The Lawrence Hall of Science

UNIVERSITY OF CALIFORNIA, BERKELEY

Organizational Features and Capacity Building Across Heterogeneous Outdoor Science Programs

Presented by The Research Group

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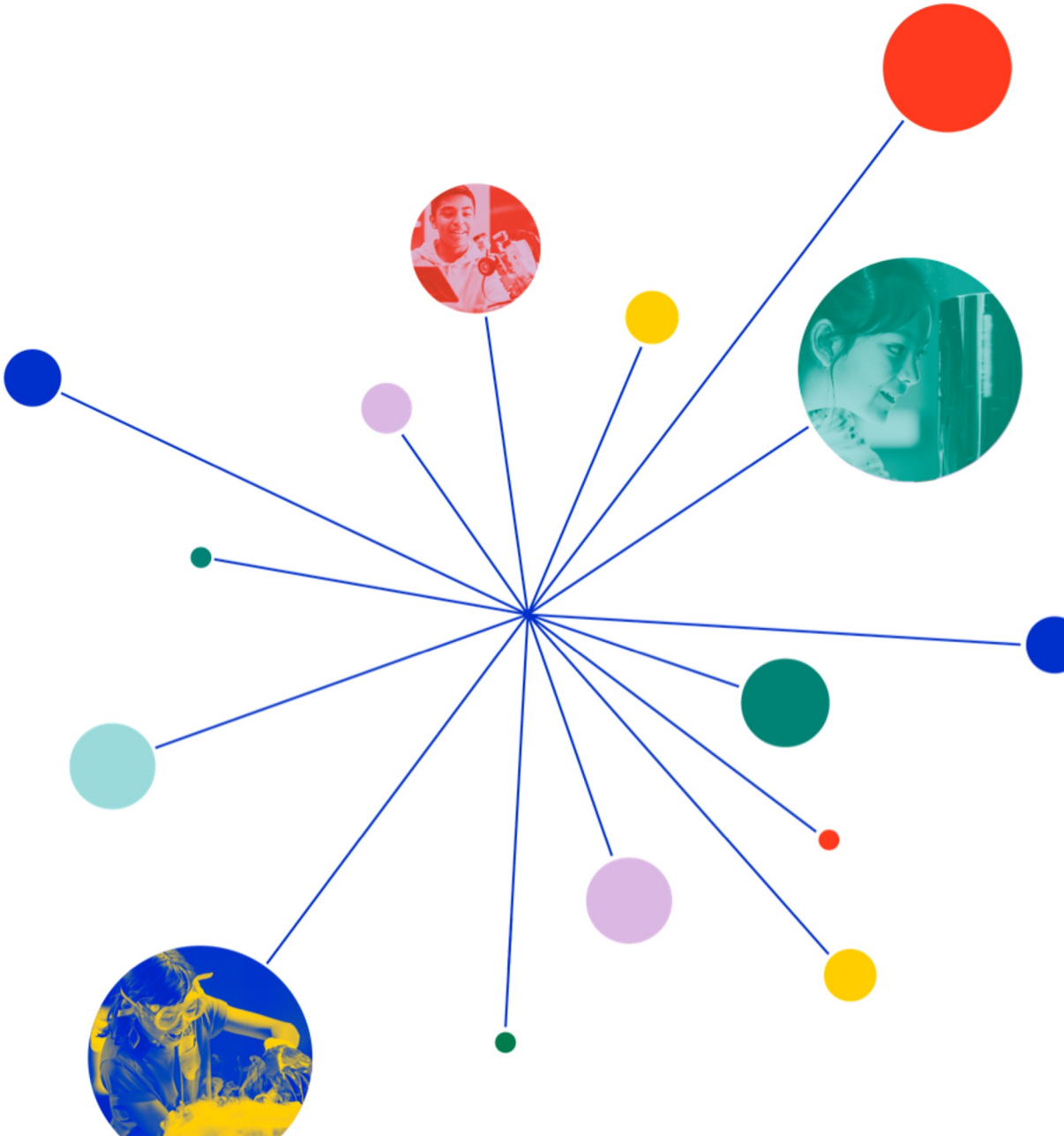

Agenda

- Research Goals and Study Overview
- Research Findings
- Implications of Findings
- Questions we're considering
- Closing

Research Goals

- This presentation is part of a five-year study that aimed *to the field of outdoor science education with evidence of the quality, value, and impact of Outdoor Science Programs (OSPs)*

- Study 1: Implementation Study (2016-2019)
    1. understand the instructional practices and learning opportunities in Outdoor Science Programs (OSPs)
    2. understand how BEETLES supports high-quality pedagogy and other practices across programs

- Study 2: Efficacy Study (2019-2021)
    1. Explore how OSPs promote positive dispositions toward science and the environment

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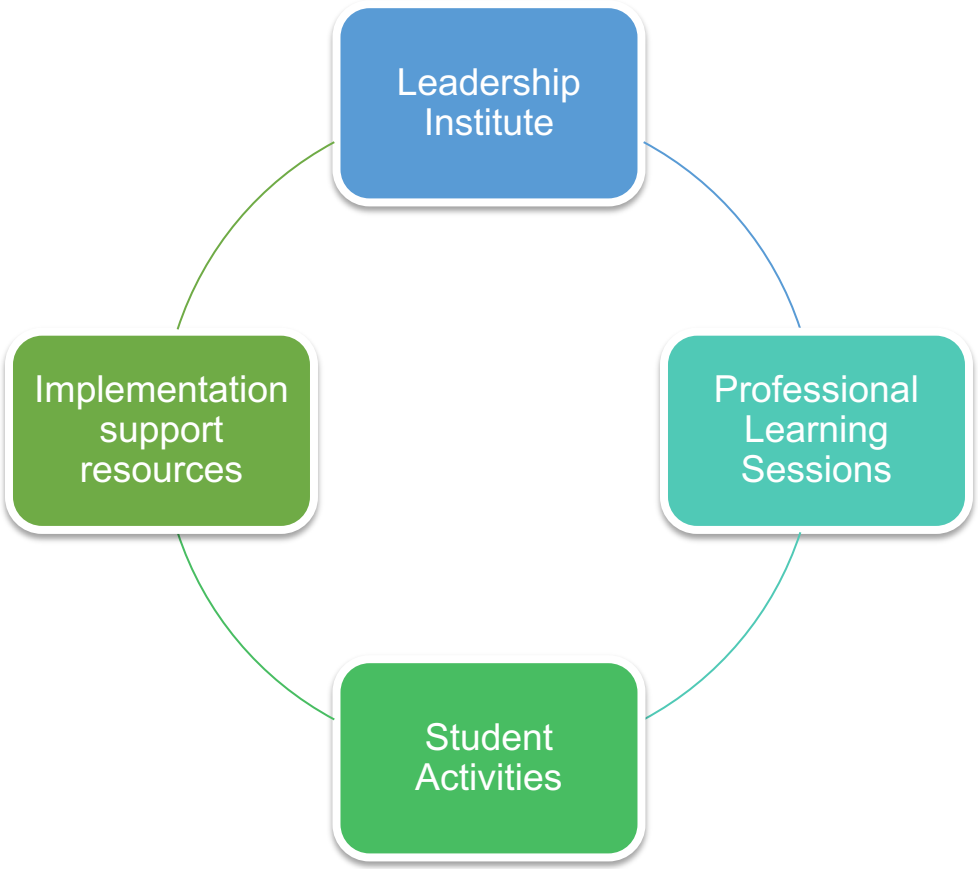
Goal: Build the capacity of outdoor science programs (OSPs) to facilitate learner-centered and nature-centered science learning experiences for youth using research-based pedagogical strategies.



Research Questions & Data Sources

1) Which components of the capacity-building model were implemented across diverse outdoor science programs?
2) What were the perceived impacts of these materials on pedagogical practices?
3) To what extent did implementation vary based on organizational features?

Post-Leadership Institute Surveys

Leadership Institute Implementation Plans

End of Year Program Leader Surveys

Sample

Cohort 1: **August 2017**

Cohort 2: **December 2017**

Cohort 3: **August 2018**

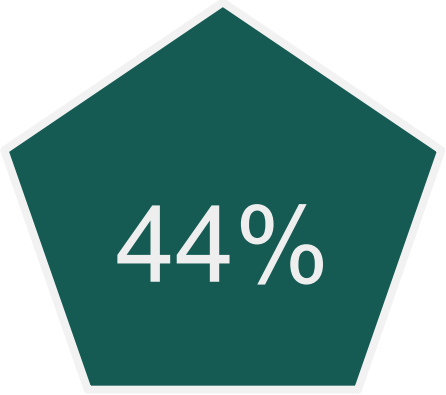
68

Programs participated

51

Programs completed the surveys used for the present analyses

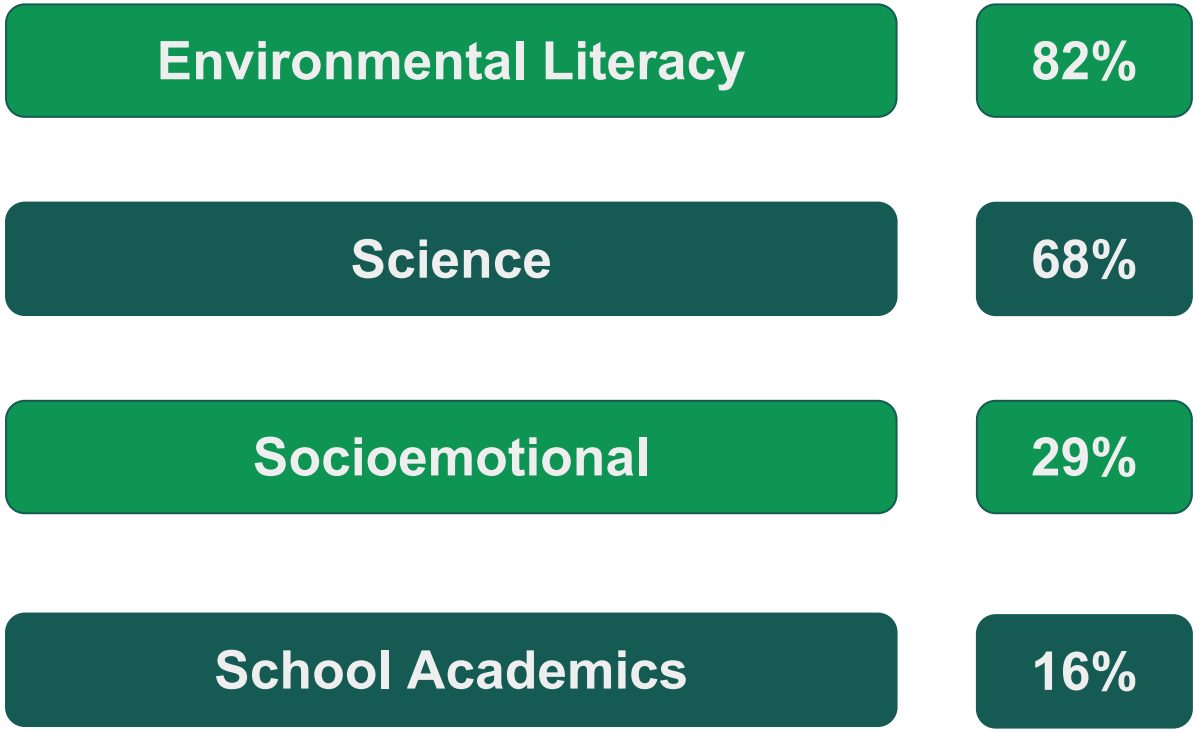
Sample - Type of Program



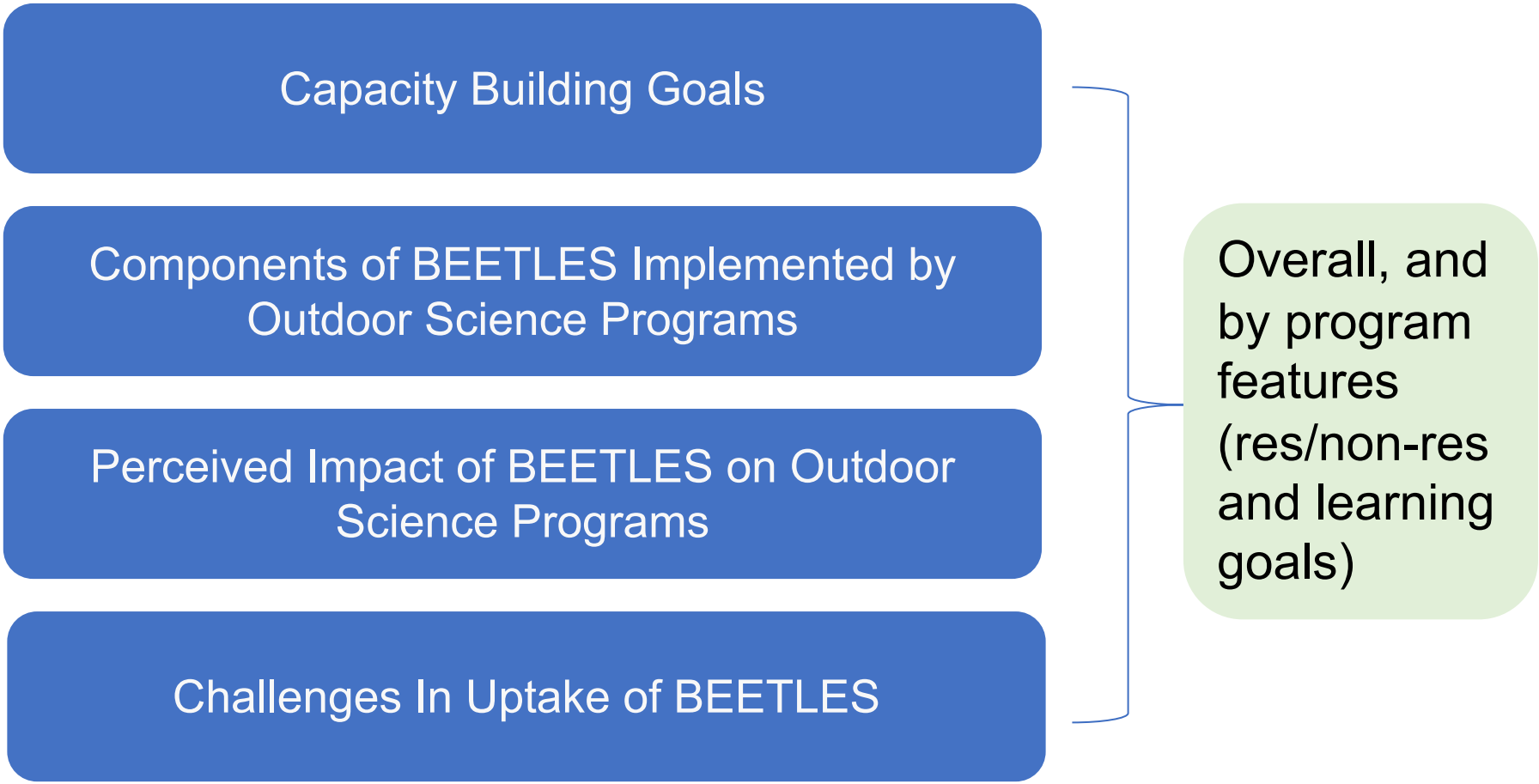
Primarily residential programs

Primarily non-residential programs

Sample – Learning Goals



Findings Overview



Why these features?

Res/Non-res as a proxy for contact hours

- Programs vary widely in how much time they have with students, but asking program leaders to report contact hours is very challenging
- Residential programs, overall, have higher contact hours, and Non-residential programs, overall, have lower contact hours

Science Learning Goals as an indicator of science prioritization and focus

- All programs were based outdoors and focused on nature, but differed in their goals
- Stated science learning goals indicate whether program leadership prioritizes and explicitly directs resources toward science learning

We hypothesized that these two key variables would influence how program leaders make decisions in capacity building efforts and prioritization

Findings:

Capacity building goals

Program Leader Identified Goals

- 52 organizations identified goals in implementation plans
- Goals shared per program: 1-37 (mean 5.24, median 3, SD=6.17)
- Codes used to characterize goals were informed by:
  - BEETLES design principles and goals (e.g. theoretical background for students' learning or instructors' professional development)
  - And themes we identified in the data themselves

Program Leader Identified Goals: Student Learning Experiences

83%
(n = 43)

Instructors' professional learning

77%
(n = 40)

Instructional resources
OR
Student experiences

Program Leader Identified Goals: Theory into Practice

54%
(n = 28)

Instructors' professional learning

67%
(n = 35)

Student experiences

Program Leader Identified Goals: Organizational Changes

Organizational changes

Equity and inclusion

Capacity Building Goals- Variation by residential/ non-residential

		Total number of programs with 1+ goal(s)	% of Residential programs with 1+ goal(s)	% of Non-Residential programs with 1+ goal(s)
Student Learning Experiences	Instructors' Professional Learning	43	91%	79%
	Instructional Resources/Student Experiences	40	86%	71%
Theory to Practice	Professional Learning	28	50%	54%
	Student Experiences	35	86%	57%
Organizational Changes	Organizational Changes	21	32%	50%
	Equity and Inclusion	18	50%	25%

Capacity Building Goals- Variation by science goals

		Total	Science Goal	No Science Goal
Student Learning Experiences	Instructors' Professional Learning	43	82%	79%
	Instructional Resources/Student Experiences	40	82%	71%
Theory to Practice	Theory to Practice: Professional Learning	28	50%	57%
	Theory to Practice: Student Experiences	35	75%	64%
Organizational Changes	Organizational Changes	21	46%	43%
	Equity and Inclusion	18	32%	43%

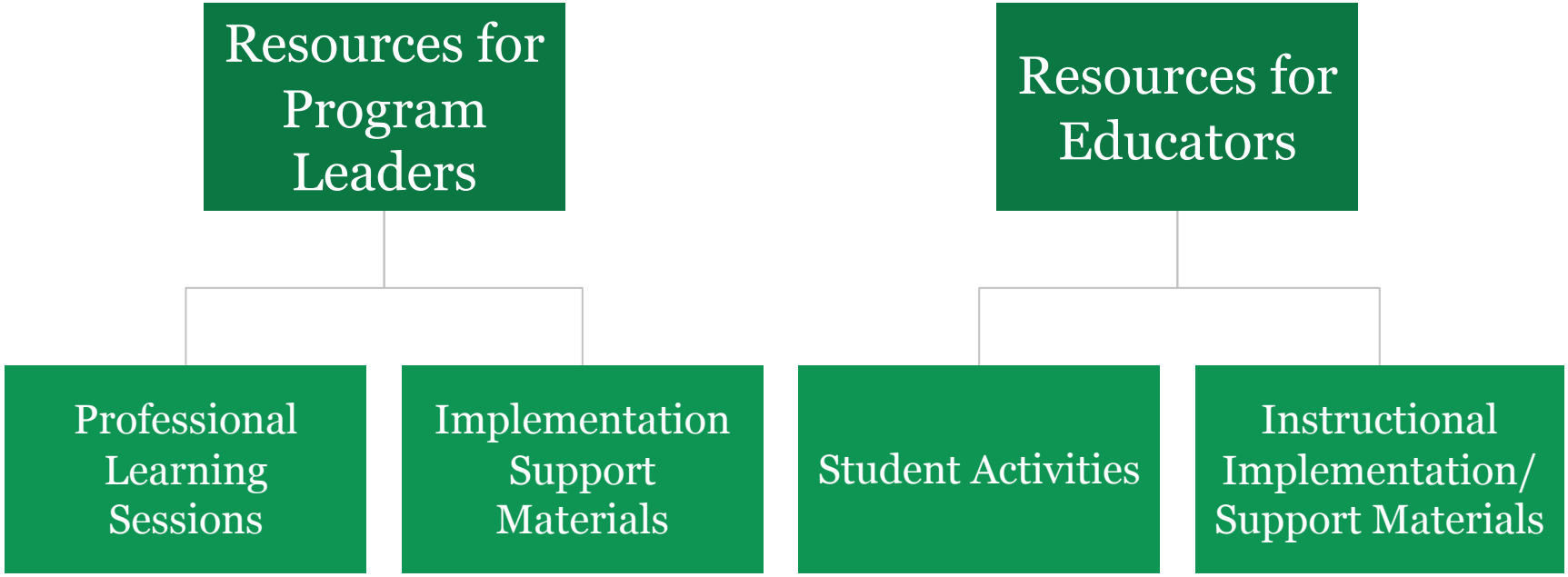
Takeaways: Capacity Building Goals

- Overall program leaders exited the leadership institutes with a range of capacity building goals at their sites
- Residential programs seemed to place more emphasis on improving student learning experiences and equity & inclusion, while non-residential programs placed more emphasis on organizational changes
- Programs with science goals were more focused on student learning experiences, and programs without science learning goals were more likely to want to work on equity and inclusion

Findings:

Components of BEETLES implemented by OSPs and perceived impact

BEETLES Materials & Resources at a Glance

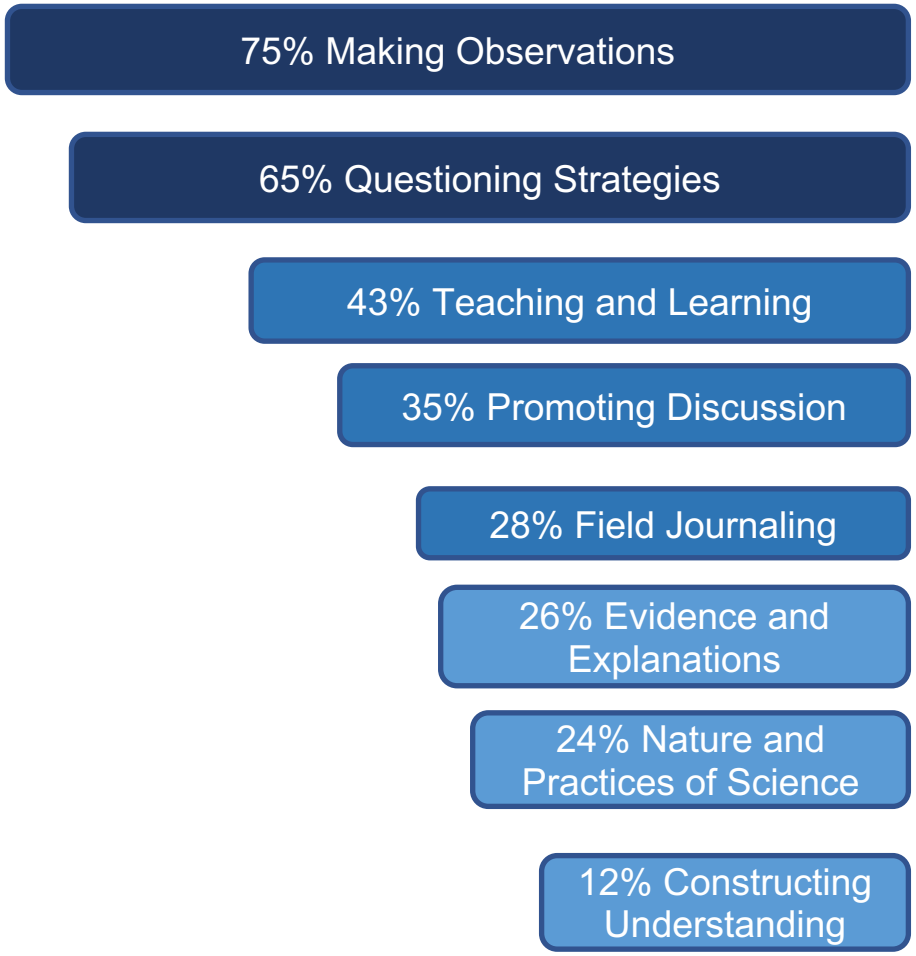


www.beetlesproject.org/resources

BEETLES Professional Learning

86%
(n = 44)

at least ONE Professional Learning Session



BEETLES Professional Learning - Variation

Residential/Non-residential

- Implemented equal numbers of PL sessions (mean = 3.15 and 3.26, respectively)

Science goals/no science goals

- Programs with science goals implemented slightly more PL sessions (3.5) than programs without science goals (2.5) (not statistically significant)

Programs differed in *which* PL sessions they implemented based on these features

BEETLES Professional Learning – Variation by residential/non-residential

- Whether res/non-res, most programs implemented Making Observations (75% & 78%, respectively)
- Some other PL sessions showed more variability by res/non-res

	Res (n=20)	Non-res (n=27)	% Diff
Questioning Strategies	55%	74%	19%
Promoting Discussion	45%	33%	12%
Nature & Practices of Science	20%	30%	10%

BEETLES Professional Learning – Variation by Science Goals

- Programs showed variability in PL session usage depending on whether they held explicit learning goals related to science

	Science Goal (n=26)	No science goal (n=12)	% Diff
Teaching & Learning	50%	25%	25%
Nature & Practices of Science	35%	16%	19%
Evidence & Explanations	31%	17%	14%

BEETLES Student Activities

100%
(n = 51)

at least ONE of the 29 Student Activities

Most Used

100% Exploration Routines

98% Discussion Routines

55% Focused Explorations

Student Activities - Variation

Res/Non-res

- Res implemented slightly more SA than non-res (means = 6.6 and 5.5, respectively; ns)

Science goals/no science goals

- Programs with science goals implemented slightly more SA than those without science goals (means = 6.7 and 6.2, respectively; ns)

Programs differed in *which* student activities they implemented based on these features

Student Activities – Variation by res/non-res

- Regardless of res/non, nearly all used INIWIRMO (100% & 96%, respectively) and Thought Swap (*formerly Walk & Talk*; 95% & 93%, respectively)

	Res (n=20)	Non-res (n=27)	% Diff
Lichen Exploration	40%	22%	18%
Discussion Routines	75%	59%	16%
Exploratory Investigation	30%	15%	15%

Student Activities – Variation by science goals

- Programs were equally likely to use I Notice, I wonder, It reminds me of, Thought Swap, and Lichen Exploration

	Science (n=26)	No science (n=12)	% Diff
Nature Scene Investigators	31%	0%	31%
Case of the Disappearing Log	35%	8%	27%

Takeaways: Use of BEETLES materials and resources

- Overall patterns show high usage of materials related to making observations and using questioning strategies to support student discussion

- Res programs seemed to place more emphasis on longer learning activities and progressions, while non-res programs seemed to prioritize maximizing impact in shorter time

- Programs with science goals tailored their choices toward discussions within the context of the nature and practices of science, while programs without science goals focused more on nature-based exploration and peer discussion

Findings:

Impact on pedagogical practice

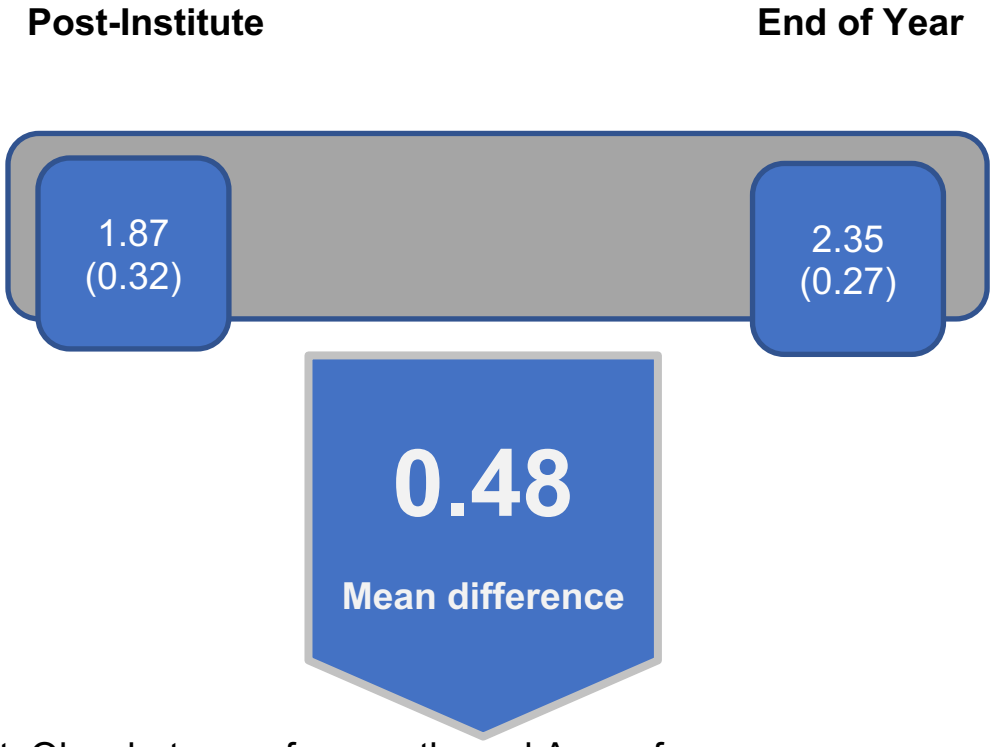
Impact on Pedagogical Practice

Student Centered Discussions	e.g., Ask learners to add on to others' thinking
Nature and Practices of Science	e.g., Ask learners to make and record detailed observations
Culturally Relevant Teaching	e.g., Encourage learners to make connections with prior experiences from family or community

20 items on 3-point scale: Needs Improvement, Okay but room for growth, and Area of Strength

Impact on Pedagogical Practice

- Student Centered Discussions
- Nature and Practices of Science
- Culturally Relevant Teaching



20 items on 3-point scale: Needs Improvement, Okay but room for growth, and Area of Strength

Impact on Pedagogical Practice - Variation

Overall, there were comparable improvements in pedagogical practices over the course of the year regardless of program features *(all significant)*

	Post-Institute	End of Year	Change	Cohen's d
Residential	1.88 (0.25)	2.32 (0.29)	0.44	1.53
Non-residential	1.83 (0.39)	2.35 (0.27)	0.51	1.43

	Post-Institute	End of Year	Change	Cohen's d
Science Goals	1.86 (0.35)	2.34 (0.27)	0.48	1.09
No Science Goals	1.84 (0.30)	2.32 (0.29)	0.48	1.53

Takeaways: Impact on Pedagogical Practice

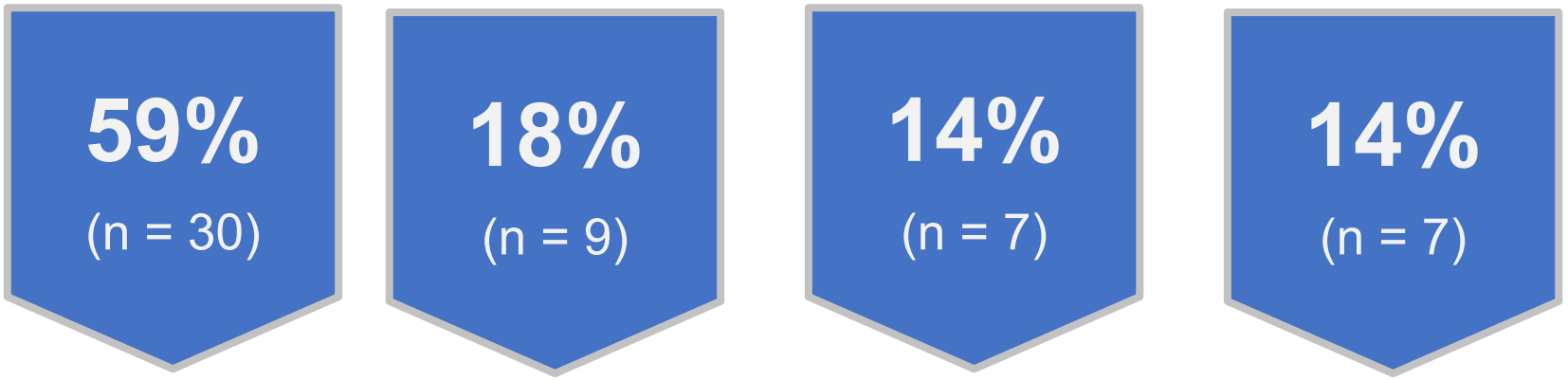
- Overall patterns show positive changes in pedagogical practices related to student-centered discussions, nature and practices of science, and culturally relevant teaching

- Improvements were similar across programs, regardless of program features

Findings:

Implementation Challenges

Challenges in Capacity Building



Limited Time

Curricular & Programmatic Design

(working within existing = 12% Redesigning = 6%)

Conflicting Goals and Priorities

Staffing Issues

(turnover, limited staff)

Challenges in Capacity Building - Variation

- There were no notable differences in challenges based on res/non-res
- Programs without an explicit science goal were more likely to report challenges with staff resistance
  - 42% of progs without science goals vs. 4% of programs with
- Programs with explicit science goals were more likely to report challenges with competing priorities (e.g., state standards)
  - 19% of programs with science goals vs. 0% of progs without
- Both of the above point to the critical role of stakeholder buy-in

Unpacking Time

- Time is often one of the most prominent challenges in professional learning and institutional change
- Limited Structures to Support Continuous Professional Learning
    - Staffing Structures (Seasonal, Full-time, Part-time)
    - Professional Learning Systems
- Limited Financial Resources
- Meaningful shifts in practice is a journey
    - Not just a "plug and play"

Implications

- The success of capacity building efforts requires careful consideration of variability of organizational features within your sample.
  - Each organization is operating within a unique context and holds unique priorities.
  - BEETLES presented a range of materials from which organizations could choose.
  - There was evidence that using BEETLES supported OSPs in shifting practice across heterogeneous contexts, but that larger structural changes were minimal.
- Findings suggest that building capacity to shift practices requires an investment in organizational time and resources.

Questions We Are Considering

- What other key organizational features may influence implementation of capacity building efforts in meaningful ways?
- How can future capacity building efforts better position organizations for broader institutional changes?
- To what extent do capacity building efforts translate into improvements in student learning outcomes?

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beetles

Thank you!

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