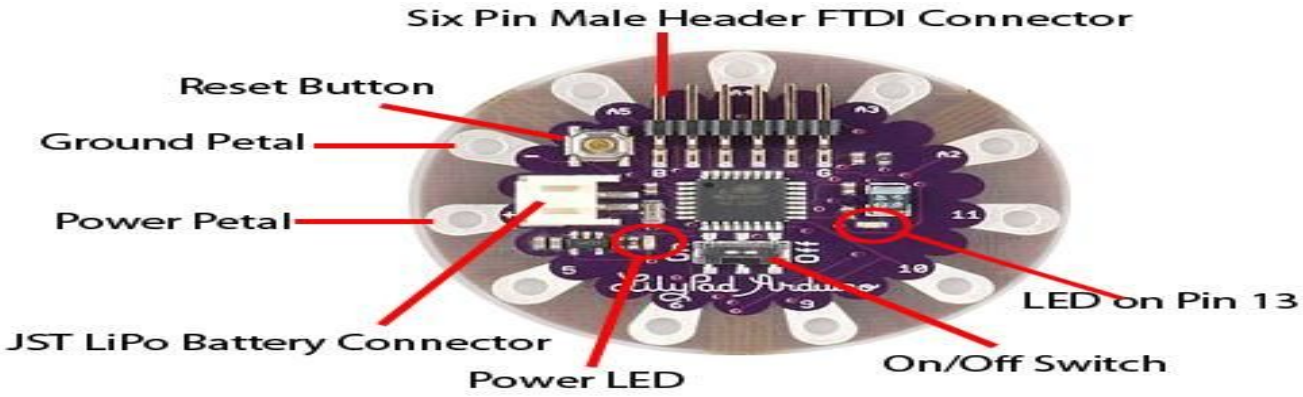

ProtoSnap –LilyPad Development Board


LilyPad Simple Board
Vibe Board
RGB LED
momentary button
on/off switch
Temp Sensor
Light Sensor
Buzzer
5 Bright White LEDs


Six Pin Male Header FTDI Connector
Reset Button
Ground Petal
Power Petal
JST LiPo Battery Connector
Power LED
LED on Pin 13
On/Off Switch

Sensors **It's Lit……LilyPad Sensors in E-Textiles**

Introduction: Students will learn basic coding and embellish apparel (Shirts, Bags, Hats, etc.) with Lily Pad components like LED lights and other sensors.

Curriculum Alignment: This assignment is aligned with:

North Carolina Essential Standards

HS.TT.1 Use technology and other resources for assigned tasks.

HS.TT.1.3 Use appropriate technology tools and other resources to design products to share information with others.

B.V.3 Create art using a variety of tools, media, and processes, safely and appropriately.

B.CX.2 Understand the interdisciplinary connections and life applications of the visual arts.

B.CX.2.4 Analyze the role of art in creating digital images, technological products, and design.

I.V.3.3 Analyze the relationship between process and product.

I.CX.2.2 Apply skills and knowledge learned in various disciplines to visual arts.

I.CX.2.4 Analyze how digital design affects communication in art.

P.V.3.2 Analyze the relationship between media, processes, and results.

P.CX.2.4 Analyze how contextual relevance affects aesthetic responses to digital media.

A.CX.2.4 Analyze the influence of digital media and technology on creating art.

CTE Essential Standards

ME11 2.01 Employ entrepreneurial discovery strategies to generate feasible ideas for business ventures/products.

ME11 3.04 Select a target market appropriate for venture/product to obtain the best return on marketing investment

MI21 1.01 Understanding the progression of fashion.

Objectives: Students will be able to:

Apply coding fundamentals.

Create a code to make Lily Pad LEDs blink, vibrate, etc..

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Evaluate materials for use in E-Textiles.

Time & Location: Three-four 90 Minute classes in classroom (Computer lab)

Teacher Materials:

Websites

- **https://www.sparkfun.com**
- **https://www.sparkfun.com/products/11262**
- **https://www.arduino.cc/**
- **https://www.adafruit.com/**
- **http://makezine.com/tag/education/**
- **https://www.sparkfun.com/products/11262**
- **http://etextilelounge.com/**
- **http://www.lessemf.com/fabric.html**

Videos

- **E-Textile paraphernalia: https://youtu.be/Y2sqwCEbrrs**
- **CRAFT Video: LilyPad Arduino 101: https://www.youtube.com/watch?v=Yj639_ez6TM**
- **LilyPad Projects: https://lilypadarduino.org/?cat=15**
- **E- Textiles Channel https://www.youtube.com/user/LynneBruning**
- **How to Sew LED Rhinestoneshttps://youtu.be/FGEdO28gpmU**

Projector and Speakers

Student Materials:

- **Apparel Item**
- **Sparkfun Protosnap kit (https://www.sparkfun.com/products/11262)**
- **Computers w/ Arduino downloaded (If computers are unavailable in the classroom students can use a computer lab in the school.)**

LilyPad programming handout (Teacher Provided)

Design materials (fabric glue, Velcro, rhinestones, sequins, etc.)

Soldering irons w/ lead free solder (Optional)

Goggles & Gloves (Optional if not using the Soldering Iron)

Scissors and needle nose plyers

Multimeter and Alligator clips (optional)

Safety:

- **While students are creating E Textiles standard computer and class safety rules will apply. Students may need safety goggles and gloves if/when they begin soldering materials. Educators should go over sewing safety to ensure students are utilizing safe practices when using a sewing needle. Educators also need to remind students that crossing the positive and negative wires or thread when using the LilyPad can cause the circuit to short or overheat.**

Student Prior Knowledge:

Students should have an Idea of how E-textiles function.

https://youtu.be/OqMffiPPjvw

https://www.youtube.com/watch?v=o91f2wmpJRQ

Teacher Preparation:

Have LilyPad Protosnap kits available

Have Arduino downloaded on student computers (https://www.arduino.cc/en/Main/Software) (May need assistance/ Permission from your IT department)

Have YouTube E-Textile Videos Available (Listed in the videos section)

Make copies of LilyPad programming handout (Attached)

Soldering irons w/ lead free solder available (optional)

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Activities:

Day One

(5 min) Warm up: Students will respond to the question…... What are E-Textiles? (show videos under student prior knowledge)

(15 min) Ideation: Ask students "If you could design/create any type of apparel (clothing /accessory) item that had technology incorporated into it, what would that Item be and what would it be capable of doing. Have students sketch the item and describe its characteristics.

(You may hear student responses along the lines of jackets, hats, shirts, and bags that light up or can play music)

Transition to the YouTube videos by informing students that they will have an opportunity to create E-Textiles. Ask students to think of apparel items they already have that they wouldn't mind upcycling to create an E-Textile with. Inform students they should take notes on the videos as they continue to generate ideas.

(20 min) Ideation: Watch YouTube videos on E-Textiles to generate Ideas.

(Now that students have watched a few tutorials on coding Arduino LilyPads, pass out the student Sparkfun Protosnap kits and LilyPad programming handout so they can begin to practice)

(50min) Independent Practice: Introduction to Arduino functions and Practice basic Coding of LilyPads with Prewritten code.

Day Two

(5 Min) Warm Up: Students will respond to the following prompt: What Lily Pad components do you plan to incorporate into you E-textile?

(Review basic fundamentals of coding and safety procedures. The goal is to make sure students have feasible ideas for their projects based on the materials at hand.)

(85 min) Independent Practice: Utilize basic code to program LEDs and create wearable devices.

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Day Three

(Analyze student's success and progress to determine if one more day of coding and creating E-Textiles is needed.)

Assessment:

Student will be able to code Lily Pad components to create E-Textiles and present their product to their classmates and teacher.

Critical vocabulary:

Research & Development: Refers to the investigative activities a business conducts to improve existing products and procedures or to lead to the development of new products and procedures.

Wearable technology: Clothing and accessories incorporating computer and advanced electronic technologies. The designs often incorporate practical functions and features.

Coding: A set of symbols that can be interpreted by a computer or piece of software

Smart Clothes: Clothing that monitors the wearer's physical condition.

Conductive Thread: Is a thread that conducts electricity. Conductive threads are a cross between the world of electric wires and the world of textiles, with attributes of each.

E-Textiles: are innovative textile materials, (fabrics, yarns and threads), that incorporate conductive fibers or elements directly into the textile itself.

Sensors: a device that responds to a physical stimulus (heat, light, sound, pressure, magnetism, or a particular motion) and transmits a resulting impulse (for measurement or operating a control)

Actuators: a component of a machine that is responsible for moving or controlling a mechanism or system. An actuator requires a control signal and a source of energy.

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I have been teaching for 7 years.

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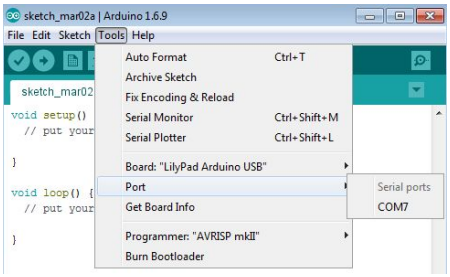
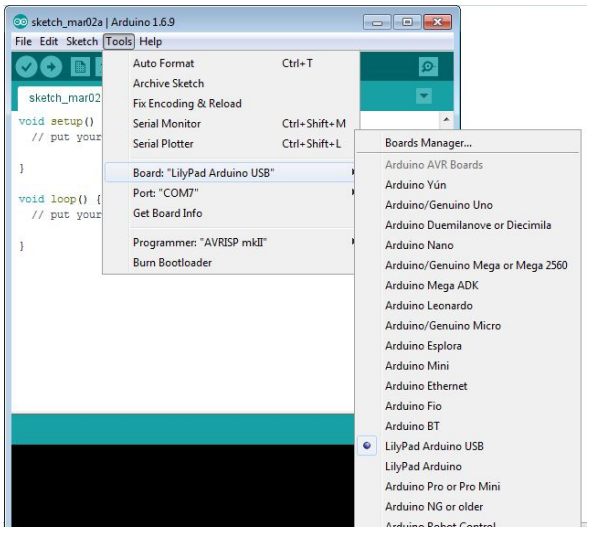
LilyPad Programming Instructions

1. **Open Arduino Software (Make sure it has been downloaded on your computer)**
2. **Attach LilyPad to computer (Attach FTDI board to your LilyPad, Plug in USB to FTDI board & The computer)**
3. **Select Serial Port from Tools**



4. Select Arduino Board



5. Program (Code) is a set of instructions written in a programming language that follows a very precise format.

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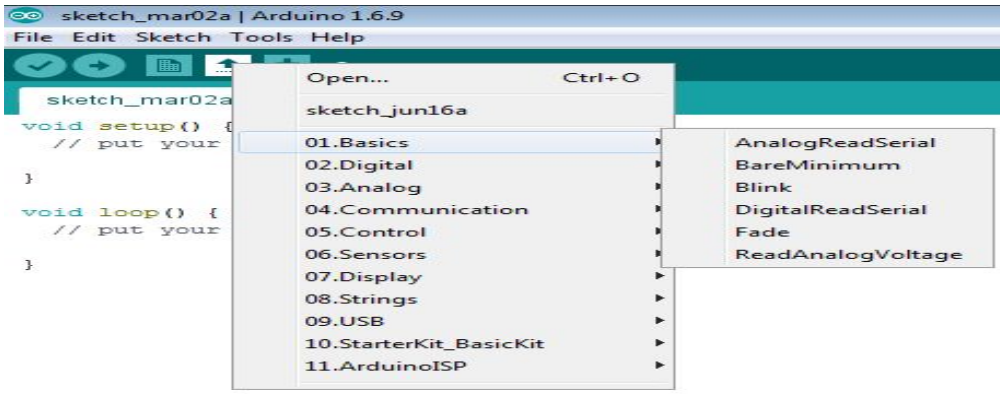
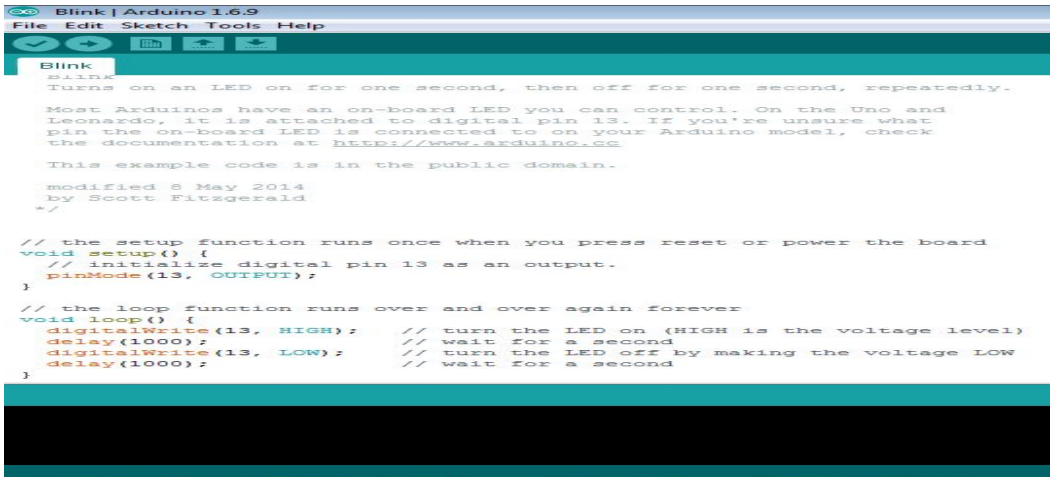
4steps:

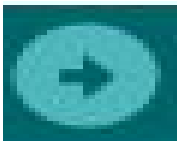
1. **Write the program (Pre-written example code)**
2. **Compile the program**
3. **Upload the program to the Lily Pad**
4. **Run the program on the LilyPad**

Prewritten Code: Blink





Compile the program: Now hit the  **or verify button (Should See done Compiling in Status Bar) If an error is found the line will be highlighted.**

Upload the program to the Lily Pad:  **(should say Uploading Done)**

Run the Program on the LilyPad: After the program is uploaded, a green LED on the LilyPad should start to flash on and off.

Now try creating your own Code by changing the delay or LED level (experiment w/ different blinking speeds)