

ACTIVITY: Empathy in Engineering: Designing an assistive device

Subject: ADST	Grade: 3-6	Date:	Duration: Approx. 2 hours
Lesson Overview	Focusing on the empathy portion of the applied design steps, students will come up with a solution to help eliminate barriers for a fellow student.		

Curriculum Ties (in addition to satisfying multiple core competencies)	<p>Applied Design</p> <p>Understanding context</p> <ul style="list-style-type: none">• Empathize with potential users to find issues and uncover needs and potential design opportunities <p>Defining</p> <ul style="list-style-type: none">• Choose a design opportunity• Identify key features or potential users and their requirements• Identify criteria for success and any constraints <p>Ideating</p> <ul style="list-style-type: none">• Generate potential ideas and add to others' ideas• Screen ideas against criteria and constraints• Evaluate personal, social, and environmental impacts and ethical considerations• Choose an idea to pursue <p>Prototyping</p> <ul style="list-style-type: none">• Identify and use sources of information• Develop a plan that identifies key stages and resources• Explore and test a variety of materials for effective use• Construct a first version of the product or a prototype, as appropriate, making changes to tools, materials, and procedures as needed• Record iterations of prototyping <p>Testing</p>
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	<ul style="list-style-type: none"> • Test the first version of the product or the prototype • Gather peer and/or user and/or expert feedback and inspiration • Make changes, troubleshoot, and test again <p>Making</p> <ul style="list-style-type: none"> • Identify and use appropriate tools, technologies, and materials for production • Make a plan for production that includes key stages, and carry it out, making changes as needed • Use materials in ways that minimize waste <p>Sharing</p> <ul style="list-style-type: none"> • Decide on how and with whom to share their product • Demonstrate their product and describe their process, using appropriate terminology and providing reasons for their selected solution and modifications • Evaluate their product against their criteria and explain how it contributes to the individual, family, community, and/or environment • Reflect on their design thinking and processes, and evaluate their ability to work effectively both as individuals and collaboratively in a group, including their ability to share and maintain an efficient co-operative work space • Identify new design issues <p>Applied Skills</p> <p>Demonstrate an awareness of precautionary and emergency safety procedures in both physical and digital environments</p> <p>Identify and evaluate the skills and skill levels needed, individually or as a group, in relation to a specific task, and develop them as needed</p>
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Content Objectives	Students will empathize with a student in a wheelchair to apply the design cycle to create potential solutions.
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Materials and Equipment Needed for this Lesson	
	<ul style="list-style-type: none"> • Popsicle sticks • Cardboard • Straws • Glue • Tape • Scissors

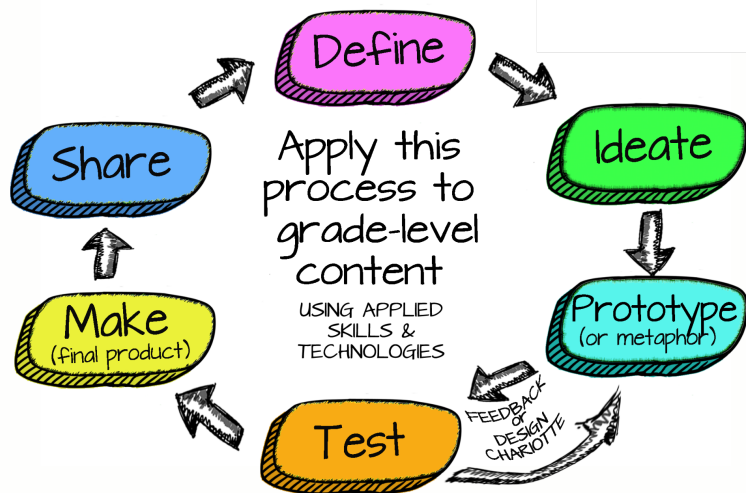
	Lesson Stages	Learning Activities
1.	Introduction	<ul style="list-style-type: none"> • Begin with introducing the problem: <p>“Davonte uses a wheelchair. At recess all his friends play soccer, but the field is grassy and has a lot of sand. His wheelchair gets stuck sometimes and is hard to push through that terrain. Davonte really wants to be able to play on the field at recess.”</p> <ul style="list-style-type: none"> • An optional extension at this point, is to borrow wheelchairs and have your class try and use them on a field and in sand, so they can fully understand what the barriers are. • Ask students: “How do you think Davonte feels in this situation? What other similar situations might he face in his daily routine?”
2.	Activity	<ul style="list-style-type: none"> • Begin the ideating portion of the stages. A fun way to do this is a jigsaw brainstorm. Have groups of 3-4 draw and write ideas on a poster paper with markers. After 5-10 minutes have students rotate the poster paper to another group and then add on ideas to the previous groups. The idea being that students can continue to grow upon the ideas of others. Continue rotating paper until students have seen each paper and built up a good repertoire of ideas. • Next students will select a promising solution. Have them sketch out or write down the ideas they plan to design. When students are selecting a design they can consider the following: <ul style="list-style-type: none"> ○ What are your top 2 designs? Why do they think they will be

		<p>successful? Do they feel confident they can create their design? What challenges do you anticipate in building your prototype?</p> <ul style="list-style-type: none"> • Next, have students build a prototype of their design. This can be a small model of their product. Don't forget that the goal is for students to design and build a prototype that would help to eliminate barriers for Davonte. • The next stage is to test and make improvements. One way to test, is to try and roll their prototypes over sand, grass etc. and see how it does.
4.	Closure	<ul style="list-style-type: none"> • Allow time for students to share their creations with each other.

Extensions	<ul style="list-style-type: none"> • Create a portable ramp for their wheelchair prototypes • Create other assistive devices such as prosthetics
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Additional Information	<p>Some other examples similar to this could be:</p> <p>Problem (Ask): Noelle is in the school play. She just broke her foot. In the play, she needs to climb 3 steps, but she can't do it on her crutches. She still wants to perform in the play.</p> <p>Problem (Ask): Nick's class is going on a hike during a field trip. The path is steep in some spots and it can be hard for Nick to balance sometimes, especially when he is coming down a steep hill. He wants to still go on the hike with his class.</p> <p>Here is a video of a demonstration of this activity: https://www.youtube.com/watch?time_continue=86&v=pjUGl</p>
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Here is the stages of the applied skills that students will be following for this engineering design challenge.

Some information about biomedical engineering:

Biomedical engineering is the application of the principles and problem-solving techniques of engineering to biology and medicine. Engineering itself is an innovative field, the origin of ideas leading to everything from automobiles to aerospace, skyscrapers and sonar. Biomedical engineering focuses on the advances that improve human health and health care at all levels. <https://www.mtu.edu/biomedical/department/what-is/>

Some more videos:

<https://www.youtube.com/watch?v=vsRuj4hjMe8>

https://www.youtube.com/watch?v=H3_mVryqXpU

<https://www.youtube.com/watch?v=hjfRIGvWTM8>

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