addresses the above environmental challenges has an impact on young people, directly and indirectly alike (CBSS, 2022). As such, giving opportunities to young people to boost their climate literacy, build competencies, gain real-world experiences in the contexts of the cross-cutting challenges of the region, feel empowered, and gain guidance towards potential career paths as the next generation of decision-makers, is considered highly important and needs to be laid today (CBSS, 2022).

3. Theoretical Framework

3.1 Science Communication Models

In this thesis, I distinguish between traditional and non-traditional science communication methods, with the intent that this distinction provides a suitable analytical framework for identifying practitioners' different communication practices for youth. Three models are used: deficit, dialogue, and participation.

3.1.1 One-Way, Deficit Model

A historically significant model within one-way modes of communication is what is referred to as the "deficit model" (Brossard and Lewenstein, 2009; Dudo and Besley, 2016; Metcalfe, 2019) or "science literacy model" (Secko et al., 2013). This model operates on the assumption that there is a gap, a deficit, in the public's knowledge, which scientists or scientific institutions need to fill, and once done so, the public's scientific literacy will be raised (Brossard and Lewenstein, 2009; Secko et al., 2013; Dudo and Besley, 2016; Metcalfe, 2019). Under this assumption, the public is imagined as an empty vessel needing to be educated with science (Brossard and Lewenstein, 2009; Metcalfe, 2019).

Beyond the model's main goal of filling people's perceived gaps in scientific knowledge, scholars identified several objectives for this style of communication. It should aim to "translate" scientific information (Secko et al., 2013). This is to be done through linear transmission of information, where experts are the senders and audiences are the receivers of knowledge (Brossard and Lewenstein, 2009; Secko et al., 2013). The "translated" information will increase people's science literacy, and as a result, science will be popularised, scientific careers will be promoted, mistrust and misconceptions about science will be reduced, public support and funding will be increased, behaviours and attitudes will be changed (Dudo and Besley, 2016; Metcalfe, 2019). Education about science is to be done outside of the formal education system (Metcalfe, 2019). The role of information is key to this conceptualisation of science communication - with increased communication of scientific information comes increased understanding, with which comes improved decision-making in people's daily lives (Secko et al., 2013; Dudo and Besley, 2016; Metcalfe, 2019). Furthermore, the role of scientific experts is key - they provide the knowledge to be "translated" and delivered through a top-down linear transmission structure (Secko et al., 2013; Dudo and Besley, 2016).

In this model, the communicator's task is to address the public's deficits of scientific knowledge by educating them, filling them with knowledge through education/information dissemination. The problem for the communicator to solve is that the level of understanding publics have about science is low.

3.1.2 Two-Way, Dialogue Model

A different approach to science communication is the "dialogue model". This model operates on the assumption that there is a gap between science and society, which scientists or scientific institutions can bridge by eliciting public input on scientific issues, and once done so, local expertise can complement scientific knowledge for the benefit of both parties (Bucchi and Trench, 2008). Under this assumption, the public is imagined as a vessel filled with local knowledge that can guide how scientific knowledge can be improved in specific contexts (Brossard and Lewenstein, 2009; Metcalfe, 2019). It differs from the "deficit model" in the way that it recognizes that people hold valuable perspectives, experiences, and forms of knowledge that should be integrated into scientific conversations. Rather than passively absorbing information without any preexisting influences, people can provide knowledge of their own through mutual understanding, learning, and respect (Bucci and Trench, 2008; Brossard and Lewenstein, 2009). Yet while the dialogue model values mutual learning and recognizes that the public may have useful insights, it is similar to the deficit model in that it positions scientists as the main knowledge providers and the public as stakeholders whose knowledge informs scientific endeavours (Brossard and Lewenstein, 2009; Secko et al., 2013).

Beyond the model's main goal of incorporating laypeople's knowledge, scholars identified several objectives for this style of communication. It should be iterative, through consultations, negotiations, and debates with the public (Bucchi and Trench, 2008; Metcalfe, 2019). Through such dialogues, experts shall seek to discover public opinion about contested science and use it to improve science communication practices (Metcalfe, 2019). Furthermore, gaining and applying the public's contextual knowledge to complement scientific endeavours signals openness, accessibility, and accountability towards the public, which can potentially reduce mistrust in science (Metcalfe, 2019). At its essence, the dialogue model stands for two-way production of information that highlights the interactive nature of the scientific process, where other expertise than scientific is accepted (Bucchi and Trench, 2008; Brossard and Lewenstein, 2009).

In this model, the communicator's task is to adapt science communication to the public's needs, by facilitating two-way exchange of information between experts and the public, fostering mutual learning, and integrating diverse forms of knowledge into scientific knowledge production. The problem for the communicator to solve is that conceptualizing the public as passive recipients of information dismisses their potentially useful experiences towards scientific knowledge production.

3.1.3 Multidirectional, Participatory Model

Another approach to science communication is the "participatory model". This model operates on the assumption that scientists and the public can co-create knowledge through equitable collaboration, and once done so, can jointly generate ideas and solutions that incorporate diverse ideas, values and interests (Bucchi and Trench, 2008; Brossard and Lewenstein, 2009; Secko et al., 2013; Metcalfe, 2019). Under this assumption, the public is imagined as equals to scientists who can be actively engaged in science communication processes in a multidirectional way (Bucchi and Trench, 2008). Besides its equitable rather than top-down focus, it differs from the "dialogue model" in the way that it focuses on interactions between all participants in a situation, rather than just on interactions between scientists and the public (Metcalfe, 2019).

Beyond the model's main goal of knowledge co-creation on equal grounds, scholars identified several objectives for this style of communication. It should democratise scientific processes through, for example, mechanism for engaging the public in policymaking and integrate their views (Brossard and Lewenstein, 2009; Metcalfe, 2019). Engagement may be fostered through various activities intended to enhance public participation in science (Brossard and Lewenstein, 2009). When multiple forms of knowledge are present and integrated, collective learning should make it possible to jointly solve specific problems (Metcalfe, 2019). Scientific processes may be made more interactive and encourage public debate about scientific issues, thereby focusing less on filling gaps in knowledge and more on actively engaging the public in science communication processes to improve communication (Secko et al., 2013).

In this model, the communicator's task is to facilitate knowledge co-creation by creating opportunities for scientific experts and the public to jointly engage, question, and interpret information. The problem for the communicator to solve is that not all voices are included in traditional forms of science communication.

Communication model	Conceptualisation of the public	Role of communicator	Aims
Deficit (one-way)	Empty vessels to be filled with knowledge	Transfer knowledge	"Translate", inform, increase science literacy, educate outside of education system
Dialogue (two-way)	Holders of contextual knowledge	Consult, negotiate	Discover opinions, complement science, public-expert dialogue
Participatory (multidirectional)	Equals to experts	Foster collaboration	Engage public, interactive, peer- to-peer and also public-expert dialogue

Table 1. Science communication models (source: adapted from Metcalfe, 2019)

3.2 Interpretative Phenomenological Analysis

With roots in phenomenology, interpretative phenomenological analysis (IPA) is a qualitative research approach within social sciences that is aimed at examining the personal lived experiences of a small number of individuals (Smith, 2017; Tuffour, 2017). The core of the IPA approach is exploring how individuals make sense of their experiences and what meanings their experiences hold for them (Smith, 2009). Researchers accomplish this by integrating three theoretical elements within the IPA approach: phenomenology, hermeneutics, and idiography (Smith, 2017). I describe these below.

Phenomenological environmental psychology focuses on the taken-for-granted aspects of daily life in which unquestioned acceptance of existing structures and patterns enable individuals to carry out everyday activities seamlessly, without consciously reflecting on each occurrence, action, or behaviour (Seamon, 1982). Phenomenologists make the taken-for-granted elements the subject of academic study by exploring their underlying experiential and behavioural structures (Seamon, 1982). Ultimately, a phenomenological study of any topic is an effort to gain a clarified understanding of ourselves and the world we live in (Seamon, 1982).

Phenomenology uncovers meanings (Pringle et al., 2011). It is a descriptive and critical science, where the emphasis is on the "what" and the "how", rather than the "why" (Seamon, 1982). Phenomenology is concerned with providing detailed descriptions of specific phenomena and uncovering general experiential themes and patterns that emerge from the phenomena under study (Seamon, 1982; Cresswell and Cresswell, 2018). Patterns and themes emerge by synthesizing several individuals' experiences of the same phenomenon (Cresswell and Cresswell, 2018).

Idiography analyses the phenomenon under investigation (Tufflour, 2017). The idiographic feature of the IPA approach stresses the need to balance both the converging and diverging patterns present across cases within the research sample (Pringle et al., 2011; Smith, 2011). Focusing solely on commonalities is not what an IPA seeks to do. Each individual's case is valued in its own merits and ought to be analysed both by itself as well as within the larger sample to present both the shared patterns and how these shared patterns manifest themselves in each of the individual cases (Smith, 2011; Tufflour, 2017).

Hermeneutics interprets meanings (Pringle et al., 2011). IPA analysis is described to be "double hermeneutic"; analysis is done through a twofold sensemaking process as the researcher is tasked to make sense of the individuals trying to make sense of their experiences (Pringle et al., 2011; Smith, 2011; Tuffour, 2017). The researcher's task is therefore both to examine how individuals make sense of their experiences, and to give detailed interpretation of how the experiences can be understood (Tuffour, 2017). Hermeneutic phenomenology has both descriptive and interpretive elements, which makes intersubjective understanding possible (Pringle et al., 2011). IPA is different from a discourse, thematic, or critical analysis in that it interprets individuals' beliefs and accepts their stories, therefore, the implications of IPA research are rooted in the words of the participants (Pringle et al., 2011). Patterns are illustrated by anchoring findings in quotes from the individuals under study (Pringle et al., 2011).

In summary, the IPA approach seeks to examine lived experiences and does so through three theoretical elements: phenomenology, hermeneutics and idiography. These elements help researchers uncover meaning in people's narratives, analyse their descriptions to identify themes that participants experience similarly or differently, and interprets the meaning of the themes to understand how people make sense of their experiences.

4. Methodology

4.1 Data Collection and Ethics

I conducted this research with the intention to bring forth how practitioners perceive their communication practices and the role of youth in science communication. To study this, I proposed two analytical research questions:

- Analytical RQ1: *What is practitioners' perception of communication, with regards to one-way, two-way, and multidirectional communication?*
- Analytical RQ2: *What is science communication practitioners' perception of youth?*

Primary data in the form of stories and recollections of experiences was collected from practitioners using a narrative approach. The most common type of data collection for IPA is in-depth interview methodology (Smith, 2011). Accordingly, I interviewed practitioners to gather information on how they have personally experienced making science communication materials and/or engagement activities for youth.

The interviews were open-ended, combining specific questions with open conversations. This openness, as opposed to a more rigid set of questions, was key for gaining reflective, honest, and expansive accounts of practitioners' experiences (Pringle et al., 2011). As per IPA interviewing, I approached each interview with just a few guiding questions to be used flexibly throughout the interviews as different topics of conversation arose (Smith, 2011). This design was important as I was interested in collecting data on how the practitioners conceptualise the science engagement activities they offer for youth, such as their own understanding of the purpose, usefulness, or drawbacks of their activities. The narrative interview approach facilitated me to ask a few generally open-ended questions which intended to give me an account of the interviewees' views and opinions (Cresswell and Cresswell, 2018).

As qualitative research deals with the purposeful selection of those participants who would best help answer my research question, my interviewees were selected based on a pre-established selection criteria that I set up ahead of my research (Cresswell and Cresswell, 2018). The selection criteria for the interviewees were practitioners from diverse BSR countries, institutions, working areas, genders, and ages. They were engaged in communication work either on the topic of a) Baltic Sea environmental challenges, b) specifically with science communication, c) specifically with youth-related science engagement activities, or d) all of the above. "Youth" in the context of this thesis included anyone that a practitioner might interact with at a Baltic Sea-related public talk, event, online, a youth forum or youth group, an educational summer camp, or similar. The IPA approach deals with a deeply thorough analysis of interviewees' personal accounts, therefore, studies are encouraged to use relatively small sample sizes (Smith, 2017). I interviewed five practitioners. This sample ended up consisting of practitioners engaged in diverse forms of youth-focused communication, as seen in Table 2.

The interviews were conducted over online videocalls based on the practitioners' availability. They took place in a password-protected Zoom room provided through the university. The conceptualization of the BSR was an important motivation for online interviews; as the selection criteria strived to include practitioners from multiple BSR countries, interviewing via videocalls was more time-efficient, cost-effective and released less carbon emissions than substantial travel around the BSR for in-person interviewing.

The interviews were recorded via Zoom's recording feature. The audio files were anonymised, transcribed, and coded for analysis. The participants were made aware that the recorded interviews and transcripts were to be stored securely on cloud storage licensed by the university and be deleted after the thesis has been completed. All participants were made aware that quotes from the conversations may be used for the purpose of this thesis as per IPA methodology, to which they have consented as well. Prior to their agreement to be interviewed, I supplied participants with a brief description of my project, as well as a consent form issued by the university, which they were asked to sign. Thereby, they were aware that themselves, their place of work, and the names of their projects were anonymised to prevent the possibility to trace data back to any one individual. Due to the relatively small area of the BSR, I made the additional decision to omit what countries practitioners work in, and what types of institutions, companies etc. they work for.

Participant	Primary youth-focused engagement
Practitioner 1	Local youth engagement, youth forum
Practitioner 2	Youth group
Practitioner 3	Youth group, communication
Practitioner 4	Science communication
Practitioner 5	Youth organisation, youth-focused projects

Table 2. Overview of participants (source: author)

4.2 Data Analysis

Following the IPA approach to data analysis, the findings of this thesis are rooted in the words of the practitioners I interviewed. Therefore, the transcription process of the interviews was followed by my extensive reading of practitioners' narratives in order to understand their first-person perspectives in their own terms. (Pringle et al., 2011; Høffding and Martiny, 2016). I paid attention to their words, use of metaphors, and chosen phrases they used as they made sense of their experiences. The small sample size made it possible for me to deeply analyse each case independently, as well as together, in order to explore experiential themes and patterns of various phenomena that the practitioners narrated similarly or differently.

I made a distinction between general experiential themes – phenomena which all practitioners talked about, and personal experiential themes – how each phenomenon was narrated similarly or differently by each practitioner. I colourcoded the lines in the transcripts which corresponded to general experiential themes across all interviews. Nine themes emerged from my initial analysis, which I later condensed to six: three themes regarding perceptions of communication, and three themes regarding perceptions of youth. I then selected extracts from the transcribed interviews which are representative of both the convergences and divergences between practitioners' perceptions of communication and youth, and synthetised them (Smith, 2011).

It is important to note that during the interviews, the practitioners engaged in the active interpretation of their personal experiences, and during the analysis, I engaged in the interpretation of how they interpreted their experiences. This is due to the double-hermeneutic nature of the IPA. Høffding and Martiny (2016) describes a knowledge generation process that comes from phenomenological interviewing to consist of two linked tiers. The first tier is the interview itself, where the researcher gains descriptions of first-hand knowledge of the interviewees' lived experiences. The second tier is the researcher's analysis of their descriptions, where the researcher gives structural dimensions to the interviewees' experiences. The double-hermeneutic IPA analysis made it possible for me to pursue both the first-person experiences and their structural dimensions.

4.3 Positionality

Cresswell and Cresswell (2018) emphasises that those who conduct qualitative research ought to reflect about how their role and background may inform how they collect and interpret data, what themes they derive from their analysis, and what meanings they assign to them.

My identity as an Environmental Communication and Management student may have influenced how I was perceived by some of my interviewees. Only some of the practitioners in my sample self-identified as communicators. As I was specifically after their perceptions of communication, I was concerned that my academic roots could have me appear as a "communication expert" who is here to derive assumptions about the work of others who may not necessarily have my formal education. I aimed to delimit any senses of power imbalances or perceived knowledge gaps between my academic identity and theirs by consciously displaying respect towards my interviewees and reminding them that there are no right or wrong answers in what they can share with me about their experiences.

I furthermore belong to the "youth" category that I am inquiring perceptions about. This could have further influenced how my interviewees talked about youth, as they were asked to talk about a group of interest to someone who was within that group.

5. Findings

From the five interviews I conducted, I identified six themes in total. Three of those themes encompass practitioners' perceptions of communication to address my Analytical RQ1, *What is practitioners' perception of communication, with regards to one-way, two-way, and multidirectional communication*? I named these themes "One-way communication", "Two-way communication", and "Multidirectional communication". These are detailed in Section 5.1. The next three themes encompass practitioners' perceptions of youth to address my Analytical RQ2, *What is science communication practitioners' perception of youth*? I named these themes "The future", "Interest and knowledge", and "A different approach". These are detailed in Section 5.2.

5.1 Practitioners' Perceptions about Communication

5.1.1 One-Way Communication

The practitioners described a number of their approaches to communication as "one-way". These approaches were focused on raising awareness, informing youth, and educating them outside of the formal education system. Working with schools, social media, and games are amongst the ways they said to be seeking to provide knowledge. These approaches were perceived to be functional as one-way forms of communication because they achieved their intended purposes of transmitting information even if no two-way interaction emerged in response to their content.

Practitioner 1 stated that increasing young people's climate literacy needs to be the starting point for any future action. To elaborate, Practitioner 1 reflected over some personally observed local impacts of global processes' consequences, like rising sea levels along the coasts of the Baltic Sea, and shared that it is *"important for [youth] to understand how everything is linked"*. Giving youth knowledge, awareness, and inspiration to engage with environmental topics is similarly mentioned by **Practitioner 2**, **3** and **4**. **Practitioner 4** suggested to me that *"youth, they don't necessarily have any science"* and **Practitioner 3** reasoned that without giving them knowledge, *"we cannot expect them to contribute and be like, okay, deliver knowledge on this policy paper"*.

When talking about deficit-style knowledge transmission, the practitioners often brought the topic of school into the conversation, having associated linear knowledge transmission with institutionalised education. For some, the association was positive. Several of them recognized school to be a prospective player in raising environmental literacy since schools have direct access to youth. **Practitioner 1** and **5** both leveraged the possibility to provide students and

teachers with educatory materials outside the school curriculum. Practitioner 1 regarded this collaboration as "mutually beneficial". Practitioner 5 noted that while "you're still in school, you can still learn about it in a safe environment" whereas society outside of school may already expect youth to contribute to environmental discussions whether they have been prepared for it or not. At the same time, both of these practitioners expressed that the complete extent of their involvement with schools only partially resembled deficit-style communication. **Practitioner 1** cited "it is enormously important that they are not only sitting in the rooms and just listening what teacher is saying" and Practitioner 5 jokingly implied head-on to "never ever do one-way [communication]". Completely deficit-style education was in fact further critiqued by Practitioner 2, who agreed that students should not merely be there "just to sit and listen". Even Practitioner 4 acknowledged that educatory materials such as "general public briefs are easy to understand, but I think briefs aren't the way to go if you want to target youth. It can't be like "Hey, here's a brief for you, it's pretty much like vour schoolbooks"".

Next, some of the practitioners considered social media to be a suitable tool for information transmission as *"there's already a lot of younger people there"*. **Practitioner 3** used online platforms for information delivery, and **Practitioner 4** elaborated about creating youth-focused social media content with the intention to change young people's attitudes towards the Baltic Sea and promote interest about it. Curiously, all practitioners that use social media platforms have expressed their desire to shift their online practices to a more two-way, dialogue-style communication, however their content either struggled to spread in the algorithm, or they struggled to establish community engagement, thus ending up resembling deficit-style communication nevertheless:

"I will say there is a one-way communication. We have not much community engagement. (...) But it would be wonderful having that. And so in this regard, we deliver a lot of information, but we do not really engage and sustain interaction." (Practitioner 3)

Like this quote implies, the practitioners were motivated to elevate their youthfocused social media content to resemble two-way community engagement over one-way information delivery. However, online communication for young people was a lower priority within the practitioners' organisations. They recalled that different priorities in budget allocation – funding projects first and online community management and promotions last, if there were funds left over – and a consequently unchanging, preexisting core following – consisting of scientists and policymakers rather than youth users –hindered the effectiveness of social media content. Being involved in creating an online game was another way **Practitioner 4** produced one-way communication materials for young people. The hope of **Practitioner 4** was that the game transfers information to its young players about the main environmental challenges of the Baltic Sea:

"Within the game, the idea was to build an understanding of the problems of the Baltic Sea, starting from the drivers. You're like tracking the problem to the driver and how to make it better and so on. It's supposed to be interesting, but also educational as well. So yeah, I guess it's about education about the issues." (Practitioner 4)

Yet while the practitioner expressed satisfaction about the project overall, it was noted that "*I think we would have needed to adjust it, we could have adjusted the information a bit more to suit youth*" because the educatory information in the game was driven by scientific thinking and not in the way youth are perceived to think about the same phenomena.

Overall, while all the practitioners have said to apply deficit-style communication in their work, they all outlined weaknesses and concerns about one-way information delivery as a communication approach towards youth and expressed desire to transform their youth-focused practices in other ways.

5.1.2 Two-Way Communication

While the majority of science engagement materials and activities embedded elements from the deficit model, involving youth in scientific dialogues and generating communication materials and activities with their inputs was just as prevalent in the practitioners' work. The practitioners recalled different ways of connecting with youth to incorporate their perspectives and needs, and demonstrated their belief in the effects of involving them:

"I think people really feel it. They feel that their voice is heard and they're listened to, and that that matters because, you know they cannot vote yet, they don't feel how much weight they have and they can have. So this, I think, also allows them to understand that." (Practitioner 5)

Practitioner 1 specifically included coastal schools in dialogue, given that they are situated near enough to the Baltic Sea to have the opportunity to personally experience the environmental challenges in question. **Practitioner 2** similarly sought out the chance to work with students from another coastal area who "*know a lot about the biodiversity of the Baltic Sea*" and facilitated two-way, mutual exchange of information between them and scientists who gave them the "*unique opportunity to touch all the species that they were learning about at their university*". This interdisciplinary approach aimed to make connections between youth with contextual knowledge and experts with scientific knowledge. **Practitioner 2** reflected over the creation of such spaces for young people to

engage in dialogue, "maybe in some years the same young people that were asking questions would join these big organizations or found their organization".

Practitioner 2, **3**, **4** and **5** believed that in some instances, successful environmental communication aimed at young people could depend entirely on seeking out their input. For example, **Practitioner 2** said to regularly consult a youth group for young people's input:

"Normally we ask within the youth group what are the activities they're expecting, or if we're doing [an event] we ask the country representative who has already experienced in several spheres "What would you like to share?"" (Practitioner 2)

This experience exemplifies a context where young people's opinions are allowed to influence communication processes to benefit their learning. **Practitioner 4** spoke of a similar experience of engaging in direct dialogue with youth about their preferences for what educational content they saw the benefits of:

"Well, I was actually asking youth, what would they like to see? So I was talking with them on this event and we organised a workshop for all the stakeholder groups. So we were asking like, "What are you interested in? What do you want to see? What would be the concepts? Where would you find this?" They were like "TikTok videos. We need to have videos" and that's it. And then one of them was like, "well, there's these "Fun Fact" videos that are really interesting" so that's how it came up, and I really enjoy videos such as those ones myself as well, so it's... it was really like sort of given to us" (Practitioner 4)

These examples demonstrate contexts in which practitioners are prepared to consult the youth about their concerns and needs with regards to environmental communication. In fact, in the case of **Practitioner 5**, the creation, implementation, and funding of projects may depend on people's need for it:

"We do many research, either in person or for some questionnaires, to see what people really want, what they really care about, what would be relevant, and only then create the project" (Practitioner 5)

Overall, engaging in dialogue with youth has been key in practitioners' work in several instances. Dialogues led to new connections and new ideas for communication content, activities, and projects. The practitioners shared ways in which they believed to have benefitted from their two-way collaboration with youth, and perceived that the youth gained benefits from getting involved as well.

5.1.3 Multidirectional Communication

The practitioners spoke fondly of any multidirectional approaches they have taken to communication. In several instances, they said to have gone beyond simply discovering youth's opinions with the intention of applying them to complement their own communication practices. Rather, their aim was to co-create knowledge on equal grounds. **Practitioner 4** emphasized that a participatory approach to science communication work is about *"recognizing [youth] as fellow human beings, being equal"*. **Practitioner 5** took the thought further to exemplify the negative impact of thinking otherwise by saying *"if you are talking from above, it's already not equal, and they will not open up that much, I think it's very important to know how to make yourselves not smaller, but equal to each other"*. Practitioners believed to have given youth an equal voice through educational and democratic forms of science engagement activities, such as events, excursions, workshops and competitive games. **Practitioner 2** shared a retelling of an experience at a youth event where both youth-expert and youth-youth dialogues took place to foster knowledge co-creation:

"This event is a kind of window that is opened from that concentrated knowledge base, and is interpreted, structured, and bringing together people from different countries who think about it, discuss it, and then it brings like a, I don't know, for me it's like a communication platform, and it's like... how to say... level of real action. You can talk a lot about the problems of the Baltic Sea but bringing young people from different countries to some spot in a new country, making investigations, discussions, debates, it's something small but really really important that is changing the general atmosphere for the better" (Practitioner 2)

This quote demonstrates the presence of interdisciplinary knowledge exchange and reiteration of "concentrated" expert knowledge with the intent to facilitate collective learning, accommodating multiple forms of knowledge, jointly address specific problems, and integrate youth views.

Competitive games were deemed by **Practitioner 1** to contribute towards collective learning, as they make the scientific process more interactive. Through coastal litter collection and identification games, competition to relocate the most garbage to a collection point, and getting involved in coast restoration efforts, young people learn why certain actions are necessary by *"seeing the reason and seeing the effect through the result [of the game]"*. **Practitioner 1** stated it is *"important that they are doing something real"* because it supports their perception that science experts and members of the public alike can evoke global benefits through local actions:

"The most important result of all these projects and all these involvements that they are changing their attitude, and they are changing their thinking in favour of the future and in favour of sustainable development by doing small concrete things." (Practitioner 1)

Creative and experimental approaches were at the forefront of **Practitioner 2**'s approach, who felt strongly about giving youth the space to "propose the topic, say what part you are ready to do in it and we will organise it together because everything is possible (...) it will be richer and it will be much more interesting for youth themselves.". Among the outcomes of **Practitioner 2**'s work were a youth-led policy workshop and a restoration workshop. **Practitioner 3** regarded the leadership of young voices in youth group meetings in a similar light, saying "I think it's a two-way communication there, we cannot run it without them. It's not just that we deliver something; if no one is in the call it doesn't work, we need something back".

Practitioner 3 further reflected over the value of youth-driven knowledge exchange in science communication, stating that experts have much to learn from young people's expertise:

"And I will say that this is also one of the biggest value for [our organization] and also why we want that to have more youth engage. Because we have knowledge, but we have so much to learn from new ways of approaching environmental issues. And maybe even more when it comes to communication, new tools, how do we communicate, which platform?" (Practitioner 3)

The above quote speaks of **Practitioner 3**'s attributed value to collective learning for the betterment of an organization in need of new approaches. This appreciation for multidirectional knowledge exchange was likewise present in **Practitioner 1**'s organization, which organized annual youth forums and described them to be a "very important tool to gather altogether and discuss all these issues". The organization provided everything from facilities to experts and the opportunity for schools to meet and exchange experiences. Uniting schools was shown to be important to Practitioner 1, who for one year has not managed to organize the forum and worried that "when you missed two years, it is a little bit too long period when you have not united schools together".

Giving both skills and lasting connections between young people was mentioned as an important outcome by several practitioners. **Practitioner 2** aimed to strengthen young people's skills of involving their communities in sea protection work and hoped to start a snowball effect of knowledge sharing, a "continuous process" that would result in more and more young people getting involved and "get attached with their heart to this environmental work and have some secret dream to become environmentalist that would come true". **Practitioner 3** similarly perceived to have empowered youth to share the knowledge, educate others or continue learning more, "the idea is to open the door and then that they continue just doing it" with or without expert guidance. **Practitioner 5** believed that multidirectional exchange of knowledge with youth would result in skills and their deeper involvement in environmental topics and "activate them as citizens", yet at the same time acknowledged that expecting so much was naïve and it is more realistic to expect them to get interested and leave them with some food for thought that may inspire them to research further:

"Of course I would like to people to be like, "OK, we will fight for climate now" after our events, but that's not usually the case." (Practitioner 5)

Overall, practitioners seemed to have perceived that youth gains even greater benefits from multidirectional communication than two-way. In addition, they have described a number of benefits their own operations can gain by fostering collaboration on equal grounds. They attributed value to young people's presence in their events and organizations who could reiterate "concentrated" expert knowledge or provide new approaches to science communication.

5.2 Practitioners' Perceptions about Youth

5.2.1 The Future

Whether via one-way, two-way, or multidirectional approaches, science communication towards youth was regarded as a valuable act by each practitioner. Each practitioner's motivation behind it revolved around youth being the future generation.

Practitioner 1 straightforwardly expressed that involving young people is *"simply absolutely necessary, because that is our future"*. **Practitioner 3** pronounced their value as vessels to carry on knowledge from the current generation of scientists and decision-makers as *"they will be the next generation and we can pass some knowledge so that it doesn't get lost from generation to generation"*. **Practitioner 2** perceived youth as *"the people who are shaping the world in the coming 10-15 years"* and **Practitioner 4** saw them as *"the future decision makers"*, both of them thereby relating young people's significance to the roles they will be expected to play when they are older. The importance of targeting youth with science communication materials now, in their current younger years, was emphasized by **Practitioner 5**:

"The phrase that everybody's saying, you know, building the future generation and stuff... In a way, yes... But on the other hand, I wanted to contradict. I mean, yeah, I see the very, very big value to work on many topics from a young age, but we also need to act now, and we cannot wait until they will grow up." (Practitioner 5)

This quote demonstrated a sense of urgency about young people's immediate involvement. A similar concern for their presence in environmental conversations was described by **Practitioner 3**:

"We start to be an old organisation, and we have a lot of expertise and really well-trained staff and colleagues. But we do not have very much the younger part engage, and this is what we're trying to do with the youth group." (Practitioner 3)

These practitioners demonstrated an almost anxious need for the young people of today to take over the mantle of caring for the Baltic Sea.

5.2.2 Interest and Knowledge

A common theme that emerged from the practitioners' recollections of working with youth is their expectation of young people to not be necessarily knowledgeable already and instead be curious.

Young people's age was a contributing factor to why their knowledge base was not expected to be high. **Practitioner 4** perceived that "their education can be still at very early steps, like 7th grade or something, of course, they don't necessarily pursue the same understanding of the world as adults might" and **Practitioner 3** noted that "we cannot expect from [youth] to be experts and have a lot of knowledge, but we expect them to reflect". The practitioners spoke highly of young people's interest and attached more value to that in their narratives than to the preexisting knowledge youth may have possessed prior to engaging in their science communication materials or engagement activities.

At the same time, **Practitioner 4** and **5** both spoke of youth's potential, with **Practitioner 4** saying they are *"really smart and they can understand way more than we as adults think they do"* and **Practitioner 5** noting *"these kids should be super smart if they will care what's happening"*.

Specifically in the case of **Practitioner 2**, young people's perceived curiosity appeared to be a driver of what science communication materials and activities were made available to them. **Practitioner 2** remarked that "when I'm asking young people what they would like to have, I am looking for... Not their lack of knowledge, but for their interest.", and that the practitioner was motivated to engage with those of the youth "who are just in love with the Baltic Sea protection activities".

5.2.3 A Different Approach

Some of the practitioners outlined traits that set youth aside from other groups they work with, while other practitioners did not necessarily consider youth to be distinct from the general public.

One distinct difference between working with youth or adults, according to **Practitioner 3**, was young people's availability and consequent reliability to get involved and stay involved.

"We work so much with expert staff that are actually paid in our organization. (...) We know who to reach because this person is employed and available 40 hours a week,

more or less. But when it comes to younger participants and the young people active in the youth group, it's a little bit less reliable, not that the people are not, but they have their studies besides, they do it on a volunteer basis. (...) So there is a huge difference in the way of approaching meetings, communication events." (Practitioner 3)

This quote demonstrates how practitioners recognize that youths have different commitments and compensation from full-time employees and that affects the planned formats for their involvement. Practitioner 3 continued by discussing that this creates a turnover in the youth group because people who may be active for two months may suddenly not be able to allocate time to stay engaged. Speaking of the same experience, **Practitioner 2** likened this phenomenon to a metaphoric shooting star, comparing youth to "a star that is appearing, brilliant, it's warm and it's light, and then it's going its way". However, youth's turnover directly impacted how these practitioners valued their contributions to a positive degree. Practitioner 3 expressed that "for this reason we need to see how valuable it is to work with them because we cannot take it for granted. They can just stop anytime (...) But when they decide to come, then even if it's for one week, one month or one year, we try to do our best". Practitioner 3 then explained that adult employees communicate with one another because of their work, but "I think for youth it might be the other way around, that it will be working because we communicate – we engage with people and then we can do project with them. It's a fully different approach".

Another trait of youth that three of the practitioners have said to affect how science communication is carried out is their attention span compared to adults.

"Sometimes I find it more difficult because the attention of a younger person is a little bit shorter and it needs to be very... attractive... for everything, engaging, and I think when having, I don't know, a conference with older persons, then they will go there, they will sit and they do not expect maybe anything else. But younger people, there is so much more engagement that is needed (...) But it's just a different way of working and communicating with them" (Practitioner 3)

This juxtaposition between adults and youth's need to be entertained was also mentioned by **Practitioner 4** and **5**, the latter having said that *"the younger they are, the shorter they can keep their attention and they wanna play more than listen"*.

Despite all of the above, **Practitioner 2** and **4** did not consider youth to be distinctly different. Practitioner 2 shared that "*it doesn't matter if it is a student of 21 years old who will act, and organize, and get involved, or it's my colleague of 35 years, she will also act, because she loves what she does. That is the main principle."* and **Practitioner 4** admitted there were "*so, so many stakeholder groups that I never actually thought of separately*".

6. Discussion

My findings gave an account of practitioners' perceptions of youth-focused communication and perceptions of youth themselves. I furthermore recounted convergences and divergences that emerged from practitioners' retelling of experiences. In my discussion, I will synthetise my findings with the literature in order to address my overarching research question: "how do science communication practitioners perceive the role youth can play in science communication?"

6.1 Deficit Model as a Springboard to Involve Youth

The findings of my thesis outline a number of science communication materials and engagement activities which apply various combinations of one-way, twoway and multidirectional communication. My results addressed practitioners' perceptions about these three different approaches to communication within the youth context. As previous research such as Brown and Scholl (2014) suggested, the practitioners I interviewed perceived that youth have their particular ways of responding to different communication approaches compared to other social groups. Their stories indicate that some science communication models may suit the need of youth - as they perceive them - more than others. Two-way, dialoguedriven engagement and multidirectional collaborative approaches were highly regarded by practitioners to be approaches that bear in mind young people's attention spans and their need to learn through stimulative means, such as competitions. In contrast, one-way information delivery as an approach was regarded poorly, as practitioners discussed its resemblance to institutional education and its inability to make scientific processes interactive, which are seen to disengage youth. The practitioners who applied one-way communication on social media or an online game aspired to move beyond it and shift these communication forms to evoke more interaction and excitement.

At the same time, all practitioners discussed the importance of information delivery. Youth need to have an understanding of the causes and effects of those processes which the more interactive approaches, such as litter picking competitions, seek to curb. Hence one-way information transmission, even when it was negatively associated with institutionalised educational materials, had a positively perceived function when it achieved its intended purpose of addressing deficits in young people's knowledge. In that sense, one-way communication was seen as a springboard for involving youth in the Baltic Sea-related topics.

In spite of many practitioners' feelings about one-way communication's deficiencies, they all have at least used elements of it to combine with other approaches, thereby demonstrating – even if unintentionally – what research such

as Brossard and Lewenstein's (2009) and Metcalfe's (2019) has also observed. The deficit, dialogue, and participatory models are not necessarily mutually exclusive in practice. For youth-focused science communication to be effective, communication materials and engagement activities can blend elements of deficit, dialogue, and participatory models to accommodate youth needs and experiences. While the perceived benefits of two-way and multidirectional communication were more pronounced in the practitioners' narratives, reaping those benefits was recognized by most to be unrealistic without increasing young people's climate literacy first. Beginning with deficit model strategies towards information dissemination can build youth's foundational scientific knowledge to ensure they have at least a base-line understanding of environmental issues. As several practitioners remarked, youth do not necessarily have a deep knowledge base of the complex issues of the Baltic Sea yet. In such contexts, the deficit model can be valued for its ability to address knowledge gaps (Brossard and Lewenstein, 2009). Consequently, this can transition into dialogue-style engagement, where two-way communication between youth and experts open the room for questions and knowledge exchange. Finally, participatory approaches can be introduced to enable young people to actively participate in environmental endeavours and cocreation of knowledge.

As theoretical conceptualisations of science communication evolve over the decades, scholars persistently return to the question of whether the deficit model, with all its undesirability, is dead (Irwin et al., 2018; Metcalfe, 2019). I can contribute to this debate by indicating that in the context of my findings, it is alive and necessary as a building block and pillar to enable new young voices to get involved in vital conversations about a future they will very much be affected by.

6.2 Participatory Model to Attribute Equal Roles

Present throughout practitioners' narration of participatory approaches was their desire to position young people as equals. While the participatory model does in fact conceptualise members of the public equal to experts (Metcalfe, 2019), I see additional significance to this within the youth context of my thesis. As the practitioners themselves recognised, members of this particular social group might be too young to vote, get meaningfully involved in, and contribute to, prominent environmental decision-making processes usually carried out by adult experts. At the same time, those I interviewed saw young people to be smart, capable, and interested. The application of two-way and multidirectional approaches were seen as gateways to give these young people the opportunity to be among experts on equal grounds.

Practitioners that saw negative connotations between one-way communication and institutional education could have done so because in their observation, classical education structures give limited agency to the young students. Practitioners displayed a strong desire to move away from having youth sitting at desks and passively consume information. An approach such as the participatory could enable young people to position themselves away from passive recipients and get involved in hands-on learning.

What can derive from equality is young people's opportunity to get involved in hands-on matters with agency of their own. Practitioners perceived participatory approaches to result in young people doing something "real". The ability to do so is significant considering how youth more often learn by reading rather than doing due to the traditional structures of their institutional education. The practitioners indicated that learning by doing can activate and empower youth as they experience how experts and members of the public can both evoke global benefits through local actions. A high value was attributed to the participatory approaches for this reason – it was believed to give youth the opportunity to see how they can shape their future already now through their own agency.

The above perceptions about multidirectional communication, and what benefits the practitioners believe youth can gain from them, may have implications about the role youth can play in science communication. Through practitioners' realisation of the participatory model, youth can be active contributors to science communication rather than passive recipients of information delivery. Their active role in scientific endeavours, as encouraged by the practitioners who offered youth themselves the chance to propose activities to be carried out, can result in co-creation of science communication materials and activities that feel relevant and engaging to youth and their peers. This, in return, can inspire current and prospective young people to get involved in environmental matters.

It is understandable why practitioners spoke highly about the participatory model if one considers the interconnections between environmental communication and action mentioned by Irwin et al. (2018). Communication is seen as central to environmental understanding, engagement, and practice. The practitioners displayed a high degree of motivation to involve youth in environmental topics and attached a high value to their inclusion. Participatory approaches therefore seemingly meet a lot of the practitioners' perceived objectives for deep involvement of young people – giving them an equal voice, their own agency, decision power to decide what activities they will engage in. It is through the realisation of these objectives that they believe youth will get involved and stay involved.

6.3 Preparing the Future Generation

The literature that informed my thesis indicated that science communication as a concept means different things to different people, therefore the goals of science communication can vary from person to person. While my findings have shown

divergences in how different models were regarded, in the context of my thesis, the goal of science communication is to some extent unanimous. The future, in relation to both communication and youth, is an element that I believe guided practitioners' overarching youth-focused science communication work and attributed an important role to youth to play.

Beyond assisting youth to see the value and impact that their involvement can result in, the elements of the two-way and multidirectional communication approaches were perceived to make it possible for practitioners to arm these young people with the necessary skills to get engaged and stay engaged. Skills like coastal restoration, engaging in dialogue, or critical thinking were seen as important outcomes of practitioners' engagement activities. This ties back to the significance attributed to "doing something real", through which practitioners believed youth could acquire skills. Skills were discussed almost always in relation to the future. Skills gained through participatory activities were said to deepen youth's knowledge and deepen both their involvement, as well as the involvement of their communities, in sea protection work.

I believe this results in a rather future-focused science communication. Ojala and Lakew's (2017) work mentions the double-barrelled future role young people are expected to take as both laypeople and the next generation's leaders, policymakers, researchers, or similar occupational positions. This perspective was present in my own findings too. Practitioners perceived that some of their communication work would change youth's attitudes in favour of the future, inspire them to join or create environmental organisations when they are older, and eventually fill in the positions occupied by current generations. Having these desired future outcomes indicate that practitioners conceive a rather large role for youth to play in science communication. For one, the role of youth, as the practitioners perceive it, is to continue to carry skills and knowledge from the current generation of scientists and decision-makers to the next. And second, their role is to eventually take over the mantle of protecting the Baltic Sea. Of course, not all the practitioners presumed that these outcomes would manifest themselves from their youth-focused science communication alone, but the stories told by several of them indicated that they sincerely hoped to keep youth interested and engaged for a long time coming.

6.4 Youth to Facilitate Diverse Communication Forms

It would be reasonable to assume, based on Ojala and Lakew's (2017) findings of perceptions about youth, that practitioners would also be motivated to equip young people with skills so that they will be prepared to deal with the adverse burdens of climate change that is expected to loom over their future. My findings did not directly uncover this to be a driver of motivation. Just one practitioner shared a sense of urgency to actively involve youth as soon as possible rather than

waiting until they grow up. This however was tied to a perception my findings also share with Ojala and Lakew (2017), that young people's open-mindedness can be an asset to science communication while their identities and ideas of the world are less internalized than adults'.

The youth whom practitioners spoke of were perceived to be curios and receptive of new ways to get involved in science communication activities. This could have had an effect on how practitioners conceptualised youth-focused communication. Youth's openness to engage with new concepts in various mediums like games, competitions and social media, could be considered a source of encouragement for practitioners to adopt diverse approaches to communication. In this sense, youth play a role in diversifying science communication. Open-mindedness facilitates diverse, inclusive, and relevant science communication. Their curiosity and adaptability can act as drivers for practitioners to experiment and introduce new approaches, and in doing so, bridging the gap between science and society.

6.5 Reflection on Methodology and Further Research

The results and interpretations based on my data were critically shaped by my chosen methodology. Therefore, it is important to reflect about my choice of having pursued narrative interviewing and the IPA approach.

Conducting the interviews in an online setting gave me the opportunity to talk to people in several BSR countries within the timeframe of this thesis. As everybody was active in their roles as practitioners at the time of their interview, I worked with the presumption that they had a good recall of recent specific experiences from their work. Although interviews are prone to response bias, my overall impression of the narrative interview methodology was positive in regard to gathering personal stories about practitioners' experiences. The open-ended approach and flexibility made it possible for me to collect detailed retellings in the words of the practitioners, about aspects they themselves found important. The analysis of these narratives was then possible through the IPA approach.

I acknowledge that as a student, I do not possess the same level of experience as IPA researchers do using this methodology. I explored several IPA-driven research papers to enhance my understanding of good practices ahead of time, but in no way am I claiming to be skilled to the same calibre as IPA researchers in the field. Smith (2011) provided an IPA quality evaluation guide, which I will refer to in my reflection.

He states that for an IPA to be acceptable, it should be phenomenological, hermeneutic, and idiographic. Throughout my use of phenomenology, I strived to be as descriptive as possible in my presentation of practitioners' experiences, using both quotes and additional context descriptions in my discussion of emerging themes from the data. Smith (2011) discredits having just one or two quotes with little interpretation, which motivated me to provide quotes each time they were relevant. With my sample size of five, Smith (2011) states that each theme should be supported by quotes from at least three participants, which I made sure of. The idiographic feature of the IPA guided my analysis by allowing me to describe each practitioner's case in its own merits within the context of all the interviews. Smith (2011) stated that an acceptable IPA may present several themes if there is data from each interviewee in each theme. I was mindful of this when I reduced my initial nine themes to six which all practitioners' narratives touched upon.

During my analysis, I was mindful of the double-hermeneutic nature of the IPA. I acknowledged that my identity as youth, and my prior knowledge of environmental communication, was inherently a part of my interpretative analysis. I strived to be continuously reflective about how I was interpreting my interviewees' stories and the quotes I lifted from them, to minimise the likelihood of interpreting practitioners' narratives differently from how they themselves interpret their experiences. However, the chance of having different understandings inherently remained.

The subject of the sample size has been a point of discussion within the IPA methodology. It has been said that a reduced number or participants allow for deeper analysis. However, I still feel the need to mention that interviewing a greater number of participants could have allowed me to explore practitioners' perceptions from additional potential perspectives and led me to uncover more nuances to support the validity of my findings.

I suggest the following topics for further research:

- An inquiry into how youth perceive their own role in science communication.
- An assessment of to what extent youth's science communication needs overlap with the means through which practitioners engage with them in the BSR.
- An exploration of underlying power structures in science communication; Comparison of how power is distributed to different actors in different models, or the study of how power structures manifest in practice within specific science communication projects.
- A gender-based inquiry into practitioners' perceptions of science communication; A discovery of preferred approaches to communication based on gender, or gender representation in the field of science communication.

7. Conclusion

This thesis explored science communication practitioners perceives of the role youth can play in science communication. This was done by examining narratives about how communication and youth were perceived by practitioners in the Baltic Sea Region. I conducted an interpretative phenomenological analysis to uncover meaning in five practitioners' lived experiences of communicating with youth about the Baltic Sea' environmental challenges. They shared their experiences of creating science communication materials and engagement activities using oneway, two-way, and multidirectional approaches. They discussed the perceived benefits and drawbacks of using these approaches in their communication work and shared how they perceive young people's relation to each approach based on their experiences.

The concept of science communication can be contested. Different individuals may regard approaches to science communication differently based on what goals they attribute to their approaches. In my literature review, I explored some goals of science communication present in theory, which led me to examine how some of these goals are embedded in three theoretical models: one-way deficit, two-way dialogue, and multidirectional participatory model.

In practice, two-way dialogue-driven engagement and multidirectional participatory approaches were held in high regard in comparison to one-way information delivery. Practitioners considered the deficit model to be inhibiting both towards their perceived need to engage youth actively through interactive means to sustain their attention and interest, and their desire to position youth as equals to experts to empower them. Linear information dissemination was furthermore thought to resemble young people's institutional education, which was seen negatively. At the same time, practitioners recognised that young people may not have deep knowledge about the Baltic Sea's environmental challenges yet and acknowledged that deficit-style information dissemination can address knowledge gaps before youth get involved in dialogue and participatory activities. Regardless of the negative reception they attributed to the deficit model, the practitioners often blended elements of the one-way approach with dialogue and participatory models to accommodate youth needs.

When it came to perceptions about youth, practitioners regarded them as openminded, curious, not necessarily deeply knowledgeable yet, but willing to learn and contribute to activities when given the opportunity. Practitioners attributed a high value to communicating with youth because they perceived young people to be the future. Through engaging them in science communication, they imagined the new generation to take over the mantle of protecting the Baltic Sea from the current generation. An importance was placed on equipping youth with the skills necessary to become future researchers, decision-makers, or similar occupational roles in the Baltic Sea Region. The practitioners hoped to keep youth actively engaged for as long as possible but recognized that this age group have preexisting primary commitments such as school that demand their time. In this regard, one-way communication may accommodate their availability, as mediums such as social media content or online games are readily available whenever youth have time to dive into environmental topics.

Based on practitioners' retelling of experiences, this thesis suggests that youth can play a role in diversifying science communication. They were seen as openminded due to their age, which is a trait that can facilitate the implementation of diverse and inclusive approaches to learning and engagement. Their curiosity and adaptability can motivate practitioners to experiment with new approaches to communication.

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Popular Science Summary

There are still many environmental challenges we need to tackle. We possess the ability to lend diverse skills and knowledge to environmental actions and conversations; therefore, our society needs to engage as many different people as possible. There are various ways to communicate about environmental challenges, which may engage different types of people. It is possible to simply inform them about environmental topics, but including them in dialogue, or giving them an equal voice to experts, are possible approaches as well. I was curious to explore how science communication practitioners in the Baltic Sea Region experience working with these different approaches. They are the people who translate masses of scientific knowledge to more accessible forms for the public. Their perspectives on ways to communicate, as well as their perspectives towards who they communicate with, can affect how they approach people with environmental topics.

My thesis explores science communication practitioners' perspectives of youth and their approaches to youth-focused communication. I address the questions of what practitioners' perception of communication is, and what is their perception of youth. These analytical questions help me address my overarching research question: *How do science communication practitioners perceive the role youth can play in science communication*?

Through interviews, I collected five practitioner's stories of experiences working on youth-focused science communication about environmental challenges in the Baltic Sea. My analysis focused on the words of the practitioners themselves. I paid attention to their chosen phrases and use of metaphors as they made sense of their experiences. My small sample of five made it possible for me to deeply analyse each case independently, as well as together. In my analysis, I found three themes about how communication was perceived, and three themes how youth were perceived.

The practitioners were highly motivated to involve young people in Baltic Seatopics. They credited schools and social media to be among the places where youth could easily be reached. However, they did not favour the traditional school-style, one-way information delivery for telling them about the Baltic Sea and wished for social media to spark interaction over passive consumption. The practitioners' stories highlighted how they aspire to give youth their own sense of agency, so that youth themselves can come up with Baltic Sea-related activities which meet their needs. Because of this, the practitioners favoured interactive types of communication, such as competitive or educational games, or activities proposed by youth. They saw value in diversifying their environmental communication work through young people's inputs. Inclusive and relevant science communication, where youth were positioned equals, was hoped to inspire them to get engaged and stay engaged in environmental topics for as long as possible.

Large hopes appeared to drive practitioners' motivations to include youth in science communication. Practitioners considered youth to be the future inhabitants of the Baltic Sea Region who could be given skills and knowledge already now to learn how to take care of the sea. It was their hope that when the time would come to take over the mantle from the current generation, this future generation would be prepared to become the next decision-makers, researchers, and stewards of the sea.

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