

5E Lesson Plan	
Course Description	<p>This lesson addresses how Margaret Hamilton debugged the Apollo 11 moon landing. It explores the core engineering concept of circuitry through soft circuits and electronic textiles. Wearable technology requires a ton of resilience because errors occur in the components, software and hardware. As such, students will make mistakes and understand how to debug their work. The lesson asks students to reflect on the importance of mistakes in engineering outcomes.</p>
Materials & Tools	<ol style="list-style-type: none"> 1) Coin Cel Battery - 20mm 2) Conductive Thread 3) LilyPad Coin Cell Battery Holder 4) LilyPad LED White (5pc) 5) LilyTiny 6) Embroidery Hoop 7) Silver Embroidery Floss 8) White Chalk 9) Hot Glue 10) Needle 11) Scissors
<p>Engage The purpose for the ENGAGE stage is to pique student interest and get them personally involved in the lesson, while pre-assessing prior understanding.</p>	<p>Basic circuitry –</p> <p>Students explore circuitry through open ended tangible activity on theme with Apollo 11 mission:</p> <ol style="list-style-type: none"> 1) Play-dough Circuit 2) Graphite pencil Circuit <p>The underlying challenge is to experience how circuits must be grounded to work, thereby getting an initial understanding of polarity.</p>

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<p>Explore The purpose for the EXPLORE stage is to get students involved in the topic; providing them with a chance to build their own understanding.</p>	<ol style="list-style-type: none"> 1) Discuss Apollo 11 moon landing in the context of computer science, specifically the role of Margaret Hamilton. 2) Address components of a circuit & polarity. 3) Diagram a circuit and design Apollo 11 patch
<p>Explain The purpose for the EXPLAIN stage is to provide students with an opportunity to communicate what they have learned so far and figure out what it means.</p>	<ol style="list-style-type: none"> 1) Begin to build circuit (adapted from SparkFun Twinkle-Zodiac-Constellation, https://learn.sparkfun.com/tutorials/twinkle-zodiac-constellation) 2) Discuss nuances of LilyPad nodes
<p>Elaborate/Extend The purpose for the EXTEND stage is to allow students to use their new knowledge and continue to explore its implications.</p>	<p>Iterate design / create and rebuild tangible circuit activity</p> <p>Essential Questions:</p> <ol style="list-style-type: none"> (1) What is a circuit and why is polarity important? (2) How were mistakes critical to the landing of the Apollo 11 mission?
<p>Evaluate The purpose for the EVALUATION stage is for both students and teachers to determine how much learning and understanding has taken place.</p>	<p>Share out result</p> <p>Learning Outcomes:</p> <ol style="list-style-type: none"> (1) Understand basic circuits (2) Demonstrate a growth mindset through designing, building and iterating wearable technologies (3) Understand that making mistakes is part of the design process

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Resources Additional resources for exploration.	Books: Websites: