



# HEAL Design Lab Annual Evaluation Report

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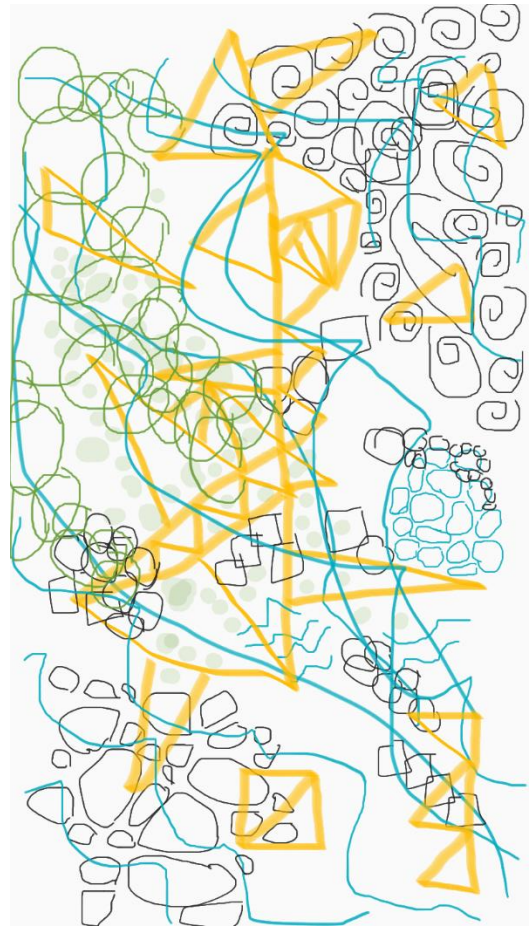


## Introduction

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Launched in 2018, the Health-sciences Education through Arts-based Learning (HEAL) partnership is an interdisciplinary collaboration of community stakeholders, Washington State University (WSU) researchers, and experts in arts-integrated STEM education and science communication. HEAL is developing an arts-based biomedical-science curriculum for use by children and their families in community organizations, such as after-school sites and libraries in Central Washington's ethnically diverse rural-agricultural regions. Intended for families with children in 3<sup>rd</sup> through 5<sup>th</sup> grades, the educational programs will include in-depth six-week curriculum modules, youth-led community engagement events, and portable take-home educational kits. Programs will use arts-integration strategies to bridge language divides, engage students and families in locally relevant systems-level health topics, and expose young learners to a diversity of biomedical science professions. Educational programs will also be accompanied by extensive capacity-building efforts that include professional development for community-based formal and informal educators through year-long, workshop, and job-embedded coaching designed to bolster educators' STEM teaching skills and self-efficacy.

This program evaluation project addresses Aim #2 of the HEAL NIH proposal, which focuses on the educator capacity building in rural-agricultural regions through professional development in arts-based health-science education. This program evaluation study provides formative feedback to the HEAL team in their development of their intervention and insight into the project's impact on participants. At the conclusion of this evaluation, it is expected that the HEAL team will have a better understanding of project impact as well as what components were successful and where further development is needed.



## Project Year Summary

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This program evaluation project focuses on the professional development arm of the intervention, the Design Lab, which began in July 2020 and ran to May 2021. The Design Lab began in the first months of the COVID-19 pandemic. The project was originally designed to be a hybrid intervention, meeting both in-person and online. The format was modified to accommodate public health orders and was held exclusively online.

From July 2020 through May 2021 there were 24 Design Lab sessions, each 90 minutes long, totaling 36 hours of professional learning. The Lab sessions included a variety of activities, including lectures, guest speakers, discussion, and visual art projects. The content was made up of science and visual art topics, including the fundamentals of viruses, visual literacy, cartography, systems thinking, and health equity.

In January 2021, participants were given the opportunity to select a module project to collaboratively develop. There were three options available: a science activity kit that families could use at home; *Cat & Mouse*, focused on toxoplasmosis; and, *HEALing COVID*, that teaches about COVID-19 from a systems approach. Each project team included at least one community educator as a member. Once the projects started, participants attended the Design Lab sessions as well as smaller project team meetings. Work on these projects extended beyond the May 2021 completion of the Design Lab and into summer 2021.

After an extensive recruiting process, nine community educators joined the HEAL project to participate in the Design Lab. Two of these educators withdrew at the beginning of the project and two more stepped away at the start of 2021 due to other commitments.

To date, the following activities have been undertaken as part of the evaluation:

July 2020 – May 2021

1. Attended weekly HEAL team meetings for project planning and to provide feedback.
2. Finalized evaluation tools and processes.
3. Conducted pre-program testing of participating community educators, including survey and performance assessment.
4. Conducted observations of Design Lab.
5. Conducted mid-year interviews with program participants in November.
6. Conducted post-program testing of participating community educators, including year-end interviews, survey, and performance assessment in May.

## Evaluation Methodology

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The evaluation was guided by the following five questions, developed with the HEAL project team, to focus the work at hand. They are:

1. To what extent do community educators understand the science content and STEAMM instruction as a result of their participation?
2. To what extent are community educators prepared to teach the science content using STEAMM instruction?
3. What is the feedback that the community educators have about the draft modules?
4. What do community educators identify as strengths of the professional development? What recommendations for improvement do they have?
5. To what extent and in what ways does the HEAL community educator professional development foster collaboration and networking among participants?

To address these questions, the evaluation project took the following steps to gather data and feedback during the 2020-21 project year.

- *A pre- and post-program survey* was administered to better understand project's impact on the participating educators' learning and attitudes.
- *Mid- and year-end interviews* were conducted with the participating educators using a semi-structured interview protocol.
- *A pre- and post-program performance assessment* was administered to gauge participants' applied understanding of the science and art integration content.
- *Observations* of the Design Lab sessions were conducted by the project evaluator and documented with field notes and video recordings.
- *Review of participant work products* was ongoing through the Lab to identify evidence of learning.

# Summary of Findings

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This section is organized by the evaluation questions guiding this study.

## To what extent do community educators understand the science content and STEAMM instruction as a result of their participation?

### Science Content

#### Viruses

Participants were asked about fundamental facts about viruses on the pre- and post-program surveys.

Among the response to these questions:

- 13% of the responses were incorrect about virus facts on the pre-program survey but were correct on the post.
- 47% were correct about virus facts on the pre-program survey but were incorrect on the post.
- 40% were correct about virus facts on both the pre- and post-program surveys.

One participant reflected that HEAL was an important source of information about viruses and zoonotic diseases. “[Before HEAL]I thought I knew science. But in reality, I had no idea that science was such a big, broad topic. I didn't realize how many zoonotic diseases there were. And how often they can occur, or how close in contact we are with so many different species that can lead up to a zoonotic disease.” Another participant enjoyed learning about “the process of how things work. Understanding how I get a virus, what my body does with the virus, what the virus does to my body. Understanding that things are very cyclical, especially when it comes to that zoonotic disease.”

#### Cells

Participants were asked about cells on the pre- and post-program surveys.

- 75% of the responses were correct on both the pre- and post-program surveys.
- 10% were correct on the post-program, but not on the pre-program survey.
- 5% were correct on the pre-program survey, but not the post-.
- 10% of the responses were incorrect on both the pre- and post- surveys.

Additionally,

- 100% correctly identified at least one difference between cells and viruses.
- 100% correctly identified how a virus gets into a cell.
- 80% correctly answered the question, “What happens to a cell after infection with a virus?”
- 60% correctly explained what is disease and what is an infection.
- 20% correctly answered the question, “Where do viruses come from?”

## Systems Thinking

Included in HEAL's goals for the Design Lab was building understand about *systems thinking*. This was touched on briefly in an August 2020 session with a discussion about *emergence* and then again in March with a collage activity about toxoplasmosis. With an ambitious project agenda, not every topic could be covered as deeply as initially intended. This concept was one that may have needed more time for participants to have a more complete understanding. Two of the four the participants who responded to the post-program survey questions about systems thinking were able to correctly define the term. (One participant was able to do so on the pre-program survey.)

In the post-program interviews the participants reported that they had not mastered the systems thinking concepts. A representative quote about this came from a participant who shared that "I feel like systems thinking is one thing I didn't fully grasp. I know we talked about it a lot, but I just I don't know why it just never really stuck. I feel like I feel like I need a little bit more with this." Another participant suggested that "doing more activities, or a little bit more variation in homework activities, [would help] to fully understand what system thinking is."

## Biomedical Careers

Like systems thinking, understanding biomedical career pathways was a part of the learning goals for the Design Lab. Biomedical careers were the focus of a session in November with guest speaker Dr. Ken Roberts of Washington State University, but did not come up again in detail in future Lab sessions. At the project's conclusion, participants reported needing more information. "I don't feel like we touched on career pathways as much as we could," reflected one participant. Another noted that "with the biomedical career pathways, I do feel comfortable teaching some, although not all, because I know there are some that I still don't know very well. Like science, there's so many biomedical careers, and pathways to go with it. I would want to know a little bit more before I'm able to teach it." That said, project participants were able to identify a greater range of biomedical careers on the post-program survey than on the pre-program survey. For example, on the pre-program survey, one participant included familiar careers such as doctor and nurse, but by the post-program survey, they expanded their list to include medical equipment designer and biomedical engineer.

## STEAMM Instruction

### Confidence in Teaching

Participants were asked about their confidence teaching science, visual art and using art integration on the pre- and post-program surveys.

	<b>More confident at end of program</b>	<b>No change</b>	<b>Less confident at end of program</b>
<i>Teaching science</i>	25%	<b>37%</b>	<b>38%</b>
<i>Using arts activities</i>	25%	12%	<b>63%</b>
<i>Integrating art and science</i>	25%	<b>75%</b>	--

During the year-end interviews, participants expressed confidence in teaching the science content, but with some caveats. One participant shared that “I feel okay [about teaching science], but I better have some great lesson plans and some notes.” Another echoed this, saying, “I definitely want like a fact sheet in front of me to make sure that everything that I thought I learned was correct.”

### Interest

Community educator interests began to develop in the first months of the program. During the November mid-year interviews, one participant reflected that “I definitely think I enjoy the art a lot, but the thing that is most interesting is that I like to be share what I've learn about the science.” Another participant echoed this in the fall, saying “the things we are looking at, I wouldn't have thought of. It has made me super interested in science and science that is happening right now and we can teach kids about. It has super-eye-opening and interesting. One participant reflected in the post-program interview that they had not experience a change in attitude, but an increase in “passion that thinking scientifically and thinking critically or creatively with art are important.”

The year-end survey results suggest that there may have been a plateau or slight drop off in interest by May. More survey respondents were less interested in teaching science in May than in the previous July.

	<b>More interested</b>	<b>No change</b>	<b>Less interested</b>
<i>Teaching science</i>	25%	25%	<b>50%</b>
<i>Using arts activities</i>	25%	<b>50%</b>	25%

## To what extent are community educators prepared to teach the science content using STEAMM instruction?

The Design Lab focus did not explicitly prepare the participants to teach the science content. However, three community educators, who were completing their teacher training, regularly made connections during full-group discussions between the Design Lab content and possible application with students. They regularly suggested adaptations or modifications of the Design Lab strategies and raised considerations for the classroom context. For example, during the discussion of Julia Marshall's "Five Ways to Integrate", an article that offered a variety of arts integration approaches, one educator noted that "I think we do these strategies without knowing it," and other educators expressed their agreement with this.

At the end of the project year, all of the interviewees felt ready to engage with STEAMM instruction. "Oh, yeah, I'm all over that," stated one participant. A second participant observed that "art is just a way of communicating and helping to strengthen whatever it is you're trying to teach, or learn. I learned that using art, we can express ourselves openly and actually make our expressions stronger." A third participant explained that this approach to instruction brought them to the project and sustained their interest. "I was already kind of in that mindset before I even started here. That's a big reason why I wanted to do the project was because I love the art aspect of it. I love incorporating different hand-on materials to learn something. So I definitely feel I would be able to incorporate art into anything science."

### Performance Assessment

Participants participated in a performance assessment prior to the start of the Design Lab in July 2020 and then again in May 2021. On the pre-program task, participants were asked to create and outline an integrated art and science lesson about enteric bacteria as a method to demonstrate their STEAMM knowledge and skills. For the post-assessment, participants repeated the lesson plan activity. This time they could amend the first version or create a new version. Four of the six remaining participants completed this assessment.

On both the pre- and post-assessments:

- the lessons produced by the participants heavily emphasized science. The visual art was secondary.
- the lessons incorporated very simple visual art materials and processes. Most could be done by children younger than ages 8-12, the target age for the project.



Participant 1 had three simple steps on their pre-assessment lesson plan. There was very little detail. Both art and science were represented in the lesson, but minimally. For the post-assessment, this participant reworked their first lesson plan, making it five times longer with greater detail and content. The May version included:

- Significantly more science content, including relevant discussion questions.
- More experiential activities for students.
- A better understanding of the art medium, how to use it, and how it could be integrated with the science content to communicate the lesson's 'big ideas'.
- Opportunities for student voice with a discussion to check for understanding, to ensure that students grasped the science content.

Participant 2's pre-assessment lesson plan was a multi-step activity that included science content and some simple art methods. The science content was vague. For the post-assessment, this participant created a new lesson plan with a new approach to art integration. The new lesson plan included:

- Extensive and relevant science vocabulary, which were not part of the first lesson plan.
- More detailed articulation of the science content.
- More experiential activities for students. The pre-assessment lesson plan was largely teacher-directed, whereas the post-version incorporated student 'choice and voice'.
- Strong alignment of art medium with science content to support student learning.
- Student voice with a discussion to check for understanding, to ensure that students grasped the science content.

Participant 3's pre-assessment lesson plan was a multi-step activity that included some broad science content and art methods. For the post-assessment, this participant created a new lesson plan with a new approach to art integration. The new lesson plan included:

- Extensive and relevant science vocabulary, which were not part of the first lesson plan.
- More detailed description of the art integration process.

Their May lesson plan however did not demonstrate an understanding of the science content or fully develop the connection between the science content and the art integration methods. The purpose of the art integration was not evident from the description.

Participant 4's pre-assessment was a clearly structured lesson plan that extensively included the science content and vocabulary. The activities described were experiential but did not use art integration. The pre-lesson also included opportunities for student voice, particularly in checking for understandings. For the post-assessment, this participant expanded on the original lesson by including

grade-level differentiation, simplifying the art activity for younger students, and adding some complexity for older students.

## What is the feedback that the community educators have about the draft modules?

During the mid-year interviews, the community educators expressed enthusiasm about starting the module projects. Community educators were asked about the module projects on the year-end survey and during the interview.

The survey respondents reported that the project experience was “helpful” or “very helpful” in learning more about zoonotic disease. One community educator shared that their university team members were “taking time to help me understand the disease and what it does.”

Two community educators wrote about how positive the experience had been. “I really enjoyed creating the projects with my team. I really enjoyed working with a team many times over working by myself on some projects.” Two other participants provided feedback about the projects’ timing. One community educator had hoped for more time to work on the project and another suggested that “the last quarter maybe should have been delayed until summer due to participants’ responsibilities at schools once they opened up. It would have been nice to finish strong with the whole team participating in the project/curriculum building.”

At the time of the interviews, participants offered several insights about their project experience to date.

- One group was able to identify the learning objectives but became overwhelmed by the number of possible options and the scope of the activities.
- The feedback from Judy Diamond and the teaching artist panel was helpful in focusing the work.
- One participant reflected that their group was not sure about how to teach the scope and sequence of science content. What do students need to learn to be ready for the big ideas in the kit?

## What do community educators identify as strengths of the professional development? What recommendations for improvement do they have?

### Strengths

Overall, the community educators were very positive about their HEAL experience. There were elements of the Design Lab about which the group was particularly enthusiastic.

### Guest Speakers

The guest speakers from Fall 2020 were noted in every mid-year interview as making positive contributions to the project. For some participants, these were the first working artists that they had met. Other participants found the guests' artistic work inspiring and motivated them in subsequent homework assignments.

### Modelling STEAMM instruction

The Design Lab used STEAMM instruction, modeling for participants the tools and techniques that might be applied with students. One participant recognized this. "I liked how we focused on specific things for each meeting. We would learn about one topic, like when we were talked about my favorite so far, toxoplasma. They introduced it, they kind of gave us some background on it. Then they showed us a map and had us also do a map. So it was an artistic piece. I think, in science, you have to do a lot of things step by step by step by step. And I like how, with each thing we're learning about, we took it step by step by step. And I think that's really helpful, especially again, because a lot of us are educators. And that's how kids learn really well is just doing things slowly. But taking it slower and doing it step by step was really helpful for me, because science hasn't always been my strong suit. I'm glad I was able to see that process."

### Structure

The participants appreciated both the large-group and small-group formats. One response that was representative of this perspective was, "working in a smaller group, you have more room to share your ideas and your opinion, and we can come to a consensus with just like three or four of us... But I definitely did enjoy a whole group, because then it helped you see different opinions and helped you connect your knowledge with other people."

## Recommendations

### Need for continued work on science content

The post-program survey findings suggested that the community educators needed more science content coverage. One participant spoke to this in the spring interviews. “The science petered off at the end, which is too bad, because I don't feel like we really dove into it as much as we would have liked. Like, we just really skimmed like, how the body reacts to viruses, and how the body specifically reacts to COVID. And they must have had a whole curriculum of other zoonotic diseases, I felt like we didn't get to learn about any of those other diseases as much, which are also going to continue to be around.”

### Homework

During the first months of the Design Lab, the project included out-of-session work (homework) including reading, watching videos, and artmaking. In November, the participants had a lot to say about the homework.

- Several participants struggled to find enough time to do the work. Some reported stopping their homework at two hours as per the agreement.
- There were differing perceptions about the homework expectations. Some participants felt they were clear and others did not.
- Several participants hoped for more time to discuss and reflect on the homework.
- One participant was unclear how the homework projects connected to each other.
- One participant recommended that the homework should ask what the activity would look like in a classroom and to sometimes incorporate the classroom setting.

The completion rate of the homework does not appear to be predictive of the participant's learning or retention in the project. There does not appear to be a relationship between completing the homework (or not) and demonstrating content knowledge and skills on the post-project assessment and survey.

### Materials

Participants were delighted to receive the generous box of art supplies at the start of the project. Some participants reported that they enjoyed experimenting with the materials throughout the year. However, not everyone used them to the fullest. One participant shared in the mid-year interview that “there are some materials I don't know how to use so I haven't.” Their materials languished for the remainder of the year.

### Time Commitment

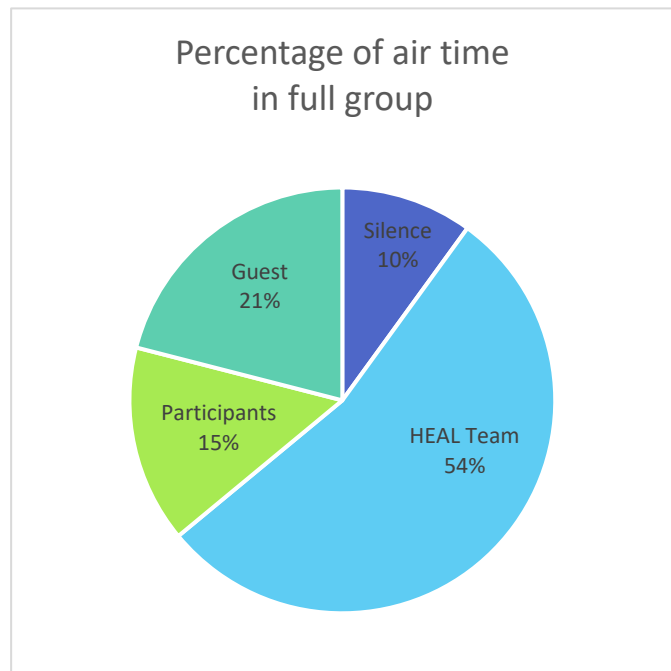
Once the projects started the time commitment of Lab, homework, and project became too much for some participants. Two stepped aside due to other time pressures.

## To what extent and in what ways does the HEAL community educator professional development foster collaboration and networking among participants?

A positive aspect of the Design Lab was the diverse backgrounds and expertise of the HEAL team and the community educators. Participants expressed a genuine interest in getting to know each other better. The breakout sessions contributed to participants' sense of community building. The social network analysis (page 22) suggests that the participants developed collegial relationships with each other over the project year.

The evaluation looked at *time equity* in the Design Lab sessions. The HEAL team has adopted this term to reference equitable access to 'air time' during the sessions as part of its participatory focus. This is built on the understanding that participation in the professional development sessions would foster collaboration and networking among the participants.

Typically, community educators primarily contributed to the full group discussion during the community-building activity at the start of each session. These were most often facilitated by a member of the HEAL university team. In the second half of the year, community educators facilitated these activities on two occasions. These activities typically generated a great deal of use of the chat function. The participants' primary use of the chat function during the Design Lab was to make connections with each other and the HEAL team. Through the chat they affirmed or complimented other participants or a HEAL team member as well as shared personal experiences and reflections.



## Additional findings

### Alignment of initial expectations and completion of project

On the pre-program survey, the participants' expectations for the project may be seen as useful predictors of their completion of the project. The more substance the participants expected from the project, the more likely they were to stay with the project. Those participants with more transactional mindsets did not complete the project, but those looking for outcomes that included themselves and students were most likely to complete the project.

	<b>Transactional</b>	<b>Transforming</b>	<b>Transformational</b>
<i>Description</i>	<i>Participants whose initial expectations fell in this category focused on making concrete gains, such as acquiring art materials or specific content knowledge.</i>	<i>These participants' expectations focused on being better able to serve youth in their communities.</i>	<i>These participants expected to focus on personal growth, collaboration with others, and being better able to serve youth.</i>
<i>Outcome</i>	These participants had sporadic participation and did not complete the project.	One participant in this category completed the project and one did not.	All the participants in this category completed the project.

## Discussion

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Overall, the community educators reported that they had a unique and meaningful learning experience. They completed the Design Lab with great enthusiasm for STEAMM instruction. Following are some reflections on the evaluation findings.

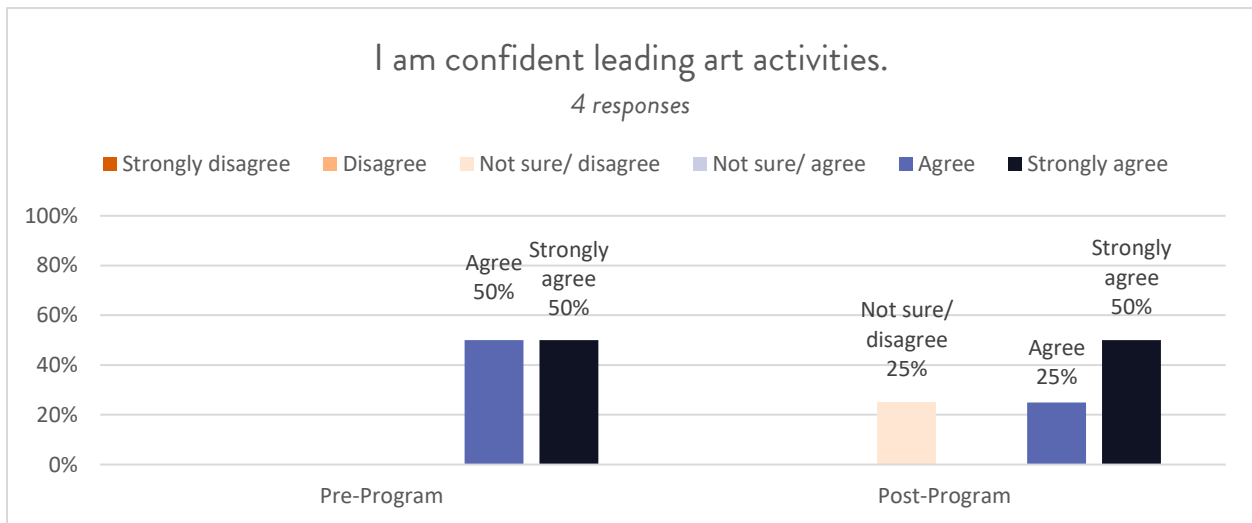
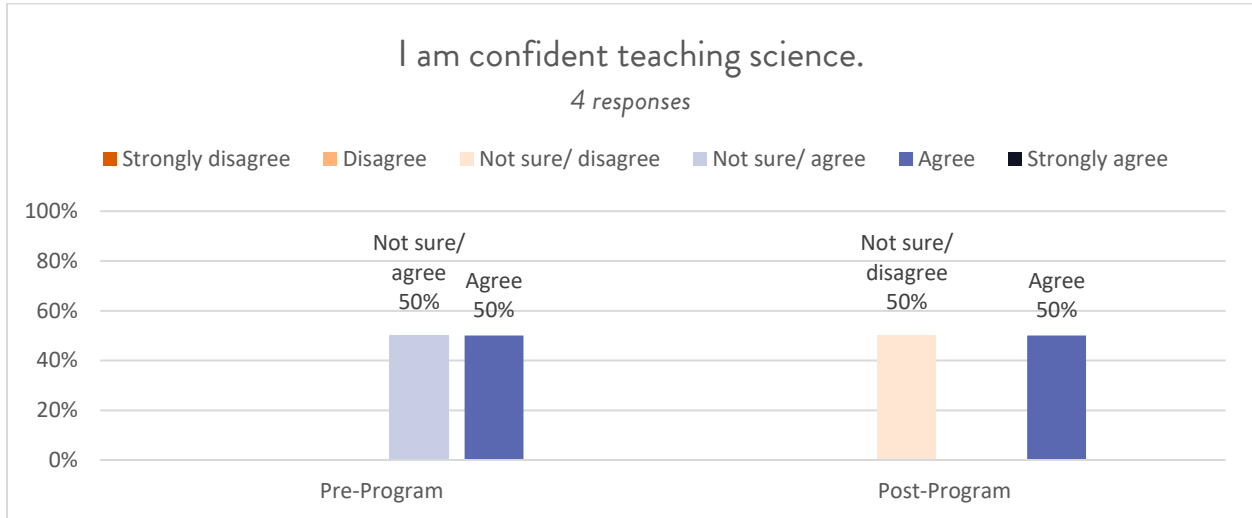
- The HEAL university team designed an ambitious intervention that was made even more so by the onset and continuation of the COVID-19 pandemic. The team worked diligently through the process to be responsive to the ever-changing nature of the pandemic conditions and its impact on participants.
- The evaluation findings are mixed on community educators' learning about science. The pre- and post-surveys did not suggest much progress, but the performance assessments, where the educators applied their learning to a real-life task, pointed towards a greater readiness and understanding. The interviews suggest that the Lab participants did develop science understanding, but still have more to learn to be fully ready and confident to teach. The Design Lab had an ambitious body of content to cover and not all of it was addressed in equal depth and detail. Future professional learning opportunities may be able to more fully address these initial gaps.
- Future iterations of the Design Lab might consider these:
  - Bring greater focus to the professional learning content. Consider going deeper on a few topics rather than broader over many topics.
  - Include more robust examples of STEAMM instruction in formal and informal learning settings.
  - Utilize out-of-session assignments (homework) sparingly and with intention. Participants should clearly understand how the homework serves their learning and meets the learning goals.
  - Continue to use a variety of meeting formats, including small- and large-group discussions, guest speakers, and collaborative artmaking. These were all seen as making positive contributions to participants' learning.

# Appendices



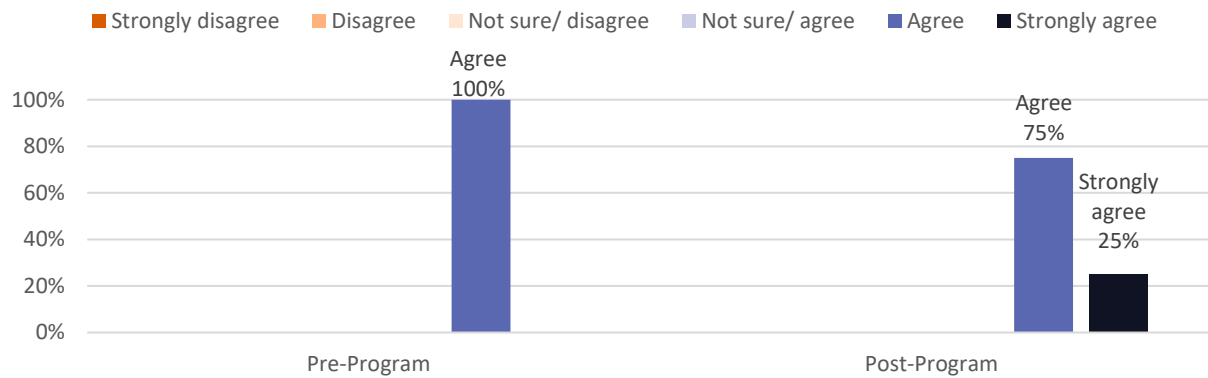
# Appendix A: Pre-/Post-Program Survey Results

## Confidence and Interest in Teaching



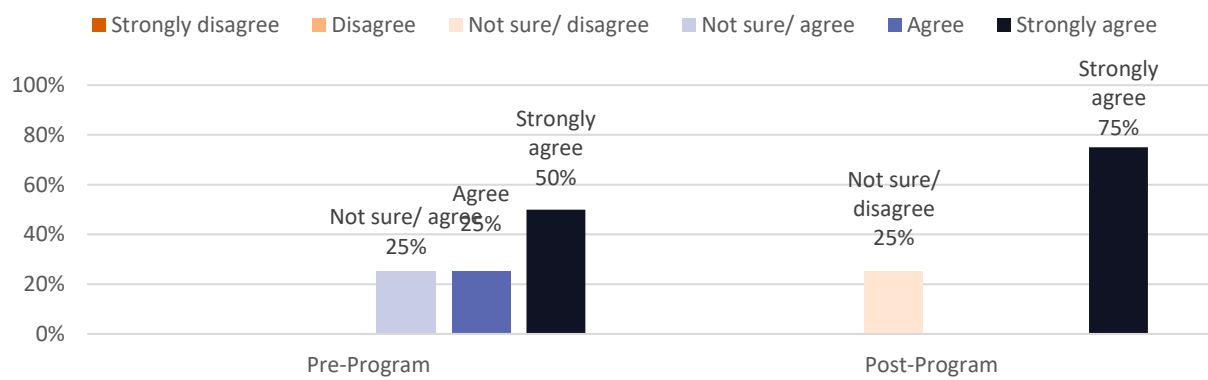
### I am confident integrating visual art and science.

4 responses



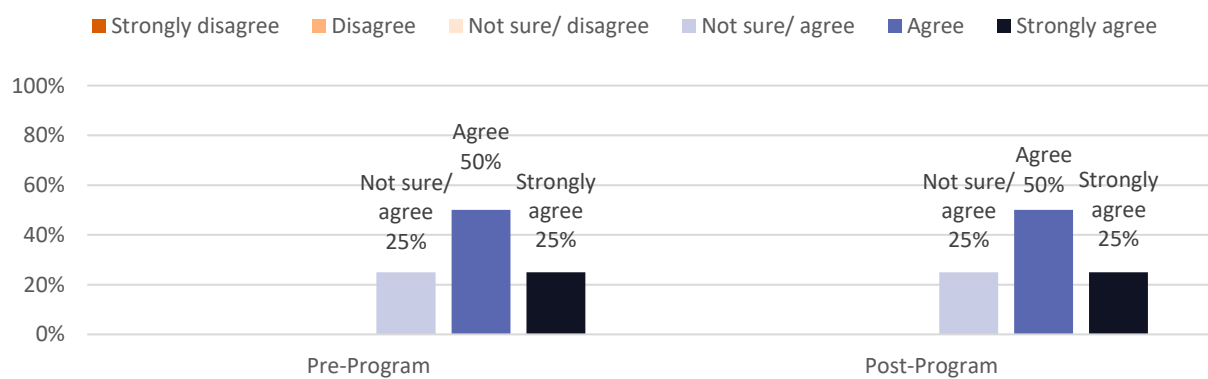
### I am confident teaching 8-12 year-olds.

4 responses



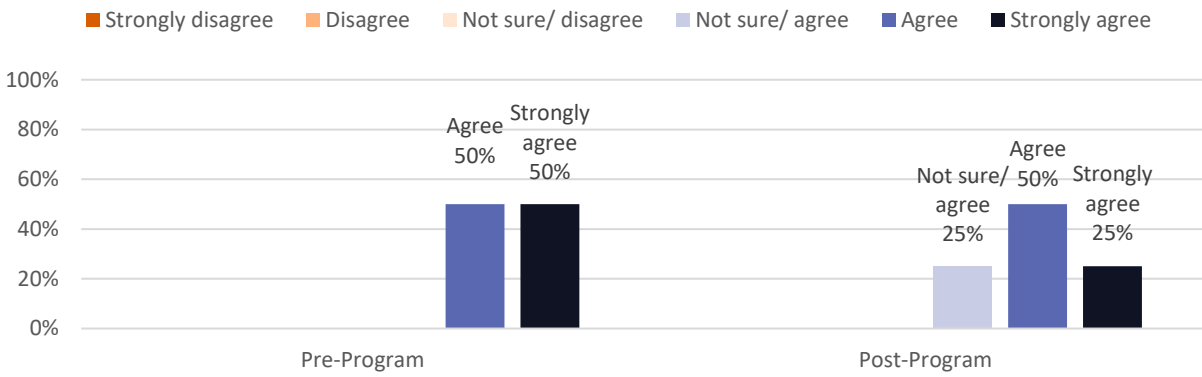
### I am confident preparing science activities for 8-12 year-olds.

4 responses



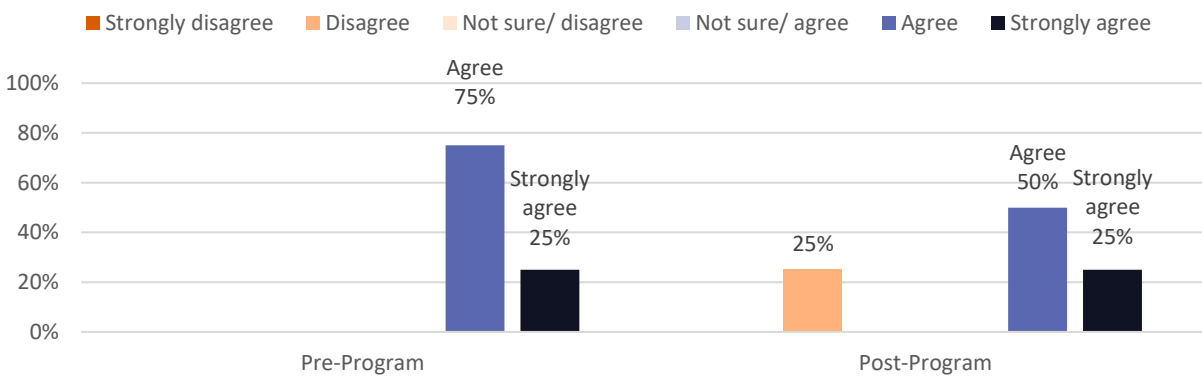
### I am confident preparing art activities for 8-12 year-olds.

4 responses



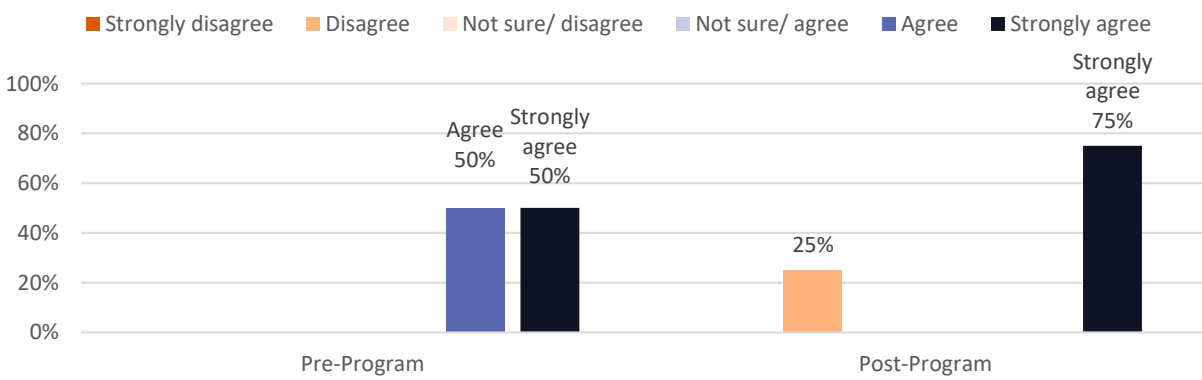
### I am interested in teaching science.

4 responses

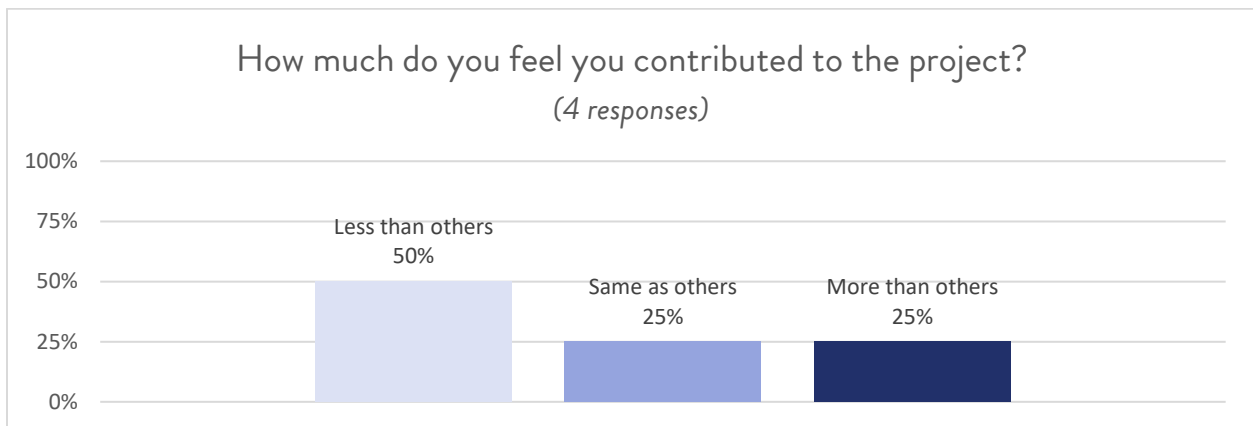
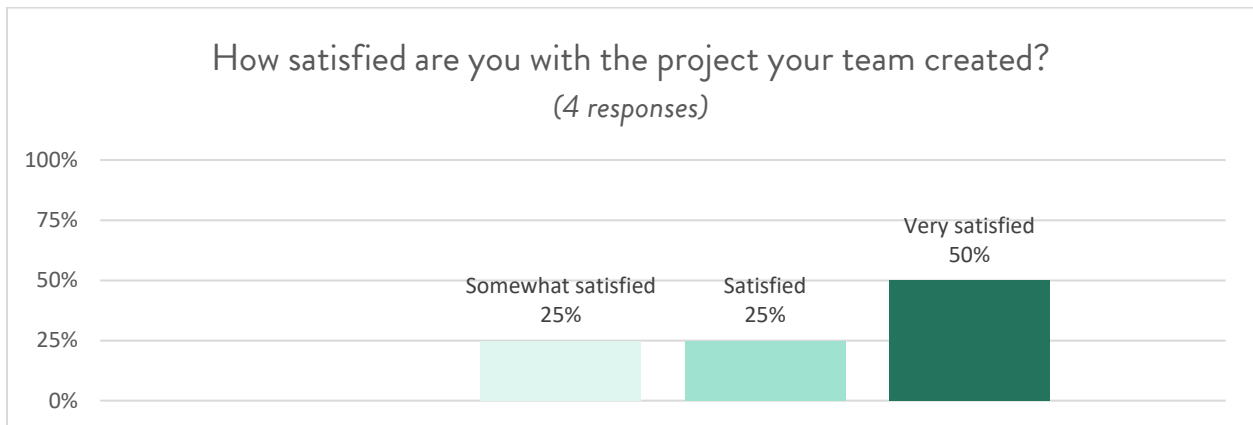
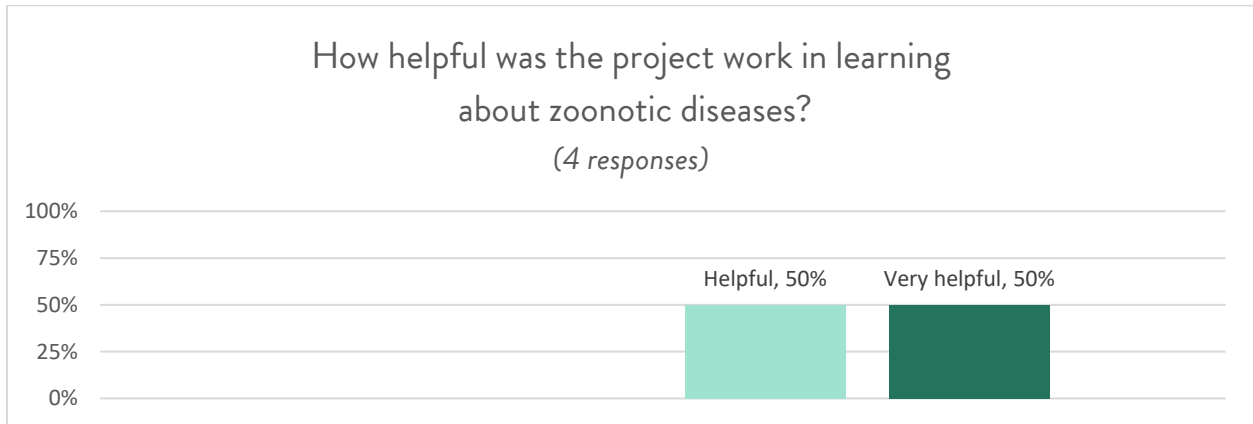


### I am interested in leading art activities.

4 responses



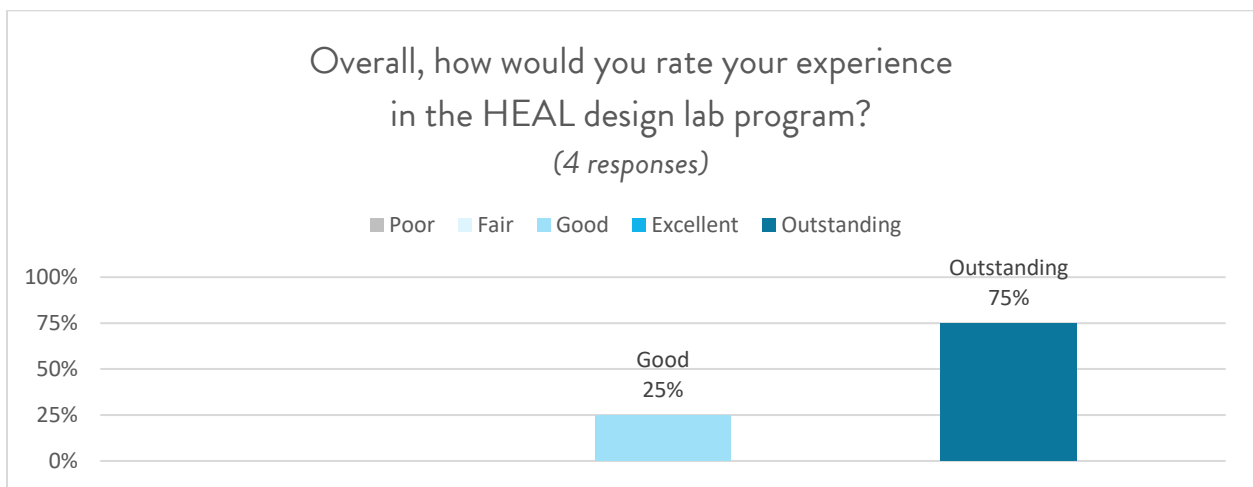
## Project Work



What feedback do you have about the projects or the process of creating the projects?

- I really enjoyed creating the projects with my team. I really enjoyed working with a team many times over working by myself on some projects.
- I wish we would've had more time, time was the key factor in our project. Both preparing it and planning for how long the kiddos would participate
- The last quarter maybe should have been delayed until summer due to other participant's extended responsibilities at schools once they opened up. It would hvae been nice to finish strong with the whole team participating in the project/curriculum building.
- It's been a joy and pleasure to work with them all!

## Overall Feedback



What were the strengths of the HEAL design lab program?

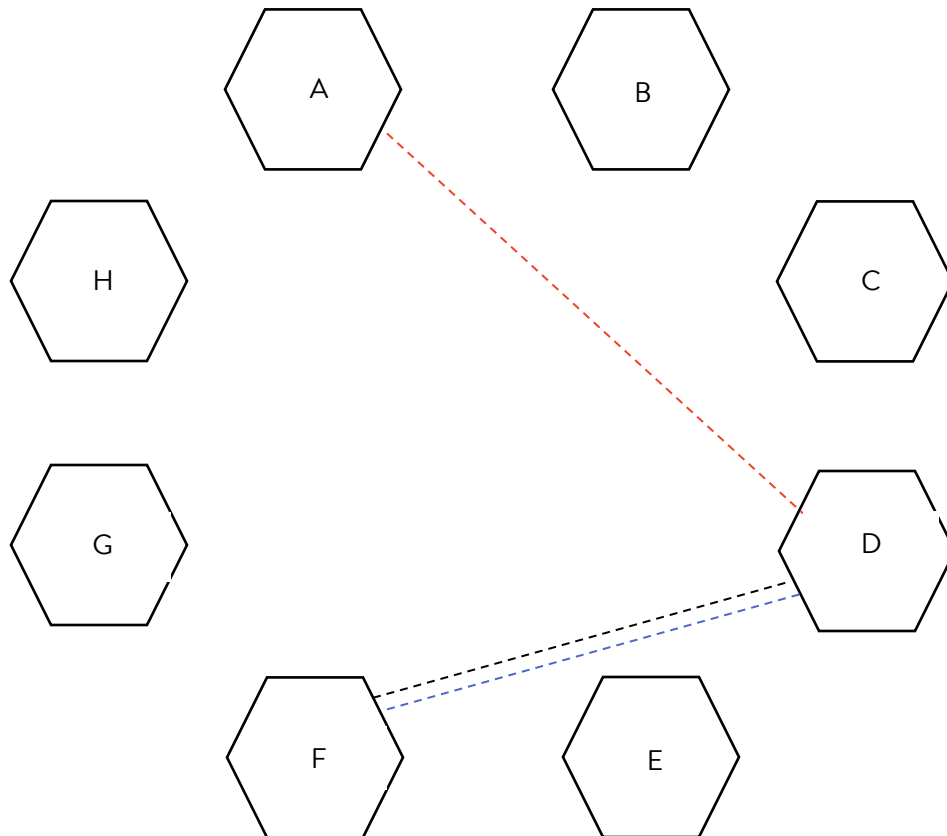
- The HEAL design lab allows educators a safe space to expand their learning and practice using new tools and ways of thinking in a manner which will improve our educational process. The combination of science and art meeting and improving our understanding of each is the forefront of how we should be teaching everything today. Providing students a variety of ways to learn the material and understanding that art is as important as science is in the learning process.
- Lots of knowledge both in art and science, getting to know people of all backgrounds and different careers, loved learning new ways of integrating art into learning with every subject not just science.
- The length of the program... although we didn't meet for long each week it's nice to know people for a long curve of experience/time. Also, the guest speakers and artists were fantastic. Also, the online notebook was a great resource and I have recommended that set up for many peers doing online projects, groups and events. Also, the setting a science foundation was super necessary and I still wish we could have dove deeper into it!
- Meeting with the staff

What recommendations do you have to improve the HEAL design lab program?

- I do not have any recommendations to improve HEAL at this time. I truly enjoyed my experiences during this process and will take many lessons into my classroom in the near future.
- Time, again I know this is very difficult but having more time would've been nice.
- More time taken on what an effective curriculum should look like and expectations of the curriculum. Also, our curriculum has many layers and simplifying the expectations of the curriculum would make it a more viable project. Better time management for activities! More participants! I wish there were twice as many community educator participants!
- the zoom and time of meetings was hard on me...especially after having been on zoom all day. it was just a bad year for zooming which was the only form of meeting. Having an opportunity to come together as a group in person would have changed the whole deal!

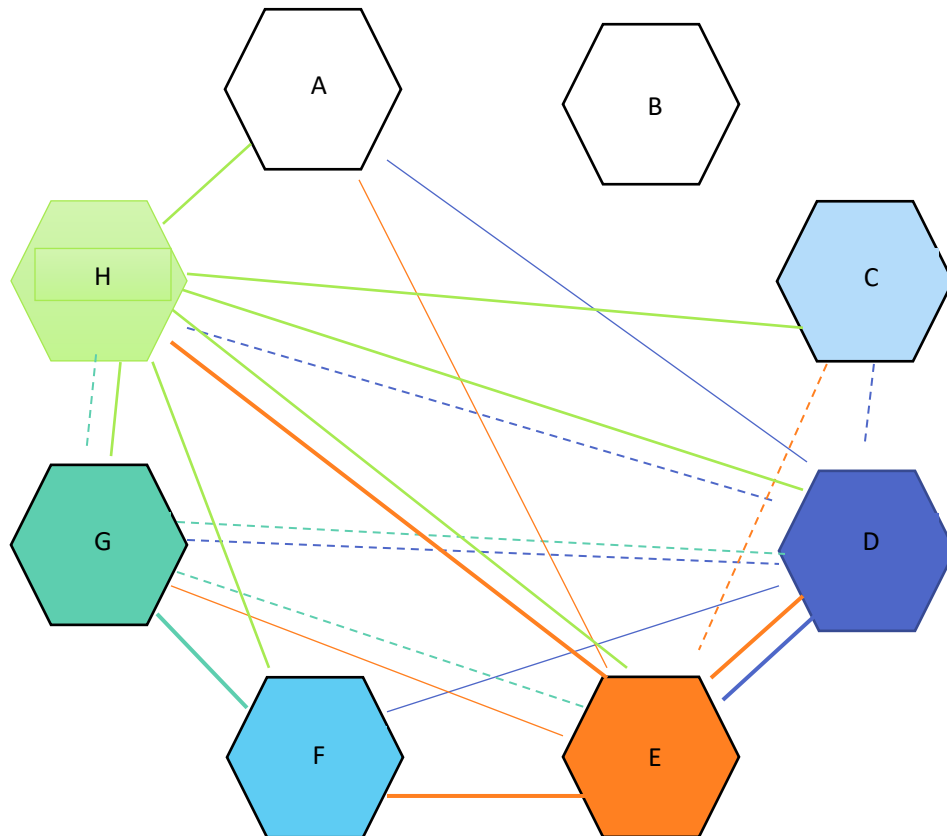
## Community Educators' Network in July 2020/Pre-Program

Educators are identified by letters in the figure below, illustrating the pre-program connections.



## Educators' Network in June 2021/Post-Program

The figure below illustrates the post-program connections. Educator B withdrew in the first weeks of the Lab.



### Impact on Professional Network

Participants were asked on the year-end survey how much the HEAL experience expanded their professional network. Four responded to this question, 2 responding that it 'expanded a great deal' and 2 responding it 'expanded a little'.