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HÁSKÓLI ÍSLANDS

Rannsóknasetur á Hornafirði

Höfn, 2025

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ISBN: 978-9935-9480-9-0

Forsíðumynd: Þorvarður Árnason

Contents

Abstract

This study explores how young people in Iceland interpret and emotionally respond to climate change communication through audiovisual media, using the short documentary *After Ice* as a case example. It forms the first phase of the LEVERAGE (VOGARAFL) project, which aims to strengthen youth climate education and engagement through creative and participatory learning. The research sought to understand how young audiences make sense of and react to visual climate messages, to identify different patterns of engagement—from activism and hope to skepticism and fatigue—and to draw lessons for designing communication and educational materials that promote reflection, emotional balance, and positive climate action.

Using Q methodology, the study examined shared viewpoints among 53 participants aged 15–20 who took part in six workshops across Iceland. After viewing *After Ice*, participants sorted 18 statements about the film and discussed their responses. This approach combined quantitative factor analysis with qualitative insights to capture both cognitive and emotional patterns in how young people engage with climate communication.

The analysis identified four distinct audience profiles: *Action Advocates*, highly motivated participants inspired by the film's message of urgency and empowerment; *Sceptical Observers*, analytical viewers who valued evidence and rational debate over emotional appeals; *Climate-Fatigued Realists*, concerned but emotionally tired participants who felt overwhelmed by repeated crisis narratives; and *Engaged Pragmatists*, informed and balanced viewers who combined awareness with realistic optimism. Together, these profiles reveal that youth climate literacy goes beyond factual knowledge—it also involves emotional understanding, confidence, and social reflection.

The findings highlight the need for transformative climate communication that balances urgency with hope, credibility with emotion, and knowledge with participation. Applying audio-video media such as documentaries within participatory approaches can help young people connect facts with feelings, turning awareness into meaningful engagement and action, and fostering emotional resilience and a stronger sense of agency in facing the climate challenge.

1. Introduction

Climate change communication plays a crucial role in shaping public understanding, emotion, and action. Over the years, a variety of formats—from news coverage and social media campaigns to documentaries and art-based initiatives—have been developed to engage audiences with the realities of a changing climate. Each format conveys not only information but also emotion, shaping how people interpret the issue and their place within it. Gaining insight into the subjective experiences of audiences is therefore essential, especially when the focus is on young people, who are both highly exposed to climate messages and deeply affected by their emotional impact. Against this background, the aim of this study is to explore how youth audiences interpret and emotionally respond to climate change communication through forms of audio-visual media. Using Q methodology, the study identifies shared viewpoints and emotional patterns among young viewers, revealing how their different ways of seeing and feeling influence how they understand and respond to climate change..

This research concerns the first phase of the LEVERAGE (VOGARAFL) project, which aims to support climate change education and communication through creative and participatory learning. The broader project – a cooperation between the University of Iceland´s Hornafjörður Research Centre and two NGOs; The Icelandic Youth Environmentalist Association (*Ungir Umhverfissinnar*) and Landvernd - Icelandic Environment Association (*Landvernd – umhverfissamtök Íslands)* - focuses on encouraging young people's emotional engagement and critical thinking by linking scientific knowledge with immersive communication approaches, including documentaries and virtual reality experiences. Within this framework, this reception study provides an initial exploration of how audio-visual media, as a format for climate change communication, can help build awareness, dialogue, empowerment and emotional resilience among young audiences. It explores how young people interpret and emotionally respond to visual climate messages, using the documentary *After Ice* (2021) as a case example. The study´s objectives are: a) to understand how young audiences make sense of and react to climate communication, b) to identify different patterns of engagement—from activism and hope to skepticism and fatigue—and c) to draw lessons for designing educational materials that promote critical thinking, emotional balance, and positive climate action. The study provides insights into how non-fiction films can promote reflection, discussion, and constructive emotional engagement, and explores how young people respond to climate change documentaries. Taken together, these findings help build a better understanding of effective communication and learning approaches in youth climate education.

This report is organized into six chapters. After this Introduction, Chapter 2 presents a brief literature review, outlining key theoretical perspectives on climate change communication, youth engagement, and the role of non-fiction film media in shaping environmental understanding. Chapter 3 describes the methodology, detailing the research design, data collection, and analytical procedures used in the reception study. Chapter 4 presents the research results, and Chapter 5 discusses these results in relation to existing research, highlighting implications for climate change communication and education with young audiences. Finally, Chapter 6 provides the conclusion, summarizing the study's contributions, methodological insights, and recommendations for future research.

2. Literature review

Understanding how young people interpret and emotionally respond to climate change communication requires an interdisciplinary perspective that connects research on climate anxiety, youth climate literacy, media framing, and reception methodologies. Climate anxiety, often described as eco-anxiety, refers to a future-oriented emotional response to environmental threats and uncertainties (Pihkala, 2022). It is influenced by social and geographic context, direct experience of climate impacts, and one's perceived capacity to act (Ray, 2020; Cianconi et al., 2020). Research shows that this type of anxiety is particularly prevalent among young people, who face the long-term consequences of climate change despite having limited influence over policy and systemic decisions (Crandon et al., 2022; Clayton & Karazsia, 2020; Léger-Goodes et al. 2020; Wu et al., 2020). Hickman et al. (2021) found that over half of surveyed youth in ten countries reported being extremely worried about climate change and expressed frustration at what they perceived as governmental inaction.

The way climate issues are framed in media and education significantly affects how young people feel and respond. Studies have shown that crisis-oriented or fear-based messaging can heighten despair and disengagement (Schreiner & Sjøberg, 2005; Ojala, 2015 , Ojala and Lakew, 2017), while solution-focused and hopeful narratives foster constructive coping and agency (Ojala, 2012a, 2012b, 2013). For instance, Maran and Begotti (2021) found that media exposure often correlates with increased anxiety, but this can be mitigated when messages that emphasize empowerment and community action. Similarly, Lorenzoni et al. (2007) identified skepticism and denial as coping mechanisms when audiences feel overwhelmed by catastrophic imagery or lack of trust in information sources. This underscores the challenge of balancing emotional impact with credibility and hope in climate communication.

In this context, youth climate literacy—the ability to understand, evaluate, and act on climate information—has become a crucial educational objective (McCaffrey & Buhr, 2008; Stevenson et al., 2014). Climate literacy is not only cognitive but also emotional and social, involving both knowledge and a sense of efficacy. Educational approaches that combine scientific content with opportunities for dialogue, collaboration, and emotional reflection are most effective in sustaining engagement (Ojala, 2012; Lee et al., 2020).

In recent years, films and documentaries have become important tools for improving public understanding of climate change, especially among young audiences. Visual media are particularly effective at presenting complex environmental issues in accessible and emotionally engaging ways (Beattie et al., 2011; Howell, 2011; Roosen & Klockner, 2020). By visualizing the real-world effects of global warming—such as melting glaciers, biodiversity loss, or extreme weather—and connecting them to personal stories, documentaries help bridge the gap between scientific data and everyday experience (Bieniek-Tobasco et al., 2019).

For young people, whose views are strongly shaped by emotion and storytelling, films can build awareness and empathy, encouraging them to think about both global and local aspects of climate change (Halverson et al., 2014). Research shows that audio-visual storytelling is most effective when it combines factual accuracy with emotional depth, strengthening young people's sense of environmental responsibility (Goodwin et al., 2021). Through visual narratives, audiences can envision not only the problem but also possible solutions—an important step in reducing climate anxiety and promoting action (Sakellari, 2015).

However, the emotional intensity of visual communication also presents risks. Studies suggest that constant exposure to alarming or catastrophic imagery can increase fear and desensitization among adolescents, leading to disengagement or "climate fatigue" (Sanson & Bellemo, 2021; Wu et al., 2015). Effective climate communication for young people needs to balance urgency with hope, making sure emotional impact is supported by reliable information and thoughtful reflection (Ojala & Lakew, 2017). When used in educational or participatory settings, such as classroom workshops, documentaries become more than awareness-raising tools—they act as interactive learning media that stimulates dialogue, critical thinking, and peer exchange (Bendl, 2023). In this way, audio-visual storytelling can serve as a transformative educational tool, connecting scientific understanding with emotional awareness and social engagement.

Q-methodology is an effective tool for analyzing the emotional responses audiences develop while watching audiovisual media. A growing body of research highlights its value in studies of media reception (Davis & Michelle, 2011; Brown, 2006). Originally developed by Stephenson (1935), Q-methodology integrates qualitative and quantitative techniques to systematically identify shared viewpoints within groups. It allows researchers to map patterns of subjectivity rather than measure frequencies, making it particularly suitable for examining how individuals interpret complex social issues such as climate change. In reception studies, Q-methodology captures the diversity of emotional and cognitive responses to media texts, combining statistical factor analysis with interpretive insight. This approach enables the identification of distinct audience profiles, revealing how differing attitudes—activist, skeptical, fatigued, or pragmatic—reflect broader trends in climate communication and education.

3. Methodology

3.1 Research design

This study employed a Q-methodological design to explore how young audiences interpret and emotionally respond to climate change communication (Brown, 2006; Davis & Michelle, 2011). Because Q methodology aims to reveal patterns of shared subjectivity rather than to generalize statistically, the goal was to identify distinct reception profiles within a small but diverse participant group. The approach combined Q-sorting to capture individual viewpoints, a short questionnaire to gather demographic and attitudinal data, and open group discussions to provide qualitative depth and interpretation.

3.2 Participants

A total of 53 participants, 15–20 years of age, took part in the study. They were recruited through six workshop sessions conducted between March and July 2024, organized by Ungir Umhverfissinnar (UU) and the Hornafjörður Research Centre (HRC). Four workshops were held with Icelandic schools and two with visiting foreign school groups. Participants were selected using purposive sampling, prioritizing diversity of perspectives and experiences over statistical representativeness, in accordance with Q-methodological practice.

Table 1. Overview of workshop sessions in Phase 1

Workshop sessions	Date	School / School group	Number of participants
1	22-03	Landakotskóli	9
2a	04-04	Menntaskóli Bjorgafjarðar	18
2b	04-04	Menntaskóli Bjorgafjarðar	10
3	06-05	Framhaldsskólinn í Austur-Skaftafellssýslu	4
4	22-05	Menntaskólinn við Sund	12
5	13-06	Atlas Workshops	8
6	03-07	Putney Student Travel/ National Geographic	7

Participation among the students in the elementary and upper secondary schools was semi voluntary, while the participation among the foreign students groups was fully voluntary, and all participants provided informed consent prior to data collection.

3.3 Materials

The documentary After Ice

The short documentary *After Ice* (12 minutes) served as the primary climate communication format for this phase of the project (figure 1). The film was directed by Kieran Baxter and co-produced by Þorvarður Árnason at the University of Iceland's Hornafjörður Research Centre , with support from the University of Dundee and several scientific institutions in Iceland.

Figure 1: the climate change documentary After Ice.

After Ice combines digital reconstructions of historical aerial photography with contemporary drone footage to visualize glacier retreat in Southeast Iceland over the past 30–40 years. The film is narrated by M. Jackson (co-writer of script), who links the visual evidence of ice loss with reflections on its social, cultural, and ecological implications. Through juxtaposing past and present imagery, the film illustrates the scale of environmental transformation and invites reflection on human responsibility. The documentary was released online in 2021 and is freely available at www.climatevis.com/after-ice.

The development of the q-sample

A first step in the Q-methodology is to define a research question. In this study the guiding question was: *What subjective perspectives exist among young viewers in their reception of the documentary After Ice, and how do these relate to broader attitudes toward climate change communication?*

Based on this question, the next stage involved developing the Q sample, a set of statements representing the range of audience responses. To construct the concourse, which captured the wide spectrum of opinions about climate change documentaries, 152 audience reviews were collected from four well-known films: *An Inconvenient Truth* (2006), *Before the Flood* (2016), *David Attenborough: A Life on Our Planet* (2020), and *Chasing Ice* (2012). Reviews were sourced from IMDb, Rotten Tomatoes, CommonSenseMedia, and YouTube to capture a diversity of viewpoints. From this concourse, a Q sample was developed. The reviews were then thematically coded using Leiserowitz et al.'s (2009) "Global Warming's Six Americas" framework, which categorizes perspectives according to varying levels of concern and engagement with climate change, from *alarmed* to *dismissive*. This framework ensured conceptual balance in the Q sample, incorporating both supportive and sceptical viewpoints. A final Q sample of 18 statements encompassing diverse perspectives (Table 2) was developed and integrated into an online survey using Q Method Software©. The statements were presented on individual cards for sorting and used in the various workshops with young adolescents.

Table 2. The final Q sample of 18 statements reflecting opinions relevant to *After Ice*.

Nr	Cat.	Statements
1	Alarmed	The damage we are doing to our planet is irreversible, and *After Ice* is exactly what we need to get people talking about climate change once again.
2	Alarmed	*After Ice* spreads messages we need to be more aware of, with convincing content to challenge sceptics.
3	Alarmed	*After Ice* shows us frightening images of a future that we try to ignore!
4	Concerned	*After Ice* reveals that Glaciers are like a warning sign for our planet, signalling important changes we need to take seriously.
5	Concerned	*After Ice* is really impressive because it makes us understand that we all have to contribute in order to make concrete changes in the environment.
6	Concerned	*After Ice* is a kind of documentary that can empower people because knowledge is the beginning of change.
7	Cautious	*After Ice* stresses the importance of measured and balanced storytelling, but it is important to address concerns without causing unnecessary alarm.
8	Cautious	*After Ice* did a good job of explaining the challenges glaciers are facing, but I'm hesitant to believe that this change will have enormous effect globally.
9	Cautious	*After Ice* increased my concern about climate change, but I'm not fully convinced that immediate, drastic action is necessary.
10	Disengaged	I am sure about what to do in relation to climate change, and watching *After Ice* did not help
11	Disengaged	I didn't really feel like *After Ice* was saying anything new. It's all stuff we've heard or seen before about environmental issues.
12	Disengaged	Glacier melting is not something that affects me directly, so I didn't really connect with *After Ice* although I'm sure it's important to some people.
13	Doubtful	I think *After Ice* will be the perfect case example for future generations on how communicating the issue of climate change often did more harm than good.
14	Doubtful	The problem of *After Ice* is that it shows just one of the perspectives of the situation.
15	Doubtful	The sceptic in me says that nothing is going to change by one more documentary.
16	Dismissive	*After Ice* demonstrates that glacier have been melting but what is the proof of HUMAN-caused climate change? Are we supposed to believe in this with no proof?
17	Dismissive	*After Ice* reminds us that the climate is indeed changing, but that's because it's in a constant state of flux. People should think and question everything.
18	Dismissive	*After Ice* lacks objectivity because it tries too hard to make a big impact but ends up being shallow.

3.4 Procedure

Each workshop followed the same structure. After a short introduction, participants viewed *After Ice* collectively. The students were then instructed to sort the 18 Q-statements according to their degree of agreement or disagreement using an online survey created with Q Method Software©, in response to the prompt: “Please sort the statements according to how much you agree or disagree with them based on your personal reaction to the documentary *After Ice*.”

Participants arranged the statements on a forced quasi-normal distribution grid ranging from –3 (most disagree) to +3 (most agree). The sorting process required them to consider the relative importance of each statement, promoting reflection on their individual viewpoints.

Following the Q-sorting, participants completed a short questionnaire to record demographic information (e.g., age, gender, place of residence) and general attitudes toward climate change. Each workshop concluded with an open group discussion, providing space for participants to explain their reasoning and emotional responses. These discussions offered qualitative context to support the later interpretation of the factor analysis.

3.5 Data analysis

All Q-sorts were analyzed using the Ken-Q / KADE software, following established Qmethodological procedures. First, a by-person correlation matrix was generated to identify similarities between participants' sorts. Next, Principal Component Analysis (PCA) was performed to extract the main factors, followed by Varimax rotation to enhance interpretability.

Participants whose Q-sorts loaded significantly ($p < 0.01$) on a given factor were identified as defining sorts, forming the basis of factor interpretation. The statistical results were then integrated with insights from the post-sort discussions to construct a holistic understanding of each viewpoint.

The analysis yielded four factors—*Climate Action Advocates*, *Sceptical Climate Observers*, *Climate-Fatigued Realists*, and *Engaged Environmental Pragmatists*—each representing a coherent audience perspective on *After Ice* and on climate change communication more broadly. These four shared viewpoints are described in detail in Chapter 4.

3.6 Ethical considerations

The study followed established ethical guidelines for research with minors and young adults. The participation of the students was semi-voluntary, meaning that participation in the VR activity was optional, but attendance in the class itself was mandatory. All participants received written and verbal information about the study's aims, voluntary nature, and confidentiality measures. Informed consent was obtained from all participants, and for school-based sessions, permissions were secured from institutional representatives. No personally identifying information was recorded, and all data were stored securely. The study was conducted in line with institutional and national standards for research involving human participants.

4. Results

4.1 Overview of factor analysis

The analysis produced a correlation matrix of all Q-sorts, followed by PCA and Varimax rotation to extract and clarify the main shared viewpoints. Four significant factors with eigenvalues greater than 1.0 were retained as interpretable and conceptually meaningful.

Factor extraction results

As shown in Table 4.1, the unrotated factor matrix produced eigenvalues of 15.42, 6.09, 4.80, and 3.99 for Factors 1 through 4, respectively. Together, these accounted for a cumulative 57% of the total variance, indicating that the four factors effectively captured the major patterns of shared subjectivity among participants. Factor 1 explained the largest proportion of variance (29%), followed by Factor 2 (11%), Factor 3 (9%), and Factor 4 (8%).

Table 4.1. Unroted factor matrix.

Category	Factor 1	Factor 2	Factor 3	Factor 4
Eigenvalues	15,42	6,09	4,80	3,99
Cumulative % Explained variance	29	40	49	57
% Explained variance	29	11	9	8

Inter-factor relationships

The correlation matrix presented in Table 4.2 shows the relationships between the four extracted factors. The correlations ranged from –0.23 to 0.61, suggesting that while certain viewpoints shared common interpretive dimensions—particularly between Factor 1 and Factor 4—each factor also maintained distinct orientations. The positive correlation (r = 0.61) between these two factors indicates a partially overlapping but differentiated engagement pattern characterized by proactive and pragmatic climate concern. At the same time, the weak or negative correlations among the other factors show that viewers had different emotional and thinking responses to climate change documentaries.

Table 4.2. Correlation between the factors.

	Factor 1	Factor 2	Factor 3	Factor 4
Factor 1	1	-0,0413	-0,0065	0,6141
Factor 2	-0,0413	1	-0,2304	-0,1434
Factor 3	-0,0065	-0,2304	1	-0,0843
Factor 4	0,6141	-0,1434	-0,0843	1

Factor significance

After rotation, 51 of the 53 Q-sorts loaded significantly ($p < 0.01$) on one of the four factors, demonstrating that the four-factor solution effectively represented almost all participants' viewpoints. Each factor thus reflects a distinct and coherent configuration of values, emotions, and interpretations of *After Ice*. As summarized in Table 4.3, the composite reliability of all factors was high (ranging from 0.966 to 0.987), indicating consistent sorting patterns among defining participants. Standard errors

were correspondingly low (between 0.114 and 0.184), confirming the stability and interpretive robustness of the factor structure.

Table 4.3. Summary of Factor Characteristics

Factor	No. of Defining Sorts	Composite Reliability	Standard Error (SE)
Factor 1	15	0.984	0.126
Factor 2	7	0.966	0.184
Factor 3	10	0.976	0.155
Factor 4	19	0.987	0.114

4.2 Profiling of the factors

To clarify the meaning of each factor, the distinguishing and consensus statements were examined in relation to their z-scores and qualitative comments from post-sort discussions. Table 4.4. presents the key statements that define or differentiate each profile. These statistical distinctions formed the basis for interpreting the four shared viewpoints and assigning conceptual labels to them.

Table 4.4. Overview of the results factor analysis with 4 factors used in the profiling

Statements		Fact. 1	Fact. 2	Fact. 3	Fact. 4
1	The damage we are doing to our planet is irreversible, and After Ice is exactly what we need to get people talking about climate change once again.		2		
2	After Ice spreads messages we need to be more aware of, with convincing content to challenge sceptics.			-2	3
3	After Ice shows us frightening images of a future that we try to ignore!	3			
4	After Ice reveals that Glaciers are like a warning sign for our planet, signalling important changes we need to take seriously.			2	2
5	After Ice is really impressive because it makes us understand that we all have to contribute in order to make concrete changes in the environment.	2			
6	After Ice is a kind of documentary that can empower people because knowledge is the beginning of change.	2			
9	After Ice increased my concern about climate change, but I'm not fully convinced that immediate, drastic action is necessary.	-2		-3	
11	I didn't really feel like After Ice was saying anything new. It's all stuff we've heard or seen before about environmental issues.			2	2
12	Glacier melting is not something that affects me directly, so I didn't really connect with After Ice although I'm sure it's important to some people.				-3
13	I think After Ice will be the perfect case example for future generations on how communicating the issue of climate change often did more harm than good.		2		
15	The sceptic in me says that nothing is going to change by one more documentary.		-3	3	
16	After Ice demonstrates that glacier have been melting but what is the proof of HUMAN-caused climate change? Are we supposed to believe in this with no proof?	-3	3		-2
17	After Ice reminds us that the climate is indeed changing, but that's because it's in a constant state of flux. People should think and question everything.		-2	-2	
18	After Ice lacks objectivity because it tries too hard to make a big impact but ends up being shallow.	-2	-2	-1	-2
Explanation					
-3	Strongly disagrees with				
-2	Disagrees with				
-1	Somewhat disagrees with				
2	Agrees with				
	Statement scores of this profile differ significantly from other (<0.01)				
	Statement scores of this profile differ significantly from other (<0.05)				
	Statement with high consensus between the profiles				

The interpretation process followed standard Q-methodological practice (Brown, 2006; Davis & Michelle, 2011), combining quantitative indicators with participants' explanations to capture both cognitive and emotional nuances. The four resulting factors were translated into audience profiles that describe how young people engaged with the documentary and the wider issue of climate change:

- Factor 1: *Action advocates* – highly engaged participants who viewed *After Ice* as an urgent call for awareness and action.
- Factor 2: *Sceptical observers* – analytical and questioning individuals who valued evidence but doubted the extent of human causation.
- Factor 3: *Climate-fatigued realists* – concerned yet emotionally exhausted participants who expressed frustration with repetitive crisis narratives.
- Factor 4: *Engaged pragmatists*– balanced and informed viewers who combined scientific understanding with a realistic, solution-oriented mindset.

Together, these profiles reveal a broad continuum of responses—from activism and empowerment to skepticism and fatigue—reflecting both the diversity and the complexity of youth engagement with climate change communication. The detailed interpretation of each profile is presented in the following paragraphs.

4.3 Action advocates (factor 1)

Factor 1 represents participants who are deeply engaged with *After Ice* and interpret it as an urgent call for action on climate change. They strongly agree that the documentary conveys a powerful and necessary message about human responsibility for the environment. High-ranked statements include:

- *"The damage we are doing to our planet is irreversible, and After Ice is exactly what we need to get people talking about climate change once again."*
- *"After Ice is the kind of documentary that can empower people, because knowledge is the beginning of change."*

They rejected skeptical views such as:

- *"The sceptic in me says that nothing is going to change by one more documentary."*

Demographic profile

This factor included 15 defining participants (6 male, 9 female). Most were aged 15–19 years and represented a balanced mix of urban and rural backgrounds. Nearly all attributed climate change to human activity, demonstrating strong climate literacy and confidence in scientific evidence.

Interpretation

These participants align with the ´*alarmed*´ group in Leiserowitz et al.'s (2009) *Six Americas* typology. They view *After Ice* as both an educational and motivational tool that strengthens their environmental convictions. The emotional tone of this factor is hopeful and action-oriented, combining concern with empowerment.

Aspect	Description
Orientation	Highly engaged, empowered, morally driven

Most agreed statements	#1, #5, #6
Most disagreed statements	#15, #16
Interpretive label	*After Ice* inspires urgency, awareness, and belief in collective responsibility.

4.4 Sceptical observers (factor 2)

Factor 2 reflects participants who acknowledge the seriousness of climate change but question the extent of human responsibility or the effectiveness of media communication. They appreciate the documentary's visual and educational qualities but remain cautious toward its message. Typical agreements included:

- *"After Ice spreads messages we need to be more aware of, with convincing content to challenge skeptics."*
- *"After Ice reveals that glaciers are like a warning sign for our planet."*

However, they also expressed doubt about causation, agreeing partially with:

- *"After Ice demonstrates that glaciers have been melting but what is the proof of HUMAN-caused climate change?"*

Demographic profile

This factor comprised 7 participants (2 male, 4 female, 1 unspecified). Most lived in urban areas, and while some recognized human activity as a key driver, others attributed climate change partly to natural causes or expressed uncertainty.

Interpretation

These participants align with the *´cautious* or *disengaged´* audiences described by Leiserowitz et al. (2009). Their skepticism is reflective rather than dismissive—indicating a demand for evidence-based and transparent communication. For them, credibility and scientific grounding are more persuasive than emotional storytelling.

Aspect	Description
Orientation	Rational, evidence-seeking, critical
Most agreed statements	#2, #4
Most disagreed statements	#1, #6
Interpretive label	*After Ice* is informative but lacks convincing scientific proof.

4.5 Climate-fatigued Realists (factor 3)

Factor 3 captures participants who are concerned about climate change but feel emotionally exhausted by repetitive messaging. They recognize the importance of the issue yet doubt the film's capacity to provoke real change. Their top-ranked statements include:

- *"I didn't really feel like After Ice was saying anything new. It's all stuff we've heard or seen before about environmental issues."*
- *"The sceptic in me says that nothing is going to change by one more documentary."*

Demographic profile

This group consisted of 10 participants (6 male, 4 female), primarily aged 16–19 years, with a mix of urban and rural residences. They generally accepted climate change as real but varied in their belief in human causation.

Interpretation

The Climate-fatigued realists correspond to the *´disengaged but aware´* category in Leiserowitz's typology. Their responses suggest cognitive agreement but emotional detachment. They are knowledgeable yet weary of repeated warnings, signaling a need for innovative, participatory, and hopeful communication strategies that can re-engage fatigued audiences.

Aspect	Description
Orientation	Concerned but emotionally detached
Most agreed statements	#11, #15
Most disagreed statements	#5, #6
Interpretive label	Aware but fatigued; sceptical of the impact of another documentary.

4.6 Engaged pragmatists (factor 4)

Factor 4 represents participants who combine acceptance of human-caused climate change with a balanced and pragmatic interpretation of the documentary. They value *After Ice* for its clarity, educational tone, and realistic portrayal of environmental issues. High-ranked statements include:

- *"After Ice spreads messages we need to be more aware of, with convincing content to challenge skeptics."*
- *"After Ice reveals that glaciers are like a warning sign for our planet."*

They rejected the claim that the documentary lacked objectivity or scientific integrity.

Demographic profile

This was the largest group, comprising 19 participants (4 male, 14 female, 1 unspecified), mainly from urban areas. They demonstrated strong climate literacy, viewing climate change as primarily human-caused and advocated evidence-based communication.

Interpretation

This factor reflects the *´concerned´* and *´informed´* group of young viewers. These participants see climate change as serious but stay rationally optimistic, focusing on practical solutions rather than emotional messages. *After Ice* reinforced their understanding and commitment without greatly changing their views

Aspect	Description
Orientation	Rational, informed, pragmatic
Most agreed statements	#2, #4
Most disagreed statements	#18, #16
Interpretive label	*After Ice* is credible and educational, reinforcing scientific understanding

5 Discussion and implications

5.1 Youth climate literacy, emotion and engagement

The results show that adolescents demonstrate a wide spectrum of climate literacy and engagement, consistent with previous research (McCaffrey & Buhr, 2008; Stevenson et al., 2014). *Action Advocates* and *Engaged Pragmatists* displayed the highest levels of scientific understanding and confidence in human causation, aligning with what Stevenson et al. (2018) describe as education-driven engagement. These groups combined factual knowledge with emotional motivation—an outcome Ojala (2015) links to *constructive hope* in environmental learning. In contrast, S*ceptical Observers* and *Climate-fatigued Realists* showed more selective or constrained literacy. Their cautious interpretations reflect the barriers of information overload and mistrust identified by Lorenzoni et al. (2007), while their fatigue mirrors the emotional effects of repeated crisis-based messaging described by Maran and Begotti (2021) and Schreiner and Sjøberg (2005). This variation highlights that young people's climate literacy extends beyond factual knowledge—it also involves emotional and social dimensions that shape how they make sense of and respond to climate change.

The Q-method results further show that emotion plays a complex role in these responses (O'Neill & Nicholson-Cole, 2009; Nabi et al., 2018). For *Action Advocates*, emotion was clearly motivational—*After Ice* inspired feelings of hope and empowerment, reflecting the ´cognitive-emotional coherence´ described by Jensen (2017), where facts and moral concern reinforce one another. By contrast, *Climate-fatigued Realists* showed emotional exhaustion, caused by constant exposure to alarming messages (Norgaard, 2011; Pihkala, 2022). *Sceptical Observers* maintained emotional distance, valuing rational analysis over empathy, which can serve as a coping mechanism against fear-based communication (Corner & Clarke, 2017). At the same time, *Engaged Pragmatists* demonstrated what Ojala (2012, p.546) calls *meaning-focussed coping*—combining awareness of risk with realistic optimism.

Together, these emotional patterns suggest that effective climate communication for young people must balance emotion with credibility—encouraging empathy and concern without causing despair or defensiveness. Tailored approaches are needed: for motivated groups such as advocates and pragmatists, messages should build on existing knowledge and emphasize practical solutions, agency, and collaboration. For more sceptical audiences, open and balanced dialogue can strengthen trust and prevent defensive reactions. Finally, to counter climate fatigue, communication should use fresh, relatable storytelling and participatory activities that help young people turn concern into constructive engagement (Corner et al., 2015; Ojala, 2015; Lee et al., 2020).

5.2 Toward transformative climate communication

Bringing together the results of this study and previous research, the findings point to the need for transformative communication—approaches that link scientific understanding with emotional awareness and a shared sense of purpose. As Pihkala (2022) and Ojala (2015) note, turning climate anxiety into action requires creating spaces where young people can express emotions, share perspectives, and build meaning together.

By using non-fiction filmic media in participatory learning settings, this study shows a practical and adaptable model for such engagement. As Bendl (2023) emphasizes, storytelling within documentaries can effectively teach about climate change impacts by connecting facts with emotion and lived experience. This approach helps bridge the gap between information and reflection, showing how

emotional diversity among youth can become a strength rather than an obstacle. In this way, climate communication becomes not just about delivering knowledge but about stimulating social and emotional learning that builds resilience, critical thinking, and hope for the future.

6 Conclusion

This research comprises the first phase of the LEVERAGE project used Q-methodology to explore how young people interpret and emotionally respond to climate communication through the documentary *After Ice*. Across six workshops with 53 participants aged 15–20, four audience profiles emerged: *Action Advocates*, *Sceptical Observers*, *Climate-Fatigued Realists*, and *Engaged Pragmatists*. These profiles show that young audiences differ widely in their emotions, trust, and sense of agency. The findings highlight that climate communication is most effective when it combines credible information with emotional balance—offering hope and participation rather than fear or repetition. Climate literacy also extends beyond knowledge to include emotional awareness and social reflection. This study shows that storytelling within documentaries, when used in participatory class room settings, can connect scientific understanding with emotional engagement, helping young people build resilience and a stronger sense of purpose.

6.1. Methodological contribution and further research

Q-methodology proved valuable as both a research and learning tool. Beyond identifying audience profiles, the Q-sorting process encouraged participants to reflect on their beliefs, emotions, and values, turning the research activity itself into a form of participatory learning. This approach provided space for dialogue, self-expression, and peer exchange, helping participants become more aware of their own viewpoints and those of others. Future research should continue developing Q-methodology in both in-person and digital formats, using it not only to study patterns of perception but also to actively foster reflection and engagement among young people. Extending this method across cultural contexts and over longer time periods could offer deeper insights into how understanding, emotions, and agency evolve. Such work would strengthen the role of creative and participatory communication in supporting climate literacy and empowering youth to face climate challenges with confidence, empathy, and hope.

Acknowledgement

This project was funded by Reykjavik Energy Science Research Fund (VOR23-120) and the National Power Company of Iceland´s Energy Research fund (NÝR 39 -2024). We gratefully acknowledges the valuable contribution of Ungir Umhverfissinnar (The Icelandic Youth Environmentalist Association) for their active participation in data collection and their insightful advice during the development of the Q-sort materials. Sincere thanks are also extended to the elementary school Landakotsskóli, and the upper secondary schools Menntaskóli Borgarfjarðar, Menntaskólinn við Sund, and Framhaldsskólinn í Austur-Skaftafellssýslu for generously hosting the workshop sessions and providing guided assistance throughout the workshop sessions. We further thank Glacier Adventure for their hospitality in hosting workshop meetings and for their support in facilitating the project's activities. Special appreciation is also given to Putney Student Travel/National Geographic and Atlas Workshops for providing student groups who participated enthusiastically in the workshop sessions.

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