A Tinkering Workshop: Making Interactive Landscapes

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Create models of real or imaginary landscapes and connect them to Scratch programs.



Introduction

First, watch this video introduction: <u>youtube.com/watch?v=Qbkx0g58UoI</u> (about 4 1/2 min.)

This project has several facets: storytelling, physical modeling (going from a sketch to a handmade landscape), and Scratch programming. The idea is to imagine a real or fictitious landscape as the setting for a simple story about what an explorer might see. An explorer (in the form of a game piece avatar) moves through the created landscape according to rules established by the maker. Along the way the explorer can focus in on details if they stop on interactive spaces. These spaces trigger a Scratch program with animation, artwork, sounds or even mini games.

The project is adaptable for classes in history, geography and language arts. It allows participants to experiment with interaction design and to build confidence as makers of objects that have both physical and digital components.

I have offered versions of this workshop over the years in several settings including after-school programs and for homeschool and library groups. Most recently (at a library), we met 2 days per week for about 2 1/2 hours each day. The workshop ran for 12 weeks, however most participants came only 1 of the 2 days.

In a classroom setting, this should be considered a semester-long project. If students work in teams of 2-4, the project timetable could be shortened.

Some variations:

1. Create a world map landscape with "paths" connecting cities where inventors lived (equal numbers men:women!) Connect it to simple "reports" in Scratch with audio, photos from the internet, simple animations or text.

2. Create a landscape board of the Mississippi River. Take a boat trip down the river (or up the river!) as an explorer. Stop at key points along the way (historical, geological, etc.). What do you see? Scratch programs show the point of view of an explorer.

3. Create a story that takes place in a building. Your landscape board is a blueprint of one floor (could you make it 3D to have a second floor?) Move in corridors between rooms. When you enter a room, a Scratch animation is triggered that has a recorded audio "chapter" with no visuals on a computer screen (hide the computer from view.) Place a small speaker near the board to hear.

4. Create small game boards that, when placed next to each other, make a complete game. Establish the design as a group. How will players exit one game board and enter the next?

Who is the workshop for?

Participants should have basic Scratch proficiency so that they can focus on design right away. Basic Scratch skills necessary: orientation to the program interface, basic blocks and scripts for movement and looks, broadcast, creating and importing graphics and sounds.

The kids in our workshops ranged from 2 novice 6 year-olds with basic reading skills (they required parental one-on-one, which worked well) to 15 year-olds with very advanced Scratch skills.

Materials and Tools (also, see Sources below)

<u>Computers</u>: Ideally, there should be one computer per landscape. There is a lot of design work back and forth between the physical and digital creations.

<u>MaKey MaKey boards</u>: These devices allow touch sensors to be constructed from simple materials. A closed circuit is translated as a key press on a keyboard. Scratch programs then are initiated by this key press. These boards cost \$50 each but they can easily be shared when kids want to run a test or present their projects. 2-3 of these devices can go a long way in a classroom. (see the **Quick Connect** topic below)

<u>Building materials</u>: The most useful materials I offer in workshops are wood scraps. If you know a woodworker, ask them to save small cutoffs. Or, if you know someone with a bandsaw, ask them to create a boxful of small interesting shapes out of scrap material.



Other materials include card stock, cardboard, string, etc.- craft store stuff. The base material we use is 1/8" tempered hardboard which Lowes and Home Depot usually have in 2x4 foot sheets for around \$6. One sheet should make 4-6 landscapes. Wear a dust mask when you cut it.

Glue: Hot melt (low or high temperature) glue is indispensable (though messy). Have a station with 2 glue guns set up with cardboard on tabletops. White glue works well if you have time to let it set. However, I find that it constrains design possibilities because clamps, or other holding devices, are often lacking to hold creations while the glue sets.

Paint and embellishments: Acrylics work best. Tempera is flat and chalky, and more naturallooking (not to mention more washable).

Other electrical components: Extra alligator leads are useful. Some are included with the MaKey MaKey, but you'll need more. Also, you'll need some hookup wire to wire the bottom of the board. A soldering iron is useful (but not required); the project presents an opportunity to learn basic soldering with minimal risk.

Camera: A camera with a macro lens (even a smart phone camera) offers the ability to photograph elements of a landscape to be used in Scratch projects as backdrops or sprites. I did this for the game in the video above. Share them via Dropbox.

Making

If possible, have available some simple examples for inspiration. Begin the design process by fleshing out ideas in drawings and story boards.

Ask participants to think about how gamification might help draw people in to experience your landscape. Do all games have to have winners and losers? If you don't want to make a game, what other ways can someone interact with your landscape? What might a player see and hear when they land on an interactive space?

Look through all the available building materials before choosing any. Think about a simple Scratch program you have made that has a sprite that moves, changes or makes a sound. Assemble some materials and start to rearrange them. Do they remind you of waves, roads, mountains, houses, etc? Make more drawings; jot down a few notes.

Building the landscape: Start with a piece of hardboard for the base and glue feet on the underside of the corners. Since you will need room under the board for wires, make sure it is elevated about 1/4 to 3/8 of an inch.





If your landscape has traditional game squares these can be applied as wooden squares or they can be painted. An advantage to using squares (3/4 inch squares of the hardboard work well) is that they can be rearranged initially to help with the design process. When you've placed them in their final positions, either glue them or trace lines around them to later fill with paint.



Interactive spaces: An initial temptation that I usually see among participants is to plan many interactive spaces- too many. While wiring them is fairly straight forward, the Scratch programs that are triggered by them can require a lot of work. It is better to plan for fewer interactive spaces if the Scratch programs are complicated, and more spaces for simple programs (e.g., single costumes and audio.) I have had many kids create mini games that dictate how many spaces forward or back a player may proceed. These often take a disproportionate amount of time so that kids have to skimp when it comes to building.

The following photos show the underside of my example landscape.





In the left photo, the green wire attaches to a "keypress" pad on the MaKey MaKey. The clear wire is soldered to a main ground wire which is attached via a single alligator clip to the MaKey MaKey. The right photo shows all the wiring for 8 interactive spaces. All are hot melt glued to keep them from pulling loose. Soldering to a single ground wire is optional. The blue tape labels the key presses.

Game pieces: We've used everything from foil-wrapped wine corks to wooden pieces with metal washers on the bottom. Copper foil tape works well, too. Polymer and other oven-cure clays are good for organic forms.

Scratch Programs

I encourage kids to think of their Scratch program as a window into the landscape. It should provide a unique perspective of something that may be hidden. For example, a dark colored interactive space could be an entrance to a cave. The script that it triggers could offer the sights and sounds of having fallen into a dark hole. What would you see and hear? It could: change to a cave backdrop, change brightness of the sprite by a negative number and play a spooky echo.

Characters that populate a landscape can be photographed for animations. For example, make a cat out of wood scraps, photograph it and place it next to an interactive space. Set the photo as the backdrop. Then make a sprite with costumes for different mouth openings. Line up the sprite with the mouth of the cat in the backdrop. Load an audio file. When the script is triggered, the cat could sing or talk

The Scratch program for my sample landscape (as seen in the video):

http://scratch.mit.edu/projects/45940598/



Sources

MaKey MaKey boards are \$50 from <u>makeymakey.com</u>. While they are also available from Amazon, I suspect that the parent company gets to keep a larger share of the proceeds (a good thing) if you buy directly. Keep them in a box when not used as the headers (connectors) can bend and break.

Electronic supplies like extra alligator leads and hook up wire are available from Adafruit (<u>adafruit.com</u>) and Sparkfun (<u>sparkfun.com</u>) and your local Radio Shack.

Wood craft parts are available from <u>caseyswood.com</u> and <u>craftparts.com</u> among others.

Sounds: We use <u>freesound.org</u> which has an extensive library of user uploaded soundseverything from wind to snoring. Make a free account to use. Use .wav files or download other file types, open with Audacity (<u>http://audacity.sourceforge.net/</u>), a free audio editor and export as .wav files. Don't overlook the recording capabilities within Scratch.

Quick Connect

While the MaKey MaKey is very easy for kids to use right out of the box, managing wires can be a problem if you are working with a group. This is especially so if kids are sharing them. Also, kids have trouble with alligator clips. They are hard to squeeze open.

One solution is a quick wire connect. You can purchase SM connectors from Adafruit (<u>www.adafruit.com/product/1665</u>) or you can make a homemade version (right).



The homemade version has holes drilled in the edge of the landscape board. They are slightly larger in diameter than a 2" finish nail. A paper clip goes through the holes and is twisted on the outside. Interactive spaces are alligator clipped to these. A separate board has nails that are spaced the same as the holes. Drill a very small pilot hole before hammering the nails through. Solder (or wrap and hot glue) wires for the MaKey MaKey. All landscape boards in the class have connections ordered in the same way (e.g., the nail holes might correspond to the key presses W, A, S, D, F, G, and ground from left to right.)

When a workshop participant wants to test or present their project, The board with the nails is pressed into the holes making an instant connection.

More photos: www.flickr.com/photos/sciencewonder/