



# LOGO SUMMER INSTITUTES 2017

## **Overview**

The Logo Summer Institute is an intensive workshop in creative computing for K12 teachers, parents, and technology integrators. Our project-based approach supports computational thinking and STEAM learning and teaching. The program is highly individualized to accommodate novices as well as more experienced participants, teachers of different subjects, and those who work in informal education settings as well as in classrooms.

The Logo Summer Institute provides a relaxed atmosphere with a small group of colleagues and a great deal of personal attention from experienced workshop leaders. We have a low participant to facilitator ratio and daily advisory meetings to insure that participants' individual needs are met.

## **Pedagogical Approach**

Our approach is project-based and individualized. Computer science concepts and practices, and coding skills are learned while developing projects using Scratch, Makey Makey, Hummingbird, other hardware and software platforms. For beginners these projects are simple at first and become more complex and elaborate as the week progresses. Participants with prior experience begin with projects and explorations that are appropriate to their levels of knowledge and experience.

This approach is based on the theory of constructivism, as developed by Jean Piaget – that people construct their own knowledge through a process of interaction with the world and people around them. In practice we see that developing a project that involves building something – a story, game, robot, or multimedia show – supports constructivist learning. The term “constructionism” for this methodology emerged during the 1980s in the Epistemology and Learning Group at MIT, led by Seymour Papert.

## **Professional Development Approach**

The underlying principles of our approach to professional development for teachers are:

1. Teachers need to know what they teach
2. Teachers should experience the learning process that their students will go through.

The project-based approach of the workshop satisfies both conditions at the same time. In addition, teachers need to make plans for how they are going to bring what they have learned into their classrooms. There is time in the Logo Summer Institute devoted to this planning. Since teachers are working in different situations, this process occurs in groups with teachers in similar circumstances sharing ideas and plans.

We encourage teachers to use the Logo Summer Institute approach as a model for how to structure a program in their classrooms. The goal is to construct a classroom in which constructionist learning can occur.

## **Workshop Organization**

The majority of the time each day is devoted to guided hands-on exploration and project development. With a maximum of 40 participants and five full-time facilitators there is a great deal of personal attention and individualized instruction.

During the first day and a half we focus on using a few core technologies that are accessible to beginners while also being suitable for more advanced projects. We begin with Scratch and then add inputs from

the real world using Makey Makey. Next, we expand to include activation of motors and lights using Hummingbird. Many participants continue to use these technologies for the projects they develop during the remainder of the workshop. Others work with additional software and hardware that are selected based on their particular interests.

During the hands-on time specific skills sessions are organized for groups of participants. These include topics in programming, project design, and construction techniques. There are also discussions and planning sessions that focus on curriculum and program implementation in school and afterschool programs. There are brief sharing sessions each day so that participants may be familiar with what colleagues are doing. On the final day of the workshop there is a more extended time for sharing and presenting projects.

**Schedule**

This is the schedule for the four-day workshop:

	<u>Monday</u>	<u>Tuesday</u>	<u>Wednesday</u>	<u>Thursday</u>
8:30 – 9:00	Introduction	Hummingbird	<ul style="list-style-type: none"> <li>• Hands-on exploration</li> <li>• Project development</li> <li>• Skills sessions</li> <li>• Interest groups</li> <li>• Discussions</li> </ul>	<ul style="list-style-type: none"> <li>• Complete projects</li> <li>• Prepare presentations</li> </ul>
9:00 – 10:00	Scratch			
10:00 – 11:30				
11:30 – 12:30	Lunch	Lunch	Lunch	Lunch, Wrap Up, and Presentations
12:30 – 12:45	Sharing	Sharing	Sharing	
12:45 – 3:00	Makey Makey	<ul style="list-style-type: none"> <li>• Hands-on exploration</li> <li>• Project development</li> <li>• Skills sessions</li> <li>• Interest groups</li> <li>• Discussions</li> </ul>	<ul style="list-style-type: none"> <li>• Hands-on exploration</li> <li>• Project development</li> <li>• Skills sessions</li> <li>• Interest groups</li> <li>• Discussions</li> </ul>	
	<ul style="list-style-type: none"> <li>• Hands-on exploration</li> <li>• Project development</li> </ul>			
3:00 – 3:30	Reflection, Advisory, and Sharing	Reflection, Advisory, and Sharing	Reflection, Advisory, and Sharing	

## Projects and Explorations

These are some of the most common areas that have been developed in recent Logo Summer Institutes:

1. Animated Stories and Adventure Games

Create a multimedia story using Scratch. This provides for learning programming as well as how to work with images, video, sounds, and music. Teachers of children in grades K-2 can also try this project using Scratch Jr. The adventure game model extends the story to include interactivity and branching by having the user choose the path the story takes and solve puzzles to move forward.

2. Video Games

Game design and creation is very popular among students. Some of these projects are based on popular video games. Others are original. These projects can involve complex design and organization, attention to user interface, and strategy.

3. Music Making

Stories and games may be enhanced with the music-making features of Scratch. Musical instruments can be built using Makey Makey.

4. Robots

Devices that interact with the world by sensing touch, light, temperature, or motion, and then use that information to activate the robot by controlling motors and lights. Initially these projects are usually developed using the Hummingbird, but may also use Arduino, LEGO, or other platforms.

5. Vehicles

A popular robotics project is to create vehicles that can interact with their environment and with each other. They can follow a line, navigate a maze, avoid obstacles, seek out light, water, or each other.

6. Turtle Geometry

The turtle offers an ideal introduction to programming as well as a rich environment for explorations in mathematics and art. Using Scratch or TurtleArt, one can quickly achieve satisfying results with a minimum of programming skill. But, the possibilities for learning in geometry, artistic expression and programming are limitless.

7. Teach to Learn

Students and Teachers are well-acquainted with drill and practice programs and instructional software, e.g. BrainPop. A much richer educational experience is had when students create their own versions of these programs using Scratch. In addition to achieving a deeper knowledge of the subject matter, they enhance their design and programming skills.

6. Interactive Dioramas and Displays

A diorama or display may be enhanced by adding sensors that when touched, trigger sounds, recorded narrations, or information on the computer screen. Adding motors and light brings the display to life.

### Next Steps

A wide range of additional projects are possible, limited only by one's imagination. Some participants prefer to concentrate on one or two projects for the week, while others prefer to sample many opportunities. Both approaches are supported at the Logo Summer Institute.

## Technologies

The specific technologies used in the Logo Summer Institute are continually evolving. For the 2017 Institutes there are several core technologies that form the basis of the introductory sequence for beginners and are also used by many participants for the projects that develop during the week.

[Scratch](#) is an enormously popular blocks programming environment that is ideal for creating games and multimedia stories, reports, and presentations. Tutorials and help are built into the programming environment and the Scratch website provides an environment for sharing projects and getting support.

[MaKey MaKey](#) works with a wide range of everyday objects to provide physical world input to Scratch projects.

[Hummingbird](#) is a microcontroller board with sensor inputs and outputs to control motors, lights, and other devices. It works with Scratch and many other programming languages.

Many additional technologies are available to be used as needed for projects. The selection of what is used at any given Logo Summer Institutes depends upon availability and participants' interests. These possible options include:

[Scratch Jr](#) is a version of Scratch for young children ages 5-7.

[Snap!](#) is an extended version of Scratch that is suitable for more advanced programming projects.

[TurtleArt](#) is an app that encourages projects and explorations at the intersection of coding and art.

[MicroWorlds](#) is a full-featured text programming environment, which, like Scratch, is suitable for games and multimedia projects. MicroWorlds is also an appropriate choice for explorations in turtle geometry and other areas of mathematics, and for language explorations.

[WeDo](#) from LEGO is a robotics environment designed for young children. It can be controlled from Scratch as well as from separate WeDo software.

[NXT](#) and [EV3](#) from LEGO is in widespread use and is the robotics system of choice for many schools.

[Finch](#) is a ready to use robot with motors, lights, and sensors built in. Since no construction is required, the focus is on programming.

[Arduino](#) is family of microcontrollers that are used in robotics projects. They provide an opportunity for learning about electronics since they require work at this level. Arduinos may be programmed with an extension of Scratch for Arduino, a blocks programming environment called *Ardublocks*, as well as the Arduino text programming language.

[LilyPad](#) is an Arduino that is designed for wearables and e-textiles.

[StarLogo Nova](#), [StarLogo TNG](#), and [NetLogo](#) are massively parallel systems for modeling emergent phenomena.

[BeeBot](#) is a simple robot that can be programmed to move around on the floor.