

Oregon Museum of Science and Industry

Youth Lead the Way:

A Youth Advisory Research Board Model for Climate Impact Education

The OMSI Youth Lead the Way Program Evaluation Report

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Executive Summary

This process evaluation study is part of the project, *Youth Lead the Way: A youth advisory research board model for climate impact education*, a three-year project (2020–2023) led by the Oregon Museum of Science and Industry (OMSI) with the support of the National Science Foundation (NSF, DRL-2005678). As part of Youth Lead the Way (YLTW), OSI created a Youth Advisory Research Board (YARB), the innovative merging of a Youth Advisory Board and a Youth Action Research Board. The YLTW project included three interrelated strands—program, research, and evaluation—that supported the development of the OSI YLTW program. Youth primary activities in the program strand involved research, development, and dissemination of climate stories, advising OSI staff members, partner interactions, professional development, and guide writing. Over the course of 16 months, youth in the YLTW program, self-referred to as the *Youth Climate Action Research Educators* (Youth CARE), learned the basics of social science research and educational approaches to use in the development of “climate stories” (educational products designed to engage visitors with climate change concepts). Over the course of the program, the program participants developed, iterated, and presented their climate stories to raise public awareness about local climate change impacts.

The aim of this evaluation study was to document the progress and improvement of the 16-month Youth Lead the Way program. Specifically, the goal of the evaluation strand was to gather evidence of how the Youth Lead the Way experience provided opportunities to elicit in youth skills that aligned with the project and youth’s priorities. The evaluation team used qualitative data that varied across each of the three evaluation phases. Data were gathered periodically through surveys, concept maps, and interviews from July 2021 to August 2022.

Findings from this process evaluation study suggest that skills such as collaboration and communication could be easily elicited by programmatic activities. Evidence suggests that elements associated with empowerment theories (such as decision-making, sharing responsibility, leadership, and networking) can be elicited in youth when program activities incorporate youth input through the process (such as clear structure, goals, and milestones) and deliverables.

Overall, responses from YARB members suggest that future programs would benefit from exploring elements related to empowerment theories with respect to social and professional interactions between youth and adults in which youth can make meaningful contributions to the organization.

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Youth Lead the Way

A Youth Advisory Research Board Model for Climate Impact Education

Youth Lead the Way program evaluation strand

Introduction

Project overview

Youth Lead the Way—A Youth Advisory Research Board Model for Climate Impact Education (YLTW) is a three-year project (2020–2023) led by the Oregon Museum of Science and Industry (OMSI) with support from the National Science Foundation (NSF, DRL-2005678). This project aimed to elevate youth leadership to galvanize informal science education (ISE) institutions, community partners, and the public to engage more effectively in science-based collective action in response to climate change. Project team members developed and implemented a Youth Advisory Research Board (YARB), in which youth were positioned at OMSI to serve as advisors, researchers, and educators regarding local climate action. At the same time, the project team explored factors that could contribute to the creation of a local YARB model.

The YLTW project included three interrelated strands—program, research, and evaluation—that supported the development of the program, and informed the YARB model, the project deliverables, and approaches to each phase of the project. Youth primary activities in the program strand involved research, development, and dissemination of climate stories, advising OMSI staff members, partner interactions, professional development, and guide writing. The primary activities of the research strand included a qualitative study to explore a local YARB model that identifies factors that contribute to youth engagement and empowerment in a collective action context, with the goals of building knowledge for the field. The evaluation strand explored elements that supported the development and improvement of the YLTW program activities through a process evaluation approach.

Over the course of 16 months, a cohort of youth (ages 16–21) held paid OMSI employee positions as purveyors of climate impact education, and to further develop their communication and leadership skills. The YARB members conducted content research on various local climate impact topics, served in advisory roles at OMSI, and developed and presented climate stories—a communication approach based on storytelling—to raise public understanding of and awareness about local climate changes and impacts. The

participants in this program self-identified as Youth Climate Action Research Educators (Youth CARE), a term that will be used in this evaluation report to refer to this specific cohort of YARB members.

The focus of this report is to document the progress and improvement of the 16-month Youth Lead the Way program. Specifically, the goal of the evaluation strand was to gather evidence of how the educational interventions—provided through the different programmatic activities—contributed to, hindered, or provided opportunities to elicit in youth skills that aligned with the project and youth priorities. Priorities included providing opportunities for youth to advise museum projects, and develop climate stories. As such, this is not an evaluation aimed at monitoring or assessing the youth increase in knowledge or skills through the program experiences.

In this evaluation report we use the terms *YARB members* and *YARB cohort* to refer to the youth who participated in the program and made up the research and advisory board. This highlights the fact that the OMSI YARB was composed of only youth, this was the youth's defined role, and was the youth's center of operation. This paper uses the term *YARB model* to refer to the theory- and evidence-informed model of YARB member empowerment that was developed concurrently through the research study of the YARB and is described in Shagott et al. (2023). Furthermore, we use the term *YLTW project team* or *project team* when we are referring to project staff (adults) other than youth. *ISE staff*, for the purposes of this report, are defined as adult members who collaborated with, guided, or mentored the YARB members through diverse activities. ISE staff include OMSI staff from education and exhibits departments, volunteers, and advisors who worked or interacted with the YARB members. Finally, the term *Youth Lead the Way program* or *YLTW program model* refers to activities, training and structure provided to youth by project and ISE staff and partners. It should be emphasized that this report presents an evaluation of the Youth Lead the Way program, or YLTW program with a focus on elements of adult and organizational programming that can be sustained, shifted, or eliminated in future YLTW programs; this is not an evaluation of the youth participants.

Evaluation phase descriptions

Over the course of the program, the purpose of the process evaluation shifted in response to input from the research and program strands, as well as YARB members' input. After a Planning Period, this resulted in three evaluation phases that reflected the YLTW program aspiration and evolution through the course of the project—Learning, Focusing, and Influencing—described below and illustrated in Figure 1.

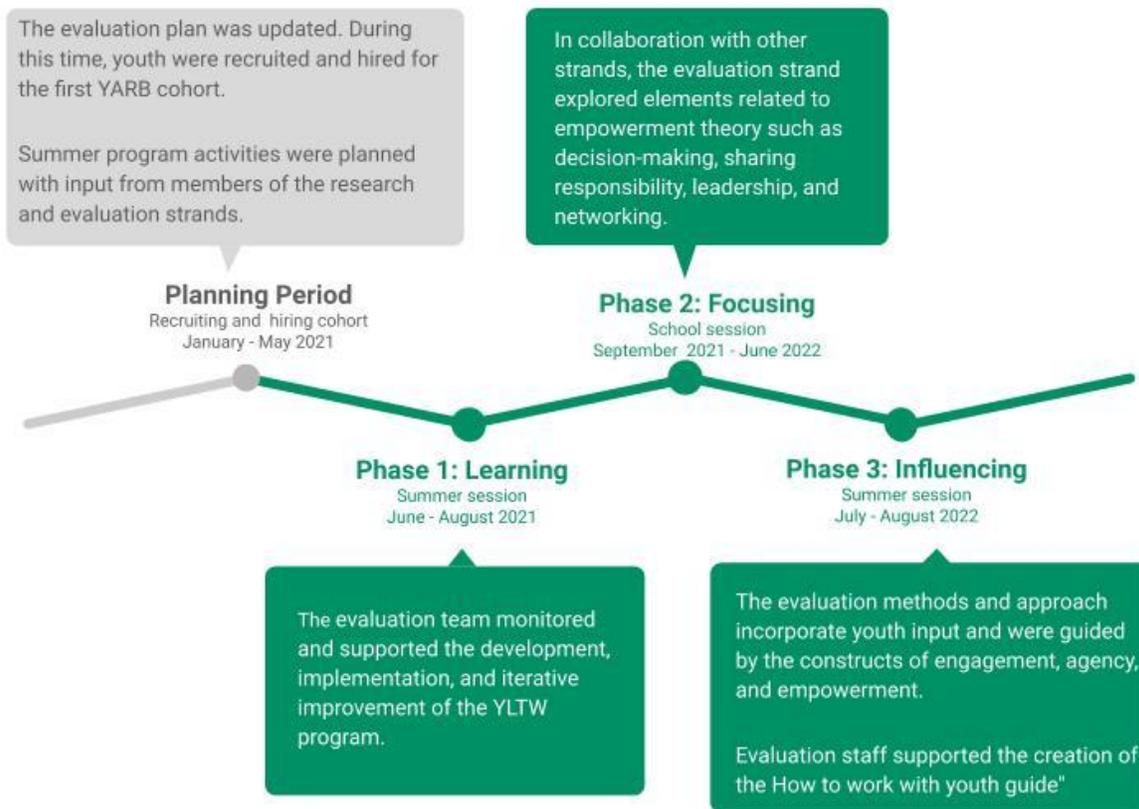


Figure 1. Evaluation phases followed the phases of the YLTW program and the project, Planning, Learning, Focusing, and Influencing.

The activities and the number of youth in the YARB varied in each phase. During Phase 1– *Learning*, the YARB started off with a cohort of 14 youth who met three times weekly for about ten weeks. The focus of the activities during this phase included orienting youth in relevant ISE programming, evaluation and research approaches, as well as providing guidance for their climate stories content, and advisory roles through different OMSI projects. Data for this phase also included ISE staff who interacted and supported youth through training, orientation, and mentoring activities. The evaluation goal for this phase was to track progress and support the development of the nascent YLTW program by gathering evidence of specific skills, such as communication, collaboration, and research elicited by the program activities.

Phase 2– *Focusing*, included nine youth who continued after Phase 1. To accommodate the youth schedules, including their school commitments, the in-person sessions took place every two weeks with the option of remote work in-between. During this phase, the youth iterated, refined, and presented the climate stories developed in Phase 1 on the OMSI main campus and various local venues. The youth, as sub-groups, worked in an advisory role on different museum projects and initiatives with OMSI staff. Guided by data collected from the youth and findings in the

literature, the research strand identified empowerment theory (Perkins & Zimmerman, 1995; Zimmerman, 2000) as a promising framework to explore factors of the local OMSI YARB model. The evaluation strand in Phase 2, in collaboration with the research and program strands, explored elements and skills related to empowerment theories.

Phase 3– *Influencing*, built on the prior phases, while better aligning the program with factors and elements that were informed by the empowerment theory, and intentionally strengthening youth input. In particular, youth influenced the structure of activities, type and content of the climate stories, and evaluation methods. This phase was implemented with six youth. This phase provided opportunities for additional improvements before the project ended. For example, YLTW project team attended to more effective communication with OMSI staff outside of the project; youth selected and prioritized their activities, such as their advisory projects; and youth determined the content and milestones of the youth-authored publication, “*Youth Lead the Way: A guide for working with youth*” (OMSI YouthCARE team, 2023) aimed at museum practitioners who work or wish to work with youth.

Methods

Study design

For each phase, the process evaluation study included methods that varied in response to project priorities and what resonated with YARB members. During the first evaluation phase, youth and project staff provided feedback and recommendations for improving the OMSI YLTW program. In subsequent phases (Phase 2 and 3) only youth program participants provided feedback on the YLTW program.

Evaluation participants self-reported information through qualitative approaches. Participants indicated skills and elements—terms used to differentiate constructs that were influenced by empowerment theories—that were supported or emergent through the OMSI YLTW program activities. The skills and elements identified varied through each evaluation phase.

Data collection approaches

During the OMSI YLTW program, three data collection approaches were used. The methods were initially informed by the evaluation plan (see Appendix A) and subsequently updated to reflect project team priorities and needs (see Table 1 for a brief description of methods and participants during each phase). In Phase 3, the methods were heavily influenced by the YARB members' preferences. The methods used in evaluation to gather

evidence and inform program progress included surveys, concept maps (Bailey & Falk, 2016), and interviews.

Table 1. Data collection approaches by phase

	Phase 1		Phase 2	Phase 3
YLTW participants	<ul style="list-style-type: none"> - Individual concept maps pre- and post-summer program - Individual surveys pre- and post-summer program 		<ul style="list-style-type: none"> - Individual concept maps post-school session - Group interview in two sessions 	<ul style="list-style-type: none"> - Individual concept maps (revision and update of their latest map) at the end of the program - Individual interview
ISE Staff	-Individual surveys		N/A	N/A

In Phase 1, the data collection methods were guided by the overarching questions included in the original evaluation plan table (see Appendix A) and the YLTW project team’s desire to gather evidence of skills elicited by the program activities. As the summer program launched with 14 youth, the YARB members, evaluation prioritized collecting data during the first weeks of the program and before youth were influenced by OMSI’s educational approaches and jargon. Data collection with the youth happened in two instances during the first couple of weeks of the summer program (referred to as pre-summer data) and during the last week of the summer program (referred to as post-summer data). During this evaluation phase, the YARB members were asked to complete individual concept maps and individual surveys.

Phase 1 data collection also included ISE staff who trained, guided, and collaborated with the YARB members through different program activities. ISE staff included a combination of OMSI staff, volunteers, and project advisors who worked or interacted with youth during the summer. ISE staff were asked to complete an online survey in September 2021 and were reminded two weeks later.

As the YLTW program progressed, the main source of data became the program participants. No ISE staff were included after Phase 1. The scope of work for the program activities concentrated on the iteration and presentation of the climate stories and the youth advisory role on OMSI projects. The YARB for Phase 2, was composed of nine youth who continued after the 2021 summer activities. During this phase, evaluation shifted

methods from surveys to interviews with the goal of capturing deeper insights and quotes from the youth about the elements and skills prioritized during this phase (see Appendix IH for group interview instrument). In this phase, evaluation staff conducted one concept map session and two group interview sessions with the youth who were available on the data collection dates.

The YARB for Phase 3 was composed of six youth who decided to participate during the summer of 2022. To tap youth expertise, the evaluation team asked what evaluation approaches and methods would resonate with them. The YARB members suggested two evaluation activities that consisted of individual private interviews with each youth (see Appendix I for interview instrument), and the revision of their latest individual concept maps).

Informed consent

Prior to starting the YLTW program, youth and their caregivers received a package that contained: 1) a letter that explained the purpose of the evaluation and research studies, and 2) informed consent and assent forms that asked parents and youth if they agreed for youth to participate in interviews, surveys, questionnaires, and other data collection activities throughout the duration of the project (Appendix B). Youth who were over 18 years of age were asked to complete a consent form (see Appendix C). The letter stated that only data aggregates or main themes would be reported (no data with individual names). However, due to the small number of youth in the YARB, evaluators could not guarantee that individuals' responses would not be recognizable. The package also contained a photo/video release form (see Appendix D).

ISE staff who participated in the program activities during Phase 1 received an email with a survey link that informed them of how the information would be used, and asked if they agreed to participate.

Sample

The sample size varied in each of the phases and depended on the number of participants who were available on the data collection day. See Table 2 for the sample size during each method. During Phase 1, the program launched with 14 youth and 13 of them completed the survey and concept map. As the summer session wrapped up, 11 youth participated in the post-summer data collection. Phase 2 included nine youth who stayed in the YLTW program. Data were collected in two group interview sessions. The first group interview session included five participants who also completed the concept map and the second group interview session included three participants; two youth participated in both

interview sessions. Phase 3 included six youth who revised their own individual concept maps and five youth who were available for individual interviews.

Table 2. Sample size per method

	Phase 1	Phase 2	Phase 3
YLTW participants	<ul style="list-style-type: none"> - Pre-summer data collection (survey and concept maps): 13 youth - Post-summer data collection (survey and concept maps): 11 youth 	<ul style="list-style-type: none"> - First group interview session: 5 youth - Second group interview session: 3 youth (2 youth were in the first session) - Concept maps: 5 	<ul style="list-style-type: none"> - Individual interview: 5 youth - Concept maps: 6 youth
ISE Staff	<ul style="list-style-type: none"> - Survey: 6 ISE staff 	N/A	N/A

Data collection for the ISE staff occurred during Phase 1 when training and professional activities with the YARB were most prevalent and part of the youth training process. Ten ISE staff who interacted with youth during Phase 1 received an online survey. Six of them responded to the survey.

Analysis approaches

Data analysis varied by the methods used in each of the three phases. During the project, four methods were used: concept maps, online surveys, group interviews and individual interviews. The concept maps were used in each of the phases (for concept map parts see Appendix J). Completed maps were scanned and the number of connections, central connections, levels and nodes were counted (Randol S. and Herran, C., 2022). Counts were entered in a Google spreadsheet along with a list of all the words (except pronouns and articles) found in each map. For the concept map dataset from each session, descriptive statistics were run, including frequencies and means. Results were reported with a set of charts and a word cloud created for the aggregate data.

Online surveys were used in Phase 1 for both the YARB and ISE staff. Survey responses were entered or downloaded into a Google spreadsheet; terms and open-ended responses were coded. For each dataset, descriptive statistics were run, including counts. The results were compiled into a set of charts.

Group and individual interviews were used in Phases 2 and 3. Interviews were audio recorded and interviewers took handwritten notes. When needed, audio recordings were used to clarify and supplement notes. Interview notes were analyzed using thematic analysis which allowed evaluators to identify themes and patterns associated with the overarching questions that guided each phase.

Limitations

As in any study, this process evaluation has certain limitations. The approach for each evaluation phase varied, meaning that the instruments of data collection were not the same and, therefore, not comparable. Data from surveys did not include statistical comparisons due to the small sample size of youth who participated. Furthermore, as the project progressed, the number of youth involved in the OMSI YLTW program decreased.

Phase 1: Learning

The OMSI YLTW program started in July 2021 with 14 youth who met regularly three times per week for two months. During this phase, training and onboarding activities were frequent and included the continuous involvement of project advisors, project team members, and OMSI museum staff. Program activities fell into three categories that included training, advising, and working on climate stories. Through these activities, YLTW participants were onboarded in ISE programming such as climate change communication, creation and presentation of demos, exhibit design and content, and best practices in museums. The training on evaluation and research approaches in the ISE field included primary and secondary content research for their projects, and professional inquiry to collect evidence on the performance of their climate stories and projects.

During this phase, program participants formed sub-groups based on specific activities. For example, for the creation of climate stories, youth organized themselves as sub-groups or individuals and were the main decision-makers in relation to the content and medium for their climate stories. For the advisory roles, sub-groups of three youth were assigned to one of the predetermined options for OMSI education or museum priority project. Throughout *Phase 1- Learning*, YARB members iterated, refined, evaluated, and reported on their climate stories. The summer session culminated with a public presentation of the climate stories with 11 youth who were part of the YARB through August 2021.

Evaluation questions

Evaluation questions in Phase 1 served to explore successes and areas of improvement of the OMSI YLTW program.

In collaboration with the project team members, the evaluation team developed evaluation questions that were used to frame the study during Phase 1 and inform instrument development. These questions were influenced by the original evaluation plan (see Appendix A):

- How did participating in the YLTW program increase youth's collaboration skills?
- How did participating in the YLTW program increase youth's research and related STEAM (science, technology, engineering, art, and math) career skills?
- How did participating in the YLTW program increase youth's confidence as STEAM content communicators?
- To what extent and in what ways do ISE staff working with the YARB members report an increase in self-efficacy related to youth researcher/advisor collaboration?

Methods

Evaluation for Phase 1 launched with the intention to explore the YLTW program activities; the methods for this phase were guided by the project desire to learn about specific skills elicited through the programmatic activities. A survey was identified as a method that could resonate with the program needs and with participants during this phase since it allowed for quick and individual responses.

During the second week of the YLTW program in the summer of 2021, the youth were asked to complete a paper survey that included both closed- and open-ended questions about their collaboration, research and career skills, and confidence in STEAM content communication skills (see Appendix E). A web-based version (hosted by Alchemer) was administered in the last week of the summer programming (eight weeks after the first survey), before the public climate stories event (see Appendix F). This approach of collecting data both pre-summer and post-summer programming allowed evaluators to collect evidence regarding ways in which the YLTW program supported the development of YARB members' skills.

ISE staff, for the purposes of this report, are defined as adult members who collaborated with, guided, or mentored the YARB through diverse activities. ISE staff include OMSI staff from education and exhibits departments, volunteers, and advisors who worked or interacted with the YARB. ISE staff activities with the youth included offering tutorials, mentorship, demonstrations, and other activities related to supporting youth in their research, collaboration, and communication skills with regards to climate change action. Ten ISE staff who interacted with youth during the summer program received an online survey (hosted by Alchemer) that included both closed- and open-ended questions about

their experience with the program (see Appendix G). In particular, the participants were asked to assess how the program impacted their skills related to communication and collaboration with youth as well as to reflect on the current YARB model. A link to the survey was shared via email in September 2021 and a reminder sent a couple of weeks later.

Results

Results from this evaluation phase are organized by self-reported evidence of the changes in participants' skills and ISE staff attributed to the summer program activities. Data were collected from 13 youth pre-summer and 11 youth post-summer. Each participant had the opportunity to complete a paper survey for the pre-summer data and an online survey for the post-summer data. There were six ISE staff who completed an online survey. The roles of ISE staff varied during the summer, as did the amount of time spent with the YARB (between 2 and 200 hours). ISE staff were asked about their self-efficacy about collaborating with youth.

The results presented in this report include only the open-ended responses from program participants. The data from the close-ended questions in the survey suggested that overall, program participants started with high confidence in communication, collaboration, and research skills, and responses did not show increases in these skills at the end of the summer. Furthermore, differences in these data were small and lacked meaning to draw conclusions about the ways in which the YLTW program supported or hindered skills in the group of participants, and is therefore not presented in detail.

Results from data collected from ISE staff include both closed- and open-ended responses. Closed-ended responses are presented in charts. Open-ended responses for these participants are included to support the charts and provide insights from participants perspectives.

YARB perspective data

In Phase 1, skills prioritized and expected to be supported by the program were: collaboration, STEAM content communication, and research.

Confidence in collaboration skills

Pre- and post-summer surveys included an open-ended question that asked about the program participants' experiences collaborating with others.

Pre-summer data from open-ended responses suggest that program participants felt confident and enjoyed collaborating with others. These are some representative quotes from youth:

“Being both the president of my school’s ASB (Associated Student Body) and speech and debate team, I have a lot of experience working with others efficiently. It is something that comes easily to me.”

“I have collaborated with others in multiple different settings with different agendas. Across the board I have had positive experiences. In all different types of collaborating work I have been able to find my place in the dynamic and work effectively.”

Solving problems with others and the value of incorporating feedback were two themes that emerged related to participants’ confidence collaborating with others. In the pre-summer open-ended responses, program participants mentioned their previous experience collaborating with others in different settings (school, sports teams, project teams, work team mates, family members). Themes that emerged were enjoyment, value, and the dynamic of the collaboration with others. In contrast to the broader topics referred to in the pre-summer, post-summer responses were usually situated in the context of the YLTW program activities and projects (climate stories). Some representative quotes from youth regarding this category are:

“Creating and facilitating an art gallery at OMSI is not a one man job. Instead, I have been working hand in hand with my coworkers to bring young artists to the front of a youth issue. It has been a process of delegating tasks and having to-do lists, as well as ensuring everyone feels heard.”

“I have been working on my climate story mainly as an independent project but this doesn’t mean that I haven’t been collaborating with others during the process. I have been working with my peers, getting their opinions and feedback and navigating everyone’s ideas and incorporating them in the final result. This recently happened to me deciding the best medium to make a video with.”

Furthermore, post-summer responses recognized that the development of their climate story projects was the result of a group effort that required communication to work as a team. Youth mentioned:

“Working in my group to divide tasks and goals and figure out how to get art for our project.”

“The development of our climate board game was only possible because of the collaborative efforts of our group. Organizing with one another ensured that we created the best game we could.”

Program participants’ interest in research and STEAM career skills

In Phase 1, the program aimed to support program participants’ skills related to their interest in research and STEAM careers. The pre- and post-summer surveys included an open-ended question that allowed the program participants to write about their interest and knowledge of research and related STEAM career skills.

Two of the youth mentioned they did not see the value of the program component focusing on research skills, stating that they already had that knowledge, or because development of their climate stories did not require those skills. The majority of the youth, however, mentioned their interest in honing these skills through the program.

“I actually don't think this program increased my research skills. The way that the research component was introduced felt unnecessary, since we already had our ideas in motion and really did not have to "research" anything. In fact, I do think the program would benefit from not having a research component because it seemed like a side-task instead of a crucial part of the experience.”

Exposure and interest in research and STEAM career skills varied in pre-summer responses. Overall, most of the program participants expressed they were already exposed to aspects tied to these skills through experiences in their schools, in OMSI, and internships. Program participants, however, also mentioned their interest in continuing learning about STEAM topics and careers.

“I have been able to learn about STEAM career skills at OMSI and at school and feel like I have a good amount of knowledge on the career skills but definitely have more to learn.”

“In formal schooling I've taken high-level chemistry and biology courses so I understand the basics fairly well. I am pretty aware of various STEAM careers,

typically related to college majors/education. I would like to learn more as I am interested in science and STEAM topics.”

“I currently attend a STEAM high school. There was a class that I looked at called advanced science research that allowed me to go through the entirety of the science inquiry process, including the research and hypothesis aspect.”

In post-summer responses, most program participants reported that the YLTW program activities supported them gaining specific research skills such as study planning, generating research questions, data collection, and literature review.

“I like to work with a group, I have some questions that we can ask visitors about and collect data.”

“Before this program, I had little experience in finding credible scholarly research sources. The research process for our board game provided me with this experience which will prove useful in further research opportunities in the future.”

“I really liked the research aspect of this program. I think that making sure research guides every decision and aids every process is really important. In doing this repeatedly I gained a lot of experience and got more comfortable with working outside and inside sources (from museum visitors to external organizations).”

Program participants’ STEAM content communication skills

The data below are related to the program eliciting youth’s confidence as STEAM content communicators at the beginning and end of the Phase 1. The pre- and post-summer surveys included an open-ended question about program participants’ experience as STEAM content communicators.

In the pre-summer open-ended responses, the majority of program participants mentioned that they already had experience presenting and communicating STEAM content in places such as their schools, other programs (such as internships, OMSI, or labs), and in conversations with friends.

“I always feel like there may be something that I don't know, still I can get through presentations well.”

“I did a lot of science during middle school but with no English so it was hard for me but I worked a lot.”

“The only experiences that come to mind are in a school doing science presentations or having conversations about science and math with friends.”

In the post-summer responses, several program participants reported that the program provided opportunities to learn and consider different approaches to science or STEAM content communication skills.

“This program taught me new ways to communicate about science in a comprehensible way. Explaining demos was part of that. In addition, learning about communication of climate change concepts helped with this.”

“The YLTW program gave me an opportunity to interact with science in an intimate manner with other people, rather than just speaking in a crowd.”

“Doing demos around the museum has helped with science communication.”

Furthermore, program participants mentioned that the program allowed them to explore these skills and that the demos gave them opportunities to practice communicating science content in a comprehensible form for the general public, including children. Open-ended responses also mentioned that throughout the program, program participants felt inspired, saw the value of collaboration, and saw the value of interaction with the communities.

“The science demonstrations portion of the program helped develop my ability to communicate science topics to children.”

“Talking to kids about your work to get some ideas before you talk with adults. I feel it's a good way.” (In reference to the data collection activities or advisory opportunities with kids from OMSI programs.)

“Having to reach out to several members of the community in order to do outreach has made it possible for my communication skills to improve.”

ISE staff data

The evaluation data for ISE staff consisted of documenting participants' perceptions about the YLTW program model regarding potential impacts on the YARB members. It also included items about skills such as communication and collaboration that could be elicited for the ISE staff, themselves, through their involvement with the YLTW program. This means that the communication and collaboration skills of ISE staff who interacted with YARB members in the program could have been influenced by their participation.

Communication Skills

The data below are related to the YLTW program's influence on ISE staff in relation to communication skills, confidence in communicating with youth, and the extent to which youth feedback influenced ISE staff communication style. Data come from ISE staff surveys after the summer program. The survey questions contained a 6–point scale that ranged from “*strongly disagree*” to “*strongly agree*” and “*does not apply*” (see Appendix G).

Five out of six ISE staff members reported they *strongly agree* or *agree* that they could communicate well with youth (Figure 22). Responses from ISE staff could have been influenced by their perceptions about conveying ideas, organizing activities, and training youth in a specific topic or content area.

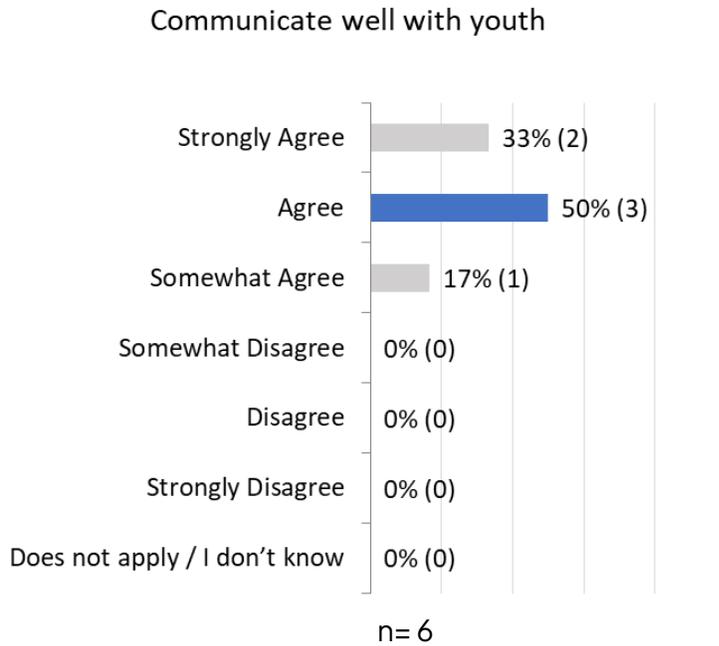


Figure 22. ISE staff- I could communicate well with the youth

ISE staff perceptions about whether input received from youth through the YLTW program influenced their communication style varied. Four out of six participants reported they *somewhat disagree* or *disagree* that youth input changed their communication style. Responses suggest that ISE staff interactions with youth provided no opportunities or that the feedback did not make a difference regarding ISE staff communication approach (Figure 23).

Youth input changed communication

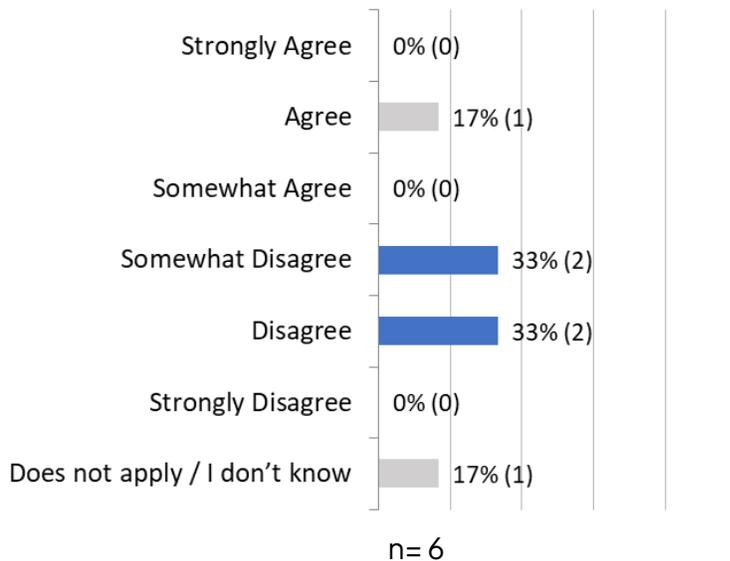


Figure 23. ISE staff—confidence communicating with youth increased from YLTW program

Collaboration skills

The data below are related to the YLTW program's influence on ISE staff confidence in collaborating and engaging with youth. Data come from ISE staff surveys that contained a 6-point scale that ranged from "strongly disagree" to "strongly agree".

Responses from ISE staff regarding their confidence in collaborating with youth as the result of the YLTW program varied. Three out of six participants reported they *strongly agree* their confidence collaborating increased while two respondents reported they *somewhat agree* or *disagree* their confidence in this skill increased (Figure 24). The type of activity and whether it required youth active participation could have influenced how ISE staff responded to this question. For example, activities that were in a lecture format or similar might not have provided for deep opportunities for ISE staff to collaborate with youth when compared to a specific project or activity that engaged youth in active roles or requested their feedback.

Confidence collaborating with youth

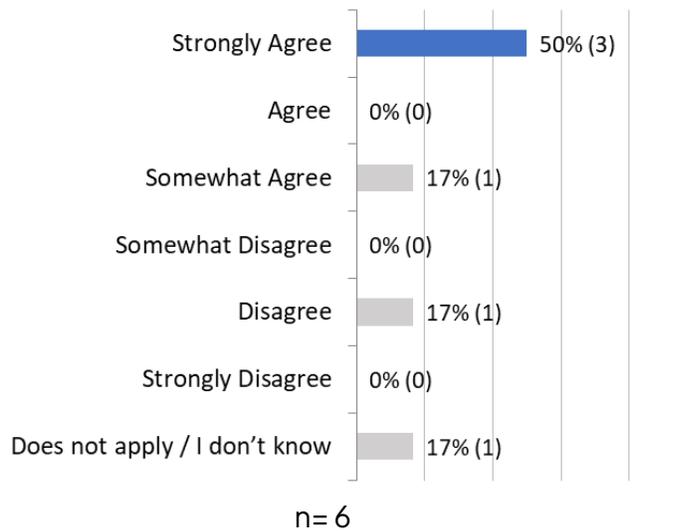


Figure 24. ISE staff—confidence collaborating with youth increased from YLTW program

Regarding the challenges when communicating and collaborating with youth, some ISE staff mentioned some disengagement from youth and challenges communicating with them.

“The first session was pretty early on in the program and the students weren't super engaged or responsive, which is always challenging. This got better by the second session I did.”

“Apparent apathy at times, sometimes they didn't seem to be listening or would fall asleep while I was talking. Also, youth rarely replied to my emails which has been a challenge for communicating with them.”

Four out of six ISE staff reported they *strongly agree* that they feel confident they can collaborate with youth in the future (Figure 25). Responses could have been influenced by the level of previous experience some of the ISE staff had collaborated with youth in the past while also influenced by an overall positive experience with the YARB.

Confidence collaborating with youth in the future

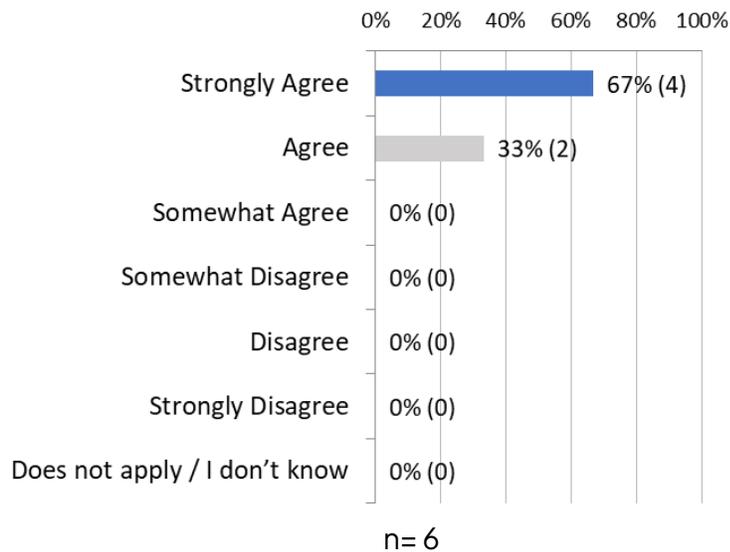


Figure 25. ISE staff— I feel confident I can collaborate with youth in the future

Two ISE staff mentioned that the program did not increase their communication and collaboration skills given that they already had that experience or confidence.

“I don't feel it increased my skills as I was confident in my abilities and skill-level prior to this experience.”

“I have already spent a lot of my career collaborating with youth, although not necessarily as much time with folks of these ages.”

Only two ISE staff mentioned some opportunities regarding their communication and collaboration skills with youth while considering the group dynamics.

“It has helped me revisit the balance between giving youth direction and letting them figure things out. I think it's also helped me remember to consider the intra-team dynamics when working with more than one young person at a time.”

“I have become more comfortable talking to youth and listening to their ideas. I have learned a little about how to make more engaging presentations and how to talk to them as a group.”

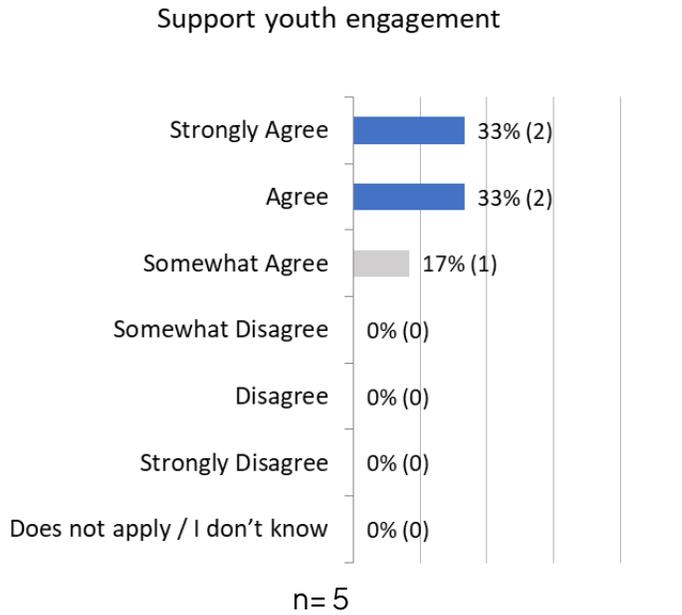


Figure 26. ISE staff—I feel I supported youth engagement through my work

Most ISE staff reported they *strongly agree* or *agree* that they supported youth engagement through their work or interactions with them (Figure 26). Responses suggest that ISE staff perceived their approach through activities and presentations fostered YARB engagement, attention, and commitment.

ISE Staff perceptions of the YLTW program model

Data include perceptions from ISE staff about the extent to which the YLTW program model was a vehicle to empower youth, the extent to which the YARB members empowered community partners and the public, and whether the YLTW program model can be implemented effectively in other museums. Data were generated from ISE staff surveys that were administered at the end of the Phase 1; items used a 6–point scale where one meant “*strongly disagree*” and six meant “*strongly agree*”.

The YLTW program model and youth empowerment and skills

ISE staff reported they *strongly agree* or *agree* the YLTW program empowered youth and supported their communication, collaboration, and STEAM skills (Figure 27). ISE staff's perception of the program's activities could have influenced their responses as seen in the open ended responses below.

YLTW program empowered youth

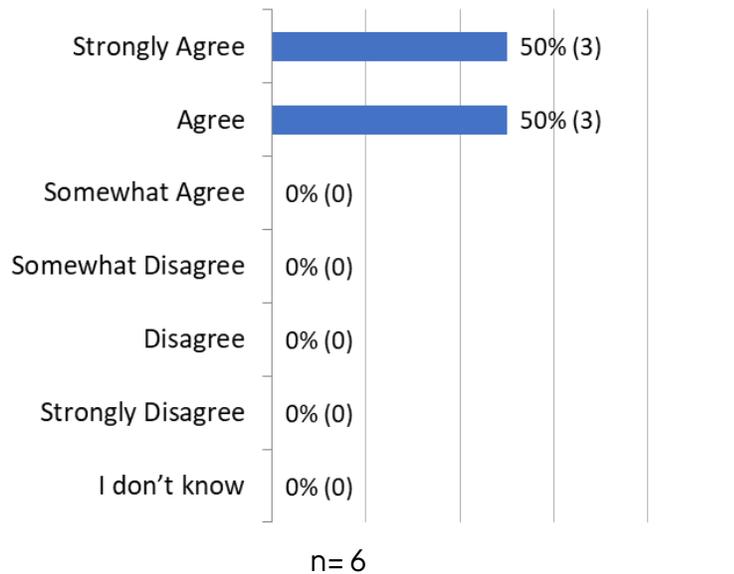


Figure 27. ISE staff—the YLTW program has empowered youth

Two themes emerged for ISE staff regarding youth empowerment to engage more effectively in science-based collective action by the YLTW program. One of the themes was the variety of resources and opportunities provided through the program.

“Providing them with access to opportunities, resources, and tools that inform their own connections to climate change!”

“I feel the model (of the program) would work well because it supports youth in conducting research and communicating it. I think the model can change a little but the base is good.”

“The opportunity to collaborate with fellow youth in a supportive environment with many resources.”

Another theme that ISE staff mentioned was cultivating youth interests through the YLTW program.

“A select few of our students would have been actively involved in climate action, but with the YARB (program) they all have taken an interest and see it as necessary to take part.”

“I think getting them to work on something that they cared about was huge.”

The YLTW program model and community partners and general public empowerment

Responses regarding ISE staff perceptions about the YLTW program model as an approach to empower community partners and the general public in responding more effectively to climate change varied. Three out of six participants reported that they did not know whether the YLTW program model empowered communities and the general public (Figure 27). Responses might have been influenced by the limited number of public events due to the global pandemic, and the level of engagement ISE staff had with the program and the limited interactions with youth’s climate project presentations. For example, ISE staff who interacted with youth occasionally or only a couple of times might have not been well positioned to answer this question because they were not aware of the YARB members’ public facing activities.

The YLTW program model empowered community partners

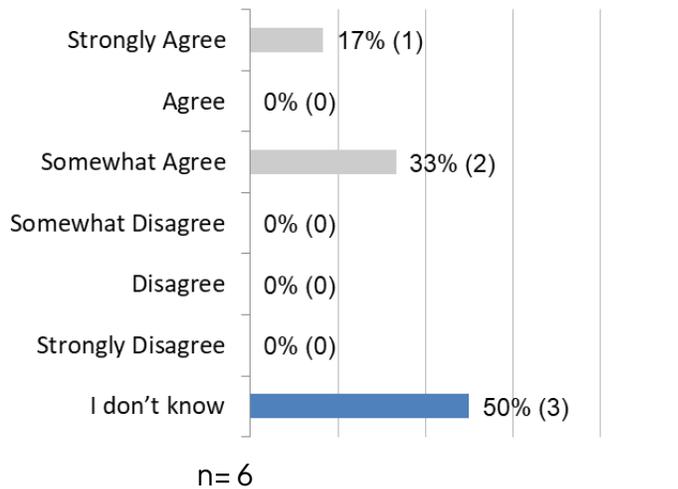


Figure 27. ISE staff—the YLTW program has empowered community partners

In open ended-responses, the majority of ISE staff mentioned that they were not sure about the extent to which the YLTW program empowered community partners to engage more effectively in science-based collective action.

“I’m not really sure what you mean by community partners. Which community? OMSI? I don’t really know who OMSI’s community partners are.”

“As far as I saw, community partners did not engage in science-based collective action. I think the model would need to be redesigned or we should just not set the expectation of community partners engaging more effectively. Or, maybe we should have been more mindful and purposeful about engaging community partners.”

Regarding the extent to which the YLTW program empowered the public to engage more effectively in science-based collective action, ISE staff open-ended responses varied. A general theme was exposure and providing foundation to the public through the climate stories.

“The public facing model brought climate stories to the public instead of letting them search it out. Many of the visitors of the climate art show’s first run were very conservative, and their children were exposed to climate action stories. This wasn’t something that would normally happen to them, and I think it was successful in helping them consider viewpoints their families may not have.”

“The art installation and plan to tour is really cool. I’m not sure how well it’s connected to science based collective action. I think there is a strong foundation to build from to eventually engage the public more effectively.”

“I did not see the public reactions, but from what I hear, there have been positive results. I think presenting climate stories needs to be embedded more strongly so that the impact on the public is larger. We are going to do that, so I’m curious about the results.”

The YLTW program model and its effective implementation in other museums

Four out of six ISE staff *strongly agree* or *agree* that the YLTW program as a model could be implemented at other museums effectively (Figure 28). Responses might be influenced by ISE staff perceptions of the program and activities setting that were created in OMSI and youth involvement with varied museum resources and activities.

YLTW program model can be used at other museums

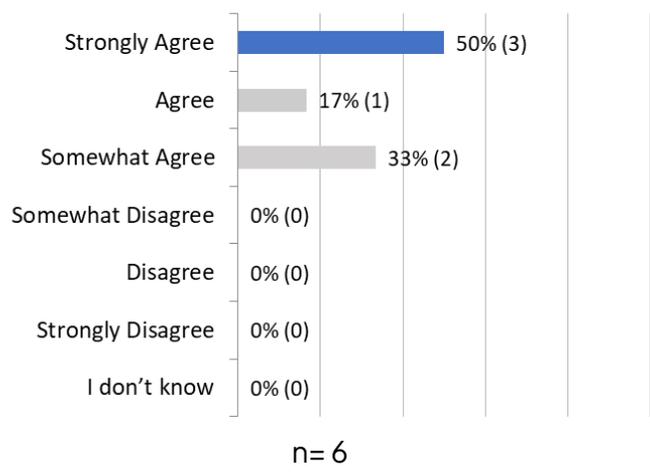


Figure 28. ISE staff—the YARB model can be implemented at other museums

Phase 2: Focusing

Phase 2, occurred during the 2021–2022 school year. Nine youth continued during this phase. During this phase, YARB members iterated, refined and presented the climate stories developed in Phase 1. The youth also continued participating in their advisory roles, working in sub-groups and in different projects and initiatives with OMSI staff. The in-person program activities took place every other week alternating with the option of remote work in between. During this phase the evaluation strand, in collaboration with the research and program strands, explored skills from Phase 1 and elements related to empowerment theories. The elements initially identified aimed to support the exploration of factors that could contribute to the YLTW program model while informing and improving program activities.

Evaluation questions

Overarching evaluation questions continued focusing on skills, such as collaboration and confidence, used in the initial framework during Phase 1. These elements included skills associated with decision making, leadership, and networking.

Evaluation questions for this phase included:

- How did participating in the YLTW program increase youth’s collaboration, communication skills, and research skills?
- How did participating in the YLTW program impact youth’s decision making skills and sharing responsibility?
- How did participating in the YLTW program impact youth’s confidence in networking with climate action organizations?
- How did participating in the YLTW program impact youth’s sense of leadership?

Methods

Given the need to provide deeper exploration of skills elicited by YLTW program activities and further explore elements associated with empowerment theories, the evaluation methods for Phase 2 were updated for a more qualitative approach that allowed more nuanced insights into and perceptions of the program participants.

A group interview with the program participants was conducted in two sessions (see Appendix H for Group Interview instrument). This was done to accommodate youth commitments with school activities. Data collection took place in OMSI during two one-hour sessions in February and March 2022. The first group interview session included five participants and the second group interview session included three participants; two youth participated in both interview sessions. Youth participated by reflecting on prompts provided by the evaluator and the educator, sharing their thoughts first in pairs, and then with the entire group that was present during the session.

Results

Initial framework: program participants’ confidence in collaboration, communication, and research skills

Program participants' perceptions about the impact of the activities and program varied depending upon the particular skill. Similar to findings from the evaluation effort during Phase 1, youth in the group interview reported collaboration skills increased for them. Responses from the group interview suggested that youth felt more confident in their collaboration skills and their ability to practice this skill in different settings and with different audiences (youth and adults).

“I’ve just found myself more willing to collaborate, like with youth and adults.”

Furthermore, youth mentioned that participating in the program activities increased their confidence in doing research and communicating. This could have been attributed to opportunities they had to practice and explain complex topics related to climate change.

“I have a better ability to explain complex things but in a more digestible way.”

“It’s directly helped me with slowing down and thinking about what I’m saying.”

While youth stated that they recognized the value of research skills, and mentioned that, overall, their research skills improved through conducting primary and secondary research, responses suggested that youth felt the research training and research questions felt disjointed from their deliverables (climate stories).

“Defining that more clearly, saying, hey, this is the aspect research is going to play...and this is the timeline”

“We had exposure to the idea of research before we had exposure of the idea of the climate story, so I didn’t fully connect those two”

Elements related to empowerment: decision-making and sharing responsibility

As the research team explored empowerment theories to inform the YARB model (Shagott et al, 2023), some elements or skills that the team did not have data about and could be elicited through the program activities were considered by the project team members. Elements related to decision-making and sharing responsibility were explored for the first time during this phase through group interview sessions.

The YARB mentioned that their definition of sharing responsibility aligned with collaborating as a group in their deliverables. Some of the definitions of shared responsibility included:

“Everybody have a task that they’re working towards and everybody also picking up the slack that they need to, they’re all I guess taking on what they want to do to accomplish the thing”

"Like everyone picking up their own delegated work to further a common goal."

Youth also mentioned that negotiating how to make decisions and assign responsibilities within their group was something that came more naturally with each other than with adults because of the perception of adults as the final decision makers.

"Making decisions with other youth is kinda like having a shared understanding and like being open to new perspectives. With adults it's kind of this different dynamic because I feel usually the adults are the people that come to the final decision so it's more about just like making sure your ideas are heard."

Skills related to sharing responsibility varied depending on the context. Youth stated that sharing responsibility occurred when they were coordinating roles and activities when developing their climate story. The youth leadership roles often shifted depending on the needs for their climate stories and the expertise or experience of the youth.

Elements related to empowerment: confidence in networking

Using their own words, the YARB participants were asked to define networking. Youth defined networking as something that is interconnected or as a skill in which connecting with others could allow them to progress in their goals. Some of their definitions included:

"When I think of networking I kind of think of, like a computer in the sense that everything's, like connected so like a circuit and if pieces aren't connected a circuit doesn't work. You need to connect all the pieces for the whole circuit to function."

"For me I think that networking is just like meeting new people from new places and using that like different backgrounds to kind of further what you're working on."

Overall, youth reported that their confidence in networking increased through the program, though they felt that they did not have enough opportunity to reach out to local climate organizations as part of the program.

“And something that we didn't do over the summer (2021) that I feel like really would help is like actually going to these places... I don't think that's a regret with the actual program. I think that's just a regret that we couldn't do it.”

“In regards to local climate activist groups I would say I would definitely be more comfortable talking to them now than before.”

“The YARB was kind of the catalyst for me to like actually like do something like that because I was like I was like talking to people at art shows and I was like calling emailing like other environmental groups get their opinion yeah and this kind of gave me an excuse to actually like build off of like what I have already like it was important.”

Some of the youth mentioned that increased confidence in networking would allow them to feel empowered and able to make their voices heard. Youth also reported that it would help them to reach out to other organizations and people in the future.

“I think that like you're meeting like other people like obviously in the future would be empowering just to let you know that like we're not we're not just like a group of kids that are like meeting out like on the weekends and weekdays like there are other people fighting (for climate change) and I think that would be incredibly empowering.”

Elements related to empowerment: leadership sense

Before asking specific questions about the leadership element, the YARB was asked what leadership meant for them. Most of the responses highlighted the role and value of a leader in a group as someone who takes others in the group into account.

“I would define it as having parsing, guiding people, motivating them, getting them interested, getting them comfortable.”

“I feel like leaders really truly like trying to make everyone better in the group while also making their self better.”

"...a leader is someone who's like in the pack, in there, the one taking charge and they're not they're like empowering everyone's like go forward with it, they're actually part of the group instead of like looking over it."

Youth recognized that leadership roles shifted when sharing responsibilities while they worked on their deliverables (climate stories) and other activities (demos, data collection, secondary research).

"It was definitely fluid there was at least in our game group there was no consistency; it would change pretty much weekly based on who was what was going on."

"I think that this was interesting because I felt like everybody was leading their projects and their work. "

Youth also stated they felt their sense of leadership increased and that the program shifted their definitions and notions of what leadership was for them.

"I see myself in, like, a leadership position here but with other people who are very competent and also my (might) consider themselves to be leaders."

"I think I wasn't growing in the same direction of leadership I was practicing prior to this. I kind of diverged and went off to a new like branch of like what leadership can be. "

Phase 3: Influencing

Empowerment theory was identified in the Phase 2 as a valuable framework to make a more robust and engaging YARB model (Shagott et al, 2023) along the codevelopment lens that OMSI as an organization is broadly adopting. At that time, the research strand explored and initially identified empowerment theory elements (skills) that could be impacted by the YLTW program. In Phase 2: *Focusing*, the evaluation strand, in collaboration with the research and program strands, explored elements and skills that aligned with and related to empowerment theory.

In the summer of 2022, the YLTW program continued with six youth from Phase 2. This phase was informed by empowerment theory and by the influence of the YARB members'

input. Additionally, the program and evaluation strands on this phase incorporated youth input on activity structure, story type, and evaluation methods. Finally, this program iteration provided opportunities for OMSI to revisit areas for improvement, such as communication with OMSI staff outside of the YLTW project and the advisory piece, and provided opportunities for youth to decide and prioritize the activities in which they engaged. For example, one of the YARB members' deliverables for this phase included a guide aimed at museum practitioners that the YARB members led and developed with the aspiration of improving practices around working and collaborating with youth. This guide was referred to as "*Youth Lead the Way: A guide for working with youth*" (OMSI YouthCARE team, 2023).

Evaluation questions

The focus for Phase 3: *Influencing* was to better align with elements that were informed by the empowerment theory while seeking opportunities to engage the YARB members' input in the evaluation data collection methods.

The evaluation goal for this phase was to learn how the educational interventions provided through the program activities contributed, hindered or provided opportunities to elicit in the program participants' skills related to engagement, empowerment and sense of agency.

Evaluation questions included:

- How did the YLTW program activities contribute or present barriers to youth's engagement?
- How did the YLTW program activities contribute or present barriers to youth's sense of agency?
- How did the YLTW program activities contribute or present barriers to program participants' perception of their ability to influence it?

Methods

Recognizing the program participants as peers who had experience conducting content research, evaluators approached youth during the first week of the Phase 3, summer of 2022, to gather input from them regarding evaluation approaches and methods that would better resonate with them. The program participants proposed two evaluation activities that consisted of individual, private interviews (see Appendix I for Interview instrument) with each member and the revision of their latest concept maps (See section about Climate Action Impacts Concept Maps for more details about this method).

Data collection took place during the last two weeks of the summer session in a conference room located in OMSI main campus where the program participants met to work on their deliverables (individual climate stories, youth guide, and advisory projects). Individual interviews were conducted with the program participants who were present during the last week of the summer session. Data collection took place in OMSI during a 10–20 minute session per participant in August of 2022. Youth were invited to a private office apart from their meeting room and were asked to reflect and respond verbally to a semi-structured questionnaire. The total evaluation activity took approximately two hours.

Results

Each youth had the opportunity to participate in individual private interviews with a member of the evaluation team. During the interviews, youth responses focused on three types of program activities that potentially elicited opportunities and barriers for their overall engagement, sense of agency, and feelings of empowerment. These included programmatic management (meetings, trainings), developing and delivering climate stories, and advising projects.

Program participants' engagement

Youth interview responses about YLTW program activities that contributed to their engagement were grouped in three broad themes: programmatic management, climate stories, and their advisory role/activities. For the programmatic management category, responses included specific activities such as ensuring that the activities had a purpose or a defined goal, regular check-ins, and activities that focus on team building. As for the climate stories, youth responses mentioned that the collective ideating provided opportunities for being engaged. The advisory activities provided opportunities for engagement when youth interacted with OMSI staff and felt they were part of a larger team. Working on *Youth Lead the Way: A guide for working with youth* (OMSI YouthCARE team, 2023) elicited engagement for youth as they were able to collaborate and ideate as a team.

“I had freedom to decide where the project (climate story) was going and how I was going about the project.”

“Check-ins before a day of work, making sure that the schedule is well constructed so that one is aware of what is going on.”

Barriers to engagement included similar themes around programmatic management and advisory role/activities. Programmatic management elements mentioned by youth as barriers to engagement included lack of clarity of project outcomes, conducting meetings and trainings in ways that did not resonate with them, and lack of guidance on how to problem solve issues. Barriers also included lack of clarity of what the activity was about during the first summer, and the lack of milestones and goals were aspects of advising activities and roles that youth felt created barriers to engagement for them.

“When unaware of a project that I didn’t know was gonna go a certain way. And then it turns out it’s not something I was expecting.”

“Some of the advising projects, especially last summer: non-specific, not clear what you were supposed to be working on.”

Program participants’ sense of agency

A sense of agency was elicited through activities, and provided opportunities for the program participants to feel they were set up with clear milestones and expectations, and they were able to lead. Activities that fostered a sense of agency usually were those where youth and staff had a shared understanding of expectations, while providing opportunities for youth to lead. Examples mentioned included opportunities to work individually on the climate stories, and the youth guide.

“Having freedom to determine what to do and how to do it. How to work with the youth guide (...Here is the basic gist of what you need to do, and now go nuts...Because it just gives people a sense that it’s theirs).”

“Climate stories (interviews) ...because it was a lot of individual work and I had to pick out who to interview and where to interview them. I had to pick out my own questions and those felt a lot like agency to me”

Barriers for sense of agency mentioned by youth that related to programming management were similar to barriers of engagement and alluded to ambiguity and lack of clear goals or milestones. Some youth also mentioned that activities that required them to work in small groups created struggles in how contributions of each member of the group effort were made, and how youth balanced the individual and collective contributions.

“When something is unclear or there’s not a lot of guidance, then it’s difficult to motivate myself to do the work, especially if there’s no end goal.”

“Throughout the work because we’re doing it as a group. And so a lot of the goals you set and how you do things, you’re done collectively, which kind of skewed how I viewed it. I always thought that I would work well with these people, but it wasn’t seen as like independent victories. It was more like okay, we did this for the collective and now it worked out.”

Program participants’ empowerment

Since empowerment, as a construct, is not easy to formulate, youth were asked to provide examples in which the YLTW program activities elicited or hindered their belief that they were able to influence the structure and process of the program. Youth reported that activities such as planning and presenting their climate stories, goal setting, and the youth guide fostered the sense that their contributions were influential and had an impact; two indicators of empowerment.

“The final event and presenting my work made me feel like I had an influence because you could actually see how the work I did was playing out.”

“The (how to work with the youth) guide was a big part. The way the facilitators talked about it made me feel it’ll be used after it’s done.”

Some youth also mentioned that agency and empowerment were interrelated constructs for them, that promoting agency for them as individuals could also foster empowerment.

“At the beginning of summer, we did some goal setting, and what was our summer gonna look like, and what were all the different projects. In those conversations, we had a bit of agency to choose what we wanted to work on or set up some structure. Being able to say, Oh I really wanna see this and then making it a goal made it something that we would be influencing as a group.”

“I think agency and empowerment kind of go hand in hand. It’s like with agency comes empowerment because you’re being trusted to do things on your own for the most part. It was up to us how we went about

our projects. Board game, how to work with the youth guide: how we went about our work.”

A barrier to youth perceiving impact of their work included the lack of opportunities to understand how the activities provided through the program would be used and how they fit within and impacted OMSI and local communities.

*“Not seeing/understanding where the YLTW program fits within OMSI:
“When it is not clear how the product is going to be used in the future. It feels like you’re not having much of an influence because the work that you’re putting in isn’t really going anywhere.”*

“I think we kind of had this goal to get outside of policies like our own climate view and to create like a climate hub and to look at Portland or even the Pacific Northwest as a region. And I feel like we got stuck in our little OMSI bubble, that it was tricky to accomplish that. So we didn’t get the exact feeling of empowerment we wanted when we thought about systematic change in reaching more communities”

Climate action impacts concept maps

Personal Meaning Mapping (Bailey & Falk, 2016), referred to in this report as concept maps, provided an opportunity to document the program's influence on how the program participants' knowledge and perception of the climate action ecosystem changed over the course of the program. Unlike other methods, concept maps did not require youth to provide answers in a linear sequence nor restrict their answers to sentences or the choice of pre-set options, hence allowing for the youth's salient ideas and connections to be explored (See Appendix J for concept map parts).

Evaluation question

Climate action was a key topic in the program content and an aspiration for the program participants through their climate stories. A concept map protocol was used to explore how participants' understanding of and ideas about the topic of climate action changed over the course of the program. The evaluation explored the question:

- In what ways has the program participants' perception of climate action ecosystem/network connections changed as a result of the program activities?

Methods

The concept maps provided an opportunity for evaluators to capture program participants' insights about the idea of "climate impacts" in a way that did not overly limit or shape their responses. As a tool it provided rich data that could be approached both qualitatively and quantitatively. Through a structured process focused on the "climate impacts" construct, concept mapping utilized input from the youth to produce an interpretable pictorial view (concept map) of ideas and concepts and how they are interrelated. The central concept of "climate impacts" remained the same throughout each of the evaluation phases. Although the method was generally consistent, each phase was approached slightly differently in terms of data collection and analysis.

In Phase 1, concept maps were gathered twice, in the first week of the summer program and at the end of the summer; the program participants were asked to complete individual concept maps. For this method, participants were given a sheet of paper with a central circle labeled "climate change impacts" (see Appendix K). For each related concept (e.g. word, idea, phrase, or thought) that came to mind, they were asked to write down the concept, draw a rectangle around it, draw a line connecting it to the central circle, and show interrelatedness by drawing a line to rectangles with related concepts.

Concept maps for Phase 2, were gathered in one opportunity and followed the same data collection approach as in Phase 1. However, unlike Phase 1, in Phase 2 no direct comparisons were made within the same phase. In Phase 3 the approach was influenced by program participants' who requested to revise their latest individual concept maps. In this phase, youth were given their previous maps which had the central circle labeled "climate change impacts" (see Appendix K) and a number of concepts or ideas that they had drawn on. The program participants revised the concepts and ideas (e.g. word, idea, phrase, or thought) that they had written before by crossing out (deleting) concepts or connections they no longer felt belonged on their individual maps, and including new concepts by writing them on the map, drawing a rectangle around it, and drawing lines showing how it connected with other concepts.

For each phase's dataset(s), evaluators counted the number of nodes, connections, levels and connections to the central nodes (for illustration of each category see Appendix K) and entered the data into a spreadsheet; descriptive statistics were run, including counts and frequencies (Bailey & Falk, 2016; Randol & Herrán, 2022). Additionally words or phrases from the nodes in each concept map were entered in one combined group list and a word cloud was created to represent the maps of the group.

Results

The results for this method are organized by phase. In each of the phases the results are presented in charts that summarize counts, and word clouds that illustrate the program participants' prevalent topics.

Phase 1: climate action concept maps

Climate action ecosystem/network connections

The data below correspond to individual concept maps created by youth both during the first week of the summer and after the summer program in 2021.

Concept Map Comparison

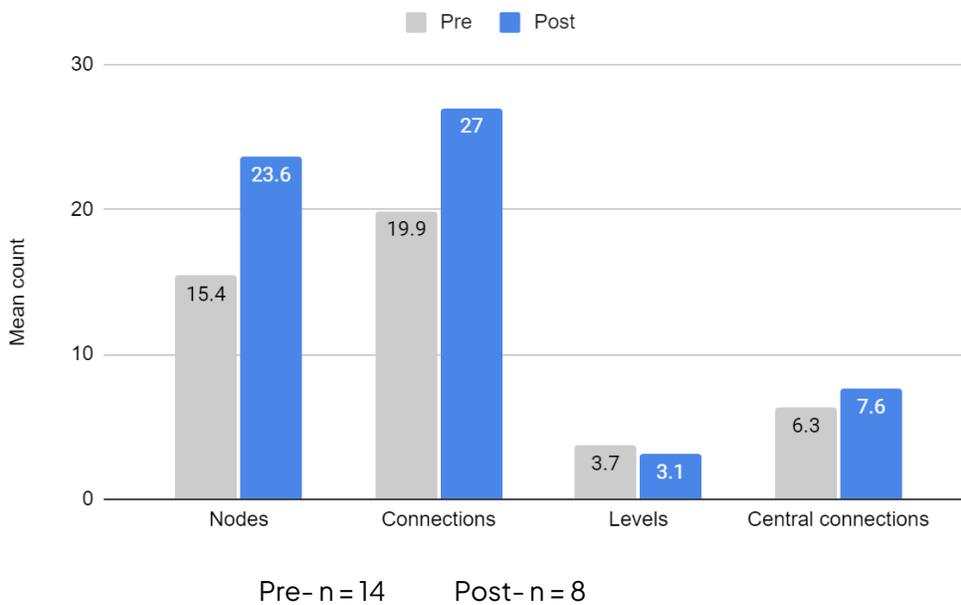


Figure 29. Phase 1—Learning: Pre- and Post-summer concept map mean counts comparison

The mean counts of concept map nodes and connections were greater post-summer than pre-summer (Figure 29). Mean counts of nodes increased from pre- to post-summer program from 15.4 (a standard deviation of 10.6) to 23.6 (a standard deviation of 9.7). Similarly, the mean counts of connections made by youth on their maps increased from 19.9 (a standard deviation of 11.7) to 27 (a standard deviation of 10.5). The mean number of levels and central connections did not vary substantially with the mean number of levels greater pre-summer and the mean number of connections greater post-summer. This

shows that although the number of ideas youth included in their maps increased, their vision of the climate action ecosystem was not particularly multilayered.

YARB climate action ecosystem/network connections-word clouds

The data from the concept maps can be visualized using word clouds in which the size of the font used corresponds with the frequency of the words aggregated from the youth's concept maps.

Words that were mentioned often by the youth in their pre-summer concept maps include broader topics that ranged from environmental themes to social themes (58 unique words). Environmental themes that were prevalent in the concept map include global warming, extreme weather, resource availability, air quality, and fossil fuel (Figure 30). Social emergent themes from the concept map include human impacts, marginalized communities, and education.



Figure 30. Pre-summer programming word cloud of concept map words

Phase 2: climate action concept maps

Climate action ecosystem/network connections

In Phase 2, the program participants were asked to create new individual concept maps. The data below correspond to the concept maps created by each youth.

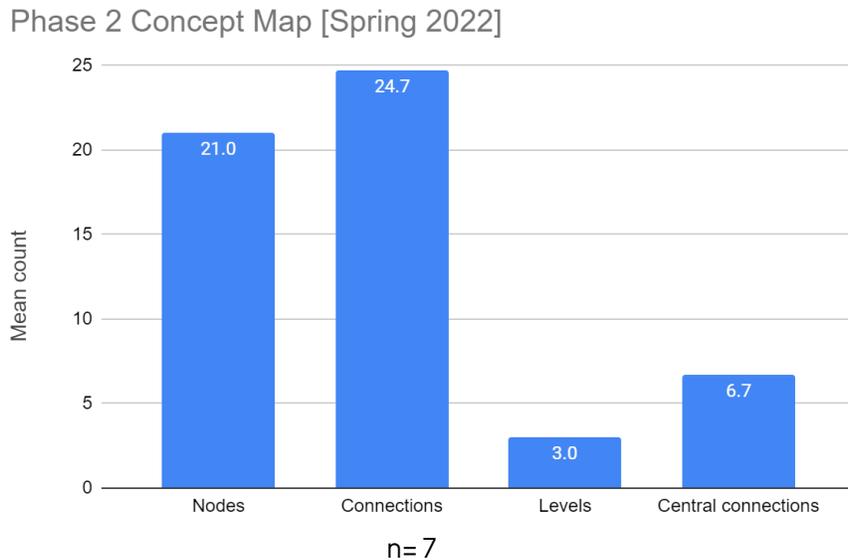


Figure 32. Phase 2—Focusing: concept map mean counts

Overall, the mean counts of concept map components were high for the nodes with a mean of 21 and a standard deviation of 9.2 and the connections with a mean of 24 and a standard deviation of 11.6. The levels component has a mean of 3 and a standard deviation of 1.5 and the central connections component has a mean of 6.7 and a standard deviation of 3.8.

The mean counts of map components in this phase were slightly lower than compared with the ones in Phase 1, post-summer data, but higher than the ones in Phase 1, pre-summer data, except for levels which is comparable to both Phase 1 pre- and post-summer data (Figure 30).

YARB climate action ecosystem/network connections-word clouds

Continuing with the themes in Phase 1, post-summer word cloud, the words that were often mentioned by the program participants in the concept maps in this phase include topics that ranged from environmental issues to social themes; however, concepts named the Phase 2 maps were much more specific. Environmental themes that were prevalent in the

concept map include extreme weather, sea level rising, ocean acidification, air pollution, and wildfires (Figure 33). Emergent social themes from the concept map include themes around social and policy issues such as community, policy change, lobbying, legislation, low income, and advocacy.

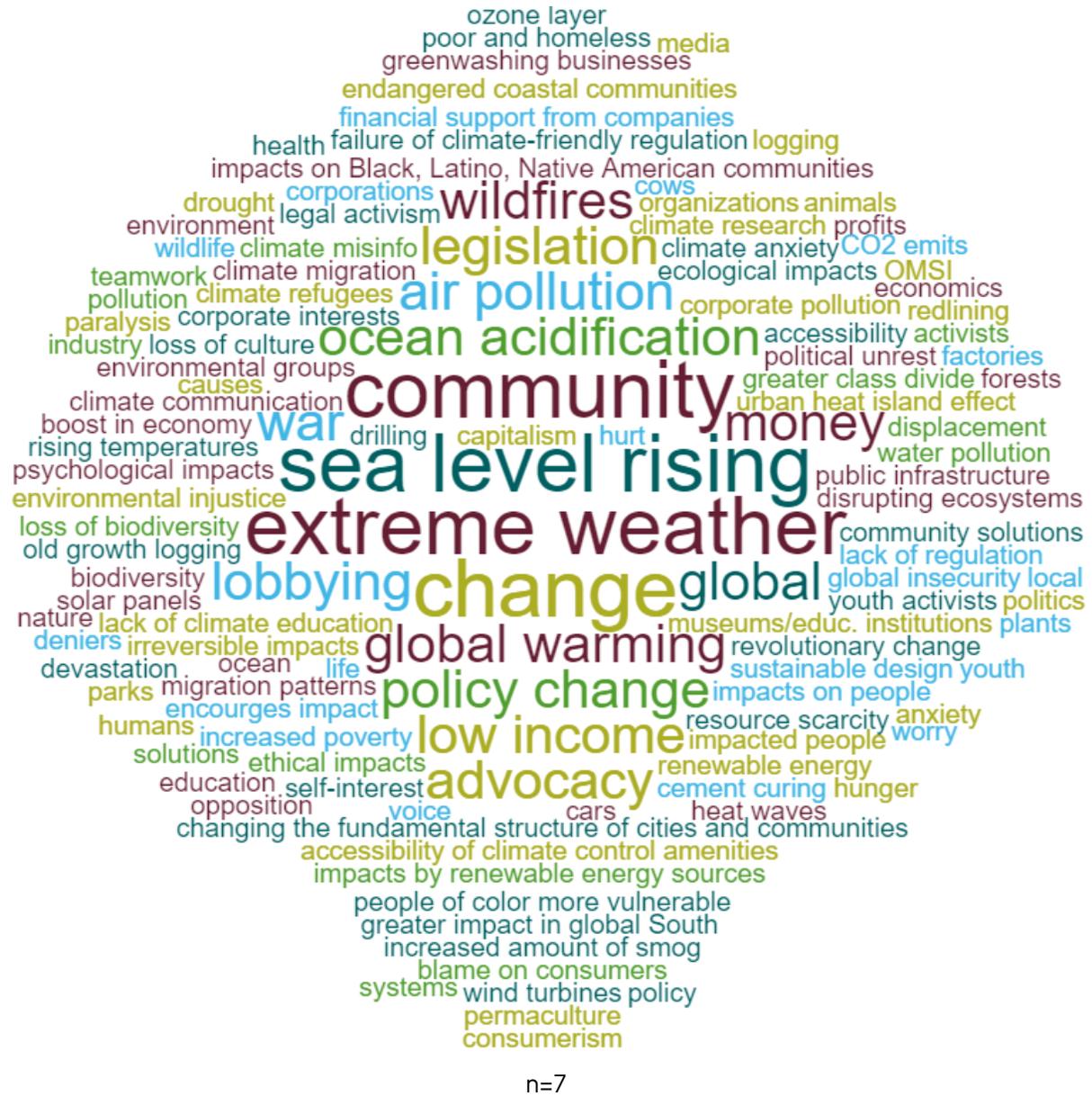


Figure 33. Post school session 2021–2022–word cloud of concept map words

Phase 2 word cloud shows that word count (137 unique words) did not increase substantially from Phase 1 post-summer (128). Words in this phase’s word cloud did, however, differ, being more specific, as described above, when compared with Phase 1 pre-summer phase word clouds.

Phase 3: impact on the program participants

Climate action ecosystem/network connections

The data below correspond to the concept maps revised and updated by each youth during the evaluation session in Phase 3. Unlike previous phases, in this phase, youth revised and edited their latest individual maps by adding or deleting connections and nodes.

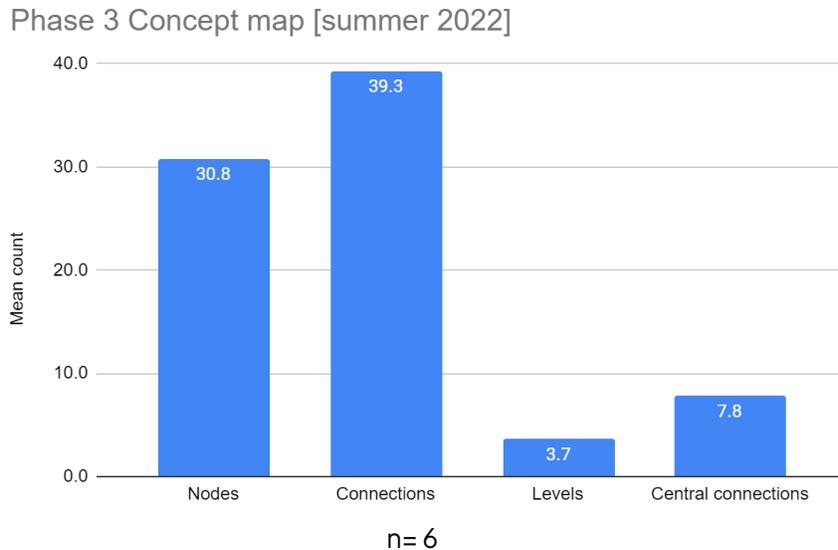


Figure 34. Phase 3—Influencing: post-summer concept map components

The mean counts for nodes was 30.8 with a standard deviation of 13.2; connections had a mean of 39.3 and a standard deviation of 14. The levels had a mean of 3.7 and a standard deviation of 1.4, and central connections had a mean of 7.8 and a standard deviation of 3.9.

Overall, this phase's mean counts of the nodes and connections were higher than in the previous phases' concept maps. The means for levels and central connections were in the range of prior Phase's maps. This shows that while the maps did not increase layers, the maps did show an increase in the number of ideas/concepts of a climate action ecosystem elicited in the program participants.

YARB climate action ecosystem/network connections-word clouds

In this Phase 3 YARB word cloud, a total of 181 words were counted, including words repeated, 28 new words were added, and 2 words were deleted from the maps.

Continuing with the trend in Phases 1 and 2, the Phase 3 concept maps included broad topics that ranged from environmental issues to social themes. Environmental themes that

were prevalent in the concept map, include causes of environmental issues such as logging, heat waves, and ocean acidification. They also included impacts of climate change such as wildfires, sea levels rising, and air pollution (Figure 35). Social emergent themes from the concept map include themes around social and policy issues such as community, policy, legislation, education, and advocacy.



n=6

Figure 35. Phase 3—Influencing: post-summer 2022 programming word cloud of concept map words

Discussion

The overarching focus of this report was to present the findings of the evaluation in relation to the progress and improvement of the YLTW program in supporting program participants' skills and knowledge that aligned with the YLTW project and the youth's priorities. Evaluators, in collaboration with project team members from the research and program strands, refined the evaluation approach and overarching questions through the evaluation phases. The evaluation questions are summarized by phase in Table 3; the questions had little overlap across phases, but the four that are repeated are presented in bold text.

Table 3. Evaluation questions per phase and topic

	Phase 1: Learning- Initial framework	Phase 2: Focusing- Initial framework and elements related to empowerment	Phase 3: Influencing- Elements related to empowerment
Program participants	<p>How did participating in the YLTW program increase youth's:</p> <ul style="list-style-type: none"> -Collaboration skills? -Research and related STEAM (science, technology, engineering, art, and math) career skills? -Confidence as STEAM content communicators? <p>In what ways has the program participants' perception of climate action ecosystem/ network connections changed as a result of the program activities?</p>	<p>How did participating in the YLTW program:</p> <ul style="list-style-type: none"> -Increase youth's collaboration, communication skills, and research skills? -Impact youth's decision making skills and sharing responsibility? -Impact youth's confidence in networking with climate action organizations? -impact youth's sense of leadership? <p>In what ways has the program participants' perception of climate action ecosystem/ network connections changed as a result of the program activities?</p>	<p>How did the YLTW program activities contribute to or present barriers to youth's:</p> <ul style="list-style-type: none"> -Engagement? -Sense of agency? -Perception in their ability to influence the program? <p>In what ways has the program participants' perception of climate action ecosystem/ network connections changed as a result of the program activities?</p>
ISE Staff	To what extent and in what ways do ISE staff working with the YLTW program report an	N/A	N/A

	increase in self-efficacy related to youth researcher/advisor collaboration?		
--	------------------------------------------------------------------------------	--	--

The data collected and analyzed through this evaluation were intended to answer questions related to specific skills and knowledge in an effort to inform the research strand and improvements to the program. The evaluation relied on methods of self-report and utilized interviews, focus groups, online surveys, and concept maps in each phase.

It is important to note that while the skills originally identified as priorities, such as communication, collaboration and research, were not studied specifically in every phase of the evaluation, they were fostered throughout the span of the program and activities, and overlapped with other skills and elements that were prioritized as the program progressed.

Interpretations by phase and topic

Given the process evaluation approach of this work, topics for each evaluation phase varied according to the project team and youth priorities; therefore, results are not comparable. The findings in this section are organized by evaluation phase and relevant topics. The topic of each phase refers to skills or elements that were part of the evaluation overarching questions in each phase (Table 3).

Initial program framework: confidence in collaboration, communication, and research skills

Phase 1: Learning included frequent training and onboarding for the YARB members. Skills such as confidence in collaboration, communication, and research were prioritized to foster for the program participants and ISE staff in Phase 1 by the project team.

Evidence from participants' responses suggests that the program had a positive influence on the collaboration skills for both YARB members and some of the ISE staff. The YLTW program activities fostered opportunities for program participants to feel confident collaborating when solving problems with their peers in the creation and iterative improvement of their climate stories. ISE staff did not report increases in confidence when collaborating with youth because they felt they were already equipped with those skills. However, the majority of ISE Staff noted they would feel more confident in future opportunities of collaboration with youth.

Although most of the program participants had previous experience and exposure with communication skills, research, and STEAM careers, the program activities provided youth with opportunities to gain hands-on experience and incorporate these skills in a more nuanced way than previous experiences. Evidence from youth responses highlighted the value of the research in their climate stories and the ability to communicate complex topics in digestible ways for broader audiences.

Overall, evidence suggested the YLTW program was successful at fostering collaboration and communication skills in youth. Findings from this phase supported the program staff at seeing the value and encouraging YARB members to iterate and present their stories at museum events and a local venue in the following phase. Overall, ISE staff however, did not report any change in their communication and collaboration skills. ISE staff perceptions about the YLTW program model empowering youth and being used in other museums were positive. On the contrary, ISE staff perceptions of the YLTW program model as a vehicle to empower communities and the public was uncertain as these participants were not aware of these opportunities through the program. Furthermore, evidence from the ISE staff suggested the need for the program to find ways in which youth could network and present their stories in other venues than OMSI as a way to empower the public.

At the end of Phase 1, and as result of the evidence presented through the evaluation, project team members suggested the evaluation for Phase 2 shift to focus on additional measures since the skills in this phase seemed to be elicited by the nature and activities of the program. The focus for Phase 2 also shifted to evaluate the program by only including youth participants and no ISE staff.

Initial framework and empowerment elements

In Phase 2:Focusing, the evaluation staff continued to gather evidence of the originally measured skills (collaboration, research, and communication) as well as elements influenced by empowerment theories (e.g. responsibility, networking, leadership). Responses from program participants suggested that the program contributed to fostering and building confidence in collaboration, research and communication which were the original skills carried from Phase 1. In the second phase, program activities contributed to the program participants' perception of the value of research skills such as primary and secondary data collection.

Elements related to the empowerment theories such as decision making, sharing responsibility, networking, and leadership were explored for the first time in Phase 2. Program participants' responses suggest that elements related to empowerment theories

overlap with communication, collaboration, and leadership skills that were part of the initial framework explored in Phase 1. Evidence from the youth responses in the group interview hinted that the skills of communication and collaboration seem to be easily elicited by the nature of the program and activities in which youth had to create sub-groups to develop climate stories or address activities (such as demos or advisory projects) in small groups. Although the research skills provided through the activities and as a part of mentoring were valuable, many youth expressed they were not cohesively incorporated in the program in a way to guide the climate stories and deliverables.

Program participants' responses suggest that elements related to empowerment theories tend to be nuanced and dependant on the context, whether a situation involved other youth or adults, and the particular role they might be in. For example, program participants' responses regarding elements such as sharing responsibility and leadership suggest that they are not distinct constructs and incorporate skills such as collaboration and communication. Roles the youth played throughout the program were not static and were influenced by the program participants' project needs. For example, when working on climate stories, decision making varied depending on which youth had more availability or expertise in certain areas. When working with other youth, responsibility and leadership shifted among youth through the program depending on the situation and activity, while when working with adults, there were expectations that OMSI staff had leadership roles as mentors and guides. Responses suggest that the program participants were interested in activities that could support increased confidence and interest in networking; however, no evidence surfaced that networking skills were impacted by the program activities.

Evidence from this report was used to inform planning sessions with research, program, and evaluation staff to articulate goals and deliverables to be elicited through the YLTW program for the summer of 2022. This was an effort to incorporate future program activities that support elements of empowerment theories such as youth agency and engagement. One of the deliverables that emerged from this planning culminated in the *Youth Lead the Way: A guide for working with youth* (OMSI, YouthCARE, 2023). This deliverable provided an opportunity for the youth to take leadership over a deliverable and to communicate more widely their thoughts and ideas on collaboration.

Engagement, sense of agency, and empowerment

In Phase 3: Influencing, the focus shifted to elements informed by empowerment theories that could be fostered by program activities during the summer of 2022. These elements included youth engagement, sense of agency, and the ability to influence the program (empowerment). Responses from program participants suggest that, in some instances, the program activities were successful at fostering engagement, agency, and

empowerment while there was still plenty of room to improve; barriers for fostering these skills also existed through the program activities in this phase.

Evidence from the youth responses hinted that there was some relationship between the skills of engagement, agency, and empowerment. Youth mentioned that both engagement and agency could be fostered through programmatic management activities such as the deliverable of “*Youth Lead the Way: A guide for working with youth* (OMSI, YouthCARE, 2023), in which youth decided for themselves the topics and the content of that guide. In this regard, these activities not only provided clear structure, goals, and milestones, but also incorporated youth input and were embedded in activities that supported team building and relationships among youth. Similarly, agency and empowerment seemed to relate to each other; program participants’ responses suggest that agency seemed to be key in fostering a sense of empowerment in them. Activities that fostered both agency and empowerment allowed program participants the freedom to choose their goals and lead projects through a shared understanding of expectations with program staff. Youth felt empowered when they were able to see that they had made contributions to OMSI and the community through their climate projects for the youth guide.

Evidence from this phase informed content for the YLTW Professional Development (PD) workshop that was conducted with the Ithaca ScienceCenter in May 2023. Evidence such as setting expectations and giving room for youth to articulate their goals and milestones was used as rationale to create best practices when working with programs that aim to incorporate youth input.

Climate action ecosystem/network connections

As the program progressed, program participants’ concept map nodes and connections increased and became more complex. Through each evaluation phase there was an increase in the number of ideas/concepts in the vision of the climate action ecosystem elicited in the program participants. Word clouds generally increased and changed from generic issues to specific topics or political and environmental issues. Program participants’ perceptions of the climate action ecosystem might have been influenced by the training and exposure through the program in which youth had to conduct research about their climate stories, learn about and engage with climate change organizations, and coordinate advisory projects and presentations.

Table 4. Summary of interpretation per phase and topic

	Phase 1: Learning- Initial framework	Phase 2: Focusing - Initial framework and elements related to empowerment	Phase 3: Influencing- Elements related to empowerment	Climate action ecosystem/network connections*
Program participants	The youth reported that the YLTW program fostered collaboration skills and provided first-hand experience in research and communication skills for program participants.	Evidence from program participants suggest that the program fostered skills from the initial framework and that elements related to empowerment theories and skills tend to be nuanced depending on the context and whether youth considered other youth or adults in their dynamics.	Empowerment related elements and skills such as engagement, agency and empowerment were supported by the YLTW program. Program participants reported they felt empowered when they saw they could make contributions to OMSI.	Evidence from the program participants suggest an increase in the number of ideas/concepts in the vision of the climate action ecosystem.
ISE Staff	ISE staff perceptions suggest that this program could empower youth, and could be used in other museums. ISE staff already feel confident about communicating and collaborating with youth.	N/A	N/A	

*Climate action/network connections span across the three phases

Evaluation findings from each phase influenced the YLTW program plans and activities in the subsequent phases. Evidence from the Phase 1, were incorporated in the planning and activities for the Phase 2. Since the initial framework skills seemed to be fostered by the nature of the program activities, the focus shifted to include not only the initial framework skills, but to also consider other skills and elements related to empowerment theories. Evidence from Phase 2, informed the program activities and focus towards being intentional about incorporating youth input and fostering a sense of engagement, agency, and empowerment in youth. Phase 3 findings were included in the professional development workshop content by providing actionable ideas of ways in which other museums could incorporate youth input in their programs.

Implications for practitioners

A YARB can provide a novel approach and opportunities for both youth and science centers. Informed by evidence from this process evaluation, OMSI's Youth Lead the Way program evolved responsively to youth input. The evidence gathered through this evaluation suggests the innovative YLTW program was an empowering experience for youth that exercised professional collaboration, communication, and research skills on complex societal issues at leadership levels.

Programs and educational interventions aimed at eliciting skills and providing opportunities for youth through YARBs could be successful at fostering first hand experiences that support youth confidence in various skills and in developing their own projects. As noticed in the results section (Phase 1), programs aimed at youth could scaffold and provide opportunities for them to apply research and communication skills into concrete projects and activities in ways that could be meaningful for youth and the public. Furthermore, program activities, training, and expected deliverables could support youth in developing a more nuanced approach to specific societal issues as observed from the concept map results and findings. Elements related to empowerment theories and skills such as engagement, agency, and empowerment could be elicited in program participants through program activities that articulate clear goals and milestones in which youth can feel they can make meaningful contributions to the organization in which they are positioned as a YARB.

Overall, responses from YARB members suggest that future programs would benefit from exploring elements related to empowerment theories and skills that are built around shared understandings of staff and youth in setting goals, deliverables, and milestones as seen in the results in Phase 3.

Future evaluation efforts aimed to track progress and areas for improvement to programs would benefit from using qualitative methods and implementing ways youth input can be incorporated in the collection and analysis of the data. Furthermore, evaluation questions should ask about the meaning and definitions youth have regarding elements related to empowerment theories. For example, asking youth to define with their own words what agency is for them could yield responses to allow program staff to have a shared understanding of that construct's meaning, but also ways in which ISE staff could incorporate activities that foster this construct.

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Appendix A: Evaluation Plan Table

Evaluation Objectives	Evaluation Participants	Evaluation Questions	Evaluation Methods	Anticipated Evaluation Products
Focus on Youth Lead the Way program				
Track progress and support the development of the Youth Lead the Way program.	a) Youth participating in the YLTW program b) Science center staff working with the YARB participants and on this project.	(a1) To what extent and in what ways do youth participating in the YLTW program report increases in collaboration skills? (a2) To what extent and in what ways do youth participating in the YLTW program report increases in research and related STEAM career skills? (a3) To what extent and in what ways do youth participating in the YLTW program report increases in confidence as STEAM content communicators? (b1) To what extent and in what ways do ISE staff working with the program participants report increases in self-efficacy related to youth researcher/advisor collaboration?	Process evaluation (surveys and interviews) conducted by OMSI evaluation staff	Findings from the process evaluation will be presented in periodic reports to the project team, including the program participants and advisors, and will inform ongoing improvement of project activities; Evaluation findings will also be included in a final summative report to be provided to project participants, community stakeholders, NSF, and the public through InformalScience.org and the Youth Lead the Way website, with dissemination through listservs, professional networks.

Appendix B: Parent/Guardian and YARB Member Research and Evaluation Consent and Assent Letter and Form

Dear Guardian,

As you may know, a youth under your care has signed up to collaborate with the Oregon Museum of Science and Industry (OMSI) on the National Science Foundation-funded project Youth Lead the Way: A Youth Advisory Research Board Model for Climate Impact Education. Together, OMSI and youth will work to empower informal science education (ISE) institutions, community partners, and the public to engage more effectively in science-based collective action in response to climate change. We are thrilled about this wonderful opportunity to have youth serve as climate action advisors, researchers, and educators at OMSI.

As part of this project, researchers and evaluators from the OMSI will be collecting information from the general audience and collaborating with youth periodically, in order to understand the impact of the activities. The purpose of this letter is to inform you about the project and to ask you for your permission to include your youth in related research and evaluation activities as outlined in the job description for the position they have accepted. If you decide to allow your youth to participate, your youth will be asked to talk to researchers and evaluators about their experiences as collaborating youth. We plan to conduct observations, interviews, distribute questionnaires, and/or conduct a focus group with collaborating youth.

Risks/Discomforts

Some information collected may identify your youth (such as names, audio, or video images). If being recorded, your youth could lose some privacy. Other than this risk, there are no known additional risks for participating. Please review the attached photo/video release form to provide or decline consent for us to take video or photos of your youth. Your youth's name will not be associated with any research and evaluation reports or publications.

Benefits

Your youth may feel empowered by helping OMSI understand better the impact of the Youth Advisory Research Board. Your youth may see how their input contributes to improved programs.

Confidentiality

We will keep your youth's data confidential to the fullest extent allowable by law. To do this, we will keep identifiable hard copy data in locked file cabinets and on secure servers that only qualified project staff can access, and will retain all electronic data (e.g., electronic survey responses) on secure servers to which only qualified project staff have access. The ethics board that reviewed this study may also have access to records for auditing purposes.

Rights

You and your youth are not required to participate in the project's research and evaluation activities. If you give consent and your youth doesn't want to participate, your youth will not be required to

take part. If your youth does not participate in the studies, he/she/they will still be able to participate in this project, although their total number of hours for participation will substantially decrease. Even if you provide consent for your youth to participate now, you may decide at any later point to withdraw your permission. Participation is voluntary. You and your youth can refuse or discontinue participation at any time without penalty or loss of benefits, aside from the decrease in assigned project hours as noted above.

Questions

If you have any questions regarding this study, please contact (OMSI staff name), the principal investigator, at (phone number) or (email), (OMSI staff name), the project’s lead researcher, at (phone number) or (email), or (OMSI staff name), the project’s lead evaluator, at (phone number) or (email). If you have complaints or questions about your rights, you may also contact (organization name) Institutional Review Board - (phone number) - (email).

Please indicate whether or not you give permission for your youth to participate in the Youth Lead the Way project research and evaluation by you and your youth signing and returning this letter. You have been given two copies of this Informed Consent. Please sign both copies and retain one copy for your files. If you have any questions or concerns please feel free to contact us. Your youth’s participation in this project’s research and evaluation activities is important and deeply valued, and we will gladly discuss any questions or concerns you may have in order to ensure that their voice and experiences can be included in improving OMSI’s programs and educational offerings.

Sincerely,

(OMSI evaluation and research staff names)

Please return this form by:

Youth’s Name: _____

_____ Yes, I give permission for my youth to participate in research and evaluation activities as part of the Youth Lead the Way project. I understand I may withdraw my permission for participation in this project at any time with no penalty to my youth or myself.

_____ No, I do not give permission for my youth to participate in research and evaluation activities as part of the Youth Lead the Way project.

Your signature does not waive any legal right. If you agree, please sign this form.

I am 18 years of age or older and agree to allow my youth to participate in these evaluation procedures.

Parent/Guardian Signature: _____ Date: _____

Youth Assent: I understand that my parent(s) have given permission for me to participate in this project's research and evaluation activities. I can still decide whether or not to participate in these activities throughout the project. I can ask any questions I may have and the OMSI staff will help me understand what I'm supposed to do. By signing below, I agree to be a part of this study.

Youth Signature: _____ Date: _____

This project has been reviewed and approved by (name) Institutional Review Board. Questions concerning your rights as a participant in this research may be addressed to: (Ph. number)-(email).

Appendix C: YARB Consent Form (for youth who were 18 or older)

Purpose

As part of the NSF-funded Youth Lead the Way project, the Oregon Museum of Science and Industry (OMSI) will be working with local youth to establish a Youth Advisory Research Board (YARB) that promotes youth leadership in climate impact education. Through this project, youth, including yourself, will work in small teams to plan and conduct research on local climate change impacts and will develop interactive educational products designed to engage public audiences on these impacts. Additionally, via their advisory positions at OMSI, youth will guide the activities and policies of the museum and other partnering institutions.

This project builds knowledge for the field through an exploratory research study assessing the factors of the YARB model that contribute to desired impacts related to youth engagement, climate impact education, and ISE professional development. In your role as a staff in this project, you are being asked to talk to researchers and evaluators about your experiences in the YARB. The research and evaluation teams plan to conduct observations, interviews, distribute questionnaires, and/or conduct a focus group with collaborating youth.

Procedures

If you decide to participate in the study, we will ask you to participate in an interview with OMSI researchers and evaluators, fill in questionnaires, and/or participate in focus group sessions. Interviews and/or questionnaires will take an estimated 10–15 minutes. In the case that a focus group is conducted, the session would not be longer than two hours.

Notes will be taken for interviews and focus group studies. The interviews and/or the focus group may also be video or audio recorded.

Risks/ Discomforts

You may feel compelled to participate in the study against your own wishes due to the fact that the project is related to your place of employment. Additionally, there is a slight risk of privacy invasion and/or loss of confidentiality. Any audio or video recording may further contribute to your sense of privacy invasion and loss of confidentiality. Please know that your participation in this research study is completely voluntary and will in no way affect your employment or participation on the project. You are free to terminate participation at any time without penalty and without impact on your participation in the project.

Confidentiality

We will keep your data confidential to the fullest extent possible. To do this, we will keep your data in locked file cabinets and on secure servers that only qualified project staff can access. Although we may use your names to identify you and your responses, we will not share your names in evaluation reports or other publications.

Benefits

You may benefit by helping us have a better understanding of researcher/advisor recruitment, our developed YARB model, and collaboration needs to support local climate impact education

projects. This understanding will help us establish a successful model that can be replicated in other places to elevate the voices of youth like yourself interested in climate change education.

Questions

If you have any questions regarding this study, please contact (name) I, the principal investigator, at (contact information: phone and email), (name), the project’s lead researcher, at (contact information: phone and email), or (name), the project’s lead evaluator, at (contact information: phone and email),. If you have complaints or questions about your rights, you may also contact Heartland Institutional Review Board - 866.618.HIRB - director@heartlandirb.org.

AGREEMENT TO PARTICIPATE

Your signature does not waive any legal right. If you agree, please sign this form. A copy will be given to you for your records.

I agree to participate in this research study.

Participant Signature: _____ Date: _____

Appendix D: Youth Photo/Video Release form

By signing this photo/video release, I give the Oregon Museum of Science and Industry (OMSI) the right to take and use photographs and video footage of the young Youth Lead the Way participant who is under my care. I agree the photos and images are the sole property of OMSI and waive any right of prior approval of using the photograph(s) and image(s) for the purposes listed below. I understand that OMSI is not compensating me for the use of the photos or images. I freely agree to these terms. I understand that by agreeing to have the youth's photos and videos used for these specific purposes, they may also be placed on the Internet or sent over the Internet, but only for the uses for which I expressly gave permission.

I give my permission to have my youth's photo(s) and images used for the following purposes:

Initial

_____ For program research and evaluation

_____ For use in presentations at educational conferences and workshops

_____ For promotional purposes

Name of participant: Age:

Signature: _____
(of parent or guardian if participant is under 18) Date

Name of parent/guardian: _____

Address: _____
City State Zip

Phone number: _____ Email: _____

Appendix E: Phase 1 - YARB Survey Form (Pre-summer)

Name:

Date:

Thank you for agreeing to fill this survey form out. We want to know how previous experiences have impacted you, including how you view yourself. Answering these questions is voluntary and you can stop anytime. If you decline or stop, that will have no influence on your relationship with OMSI or your YARB membership, but your responses are deeply appreciated and will help us to learn about and improve the YLTW program in the future.

Your response is anonymous and the survey takes only a few minutes of your time. Throughout this survey you will see the acronym STEAM used, which stands for Science, Technology, Engineering, Art, and/or Math.

1. It is important to know one's own strengths and weaknesses. Use this table to think about how likely you are to complete these tasks with confidence.

How confident do you feel about your ability to...	NOT confident at all	Mostly NOT confident	Slightly NOT confident	Slightly confident	Mostly confident	Completely confident
a. collaborate with youth who you know well						
b. collaborate with youth that you don't know						
c. work as part of a team						
d. talk to people you don't know						
e. collaborate with adults						
f. solve problems with others						

2. Please tell us about your experience collaborating with others.

3. For each question below, choose the answer that describes how strongly you agree with each statement.

Tell us about your interest in STEAM career skills.	Strongly Disagree	Disagree	Somewhat Disagree	Somewhat Agree	Agree	Strongly Agree
a) I am interested in science.						
b) I have the ability to conduct research.						
c) I have the ability to think critically.						
d) I have the ability to understand science.						
e) I have the ability to understand climate science.						
f) I feel confident when I talk about climate science.						
g) I am aware of possible STEAM career paths						
f) I am good at making connections with others						
f) I am connected to my local community						

4. Please tell us about your knowledge of research and related STEAM career skills.

5. For each question below, choose the answer that best completes the sentences.

When communicating an idea or concept...	Never	Rarely (<10% of the time)	Occasionally (about 30% of the time)	Sometimes (about half the time)	Frequently (about 70% of the time)	Usually (about 90% of the time)	Always	Not Applicable
a) I feel confident in my ability to give a presentation to the public								
b) I feel confident in my ability to be understood								
c) I can help people learn something new								
d) I feel confident in my ability to talk about complex topics								
e) I can speak to people of many ages								

6. Please tell us about your experience as a STEAM content communicator.

Thank you for your feedback! 😊

Appendix F: Phase 1 - YLTW Program Survey Form (Post-summer)

Date: __

Thank you for agreeing to fill this survey form out. We want to know how the Youth CARE experience has impacted you, including how it has changed you or how you view yourself. Answering these questions is your choice and you can stop anytime. If you decline or stop, that will have no influence on your relationship with OMSI or your Youth CARE membership, but your responses are deeply appreciated and will help us to learn about and improve the Youth CARE program in the future. Your response is anonymous, we won't know who says what, and the survey takes only a few minutes of your time. Throughout this survey you will see the acronym **STEAM** used, which stands for Science, Technology, Engineering, Art, and/or Math.

1. *It is important to know one's own strengths and weaknesses. Use this table to think about how likely you are to complete these tasks with confidence.*

<i>How confident do you feel about your ability to...</i>	NOT confident at all	Mostly NOT confident	Slightly NOT confident	Slightly confident	Mostly confident	Completely confident
a. Work with youth who you know well						
b. Work with youth that you don't know						
c. Work as part of a team						
d. Talk to people you don't know						
e. Work with adults						
f. Solve problems with others						

2. Please tell us about a recent experience collaborating or working with others.

3. For each question below, choose the answer that describes how strongly you agree with each statement.

Participating in the Youth CARE and/or the climate science trainings...	Strongly Disagree	Disagree	Somewhat Disagree	Somewhat Agree	Agree	Strongly Agree
a) Increased my interest in science.						
b) Increased my ability to conduct research.						
c) Increased my ability to think critically.						
d) Increased my ability to understand science.						
e) Increased my ability to understand climate science.						
f) Made me feel more confident when I talk about climate science.						
g) Made me think differently about possible STEAM career paths.						
h) Helped make new connections with others						
i) Helped me connect to my local community						

4. Please tell us *In what ways has this program increased your research and related STEAM (Science, Technology, Engineering, Art, and/or Math) career skills?*

5. For each question below, choose the answer that best describes your communication skills.

When talking about an idea or concept...	Never	Rarely (<10% of the time)	Occasionally (about 30% of the time)	Sometimes (about half the time)	Frequently (about 70% of the time)	Usually (about 90% of the time)	Always
a) I feel confident in my ability to give a presentation to the public							
b) I feel confident in my ability to be understood							
c) My audience learns something new							
d) I feel confident in my ability to talk about science							
e) I am comfortable speaking to people of all ages							

6. Please tell us *In what ways the Youth CARE program changed the way you think about your confidence as a STEAM (Science, Technology, Engineering, Art, and/or Math) content communicator?*

Thank you for your feedback! 😊

Appendix G: Phase 1 – OMSI Staff/Volunteer Survey Form (Post-summer)

Thank you for being a part of the Youth Lead the Way Youth CARE trainings. We want to know how the Youth CARE experience has impacted you, including how it has changed you or how you view yourself. Answering these questions is voluntary and you can stop anytime. If you decline or stop, that will have no influence on your employment or relationship with OMSI. Your responses are deeply appreciated and will help us to learn about and improve the Youth CARE program in the future. Your response is anonymous and the survey takes only a few minutes of your time.

Approximately how many hours did you spend with Youth CARE members? _____

For each question below, choose the answer that describes how strongly you agree with each statement.

1. <i>Regarding the communication and collaboration with youth collaborators...</i>	Strongly Disagree	Disagree	Somewhat Disagree	Somewhat Agree	Agree	Strongly Agree	Does not apply / I don't know
b) I could communicate well with the youth							
d) My confidence <i>communicating</i> with youth increased as a result of my Youth CARE experience							
e) My confidence <i>collaborating</i> with youth increased as a result of my Youth CARE experience							
g) I feel the input I received from the Youth CARE members changed how I communicate							
h) I feel confident I can collaborate with youth in the future							
i) I feel I supported youth engagement through my work							
j) I feel I developed professionally in informal science education, even though I might not be an informal science educator							

3. In what ways, if at all, has participation in this program increased your skills communicating and collaborating with youth?

4. What challenges and/or obstacles did you encounter when communicating or collaborating with youth?

5. For each question below, choose the answer that describes how you agree with each statement. If you feel you did not have enough exposure to the Youth CARE team members to make this assessment, please select *IDK*

	Strongly Disagree	Disagree	Somewhat Disagree	Somewhat Agree	Agree	Strongly Agree	I don't know
a) The Youth CARE program has empowered youth and supported their communication, collaboration, and STEAM skills							
b) The YARB model has empowered community partners and the general public in responding more effectively to climate change							
c) I think the YARB model can be implemented at other museums effectively							

6. Reflecting on your experience with the YARB, in what ways do you feel the YARB model has been successful in empowering the following groups to engage more effectively in science-based collective action in response to climate change?

youth,

community partners

the public

Thank you for your feedback! ☺

Appendix H: Youth CARE Group Interview

This group interview shouldn't take longer than 20–30 minutes. I want to get to know you a little and ask you about five things: collaboration, STEAM careers, communication, decision making, and shared responsibilities.

Answering these questions is voluntary and you can stop anytime. Responses will be kept anonymous and no names will be attached in any report. Our goal is to learn how to inform and improve the YARB model.

1. Think about your collaboration skills, how you work with other people.
 - a. How, if at all, has the YARB changed how you feel about collaborating?
 - b. In what ways have you become better at collaboration? Worse? The same?
 - c. (probe: how do you feel you collaborate with other youth as a result of being in a YARB? With adults?)
2. You all conducted research to design your climate story. We are interested to know more about your skill doing research.
 - a. Do you feel your research skills have changed? In what ways? (if not, what would make it so they could change?)
 - b. Thinking about what you want to do in the future (everyday life or career), do you think this experience will be helpful? If so, How?
3. You have been communicating your *climate stories* with the general public (adults and peers).
 - a. How has the YARB experience influenced how confident you feel when communicating STEAM topics?
4. Let me ask you about decision making skills as individuals and within your groups.
 - a. How did you participate in decision making with your climate story group? How, if at all, has the YARB experience changed how you make decisions or how able you feel to do so?
 - b. What approaches do you take in decision making with youth? With adults? With your community?
5. Finally, Let me ask you about shared responsibility.
 - a. What was your role in sharing responsibilities with your climate story group?
 - b. How, if at all, has the YARB experience changed how you share responsibilities within the YARB and beyond? How do you negotiate sharing responsibilities with youth? With adults? With your community?
6. How confident do you feel in your ability to network with local climate action (or other) organizations because of the YARB experience? Reflecting on your experience with the YARB, how, if at all, do you feel your sense of leadership has changed?

Appendix I: Youth CARE Individual Interviews

v.8.16.22

Thank you for agreeing to participate in this interview. I would like to ask you about how the activities fostered by OMSI supported your sense of engagement, agency and your belief in influencing the structure and process of the second YARB (OMSI staff and the organization) version.

Answering these questions is voluntary and you can stop anytime. Responses will be kept anonymous and no names will be attached in any report. Our goal is to learn how to improve a Youth Advisory Research Board and youth experience in a museum—OMSI in this case.

This interview will be recorded for the purpose of capturing transcripts and using some quotes.

Prompt. Consider the program activities: advisory project, guide, climate story, networking

1) Please give me specific examples of activities or instances that fostered/ contributed to your engagement? What examples of barriers?

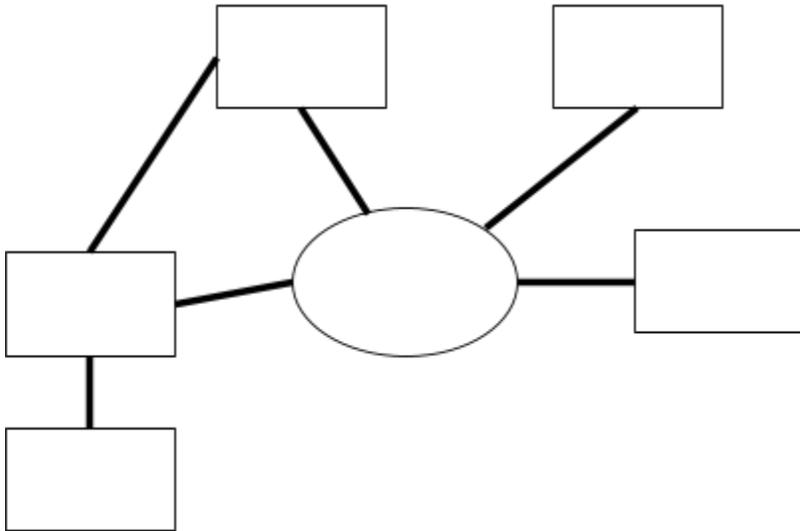
2) Please give me specific examples of activities or instances that fostered/ contributed to your sense of agency? What examples of barriers?

3) Please give me specific examples of activities or instances that fostered/ contributed to your belief that you were able to influence the structure and process of this second YARB? What examples of barriers? (prompt. Your input being taken into consideration)

Appendix J: Concept Map Diagrams and Parts

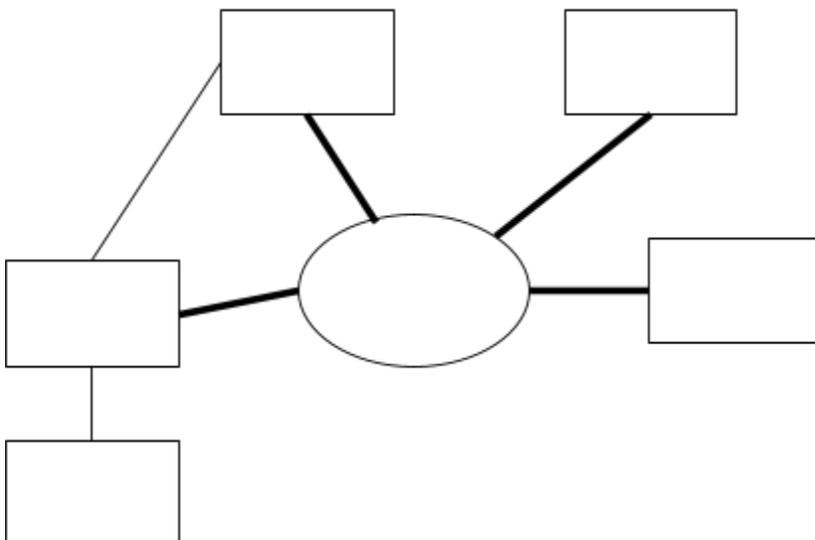
Below are the concept map diagrams with representations of their parts. Each of the parts or components was counted and means were run separately for each component (Bailey & Falk, 2016; Randol & Herrán, 2022).

Connections



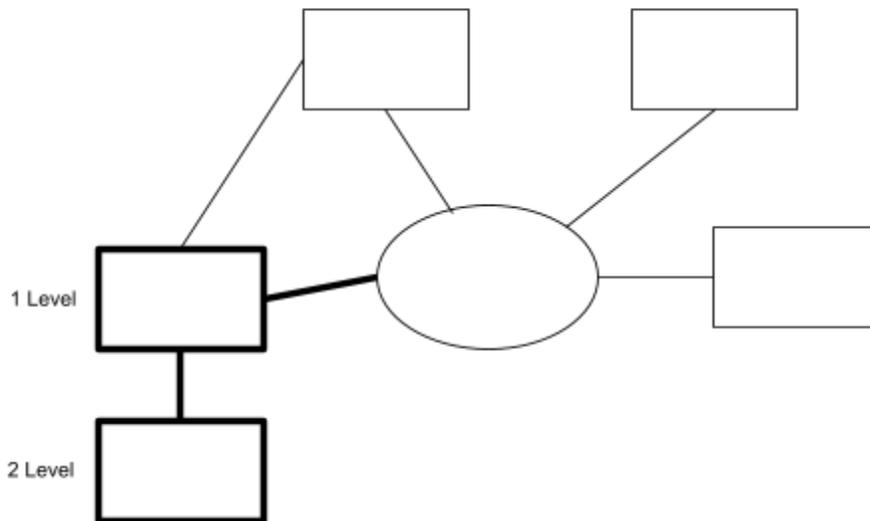
Connections are the lines that connect elements of the map such as ideas, concepts, or words.

Central Connections



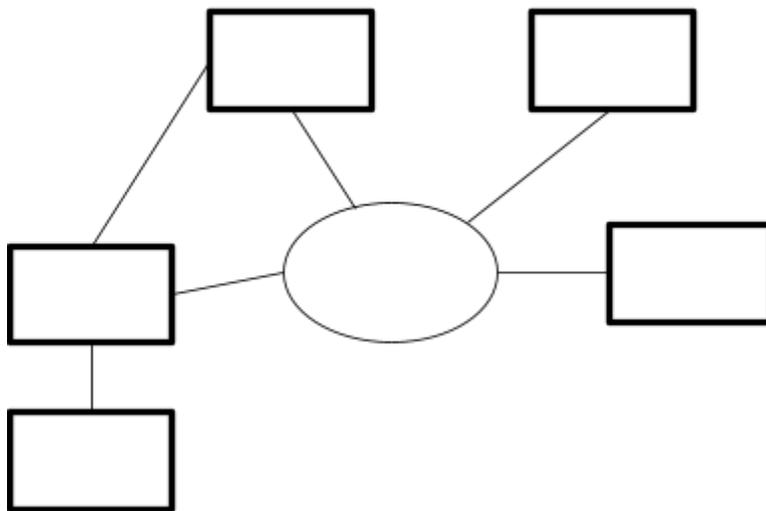
Central connections are lines that connect the central idea or concept with the nodes.

LEVELS



Levels are determined by the proximity or connections that nodes have to the central idea or concept.

NODES



Nodes are ideas or representations that connect with the central topic or main idea. These representations are usually contained in boxes or circles. Nodes might include people, organizations, sources of information, beliefs, activities or other elements associated with the central idea.

Appendix K: Concept Map Instrument

Youth CARE Personal Meaning Map

Instructions

Write down as many words, ideas, phrases or thoughts that come to your mind related to the phrase in the circle. Put each in a box with a line connecting it to the circle. Please make sure both boxes and lines are clear enough.

Your boxes might include people, organizations, sources of information, beliefs, activities, etc. that you associate with the prompt.

If certain boxes are related, draw lines between those to show connections.

Add linking words (causes, teaches, is part of, believes, knows, etc.) along the lines to explain relationships.

Name:

Date:

