STEM in the Playscape: Tools for Research and Education

Principal Investigator: Victoria Carr
Co-Investigators: Rhonda Brown and Heidi Kloos
Project Coordinators: Leslie Kochanowski and Sue Schlembach
Research Coordinator: Catherine Maltbie

Introduction

Playscapes are intentionally designed nature-focused play environments for young children where children learn through exploration, discovery, play and adult supported provocations. The primary objective of this ongoing research-in-service to practice project is to engage in a collaborative mixed methods study to investigate aspects of science, technology, engineering, and math (STEM) learning with regard to playscape design, teacher efficacy, children's learning, and dosage effects. It builds upon a previous NSF Pathways study.

The goal of this poster is to showcase the usable research and instructional tools developed by this project team and describe how they address our project's aims.

Aims:

1. Create Early Childhood Digital Modules to Promote STEM Learning on playscapes, specifically to increase pedagogical content knowledge, promote effective instructional practices, and inform playscape design.
2. Investigate the impact of trained teachers on children's STEM learning on playscapes. Trained teachers will use the Digital Modules as part of their professional learning to increase teacher efficacy.
3. Investigate what critical elements of playscapes are portable and adaptable to other early childhood nature-oriented play and learning settings.

Research Tools and Deliverables Developed

Developed Research Tools

Curriculum Based Assessment (CBA)

An interview style assessment that captures children's developmental growth related to STEM concepts based on playscape experiences.

Behavior Mapping

A fast-paced structured observation process that is recorded through an iPad application. This method investigates not only where children are playing but how they are engaging with the space.

Project Deliverables

Mini Playscape Development

Investigating and reporting what critical elements of a playscape are portable and adaptable to smaller greenspaces.

Digital Modules

Accessible, free professional learning opportunities that equip teachers with knowledge, resources and strategies to enhance children's attitudes, interactions, and concept development in nature.

Methods

The tools used in this project were enhanced from the Pathways study. They are interrelated and provide critical information relating to each of our project aims. Additional tools include teacher self-efficacy surveys, focus groups, journals, teacher audio, and teacher and child video. Deliverables are unique to this project.

CBA –

- 20-item assessment that is conducted as a one-on-one interview between trained assessor and child that lasts approximately 10 to 15 minutes.
- STEM related concepts assessed are science, math, math and spatial cognition, spatial and wayfinding abilities, and concept of living things.

Scoring:

- Assessors record children's responses to open-ended questions verbatim but do not score the assessment.
- Raters use a developed scoring guide to administer points based on the assessors recorded response. Interrater reliability is analyzed to ensure consistency.

Use:

- The CBA data addresses Aim 2 and specifically helps us answer the question: *What are the STEM learning trajectories of these children with and without their teachers using the Digital Modules as training?*

Behavior Mapping –

- Using a strategic observational technique, researchers are able to optimally observe individual children's engagement on a playscape in five second segments.
- Through the use of an iPad app we developed, observers are able to capture where a child is playing, their social interaction with their peers, whether or not an adult is present, their engagement type, their environmental interaction, what loose parts they are interacting with, and their probable science learning.
- Interrater reliability is analyzed between all observers for consistency.

Use:

- Behavior Mapping data addresses Aim 2 and specifically helps us answer the question: *How do children engage in informal STEM learning within the playscape with and without their teachers using these Digital Modules?*
- We developed a viewer that allows us to visualize our data: how, where, and with what children play.

Mini Playscape Development –

- This project modified the existing greenspace at our participating centers to create mini playscape site.
- It was through the collaboration between our participants, ourselves, and the landscape architect that this was possible.
- The planning and decision making process from start to finish was recorded to inform module 4 which will act as a guide to help other centers create playscapes. This data includes emails, meeting notes and recordings, planning documents, and reflective stakeholder focus groups.

Use:

- Mini playscape development data addresses Aim 3 and specifically helps us answer the question: *What playscape affordances should be incorporated into preschool play areas and what data would help facilitate these changes?*

Digital Modules –

- This project is creating 4 digital modules covering the following content:
  - Exploring the Value of Play in Nature
  - Exploring STEM Learning in Preschool Environments
  - Teaching Strategies to Promote Inquiry in the Playscape
  - Supporting STEM Learning in Nature: A Guide to Designing Playscapes
- Modules were created through the guidance of experts in the field but are being polished to incorporate the feedback from participating teachers before being publicly released.

Use:

- Creation of the Digital Modules and the data we collected address Aim 1 and specifically helps us answer research questions related to pedagogical content and best instructional practice fostering informal STEM leaning on playscapes.
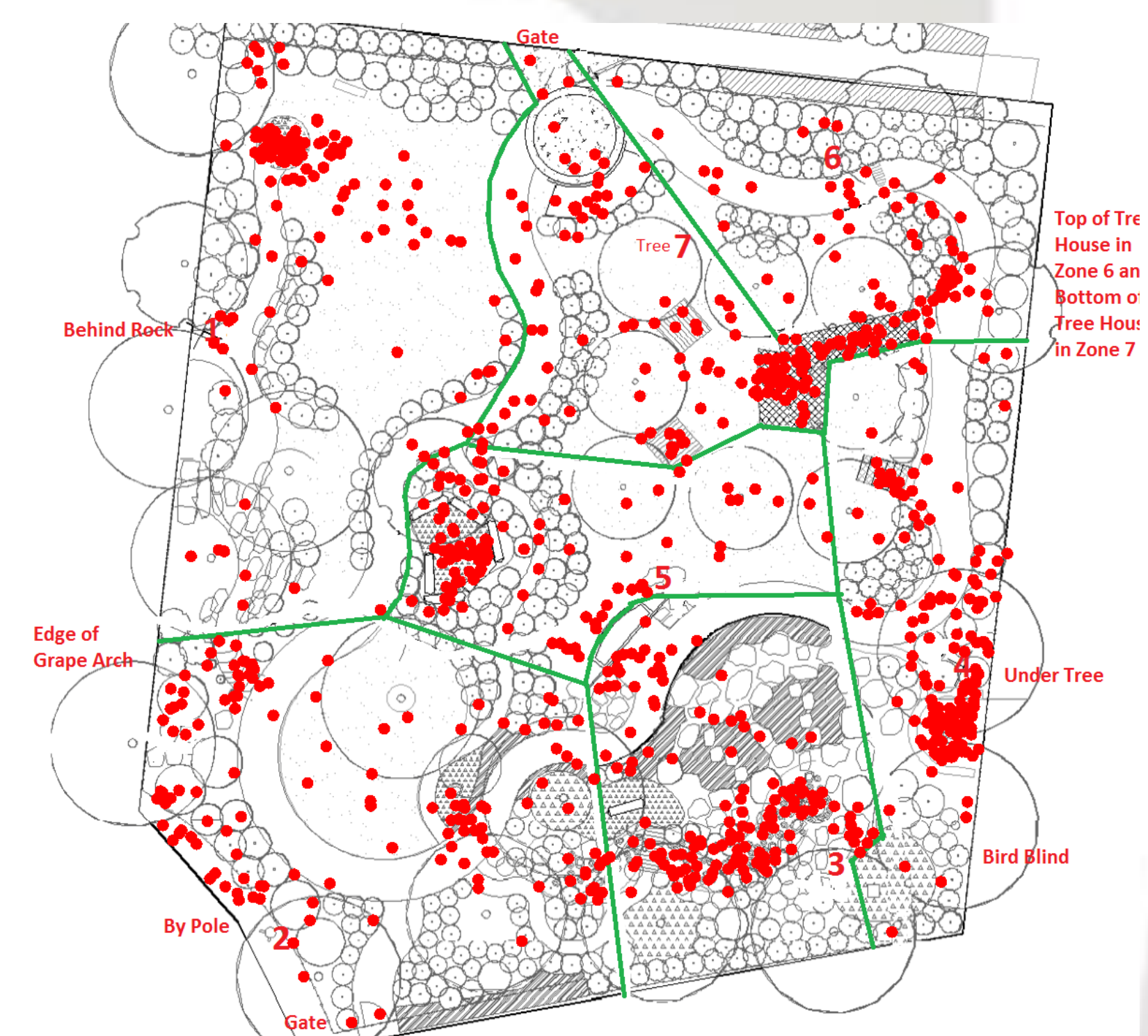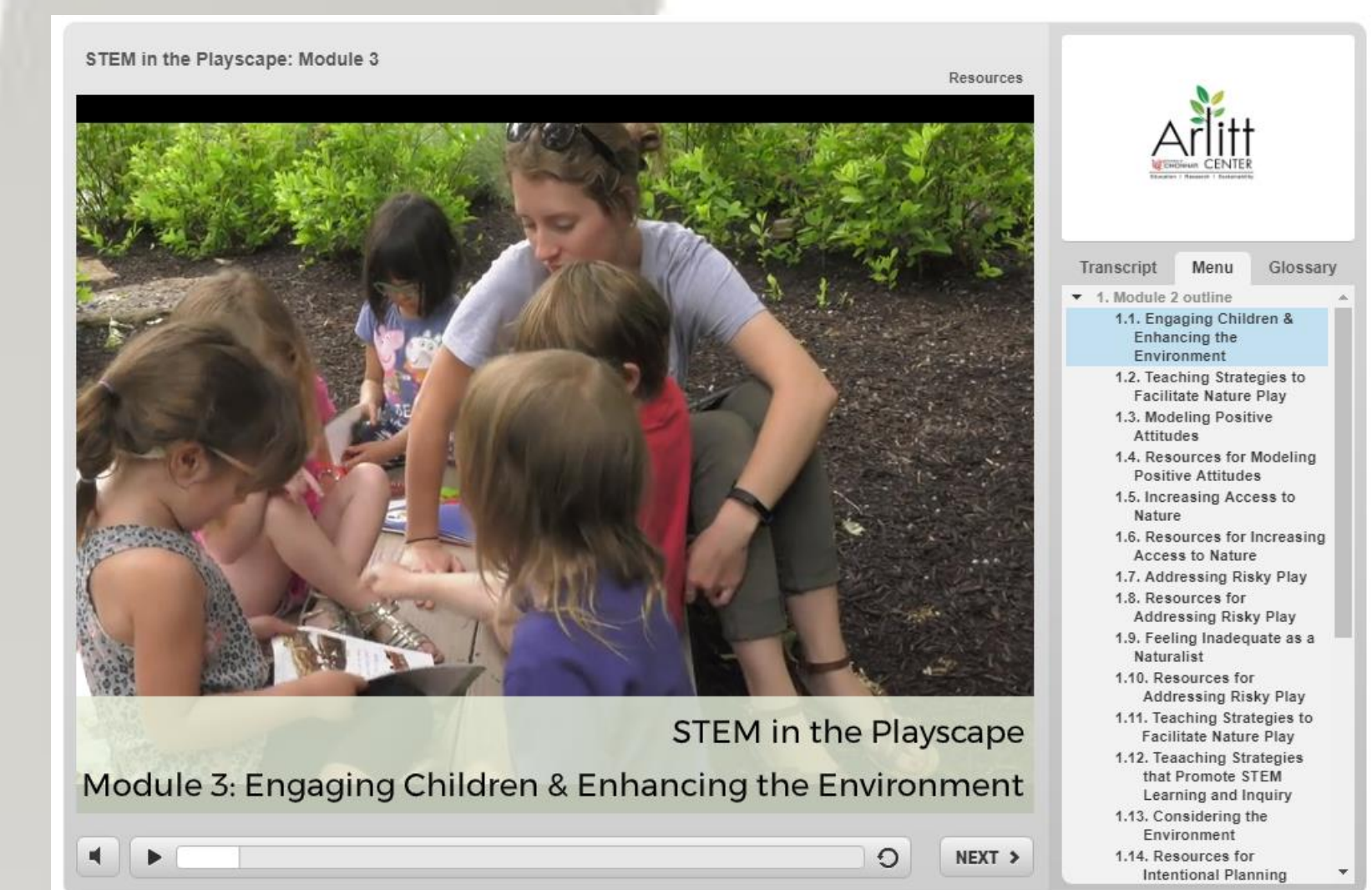
Sample Publications

Kloos, H., Waltzer, T., Maltbie, C., Brown, R., & Carr, V. (2018). Inconsistencies in early science education: Can nature help streamline state standards? *Ecopsychology, 10*(4), 243-258. https://doi.org/10.1089/eco.2018.0042

Schlembach, S., Kochanowski, L., Brown, R., & Carr, V. (2018). Early childhood educators' perceptions of play and inquiry on nature playscapes. *Children, Youth & Environments, 28*(2), 82-101. DOI: 10.7721/chilyoutenvi.28.2.0082

Kloos, H., Brown, R., Maltbie, C, & Carr, V. (2018). Listening in: Spontaneous teacher talk on playscapes. *Creative Education, 9*, 426-441. Special Issue on Environmental Education DOI:10.4236/cc.2018.93030

Carr, V., Brown, R., Schlembach, S., & Kochanowski, L. (2017). Nature by design: Playscape affordances support the use of executive function in preschoolers. *Children, Youth & Environments, 27*(2), 25-46. Special Issue Jean Piaget Society

Rossmiller, A., Lindberg, R., Schlembach, S., & Carr, V. (in review). "We want snow": Exploring winter play at a nature preschool. *International Journal of Play*.

Acknowledgments