

## Study Circle Impacts Research Findings

### **NATIONAL NETWORK FOR OCEAN AND CLIMATE CHANGE INTERPRETATION**

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## EXECUTIVE SUMMARY

This preliminary report, prepared by New Knowledge Organization Ltd. in collaboration with Pennsylvania State University, summarizes evaluation results from the development of an online and in-person national training program to support the creation of a National Network for Ocean Climate Change Interpretation (NNOCCI). The project also explored whether and how training might prove to be an effective and efficient vector for increased public literacy about ocean climate science at a national level.

The pilot program consisted of three in-person meetings and a series of online activities aimed at developing shared knowledge and interpretation tools that can aid in increased public literacy related to climate change science. Global climate change is on a fast track and it is significantly impacting the world's oceans: from the Arctic's vanishing sea ice, to New England's vulnerable coastal areas, to Australia's fragile Great Barrier Reef, sea levels are rising along with CO<sub>2</sub> levels, with resultant impacts on marine flora and fauna. The oceans are a leading indicator of climate change, and they in turn affect the climate. The nation's aquariums are in a unique position to increase public awareness and action on these challenges.

Two six-month pilot programs were conducted between March 2011 and January 2012, each consisting of approximately 22 participants comprised of up to four graduate students focusing on ocean climate change science and up to 10 dyads of place-based, environmental education interpreters. The evaluation consisted of a four-stage, mixed methods research protocol including front end qualitative study surrounding experience, knowledge, attitudes, skills, and motivations related to climate change interpretation at aquariums, zoos and nature centers.

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Front end results demonstrated that prior to the training, most environmental educators find the politicized nature of public discourses related to climate change to be emotionally taxing. They were experiencing difficulties in engaging the public in meaningful dialogue about the science, and most interpreters were not confident in their own understanding of ocean climate science. These results revealed that most front-line educators do not have the skills they feel they need to embark on climate change interpretation and did not feel confident about how the science itself might be integrated into the types of programs they might offer. The most emphatic finding was that educators experienced a high level of emotional distress about how Americans are responding to the science and socio-environmental challenges of climate change and were likely to resist engaging in climate change discussions because the emotional toll was considered too effortful.

Formative evaluation consisting of surveys, focus groups, and observations of live meetings{,} and analysis of online participation in the asynchronous parts of the study circle program revealed that training in strategic framing analysis, practice in interpretive strategies that help personalize and depoliticize the basic science findings, and focus on collaborative meaning-making with visitors to nature-learning places, all helped to build capacity and skills that increased perceived efficacy for participants. Furthermore, the six-month program design and in-person, mid-career training supported development of a self-supporting community of practice that continues to (share) strategies to enhance the skills of other participants.

Following the conclusion of the pilot programs, the external evaluation team engaged in a post-program evaluation to determine not only the direct impacts and outcomes for participants, but also to assess the social impacts of these communication strategies. This exploratory research project recognized that ocean climate change interpreters not only discuss environmental science with visitors, but also work closely with colleagues, volunteers, and their social networks. It recognizes that knowledge is developed through relationships with social contacts, and that nature interpreters are often seen as central, reliable resources by their friends and colleagues, who then share their knowledge further in the community. It is in this four-armed vector that this study explored the efficacy of this training program to enhance public literacy, by describing how communications across all four vectors can more fully explain how knowledge emerges in society and the overall impacts of climate literacy work in informal science learning sites.

This report addresses results from two waves of summative research following completion of the programs. Results revealed that the study circle program positively increases participants' skills as interpreters of climate change education. The results further revealed a pronounced ripple effect from the participants' increase in skill, showing that it creates increased, positive attitudes, interest, knowledge, and motivation regarding climate change remediation among visitors to nature centers, peers in the environmental education community, trainees, and interpreters' social networks.

## OVERVIEW OF METHODOLOGY

To operationalize this study, the researchers found participants for two waves of study circles and members of their social networks. Wave One participants were sent a survey two weeks after the training and two follow-up requests to complete the survey were sent over the next month. Wave Two participants were sent a survey one month after completing the training and two follow-up requests within the next month. Eighteen out of 22 (82%) of Wave One members and 12 out of 26 (46%) of Wave Two members completed a web survey, for an overall sample of 34 study circle members (26 women, (3 men), and one person whose gender was unknown), and a 62% response rate.

## SUMMARY MEASURES AND RESULTS

### Emotional States and Perceptions of Climate Change

Participants were surveyed to assess their emotional reactions on four measures regarding climate change and climate change messaging: 1) personal hope; 2) distress about climate change impacts; 3) anxiety vs. hope about America’s ability to address climate change; and 4) energized vs. overwhelmed by information about climate change. After participating in the study circle, relative to how they recalled feeling prior to the study circle, participants felt more personally hopeful about their ability to discuss climate change with others, less anxious (therefore, more hopeful) about America’s ability to address climate change, and more energized (therefore, less overwhelmed) by information about climate change (Table 1). They also felt more distress about climate change after their study circle participation than before. The results suggest that while participants felt more concern about climate change after their study circle work, they also felt greater confidence in moving forward, based on increased knowledge and the creation of a like-minded community providing cultural support for their work promoting climate literacy (Figure 1). Personal hope and feeling energized, rather than distress and anxiety, were more likely to be associated with frequency and comfort of network discussions.

Table 1. Emotions before and after study circle

	Retrospective pre- measure <i>M (SD)</i>	Post measure <i>M (SD)</i>	<i>t</i> (29)	<i>p</i>
Personal Hope	2.88 (.75)	3.89 (.54)	7.64	.000
Distress	3.61 (.42)	3.83 (.31)	3.34	.002
Anxiety vs. Hopeful	2.99 (.50)	2.64 (.63)	3.21	.003
Energized vs. overwhelmed	2.59 (.47)	3.07 (.40)	4.79	.000

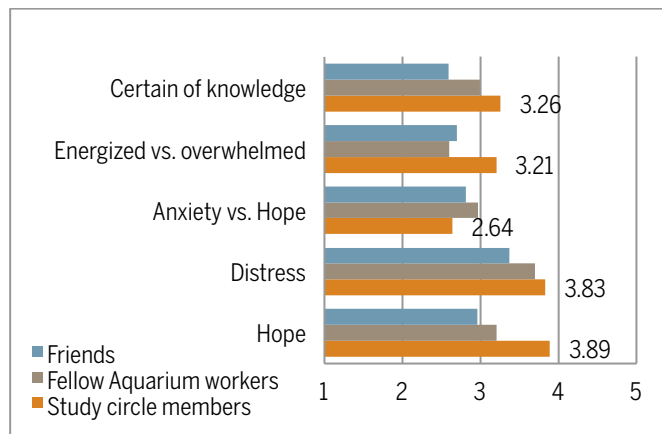


Figure 1. Emotions and certainty of knowledge about climate change

### Attitudes about Ocean Resilience

Participants were asked to select one of four myths, stories, or types of belief about the oceans that reflected their view of the impact of climate change on the oceans. The four options were: 1) a view where the impact of climate change on the ocean is perceived to be benign: “The ocean is safe and stable and we do not need to worry about the impacts of climate change on the ocean because in the end, these problems will always be resolved by human- or naturally-occurring solutions”; 2) a view where the ocean is tolerant of climate change impacts: “The ocean is somewhat stable and climate change is not running out of control, but the government should dictate clear rules about what is and what is not allowed”; 3) a view where the ocean is perceived to be ephemeral: “The ocean is precariously balanced such that it would not be difficult for the ocean to tip into a disaster due to climate change and the health of the ocean can only be controlled by enforcing radical changes in human behavior and in society as a

whole”; and 4) a view where the ocean is perceived to be capricious: “We do not know whether the ocean is precarious or stable or whether it will get better or worse.”

Despite the differences in emotions about climate change (see above), the beliefs about oceans’ climate change-coping capacity were very similar across groups. None felt that the oceans were “benign,” i.e., that they were safe and stable, and nearly all believed that the oceans were “ephemeral,” i.e., that their health was precarious and that radical changes in human behavior were necessary.

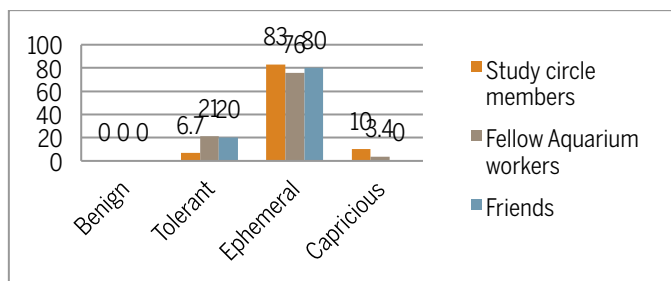


Figure 2. Beliefs about oceans ability to cope with climate change impacts

### Certainty of Knowledge

Participants took a true-false quiz to assess their knowledge about climate change. Four of the items were true and four were false, and participants indicated their certainty, based on a four-point scale ranging from “very certain” to “very uncertain.” The results of the quiz indicated that study circle members were more certain of their knowledge about climate change than their fellow aquarium workers, who in turn, were more (certain) than the study circle members’ friends.

### Connections among Study Circle Participants

Participants were given a list of names of those who attended their study circle, and asked to indicate, using a sliding scale ranging from “very unlikely” to “very likely” the extent to which they would seek out each person for advice. These ratings were used to create social network measures of in-degree centrality (i.e., the extent to which others seek them out) and out-degree centrality (i.e., the extent to which they seek others out). The results indicated that the more directly and indirectly a study circle member would be sought after for advice, the more likely they were to discuss climate change with others. This proved true when centrality was measured as in-degree rather than out-degree centrality. The more each individual directly

and indirectly sought others out for advice was not related to discussions about climate (change) with others.

### Characteristics of Climate Change Discussions

Multi-level modeling was used to assess the qualities of discussions about climate change, including types of communications with others, and frequency of discussions, and level of optimism experienced after discussions..

### Types of Communication with Others

Participants indicated the extent to which they had various types of discussions about climate change with others, including different types of discussions within their networks, in professional settings of their aquarium, with fellow workers at their institution, and with friends. The study circle participants discussed climate change with, on average, 69 other people within their social networks (friends and fellow aquarium workers). Half reported discussions about climate change in their everyday conversations, 53% in formal training sessions they lead, 77% in informal discussions during weekly meetings, 70% in training sessions not specifically about climate change, and 73% in other efforts such as media announcements, changes in their programming, new presentations, and staff presentations about what they learned at study circles. Climate change conversations were more likely to occur within participants’ immediate networks at their institution than outside these settings, with participants reporting more conversations with co-workers than with friends, and more conversations within friendship and aquarium networks than within their professional organizations.

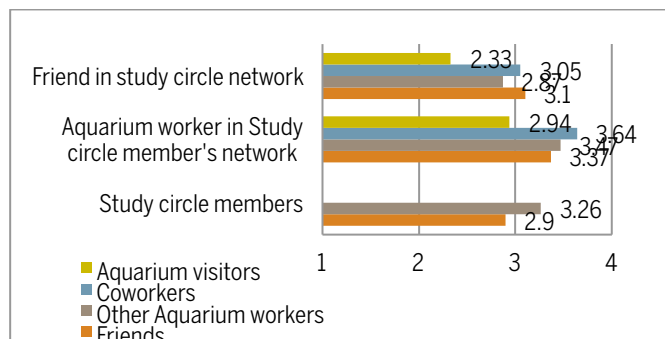


Figure 3. Discussions with others

### Frequency of Discussions

Study circle participants were asked how frequently they discussed oceans and climate change with employees and staff at their institution, with visitors, and with friends. These four items were

averaged together to assess the frequency of study circle participants' conversations with others about climate change. Study circle members perceived and were perceived by others to talk to other study circle participants between a few and many times. As Table 5 illustrates, the extent to which they spoke to friends was perceived differently by the two groups, with those nominated as contacts for the study reporting slightly higher frequency of discussion.

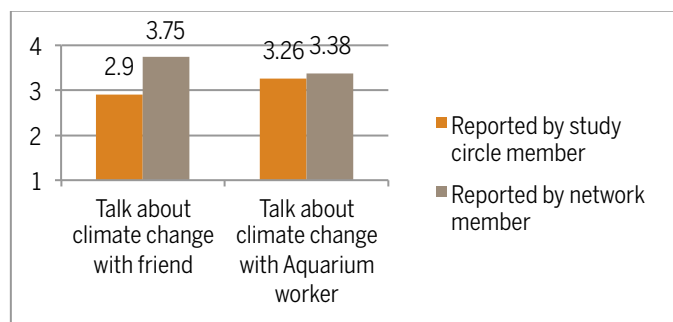


Figure 4. Frequency of climate change discussions with others.

### Optimism

Both study circle members' and network members' emotions after their discussions tended to be positive, with study circle members being more likely to report feeling positive about their interpretive experience (see Figure 5). About half reported feeling optimistic after their discussion with their friends (53%) whereas few friends shared this emotion (16%). This reported optimism, however, is taken with a degree of concern because study circle members also were more likely to report depression and fewer other emotions after talking to others about climate change.

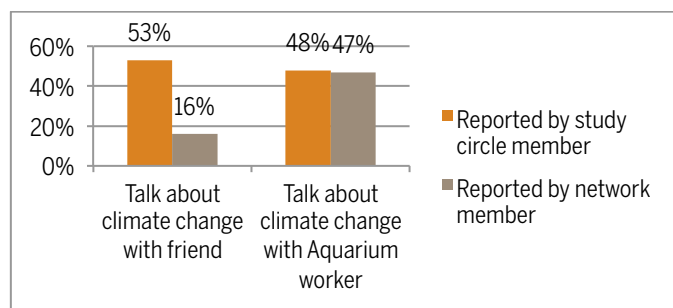


Figure 5. Optimism after discussion

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## CONCLUSION

The development of an online and in-person national training program to support the creation of a National Network for Ocean Climate Change Interpretation (NNOCCI), provided important results based on analysis of two six-month pilot programs conducted between March 2011 and January 2012 and the resulting impacts on social peer and social network colleagues.

Among the more important findings was that frequency and comfort of network discussions led to increased feelings of personal hope and energy. To a direct degree, more personal hopefulness about the ability to have productive discussions about climate change with others correlated with: more hopeful attitudes about climate change in general; higher frequency of discussions in networks and professional organizations; and more comfort with talking to aquarium workers about climate change. Similarly, the more energized (and less overwhelmed) network members felt about climate change information and the greater the increase in energy feeling energized, the more they discussed climate change in professional organizations and the more comfortable they felt talking to aquarium workers about climate change. Greater personal hope and feeling energized were also associated with increased greater comfort discussing climate change with friends but both of these relations were marginally significant and the change in these emotions did not predict this outcome.

These results lead to the conclusion that the NNOCCI Study Circle program positively increases participants' skills as interpreters of climate change education, is attributed with increasing confidence{,} and promotes more positive interactions in the interpretive process which leads to higher frequency and more positive communications about climate science. These results further reveal a pronounced ripple effect that is more likely to increase positive attitudes, interest, knowledge, and motivation to engage in discussions or participate positively in remediation or mitigation efforts among those who visit aquariums, zoos or nature centers, among these professionals' peers in the environmental education community, trainees, and through interpreters' social networks. With impacts felt across four vectors that can influence public understanding and the broad network of institutions capable of supporting this type of skill development for staff, it is likely that the NNOCCI Study Circle approach may have direct impacts on literacy in most areas of the country through the large population that considers zoos and aquariums reliable sources of environmental science information.

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