



PLAYFUL INVENTIVE EXPLORATION



CREATURES

Science Museum of Minnesota

May 8-12, 2006



PLAYFUL INVENTIVE EXPLORATION

The PIE Institute is a museum collaboration offering professional development opportunities for informal educators to explore new approaches to teaching science, art, and technology.

SMM Atelier:
CREATURES
and Their Habitats

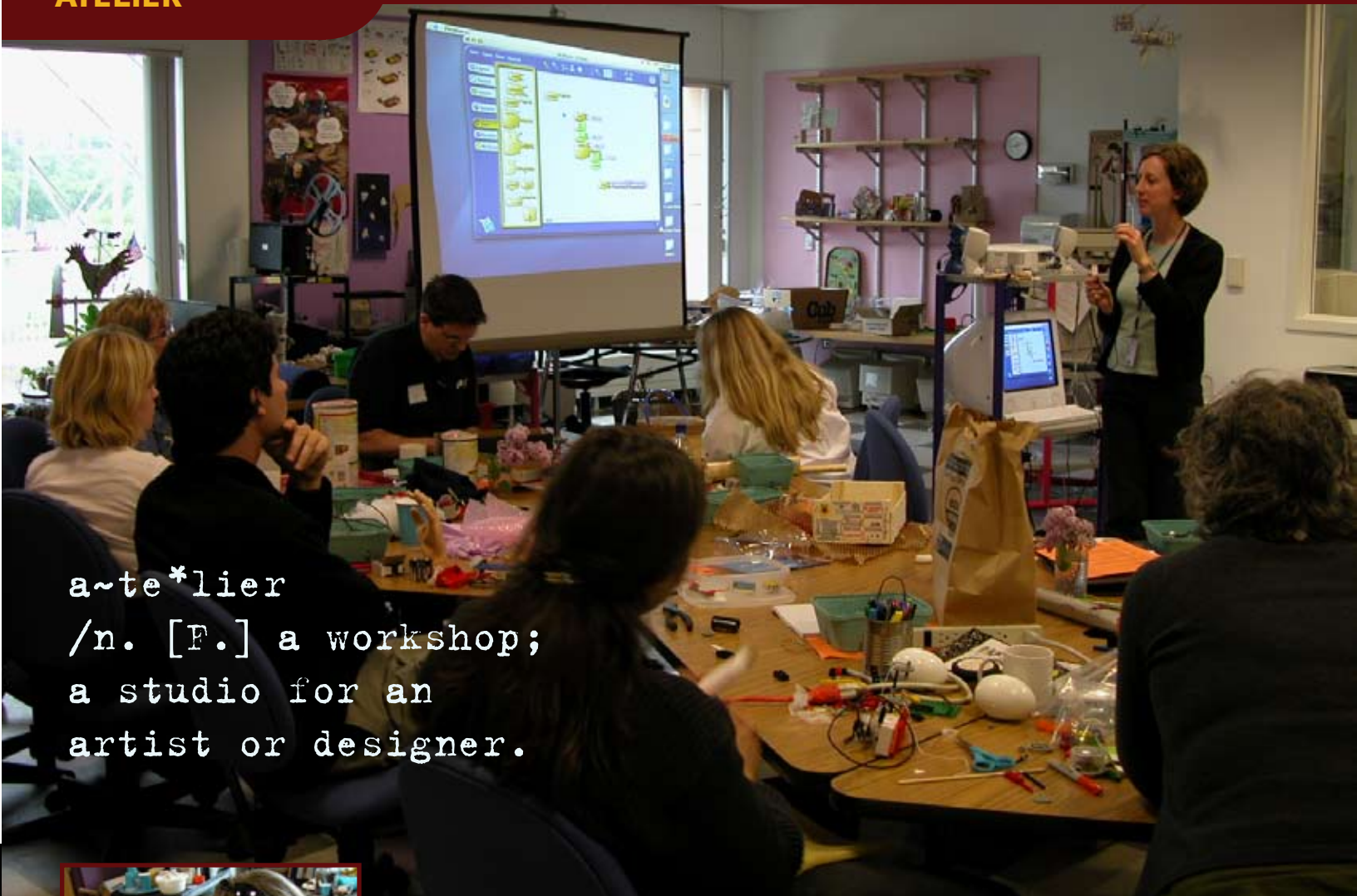
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Contents

| | |
|-----------------------------|------|
| Atelier defined | 1 |
| Creatures description | 1 |
| Monday | 2 |
| Tuesday | 3 |
| Wednesday | 4 |
| Thursday | 5 |
| Friday | 6 |
| Workshop details | 7-15 |

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a~te*lier
/n. [F.] a workshop;
a studio for an
artist or designer.



Atelier Goals:

- ▶ To introduce participants to PIE philosophy, materials, technologies, and process, using open-ended activities and focused discussions
- ▶ To give participants an opportunity to lead a PIE activity for a group of youth
- ▶ To begin developing new ideas for use at each participant's institution, by offering time and support for activity development

Atelier Context:

The PIE approach is defined both by the technologies and materials used (including Crickets, computers, and craft materials), as well as the spirit of the activities themselves. The PIE approach is playful and inspired, with a focus on the voice and vision of the learner. Narrative has an important place in many PIE activities, and this atelier's theme of Creatures and Their Habitats allowed us to explore activities that rely on learners' stories for inspiration. In order to feel empowered to try material-based, technology-rich activities with youth and adults back at their home organizations, we also spent time developing new or modified PIE activities that relate to participants' interests and needs, and tested these activities with children at a local school.



WHAT HAPPENED MONDAY



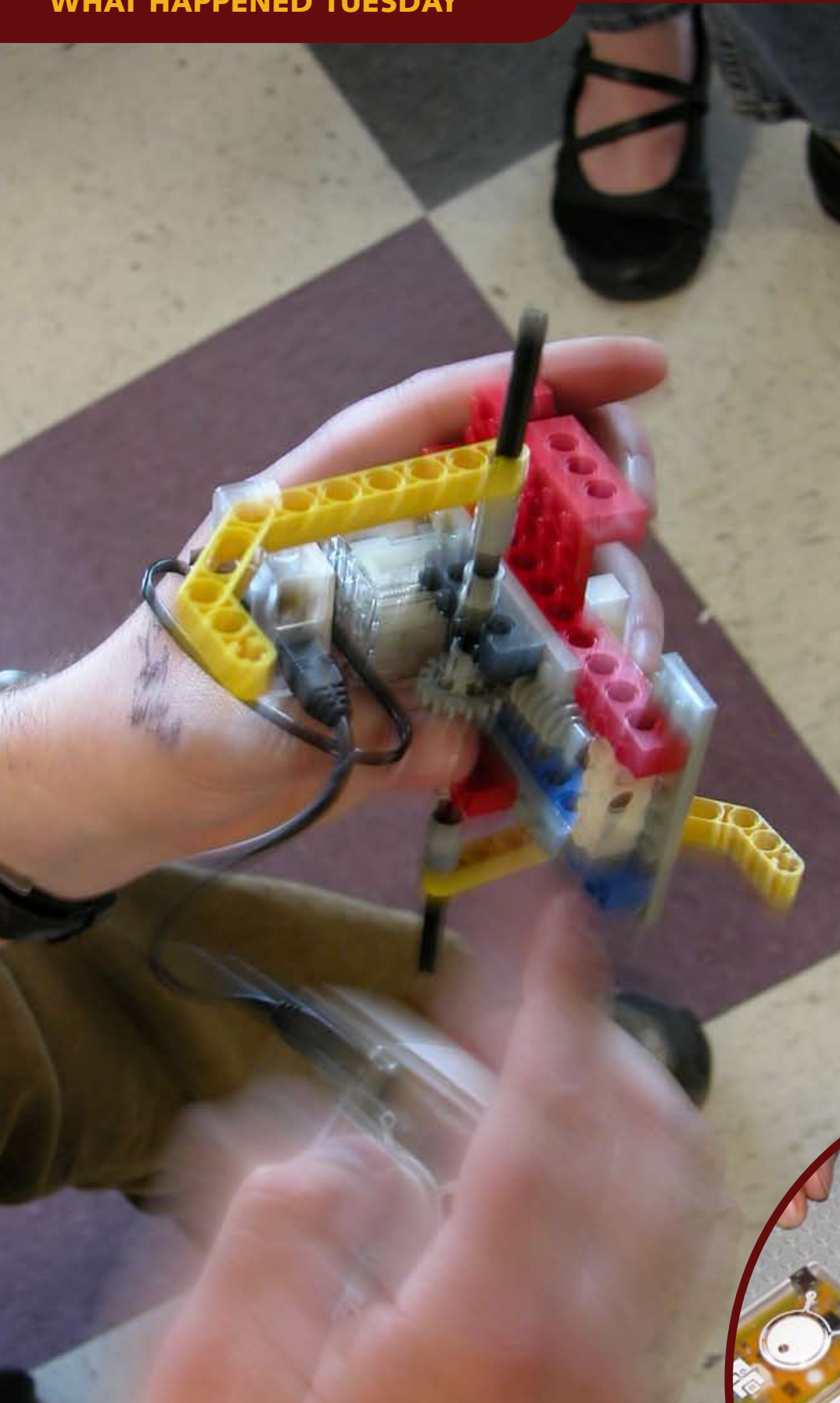
We started the week with an activity called "Covert Creatures". Bags, fabric, containers, and other everyday objects came to life by putting a motor and a Cricket inside. This was a fun way to play with materials and crickets, and to start programming.

"This project got us laughing, which is a key element of PIE!" -Kristen



Center: Sam works on his covert creature. Upper right: Mike works on a Cricket program with Cheryl and Sherry. Lower right: Connie studies her program that will move a bit of fur hidden under a plastic plate.

WHAT HAPPENED TUESDAY



We dug deeper into motion and mechanisms by looking at LEGO motion modules, as well of the work of local artist, Anastasia Ward. We also explored how switches can trigger movement, and used some of these ideas and techniques to make responsive creatures.



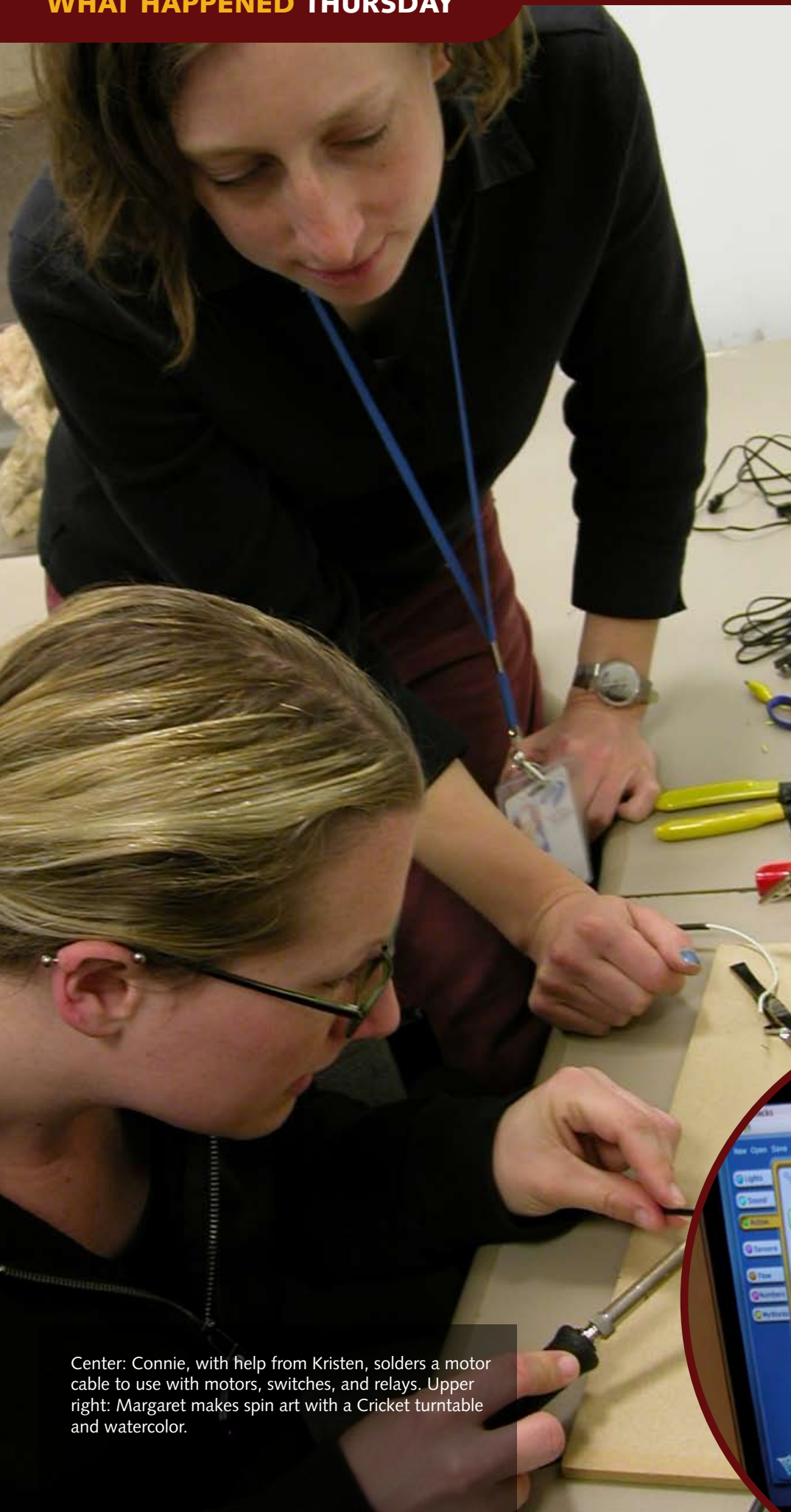
Caption: Center and Lower right: We looked at "Motion Modules"—these are pre-built LEGO mechanisms that incorporate interesting gearing to change the direction and speed of movement. Upper right: A variety of craft and found materials provided inspiration for our creatures.



After exploring resistance using ice, Play-Doh, and other conductive materials, we met Diane Willow, an artist and PIE advisor who makes responsive environments using Crickets, lights, motors, and sensors. The day ended with a trip to Ax-Man Surplus to look for interesting parts to add to our projects and inspiration for later projects.



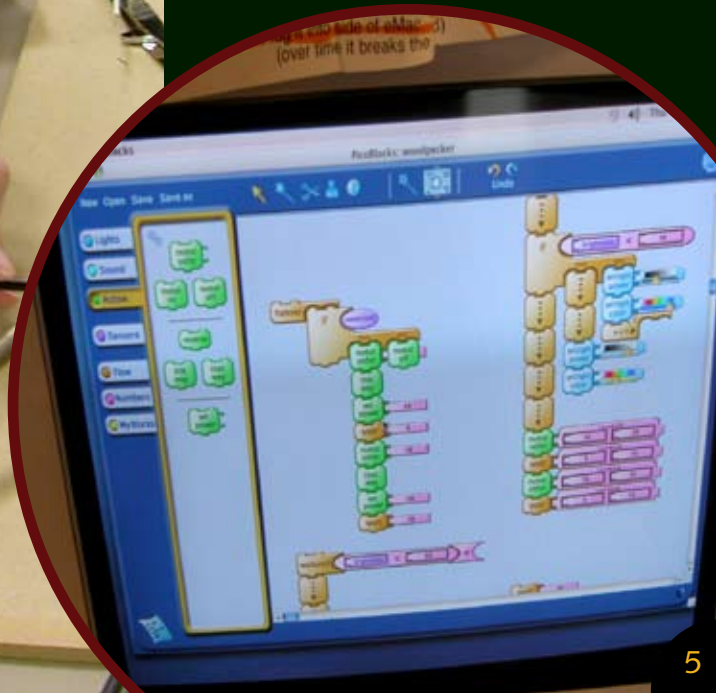
Center: The bins at Ax-Man hold a cornucopia of surplus materials - electronics, manikins, bottles, wheels, and more. Upper right: Nathaniel explores the aisles with his Cricket, testing motors, switches and sensors. Lower right: Ax-Man Surplus, a Twin Cities institution.



Center: Connie, with help from Kristen, solders a motor cable to use with motors, switches, and relays. Upper right: Margaret makes spin art with a Cricket turntable and watercolor.



Working with their colleagues, participants brainstormed how they could incorporate PIE ideas and activities into their work at home. Pairs also began planning an activity to try with children the next day, and experimented with PIE activities like Light Painting and Cardboard Automata.





Friday morning we packed up our supplies and drove to Museum Magnet School, a public school near the museum. We shared several new activities developed in the workshop with third-fifth graders, who were really excited by the Crickets and by what they were able to do.



Center: Students at the Museum Magnet School experiment to find conductive materials. Upper right: Nathaniel and a student make a firefly with a Cricket and LED. Lower right: Sam helps students program LEDs to change color.

Science Museum of Minnesota *Creatures and Their Habitats* Atelier

May 8-12

During the week, participants moved through two phases:

- ▶ learning to use Crickets to make their own project...
- ▶ and then learning to use Crickets as core material for a workshop.

Creatures and Their Habitats is the theme we used to develop the projects and activities. The work of local artists, along with related film and video, were featured to inspire ideas for projects.



Monday's Theme:

Getting Started

Goals:

Introduce a playful activity that uses a variety of materials alongside Crickets and motors. Explore simple mechanisms and Cricket programming to enhance projects.

Covert Creatures Activity

"Covert creatures" are common materials like boxes, bags, or blankets that twitch, wiggle, or tap in surprising ways, implying that something is hiding inside. When programming logic is added in (especially random pauses and varying motions), the sculptures begin to lose their mechanical qualities and become much more life-like.

Thoughts about Monday

From Facilitators

"We wanted to start out with an activity that was fun and provided a way to experiment with materials and Crickets with a lot of flexibility. Making projects that are about what you can't see worked well for that, plus it got us laughing, which is a key element of PIE!" -Kristen



Tuesday's Theme:

Mechanical Creatures

Goals:

Further explore motion and mechanisms. Meet a local artist who makes kinetic creatures by repurposing battery-powered toys, and learn how to scavenge toys for interesting inputs and outputs.

Anastasia Ward

Anastasia Ward is a Minneapolis-based artist who uses scavenged toy parts to create new creatures. She makes hand-sewn animals that move, make sound, and respond to their environment. She shared several of her pieces, gave tips on finding interesting mechanisms and sensors in toys, and got us started taking toys apart.



Making Switches

We explored how to use switches to trigger a motion. Then we designed our own switches to detect wind and a person sitting down, building them out of aluminum foil and other craft materials.

Motion Modules

Participants added onto their creatures or explored new ideas, using LEDs, motors, or sound with their Cricket. Motion modules and Modesto Bugs provide more ideas about creating interesting motions for creatures.

Discussion

To reflect on the first two days of working with Crickets, we discussed the following questions: If you were introducing Crickets to another educator, what would you tell them? What would you say about the activities we've done with Crickets?



TUESDAY RESOURCES

Some of the responses included:

- ▶ Crickets are a tool, and there's a lot you can explore with them: art, science, and engineering.
- ▶ It's fun to see all the different things that people want to do with them, but in order to help people down all these different roads, it's nice to have only a few students.
- ▶ Examples are helpful, both for the physical part of the project and the programming part.
- ▶ These activities can adapt to lots of different learning styles.
- ▶ They help build problem-solving skills, and the problems you solve come from your own idea.
- ▶ You need to allow time to do these activities.



Thoughts about Tuesday

From Facilitators

Much of PIE's work is inspired by artists. Working with creative individuals in the community is a wonderful way to discover new ways to develop ideas, skills, and activities, and to learn about material resources. Anastasia offered a passion and an aesthetic approach to mechanisms that went right to the heart of the question, why tinker? Why struggle to understand how something works? Because you can transform something mundane into something mysterious.

Find Out More

[Anastasia Ward](#)

[Motion Modules](#)



Wednesday's Theme:

Sensors and Habitats:

Sensing Change in the World Around Us

Goals:

Deepen comfort with Crickets by exploring resistance and sensors. Experiment with ways of sensing changes in our habitat. Meet an artist who creates habitat-sized sculptures with Crickets and an educator whose students work on PIE projects during the school day. Visit a local surplus store to find interesting materials and electronics bits.

Exploring Resistance:

The ice theremin—an instrument that turns electrical conductance through ice and your body into sound—makes it possible to hear changes in resistance. After trying the ice theremin, we used the Cricket's resistance and light sensors to affect different outputs such as light color and brightness, or pitches of notes. Finally, we worked in teams to build switches using aluminum foil, alligator clips and a Cricket. One group designed sensors that detected wind, and the other group designed "sitting sensors" that detected when a person sits in a chair.

Diane Willow:

Diane Willow is a Professor of Art at the University of Minnesota and a PIE advisor. She shared several examples of ways that she and her students have transformed rooms into responsive spaces, using electronics in combination with common materials like twinkle lights, fans, and leaves.

Karen Thimmesch:

Karen Thimmesch leads the enrichment program at the Museum Magnet School, a St. Paul elementary school. She brings a wealth of experience and expertise in the educational implications and necessary conditions for PIE activities. Some of her work with youth and Crickets (developed in partnership with SMM) is documented at: <http://ltc.smm.org/museummagnet>

In our afternoon conversation, she shared her reflections on doing material-based, creative design projects (often



involving Crickets) with youth. Some of her thoughts included:

- ▶ Kids want to do stuff. They want to work with materials and make things. It doesn't matter what. The educator's role is to connect these projects to big ideas, and to make the project so precious that the students, will want to take it with them.
- ▶ Even though technology does amazing things, we need to be aware of the levels of kids' knowledge and skills. Our job is to help them explore individual elements that contribute to the bigger ideas. We want to assure that they understand the foundational concepts that explain what the technology is doing to make the "magic." As the educator, you don't have to have all the answers to the students' questions today. You can learn with them, and give them time to find out for themselves, realizing that this slower process will give them more to build on later.
- ▶ It's important to allow time for kids to develop and change their ideas as they learn more. Don't hold kids to making what they drew or designed at first. Have them also draw a picture after they build it. Choice is critical. How will kids develop curiosity, a love of learning, and the feeling of satisfaction that comes with following their curiosity if they don't have a choice over what they do? As an educator, keep this choice at the front of your mind. Sometimes you need to remember to keep your mouth shut to understand their ideas.

Ax-Man Surplus Store:

Surplus stores and second-hand stores are great places to find surprising materials, odd parts, and interesting electronics and circuit parts. Ax-Man Surplus is a Twin Cities institution. We took a trip there with Crickets in hand. By programming them to turn on the motor board and adding a modified motor cable, we could see if the Cricket could power motors, lights, buzzers, and other outputs that we found at the store. Other Crickets, programmed to display the value of the resistance sensor, let us check the range of light sensors, potentiometers, and other interesting inputs.



Make A Motor Cable:

The PicoCricket motor board can send power through a modified LEGO motor cable to homemade and found devices such as relays, lights, motors, and other actuators.

To make your own cable, just cut off one of the black motor connector pads from a motor cable, and attach one alligator clip to each of the two exposed wires.

Download the [Motor Cable PDF](#)

Thoughts about Wednesday

From Facilitators

By building a cricket tool to take to Axman we were able to explore an array of material. Much of the material in the surplus store is opaque, black boxes. Without understanding what it was, the objects are in a sense use-less. By using the Cricket to explore materials we could 'look-inside' and tap into the possibilities for our work and play. Suddenly everything becomes interesting (and fills your shopping basket).

Find Out More

[Ice Theremin](#)

[Diane Willow](#)

[Karen Thimmesch and the Independent Museum Learners](#)

[Ax-Man Surplus Store](#)



Thursday's Theme:

From Learning to Teaching: Developing Activity Ideas

Goals:

Make plans for bringing PIE back to participants' organizations. Try additional PIE activities, and develop activities in small groups to try with Karen Thimmesch's students on Friday.

Small Group Discussions: *PIE at Home*

Working with their colleagues, participants brainstormed how they could incorporate PIE ideas and activities into their work at home. Some made plans to host a workshop for other staff, to lead activities for educators at their museums, to write grant proposals to help them buy a full set of Crickets, or to plan classes and camps around PIE activities.

Light Painting

Some participants tried making light paintings, using Crickets, tricolor LEDs, and digital cameras set to long exposure times. Download the [Light Painting pdf](#) for a materials list and step-by-step directions.

Cardboard Automata

Participants also made cardboard automata, inspired by the work of [Cabaret Mechanical Theatre](#) artists. Download the [Cardboard Automata pdf](#) for a materials list and step-by-step directions.

Lunchtime Discussion of a section of Eleanor Duckworth's book *A Reality To Which Each Belongs*

Make an Activity Your Own

Sharing an activity or idea with others, even if you are new to it yourself, is a powerful experience. In order to give participants the experience of being leaders



and developers of PIE activities, as well as learners, Thursday was focused on developing or modifying a Cricket-based activity, possibly related to something they might want to try at home. On Friday, participants could share these activities with Karen Thimmesch's students at the Museum Magnet School.

Throughout the afternoon on Thursday, each participant worked with his or her partner to create or modify an activity. One group developed an activity about the conductance and resistance of different materials, another about Cricket programming using the LEDs, and a third about making fireflies with Crickets and LEDs.

Thoughts about Thursday

From Facilitators

"When you start creating new PIE activities or modifying tried-and-true ones, it really makes you think about what the nature of a PIE activity is. Is it the Crickets, the materials, the open-endedness, the exploration, the connection to art? You start thinking about all these elements when you begin designing your own activities." -Kristen

Find Out More

Download these Light Painting and Cardboard Automata PDFs

[LIGHT PAINTING](#)

[CARDBOARD AUTOMATA](#)

Visit the Cabaret Mechanical Theatre and the PIE Idea Library

[CABARET MECHANICAL THEATRE](#)

[PIE IDEA LIBRARY](#)



Friday's Theme:

Sharing It With Kids!

Goals:

Test the activities planned yesterday with students at Museum Magnet School. Atelier wrap-up, reflections, and next steps.

Morning at Museum Magnet:

After Thursday's planning and prep time, participants loaded up materials, Crickets, and laptops to bring to the Museum Magnet School. Once there, three groups of participants worked with small groups of 5th and 6th graders for an hour, trying out the activity that they planned. The students expressed genuine interest in the activities and the Crickets, and it turned out to be an exciting experience for participants, too.

PIE Reflections and Planning Discussion: We reflected on the day, the past week, and the future, using the following prompts:

- ▶ What are some of the things that you're most excited about taking back with you?
- ▶ What are some of the challenges that you'll face, and what are some ideas for how you'll overcome them?

Thoughts about Friday

From Facilitators:

"It was a really intense experience, for both the participants and the facilitators, to plan and share an activity with real, live kids at the end of just a week-long workshop. But it was invigorating to see how the kids responded, and to realize that you can try out the seed of an idea with learners. It doesn't have to be polished and perfect, and you can learn a lot from what happens."
-Kristen

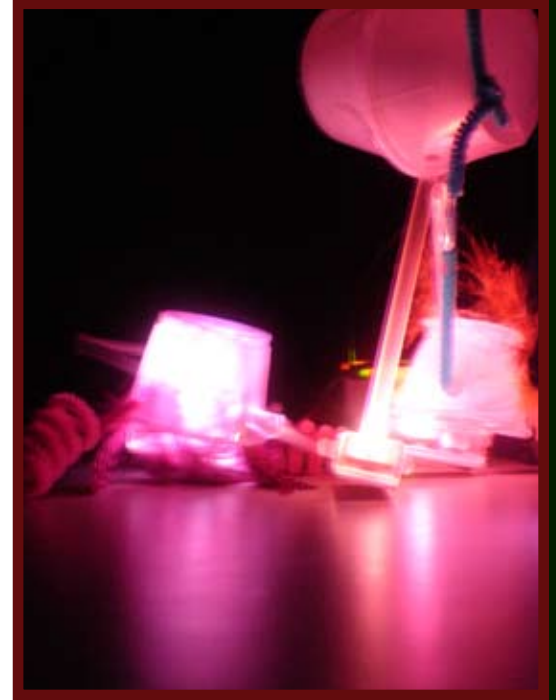


From Participants

"I'm excited to try out these program ideas. A lot of the ideas on the website seem more possible now, and make more sense." -Twila

"One of the challenges we'll face is how to facilitate these activities. Maybe we can do mini professional development workshops to train staff, or recruit teens as volunteers to help facilitate." -Connie

"I'm excited to combine art and science, and to share these passions with kids and families." -Sam





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