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INSTRUCTOR GUIDANCE

<http://dwig.lmc.gatech.edu/projects/prototypingpuppets/>

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Welcome!

Welcome to our educator cheat sheet! This fun project will introduce circuitry through the creation of puppets, and further explore creativity with story development and performance. This sheet will walk you through your role step by step. The workshop consists of four main steps:



Activity Breakdown

Preparation	30-40 min
Teaching Designs	20-30 min
Story Development	30 min
Puppet Creation	45-60 min
Rehearsal	20 min
Performance	10 min
Total	3 hours 10 min



For questions or comments, please contact Michael Nitsche: michael.nitsche@gatech.edu

Preparation

Before to the workshop, look over the **LIGHT-UP ROD PUPPET** instruction sheet and build your puppet to understand what you are about to teach. Assemble the tools and materials.

*Tip: Find a video of the step-by-step process to build our sample puppet on our website.

*Tip: Find a list of materials and tools in our downloadable materials and in this package.

*Tip: Have all materials laid out on a separate table before you start the workshop. If possible: have a clearly marked stage area set up.

Teaching Designs

You built the puppet and understand the technology. Now you can explain it to the students. Show the students your pre-built puppet, then guide them through the process step by step. Provide them with the **LIGHT-UP ROD PUPPET** instruction sheet.

*Tip: If you use a Prometheus board or the like: Show the **LIGHT-UP ROD PUPPET** instruction on the projection. The instruction sheet has embedded links to our YouTube instruction video. You can click on the different steps and this section of the video will play.

Story Development

Once the basic building technique is clear, invite students to develop their own story together. We recommend groups of up to 12 students to work together. Provide each group with the **STORY BOARDING** worksheet.

*Tip: Encourage students to develop stories from their neighborhood and communities.

*Tip: Keep an eye on the length and scope of the story. How many puppets are needed, how long will it take to tell this story?

*Tip: Use the second page of the **STORY BOARDING** worksheet to identify puppets and props that need to be built and let student self-assign to the building process.

Puppet Creation

Let students build their puppets for the shared storyline. There is no right or wrong way for the puppets. Let the students' creativity flow!

*Tip: Encourage peer-tutoring where feasible.

Rehearsal

Once a story puppet is finished, find its personality by interacting directly with the puppet operated by the student. Encourage students to voice the puppets and improvise their puppets' personalities on the spot.

*Tip: Do not operate the puppet yourself but leave it in the hands of the maker/ puppeteer.

*Tip: Ask the puppet questions such as "What is your name? What is your role in the story? What do you think about the other characters in your story?"

Once all puppets, props, and stage backdrops are finished, assemble the students to play through their story. We suggest at least 3 full play rehearsals to allow them to settle into a story and character.

Performance




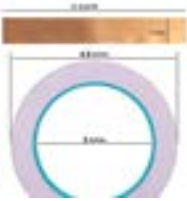


With the rehearsals complete, call for the final performance.

*Tip: Have a camera ready to record the final performance.

MATERIALS LIST

<http://dwig.lmc.gatech.edu/projects/prototypingpuppets/>

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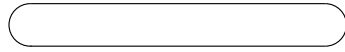
	Material	Price	Supplier
	LEDs (300)	\$11.86	Amazon
	Battery (20)	\$8.28	Amazon
	Cardstock	\$18.98	Amazon
	1/2" thick copper tape	\$7.99	Amazon
	Craft stick (100)	\$4.18	Amazon
	Scotch Tape (3 pack)	\$7.32	Amazon

LIGHT-UP ROD PUPPET

<http://dwig.lmc.gatech.edu/projects/prototypingpuppets/>

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Materials & Tools:



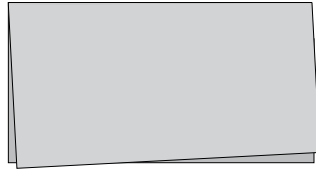
large craft stick



copper tape



clear tape

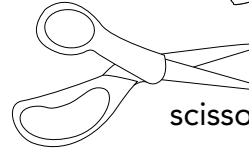


construction
paper

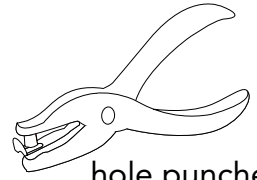


LED

battery



scissors



hole puncher



actual size of large craft stick

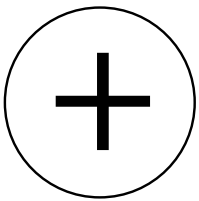


actual thickness of copper tape

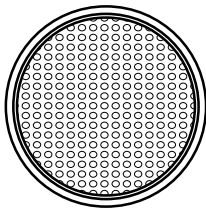
Understanding Polarity

There is a **POSITIVE** and **NEGATIVE** side on both the battery and LED. Positive must connect to positive, and negative to negative for the electricity to flow. This is called **polarity**.

BATTERY



Positive Side



Negative Side

Look at both sides of the **battery** to familiarize yourself with each. The flat side with a \pm sign is **positive**, and the bumpy side is **negative**.

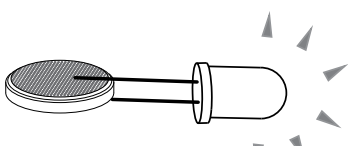
LED



Negative Lead

Positive Lead

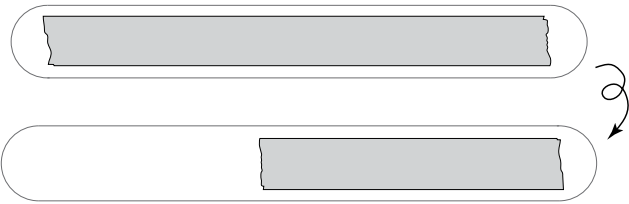
On the LED, the wires that come out are called **leads**. The longer lead is **positive**, and the shorter lead is **negative**.



Connect the **LED** to the **battery**, to illuminate it. Not working? Check your polarity and try the other way

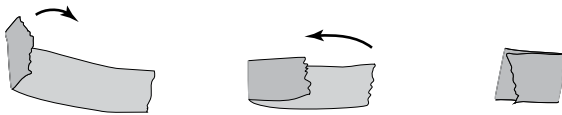
Instructions:

Step 1: Attach a strip of **copper tape** on to one side of the **craft stick**.



Flip **craft stick** over, and attach **copper tape** strip halfway across this side.

Step 2: Form loop with **copper tape**, sticky side facing out.



Attach **copper tape** loop on middle of **craft stick** over **copper tape**.



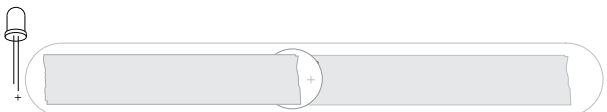
Step 3: Attach **battery** on top of **copper tape** with **positive** side facing up.



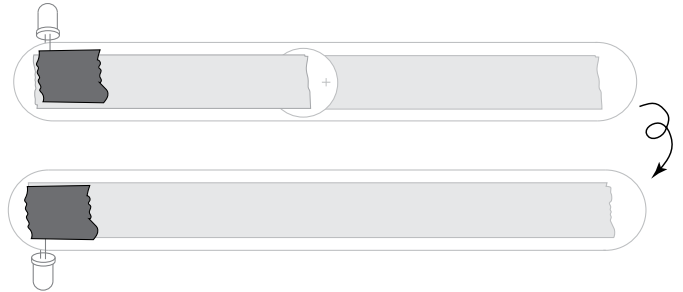
Step 4: Attach another piece of **copper tape** over middle of **battery**, extending to end of **craft stick**.



Step 5: Place **LED** over **popsicle stick**, with **negative lead** connecting to **negative battery** side, and **positive lead** to **positive battery**.

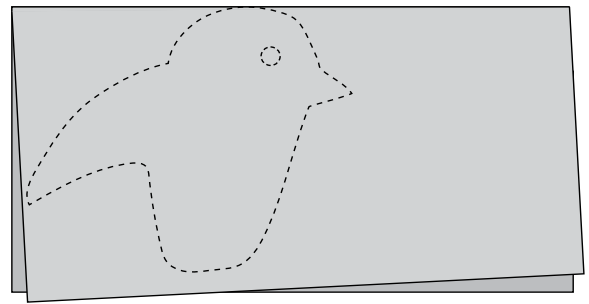


Step 6: Attach another piece of **copper tape** over each **lead** on both sides of the **craft stick**, to secure the **LED**.

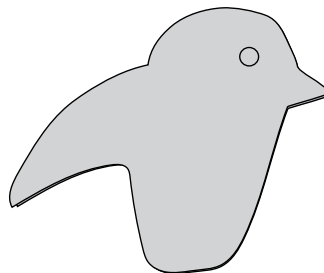


Step 7: Trace your puppet design on to **construction paper**.

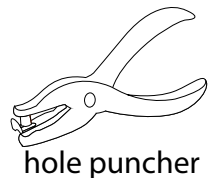
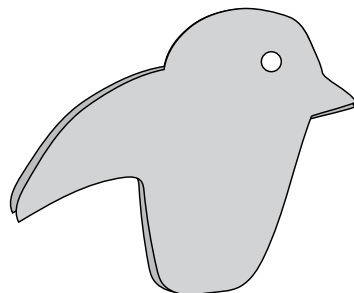
Note: ensure that design matches **folded edge** of **construction paper** so that a part of the puppet contains the fold.



Step 8: Cut out design.

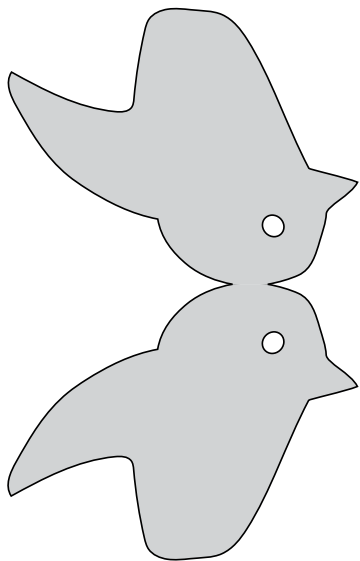


Step 9: Using **hole puncher**, punch a hole where you want the **LED** to shine through.

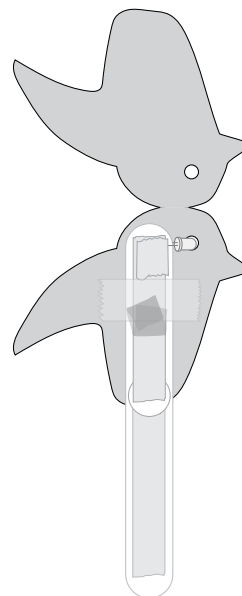
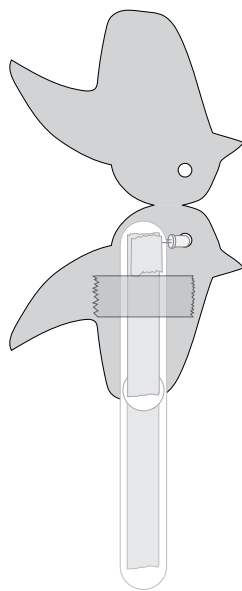


Great work!
You are more than halfway finished!

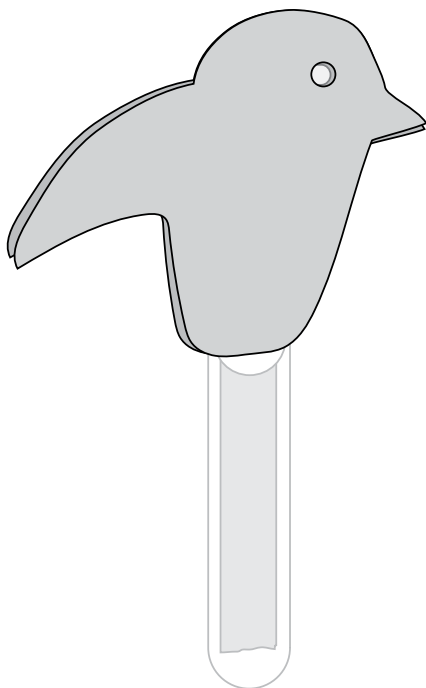
Step 10: Unfold your cutout.



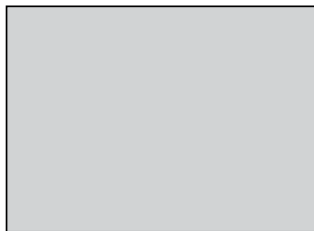
Step 11: Place **craft stick** on top of **cutout**, lining up **LED** with hole. Attach strip of **clear tape** over **cutout** and **craft stick**. Form another **clear tape** loop and place over **craft stick**.



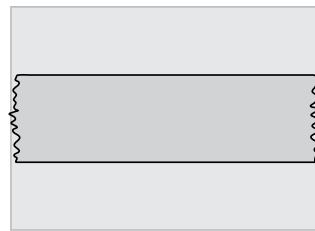
Step 12: Fold **cutout** over to line up with other side.



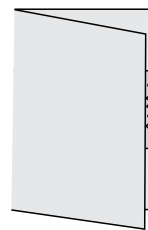
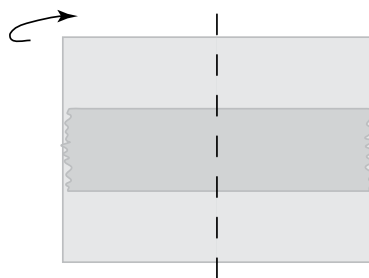
Step 13: Cut out piece of **construction paper** to act as your switch.
Actual size



Step 14: Attach **copper tape** on to **construction paper**.

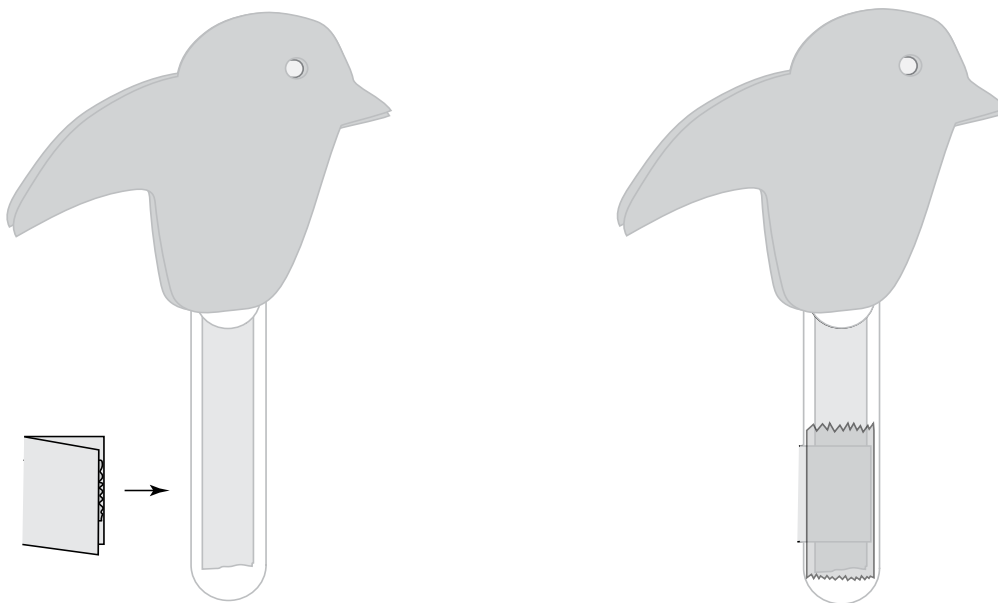


Step 15: Fold **construction paper** in half, vertically.



Step 16: Place folded paper from step 13 over copper tape on craft stick. Make sure that copper tape on craft stick makes contact with the copper tape on the construction paper.

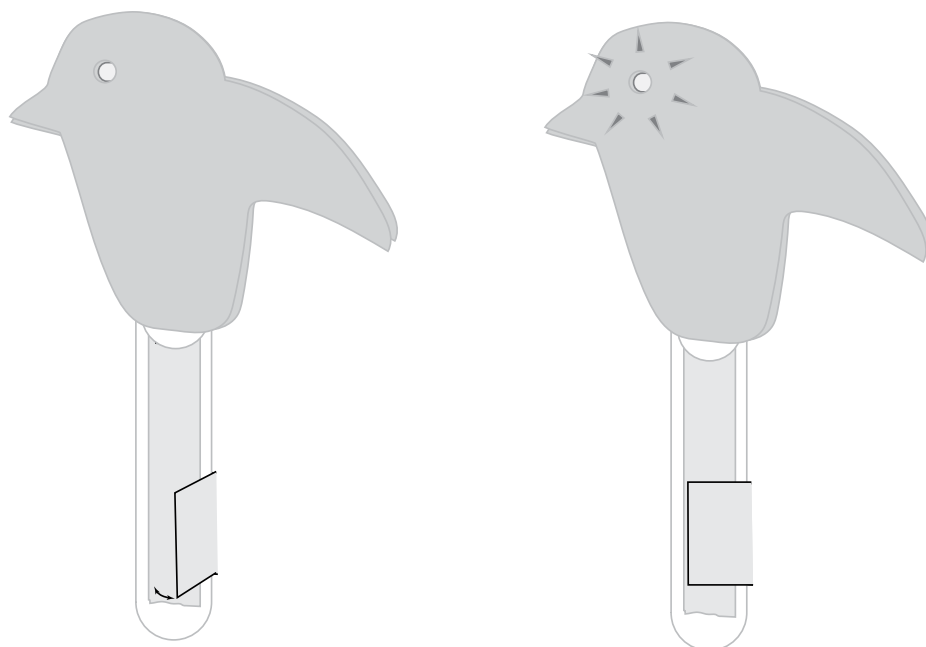
Tape with scotch tape to attach construction paper to craft stick.



CONGRATULATIONS!

Your puppet is now complete!

To light up, press down paper flap on copper tape.



OFF

ON

How does your puppet move?
Does it walk, fly, swim?

How would it eat from your hand?

How would it dance?

What causes it to light up?

What is your puppet's name?

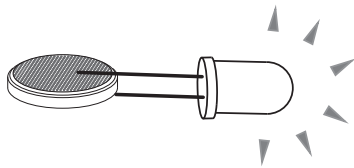
TROUBLE SHOOTING

puppet not lighting up? revisit these steps for common problem areas



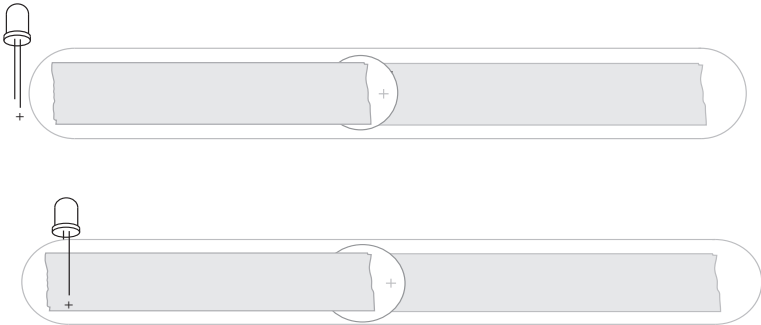
Materials:

Make sure before you start that the **battery** and **LED** both work. If it does not light up check polarity. If still does not light up, try the *same LED* with a *different battery* or *same battery* with *different LED*.



Step 5:

Make sure the polarity is correct, and that you have attached the **LONG lead** to the **POSITIVE side** of the **battery**.



Step 3:

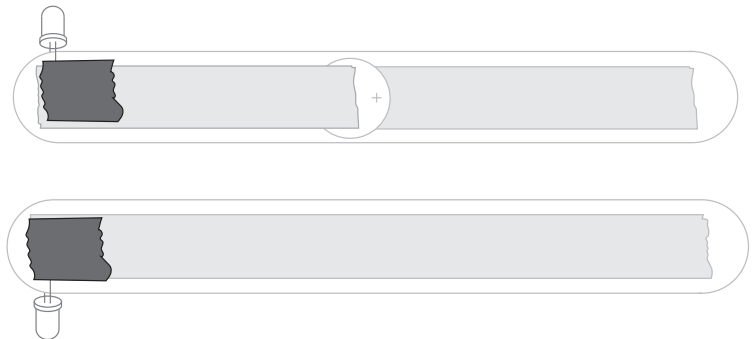
Make sure no **copper tape** sticks out from the left side of the **battery** as shown in image below.

Make sure your **tape loop** is sticky. Sometimes a **fresh tape loop** helps if the other one has been stuck and unstuck to fingers too much.



Step 6:

Make sure that there is a **tight connection** from the **LED lead** to the **copper tape below**. You can check if this is the problem by squeezing the **LED** in place and turning on the puppet.



STORY BOARDING

<http://dwig.lmc.gatech.edu/projects/prototypingpuppets/>

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Draw out your story.

Beginning

Middle

End

Who is in your story?

Characters

Characters

Where does your story take place?
When does it happen? Day or night? Past, present, or future? Does it stay in one place?

Time

Place

What props are involved in your story?

Props

Props

Common Core Georgia Performance Standards

Standards were taken directly from: <https://www.georgiastandards.org/Georgia-Standards/Pages/default.aspx>



This prototyping puppets curriculum complies with Common Core Georgia Performance Standards. (CCGPS) grade six standards in the following ways:

Mathematics:

(from: <https://www.georgiastandards.org/Georgia-Standards/Documents/Grade-6-8-Mathematics-Standards.pdf>)

Standards for Mathematical Practice:

Make sense of problems and persevere in solving them	With simple building materials, students will have to figure out how to make a complete circuit to make your light illuminate. It is not usually done on the first try, and students will have to figure out the error points	"if you injected the fun in problem solving. You let them know: If it does not work, this is part of the fun – we're gonna find out together. We're gonna make this part of the project: it's not gonna work all the time, don't let that get you down"
Reason abstractly and quantitatively	In figuring out error points, students will have to base it on the knowledge they've gained. They will use this knowledge to reason and explore more discoveries in electronics, such as how many LEDs can light up from one battery.	"take on any journey as long as you're keeping the positive and negative where they're supposed to be going, it almost creates a game in my mind –its pretty exciting that you can take these things and run them anywhere"
Construct viable arguments and critique the reasoning of others	Students collaborate in some building exercises and their puppets have to work together in the final performance, thus they have to be able to critique and take critique from others about their objects]	
Model with mathematics		
Use appropriate tools strategically		


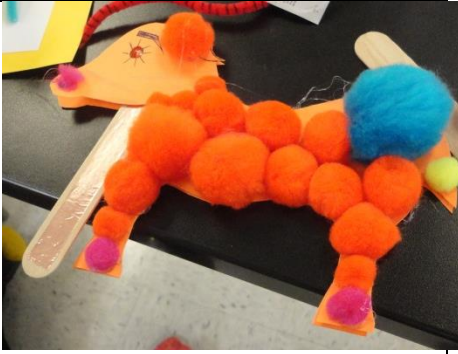
<p>Attend to precision</p>	<p>It takes precision to put on the tape and connect it to the right lead of the LED. This will be challenging but rewarding.</p>	
<p>Look for and make use of structure</p>	<p>To increase the scale and size of one's puppet, students will have to think about and build supporting structure</p>	
<p>Look for and express regularity in repeated reasoning</p>		

VISUAL ART



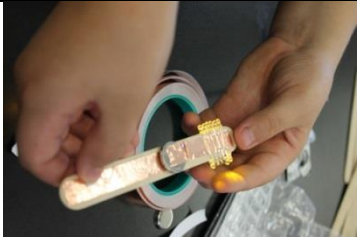

(from: <https://www.georgiastandards.org/Georgia-Standards/Documents/K-12-Visual-Art-Standards.pdf>)

Creating




VA6.CR.1

Visualize new ideas by using mental and visual imagery	Students will create their own puppet designs.	
Explore essential questions, big ideas, and/or themes in personally relevant ways.	Students will create a story that is relevant to their home or setting.	
Incorporate a variety of internal and external sources of inspiration into works of art (e.g. internal inspiration – moods, feelings, self-perception, memory, imagination, fantasy; external inspiration – direct observation, personal experience, events, pop culture, artists and artwork from diverse cultures and periods).	The story and characters will come from student's minds, depending on their current state of thought. Some may be inspired by pop culture or external influences.	
Formulate and compose a series of ideas using a variety of resources (e.g. imagination, personal experience, social and academic interests).	The characters and story will come from imagination, personal experience, and interests. Students will use different steps to develop your story (and write down key points), develop puppet ideas, ideas of props and other components (e.g. backdrops) - these will draw from their own experiences	
Document process (e.g. journal-keeping, sketches, brainstorming lists).	Students will document their processes by storyboarding their ideas.	We provide worksheets such as storyboarding and character development worksheets. These will set a framework, but leave the creativity entirely up to the students.

VA6.CR.2

<p>Produce original two-dimensional works of art using a variety of media (e.g. pencil, marker, pastel, paint, printmaking materials, collage materials, media arts).</p>	<p>Students will create 2d puppets using construction paper that can turn into 3D objects from them. They will draw out the puppets before cutting them out. They will customize the puppets with various materials (including paints, stickers, feathers)</p>	
<p>Produce three-dimensional works of art using a variety of media/materials (e.g. clay, papier-mâché, cardboard, paper, plaster, wood, wire, found objects, fiber).</p>	<p>Students will create 3D puppets other materials – paper, pom poms, feathers,</p>	
<p>Use technology in the production of original works of art.</p>	<p>A circuit is integrated into this.</p>	
<p>Produce works of art that represent a range of intentions (e.g. realistic, abstract, nonobjective).</p>	<p>Students will be creating puppets, based on a collaborative shared story outline; these puppets are created with the intention of performing this story</p>	

VA6.CR.3

Engage in an array of processes, media, techniques, and/or technology through experimentation, practice, and persistence.	Students will use drawing, cutting, and gluing to create the basic puppet. They will be producing an actual puppet. Persistence is required in order to have a complete puppet.	
Demonstrate a variety of skills and techniques for two-dimensional and three-dimensional works of art.	Students will use different skills such as drawing, cutting, gluing, designing, decorating.	
Demonstrate quality craftsmanship through proper care and use of tools, materials, and equipment.	Students will use tools such as scissors, and glue. The craftsmanship will show through use of the proper amounts of glue and tape.	
Utilize and care for materials, tools, and equipment in a safe and appropriate manner	Students must use scissors and glue safely.	


Theatre art

(From: <https://www.georgiastandards.org/Georgia-Standards/Documents/K-12-Theatre-Art-Standards.pdf>)

Creating

TA6.CR.1

Organize, design, and refine theatrical work.	Students will be creating a theatrical performance from scratch.	
Identify artistic choices, utilize theatre vocabulary, and demonstrate non-verbal communication skills in the rehearsal process.	Students will be building their own set, and will learn and practice words such as rehearsal, script, and performance. They will rehearse their puppet show before the final performance. They will have to collaborate with others to deliver the performance and work on your timing, voice, and delivery	"I like this activity because I get to profess in my artistic skills."
Interpret a character's motivation by understanding the relationship between their background and their behavior.	Students will be developing a shared story. They will "get into" their own characters as they rehearse them. Filling out the worksheet about your characters will develop the students understanding of their own characters.	AB: "this [Firaz design] is great because it had a dramatic relationship already and puppets are about dramatic relationships and stories" there was a thing and there was something it needed to do "it had a goal, it had a reason and that made us want to complete it even if it got hard and frustrating"
Identify the variety of relationships between characters.	Students will write in a conflict and resolution, which will largely involve character relationships.	This will happen through the storyboarding worksheets
Identify, define, and classify character traits.	Students will create traits for characters by writing them out, and then expressing these traits through performance.	
Recognize and demonstrate the roles, responsibilities, and skills associated with	This performance is done as a group, and many tasks will need to be done within the	


collaborative performance.	given time frame. Roles will have to be given to allow this to happen. For example- students will need a script writer, a stage manager, and know which actors are going to portray which character.	
Use resources to identify and create technical elements of theatre.	Students will focus on prop construction, and scenic elements.	

TA6.CR.2

Develop scripts through theatrical techniques.	Students will fill out a story board	
Identify the elements of a story.	<p>These will all go out and be written in the storyboard:</p> <p>Introduction</p> <p>Climax</p> <p>Resolution</p>	
Identify the theme and structure of a play.	The theme will influence student's storyboard. The storyboard will define the structure.	
Articulate creative ideas in oral and written forms.	Students will first write out their creative ideas in the storyboard. The performance will articulate the oral version of their ideas.	
Use the dramatic writing process to generate a script.		
Demonstrate the conventions of dialogue and stage directions.		

Performing


TA6.PR.1

Act by communicating and sustaining roles in formal and informal environments.	Must keep in character in this semi-formal environment	
Demonstrate effective verbal and non-verbal communication skills (e.g. rate, pitch, volume, inflection, posture, facial expression, physical movement).	Verbal: Must use words to convey the story Nonverbal: posture of the characters, and movement of them in space for story telling.	
Execute character creation in a performance.	Students will be creating their own puppets with personality and role in story.	
Demonstrate a variety of types of theatre performances.		

Science

(From: <https://www.georgiastandards.org/Georgia-Standards/Documents/Science-Eighth-Grade-Georgia-Standards.pdf>)

S8P5.

Obtain, evaluate, and communicate information about gravity, electricity, and magnetism as major forces acting in nature	Students will be directly be learning about electricity in this.	
Plan and carry out investigations to demonstrate the distribution of charge in conductors and insulators	Students will see that electricity flows between the copper tape, but not the scotch tape. Students will use this in their designs.	

NGSS Standards

<http://dwig.lmc.gatech.edu/projects/prototypingpuppets/>

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Next generation Science Standards

Middle school, grades 6-8

Taken from: <https://www.nextgenscience.org/search-standards>

This prototyping puppets curriculum complies with Common Core Georgia Performance Standards. (CCGPS) grade six standards in the following ways:

MS.Engineering Design

MS-ETS1-1.	Define the criteria and constraints of a design problem with sufficient precision to ensure a successful solution, taking into account relevant scientific principles and potential impacts on people and the natural environment that may limit possible solutions.	Students will be learning the framework for a puppet design, and then coming up with their own design. Students are free to explore a totally new design, and are given no limits. They are free to use any means given the materials to make your puppet light up.	
MS-ETS1-2.	Evaluate competing design solutions using a systematic process to determine how well they meet the criteria and constraints of the problem.		
MS-ETS1-3.	Analyze data from tests to determine similarities and differences among several design solutions to identify the best characteristics of each that can be combined into a new solution to better meet the criteria for success.	Students will be learning circuitry at its basics. With this understanding of circuitry, they will have the knowledge to be able to come up with their own way of building a circuit, and will not necessarily have to follow the given framework	In this case, the students used their circuit knowledge to create a circuit their own way.. 