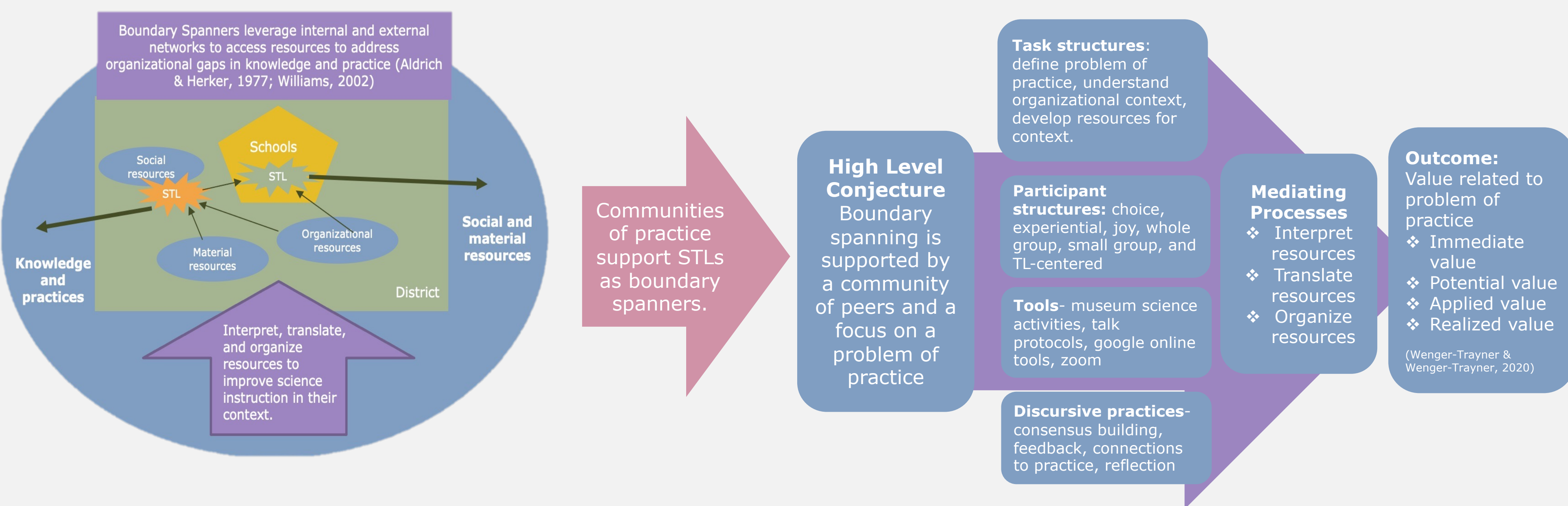


Research+Practice Partnership: Museum-based Network for Science Teacher Leaders (STLs)

- In 2016, the Exploratorium started a statewide network to support STLs to implement the Next Generation Science Standards.
- Participation in the network is application-based. The network serves a variety of districts, schools, and STL contexts.
 - Eligible STLs support the professional learning of other science teachers in their contexts.
 - STLs hold a variety of positions within the school system: classroom teachers, teachers on special assignment, district and county science coordinators, and independent educational consultants.
- Benefits of network participation include a one-week PL workshop at the museum, online content-based workshops, a listserve, access to museum scientists and expert science educators.
- 2020/2021 and 2021/2022 RPP implemented an online community of practice model as a component of the professional learning opportunities for STLs in the network.
 - Interviewed a sample of STLs in the network to surface problems of practice (PoP) that could serve as foci for the communities of practice.

Conceptual Framework and Professional Learning Design Conjecture Map



Research Questions

- What roles do STLs occupy as they work to support the implementation of science standards in their schools and districts?
- How do communities of practice support STLs as boundary spanners to develop professional learning resources for use in their schools and districts?
- What value do communities of practice generate for STLs in their work as boundary spanners (locate, interpret, translate, and organize) resources for improvement?

Intellectual Merit

- Developed and tested a conceptual framework for the work of science teacher leaders (STLs) as boundary spanners who locate, interpret, organize, and translate external material and social resources to improve science instruction in their local contexts.
- Empirically tested a professional learning model for STLs supported by an informal science museum (ISI).
 - Combine best practices in teacher PD with aspects of learning in informal settings
 - Facilitate a network of STLs to can share resources beyond individual school and district contexts.

Broader Impacts

- Findings will be used to support future cohorts beyond the life of the grant as well as to assess the efficacy and potential of this infrastructural arrangement.
 - The professional learning model will be used as part of a different project to disseminate curricular innovations developed at the museum in partnership with teachers.
- Understanding how an ISI can provide an improvement infrastructure for STEM educator development and serve as a model for other communities, districts, or states invested in empowering teacher leaders to implement NGSS or other education reform.
 - Small-scale pilot of maker teacher leaders supported by a community makerspace in North Carolina.
- Findings have been shared with both research and practitioner audiences through the use of professional networks, online and social media, conferences, and publications.
 - See QR code for a folder of published manuscripts.

Sample of STLs participated in PL

Year	Classroom STLs	District STLs	TOSAs	Total
2020/2021	10	11	3	24
2021/2022	16	16	0	32*

* 22 STLs stayed for a second year + 11 new STLs; total of 35 STLs served

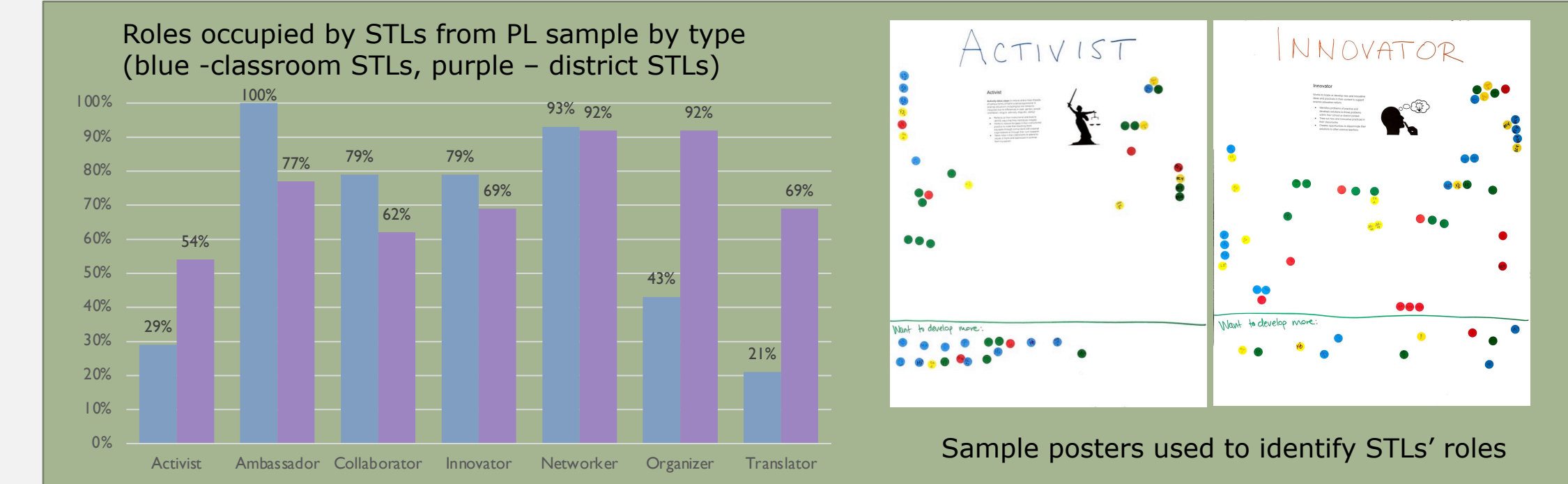
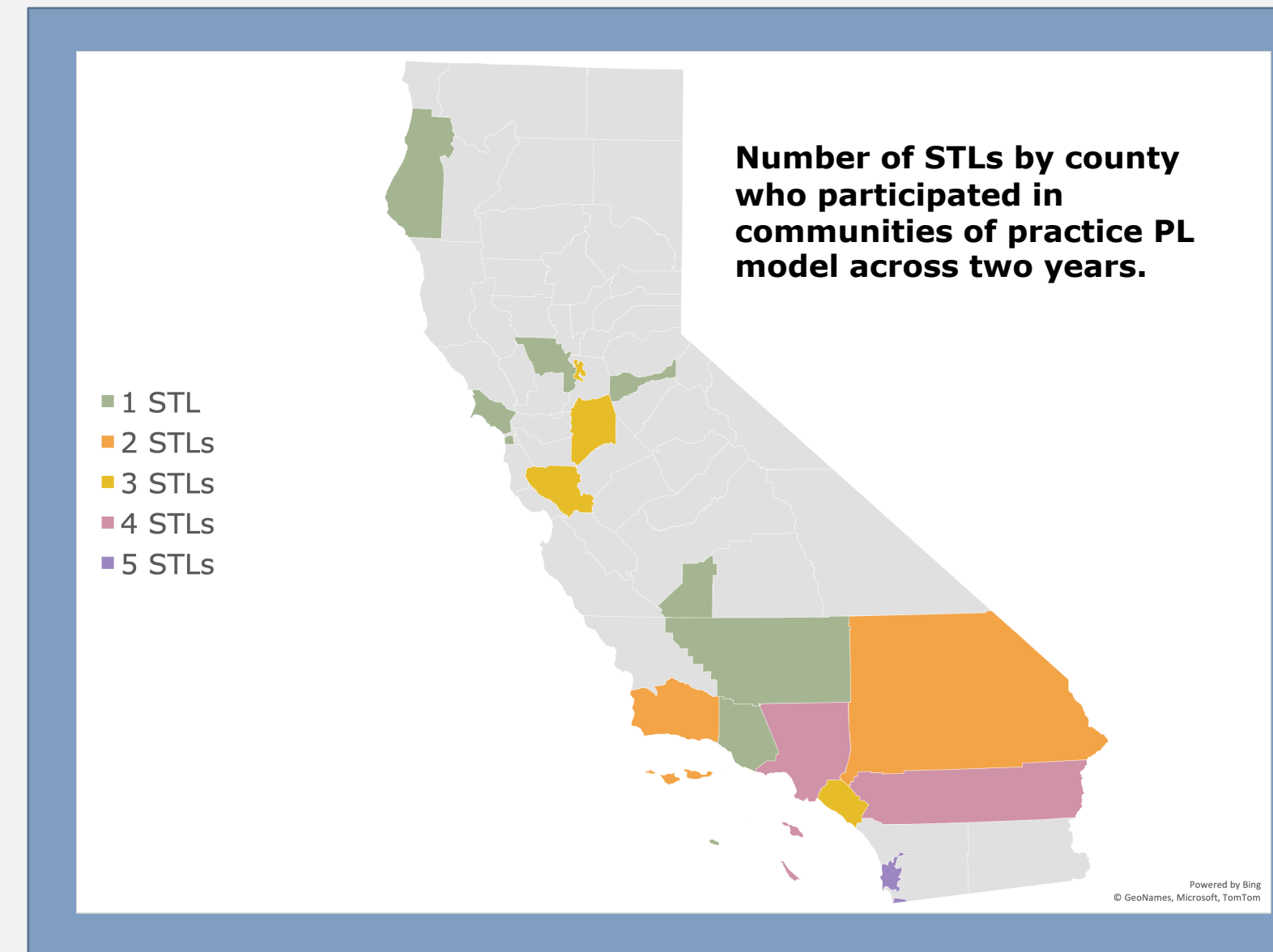


Table 2. Science teacher leaders' described roles in NGSS implementation. (Heredia et. al, 2023)

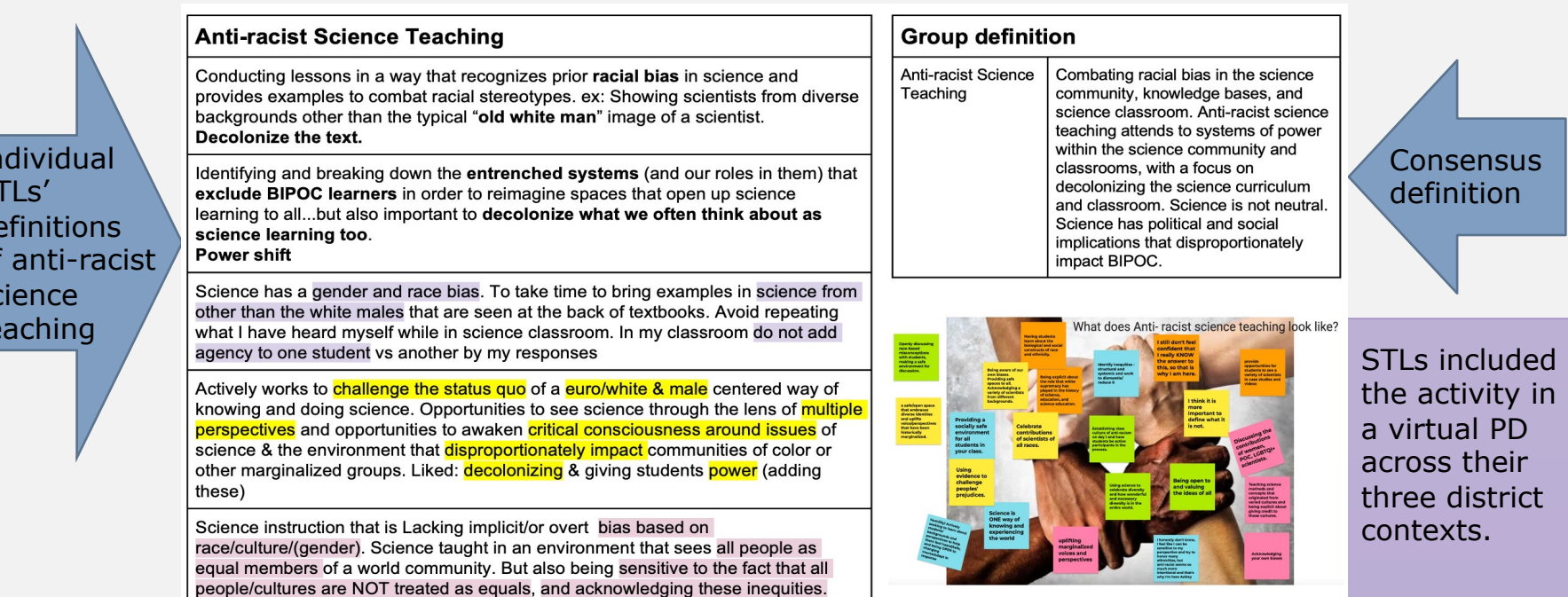
Role	Description
Activist	Actively takes steps to reduce and heal impacts of various forms of harm and oppression in science education.
Ambassador	Is the "go-to" person for NGSS or equitable science instruction in their district or school.
Collaborator	Works with other teachers or district leaders to coordinate and implement reform efforts.
Innovator	Works to locate or develop new and innovative ideas and practices in their context to support science education reform.
Networker	Connects teachers, school, and/or district to social and material resources.
Organizer	Coordinates the logistics of science reform initiatives dictated by their district and/or school.
Translator	Provides coherence across their organizations and acts as a liaison between administrators and teachers to translate policy to practice.

Professional Learning Structures that Generated Value for STLs

Defining the Shared Focus (PoP) for the Group

- Activity Design:**
- The facilitator asked each STL to write their own definition of the problem of practice on a shared google document.
 - Each STL read their definition aloud to the group.
 - STLs listened and highlighted commonalities between their definition and what was being shared.
 - STLs discussed areas of divergence and shared ideas to create a consensus definition inclusive of each STLs definition.

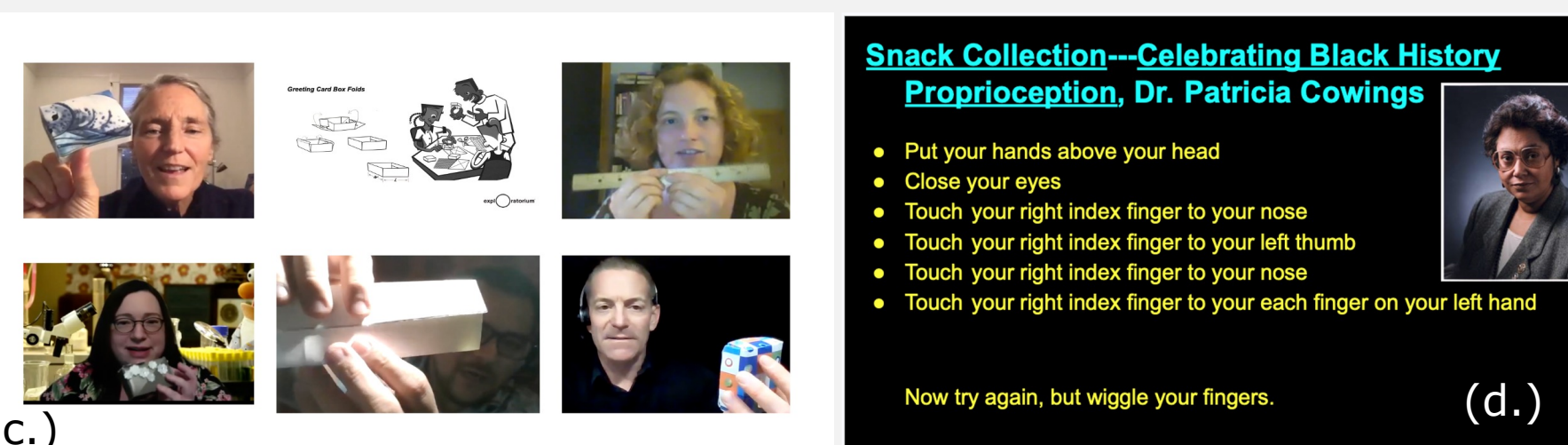
- Value Created:**
- Immediate value: engagement with different perspectives and identification with others who care to make a difference.
 - Potential value: a protocol for defining a common problem of practice
 - Applied value: some STLs implemented the activity with science teachers in their contexts.
 - Realized value: an understanding of the importance of coming to consensus about problems of practice and what they're trying to improve.



Modeled Pedagogy

- Activity Design:**
- Facilitators or STLs in the group modeled their use of science or leadership activities related to the focus of their community of practice.
 - STLs participated in the activity as learners.
 - STLs engaged in reflection and sensemaking around if and how the activity or pedagogy could be used in their contexts.

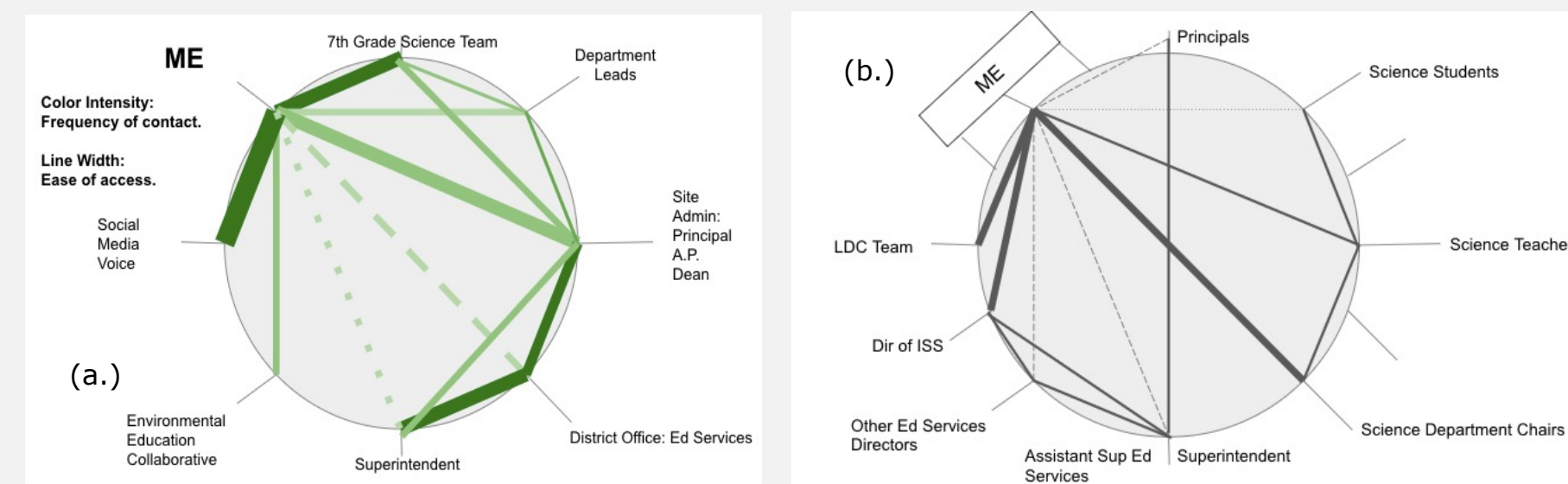
- Value Created:**
- Immediate value: joy, conviviality, exciting company; productive discomfort; sense making.
 - Potential value: new activities, protocols, or facilitation practices.
 - Applied value: some STLs implemented or adapted activities in their contexts.
 - Realized value: better understanding of pedagogy that will help make a difference for their problem of practice (particularly around SEPs).



Understanding Organizational Context

- Activity Design:**
- The facilitator gave each STL a Google slide displaying a circle with nodes around the perimeter.
 - The circle represented their organizational contexts, and each node represented an actor or resource related to their problem of practice.
 - Each STL labeled each node on their circles according to their contexts.
 - STLs indicated the strength (strong, medium, weak) of connections between each of the nodes with different styles of lines.
 - Some STLs shared their maps with some of the stakeholders they identified in their contexts to gather other perspectives on the context.
 - STLs discussed with each other what they discovered in the process.

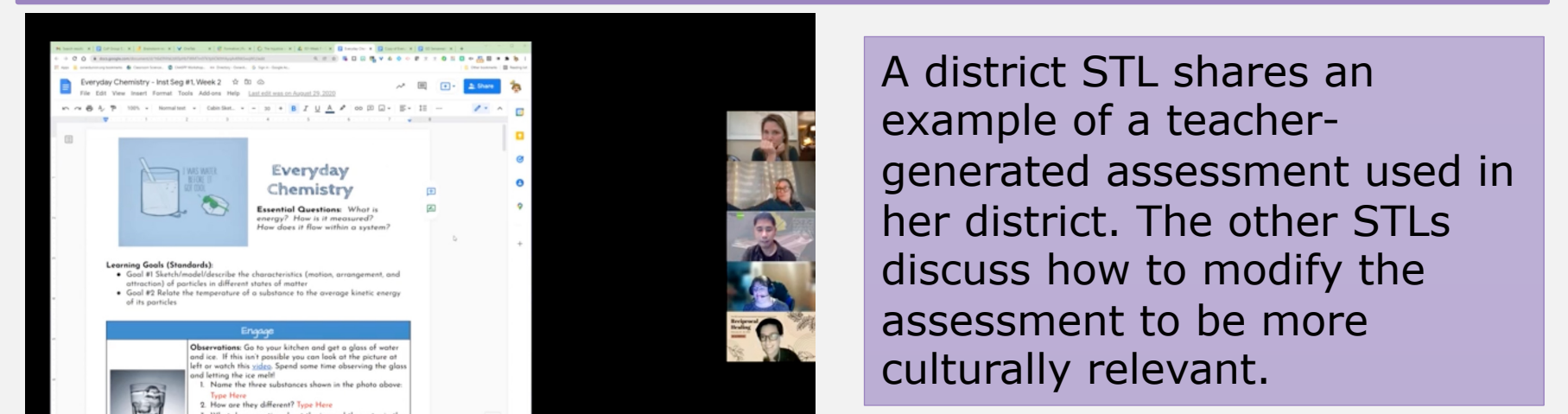
- Value Created:**
- Immediate value: mutual recognition as learning partners
 - Potential value: an activity to use with the teachers they support for reflecting on their agency and influence.
 - Applied value: STLs shared their maps with stakeholders and learned more in the process.
 - Realized value: an understanding of their sphere of influence within their contexts and where to invest energy to strengthen their influence.



Project Time to Work with Other STLs

- Activity Design:**
- Individual facilitators varied in how they organized project time.
 - Each CoP was encouraged to complete a final product to share with the network.
 - Some groups were highly structured with facilitators providing protocols to guide STLs' collaborative work.
 - Other facilitators supported less structured project time, allowing STLs to work in configurations that made sense for their projects.
 - STLs were encouraged to share their work with others to:
 - Invite feedback on the work.
 - Support to translate activities and projects to their contexts.
 - Each CoP was encouraged to have a final product to share with the network.

- Value Created:**
- Immediate value: engaging with others' perspectives; productive discomfort.
 - Potential value: innovation, insight, resources, suggestions and ideas; feedback; concrete help; productive critique; potential collaborators.
 - Applied value: STLs implemented and shared the products they created.
 - Realized value: better understanding of how to harness mutual interest and synergy, have a collective voice, and create practical strategies.



Acknowledgments: We would like to thank all the science teacher leaders that shared their insights and learning with us through this professional development program. We would also like to thank the museum staff for their help in facilitating the professional development programming.

This material is based upon work supported by the National Science Foundation under grant no. 1907460. Any opinions, findings, and conclusions or recommendations expressed in this material are those of the authors and do not necessarily reflect the views of the National Science Foundation.



QR code for a folder of published manuscripts, a PDF of the poster, and a list of references cited.

