



Student Science & Solutions: A Lesson in Making a Difference

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Target Grade: 9-12 grade science

Time Required: 6 days – 60-minute class periods

Standards

Next Generation Science Standards (NGSS)

- HS-LS2-7: Design, evaluate, and refine a solution for reducing the impacts of human activities on the environment and biodiversity
- HS-ETS1-1: Analyze a major global challenge to specify qualitative and quantitative criteria and constraints for solutions that account for societal needs and wants.
- HS-ETS1-2: Design a solution to a complex real-world problem by breaking it down into smaller, more manageable problems that can be solved through engineering.
- HS-ETS1-3: Evaluate a solution to a complex real-world problem based on prioritized criteria and trade-offs that account for a range of constraints, including cost, safety, reliability, and aesthetics as well as possible social, cultural, and environmental impacts.

Lesson Objectives

Students will:

- Develop a deep understanding of local issues and the implications of those issues in their community.
- Apply STEM knowledge and skills to address local community issues through the creation of a project proposal.
- Collaborate, research, plan, implement and evaluate a solution to a local issue.
- Peer review other project proposals and provide insightful and helpful feedback

Central Focus

Students will get a glimpse into what it is like to be a real scientist by planning and proposing a STEM project that will benefit the community. Students will begin by looking at what goes into creating a project proposal including time, resources, motivation, formatting, topics, and creating realistic goals. Students will then brainstorm and choose a specific topic for their project. Then, they will work (individually or with a group) to write a proposal that will be reviewed by their peers and other community stakeholders. This lesson plan is designed to engage students in a project that encourages student inquiry, innovative engineering design, and community engagement within the classroom.



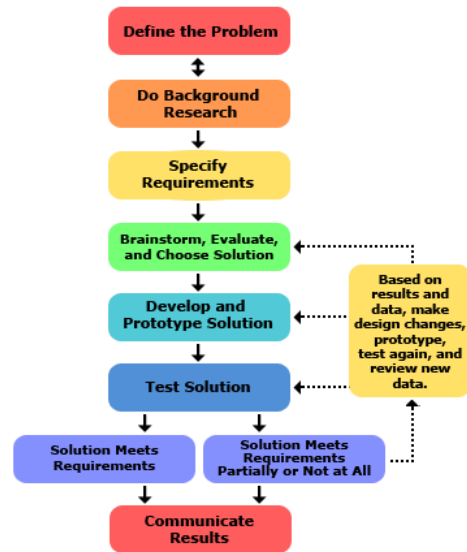
Key terms: STEM, environmental science, engineering design, inquiry, innovation, proposal, service learning, competition, budget, research, community, critical thinking, project management

Background Information

Students and teachers should have some basic knowledge on the following:

- Ecological Processes (Water cycle, energy flow, community interactions)
- Biodiversity (the variety we see in the world or in a habitat or ecosystem)
- Energy sources
- Sustainable environment practices

This lesson is based around student exploration of chosen topics through a project, so students should have some understanding of how to recognize problems in their environment/community. Students should also be able to use knowledge of the engineering design process (to the right) to develop their project idea through the proposal. The engineering design process is a series of steps that helps engineers find a solution to a problem. The steps in this process can be repeated as many times as needed so that improvements can be learned along the way. This way, failures at specific steps can be addressed and learned from and adjusted along the way so that the final solution will be better.



Teachers can help further engage their class by having the winning project proposal be incorporated into the curriculum at some point. This is not necessary with the lesson plan, but it may help drive students to put forward better work. Teachers should also make a note to have students focus on researching and really understanding what exactly their problem they want to solve is before they try to solve it. Students should be able to answer the question of “why do we need your proposed solution” when asked, and this involves getting to know their problem very well.

Materials

- Teacher computer
- Projector
- Student devices
- Paper
- Writing utensil
- Slideshow
- Planning Worksheet
- Proposal Form



- Rubric for Project Proposals
- Closing and Peer Review Worksheet

Instruction

Day 1

Before class, set up 9 tables in a formation similar to that shown in Fig. 1 OR set up 9 numbered sheets of paper around the room. This allows students to get up and move around during lessons to stay engaged.

Introduction (10 Minutes)

- Ask students questions in a discussion that get them thinking about environmental issues in a way that can connect to them personally.
 - What environmental issues have you seen or experienced in your community and how did it impact you?
 - How can you make a difference and help address environmental and social issues in your community?
- Introduce to the students that over the next few days, they will be tasked with creating a project proposal that EITHER
 - Identifies an issue in the local community and proposes a solution to this problem OR
 - Identifies new and relevant research in a scientific area of interest that could increase scientific knowledge of a certain issue they can see in the local community. Students will find research for their topic and think of how they can apply it to the community.
- Explain that for each project, students can request funding of up to \$250 for supplies, equipment, and travel, but they should try to use recycled materials and not ask for more money than they really need.
- Hand out the Planning Worksheet to students and instruct them not to write anything on it yet. Explain to students that the goal of this worksheet is so they can organize their initial thoughts about the project.

Exploration (45 Minutes)

Part 1 – Resources

- Have students think first about the time they can realistically put towards this project and have them get up and go to the table/number sheet that fits them most. This will help students self-identify for the class to see. After they get to their table, explain that students should briefly discuss (~1 minute) with the other students in this new group as to why they picked this table. This process will repeat for each of the times students split into new groups. (see Fig. 1)
- Then, have students do the same thing but think about the resources they have available, which can include money, location to work, transportation, or physical materials. (see Fig. 1)



1 - Think About What Time and Resources You Will Invest

Time

- How much time do I have
- When do I have time to work on this project
- Am I willing to devote time to this project

Table 4 No time	Table 5 Some Time	Table 6 Lots of Time
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Resources

- Do I have resources at home or do I need to rely on school resources
- Can I/Should I/Will I spend any money on this project
- Do I have reliable transportation

Table 1 No money No resources	Table 2 No Money Some Resources	Table 3 No Money Lots of Resources
Table 4 Some Money No Resources	Table 5 Some Money Some Resources	Table 6 Some Money Lots of Resources
Table 7 Lots of Money No Resources	Table 8 Lots of Money Some Resources	Table 9 Lots of Money Lots of Resources

On your worksheet, reflect on the time and resources you can dedicate to your project.

(Fig. 1 – In Slides)

- Have students return to their seats and fill out the first section of their planning worksheet (Time and Resource section) and discuss their answers with their table while you walk through and observe.

Part 2 – Motivation

- Next, have students find and go to the table that fits the best with their motivation for the project (Fig. 2)
 - Those looking for a good experience should look for a long-term project like a STEM competition
 - Those looking to do good for the community should focus on a service-learning project
 - Those seeking knowledge should focus more on a research project
 - Those doing it for a grade should be careful to not take on too much or make their projects too complicated



2 - Think About What You To Get Out Of This Experience

Experience

- You want to get experience you can use for other classes or on a resume
- You want the satisfaction of knowing you accomplished something good
- You want to help other people

Knowledge

- You want to learn something new

A Grade

- You really, honestly, are just doing this for the grade. And you'll be happy with a passing one at that

Table 1 A good experience	Table 2	Table 3 Do good for the community
Table 4	Table 5 Some Combination	Table 6
Table 7 Knowledge - I want to learn	Table 8	Table 9 I'm only doing this for a grade

On your worksheet, reflect on what you hope to get out of this experience.



(Fig. 2 – In slides)

- Have students return to their seat and fill out the next section of their planning worksheet. After it seems like most students are done, move on to the next section.

Part 3 – Type of Project

- Next, have students find and go to the table/paper that fits the best with the project they are most interested in doing. (Fig. 3)
 - Those wanting to do a science investigation should think of their project in the terms of being a traditional science fair experiment. Students will identify a question that needs to be answered and figure out a way to answer it using the scientific process.
 - Those wanting to do innovative engineering should invent or modify a solution to a community issue that they have identified.
 - Those wanting to do a service-learning project within the school should create something that provides service within the school that is related to the environment or STEM.
 - Those wanting to do a service-learning project outside of school should create/participate in something that provides a service to the community.



3 - Choose a Format

On your worksheet, write down the kind of format you are interested in and why you chose that format

<p>Science Investigation</p> <ul style="list-style-type: none"> You are interested in planning and carrying out your own scientific investigation. You want to do your own experiment and learn something new that you can share with others. This could be done independently or as part of a science fair event (local science fair, FFA AgScience, etc) 	<p>Innovative Engineering</p> <ul style="list-style-type: none"> You are interested in designing and building and want to create a new product that can improve some aspect of society This could be done independently or as part of a STEM competition 	<p>Table 1 Science Investigation</p>	<p>Table 2</p>	<p>Table 3 Innovative Engineering</p>
<p>Service in the School</p> <ul style="list-style-type: none"> You are interested in providing service within the school that is related to STEM or the environment. Examples include planning a recycling program, constructing a rain garden, starting a STEM club, or creating material that promotes STEM and CTE 	<p>Service Outside the School</p> <ul style="list-style-type: none"> You are interested in providing service in the community outside of the school. Examples include serving as youth representative on a local environmental or public health organization, making improvements at a local wildlife refuge, or planning an awareness event for a local cause 	<p>Table 4</p>	<p>Table 5</p>	<p>Table 6</p>
		<p>Table 7 Service In The School</p>	<p>Table 8</p>	<p>Table 9 Service Outside The School</p>

(Fig. 3 – In slides)

- After students have moved to the table/paper that fits them best, ask some students why they chose what they did. The goal is not to have students go where their friends go, but to have them choose something that they are actually interested and invested in.
- Then, have students return to their seat and fill out the next section of their planning worksheet and discuss their answers with their original table they were at before picking a format about why they chose what they did while you walk through and observe. This is so they can discuss their answers with their original table and get insight about different ideas that their classmates had instead of just like-minded opinions of those that have the same category as them.

Part 4 – Project “Big Ideas” -

- Next, have students find and go to the table that fits the best with their potential topic interest. This will include the following “big ideas”. Make sure to go through each big idea and what each of them entail (shown in Fig. 4).
 - Science
 - Technology
 - Engineering
 - Math
 - Environmental Literacy
 - Social Issues



4 - Choose a Topic

A topic isn't a project. It's a big idea. It is a place to start looking for ideas FOR a project and something that is broad and open-ended. For our purpose, topics include:

Table 1 Science	Table 2 Technology	Table 3 Engineering
Table 4	Table 5	Table 6
Table 7 Math	Table 8 Environmental Literacy	Table 9 Social Issues

On your worksheet, write down two possible topics and explain why you find them interesting

Topics	Explanation
Science	Study of the natural world - biology, chemistry, geology, physics
Technology	Study of or use of tools to make the world a better place - computers, medicine, cooking, are all technologies
Engineering	Designing and building - goes hand in hand with technology. Cooking is technology but inventing a new recipe is engineering
Math	Math is... well, math. Chances are you will use math in whatever idea you decide to pursue for a project. But maybe you want to just do a plain old math project like statistics or graphing.
Environmental Literacy	Environmental science technically falls under technology. And is based on the sciences. And is explained using math. But environmental literacy is all about awareness and appreciation for the environment.
Social Issues	When we talk about social or environmental justice, homeless, hunger, access to medicine, etc we are talking social issues

(Fig. 4 – In slides)

- After students have moved to the table that fits them best, ask some students why they chose what they did. The goal is not to have students go where their friends go, but to have them choose a topic that they are interested and invested in.
- Then, have students return to their seat and fill out the next section of their planning worksheet and discuss their answers with their table about why they chose what they did while you walk through and observe. When most students seem like they are finished, move on to the next section.

Part 5 – What I Can Accomplish -

- Next, now that students have a rough idea of the resources, time, motivation, and topic they would like to use for the project, instruct them that they will fill out the next section on their worksheet.
- Students will need to think back on their thoughts from the previous four parts of the worksheet.
- As students complete the “What I Can Accomplish” section, circulate around the room.
- After most students have finished their diagram, ask a few students to share what they wrote. Allow other students to respond or add on to each other, prompting a small discussion between them.

Part 6 – Brainstorming



- Begin this part with a short class discussion that helps students learn how to properly brainstorm for potential problems. Make sure to touch on key points that include the following big ideas:
 - Make sure to write down everything – even the wild and creative ideas. Everything you think of or say should be written down.
 - Build on other peoples' ideas. Listen to what other students say, think about it, and build on it.
 - Don't criticize your own or other students' ideas. Be open to creative possibilities.
 - In this stage, we are aiming for quantity over quality – we just want to be able to get as many ideas as we can out there.
 - If you need to, make it visual – draw a picture of what you're thinking.
- For the next part of class, have students discuss their brainstorming ideas with their table/those sitting close to them.
 - Explain to students that they should all help one person brainstorm problems for about 2 minutes, and then move on to the next person's ideas. This will continue until about 5 minutes before the end of class.

Closing (5 Minutes)

- Before class ends, have students write down their top three ideas of potential problems they are interested in on a sheet of paper along with their name as an exit ticket and have them turn the papers in.
- Students will turn in both the worksheet and the exit ticket and they will get them back the next day so they can refresh themselves on their ideas.
- Explain that they should continue thinking of ideas and that the class will discuss more tomorrow.

Day 2

Before class, take some time to review students' exit tickets and worksheet. Organize students into groups of 4 based off of their problems they are interested in working on. Project problems don't have to be exactly the same – but try to at least make sure the overarching concepts are similar (ex: water science, pollution, etc.)

Introduction (15 Minutes)

- To begin class, have students group up how you organized them based off their exit ticket and worksheet from the prior class. Instruct students that they are to share the problems they are interested in and why. Students will spend the first 15 minutes continuing to brainstorm from yesterday's class and discussing with their group.
- After these first 15 minutes, if students are confident in wanting to go forward with a specific problem, they will come request your approval on it.



- If students are still ideating – that is ok. They can continue to brainstorm in the next section.
- If students do not want to stay in a group of four after their discussion, that is ok. They can either split up their group of four or work alone.

Exploration (40 minutes)

- After the introduction, have students either continue working with their group to come to a common consensus on a problem to focus on, or (if they have already gotten your approval for a problem) they will begin researching the problem. This will continue on for 20 minutes.
 - Remind students that this is **not** a time to research solutions – it is time to investigate their problem more thoroughly. They should be able to say *why* their eventual solution is needed to help the problem – not just that they want to do the solution.
 - Remind students to take notes while they research their problem.
- After the 20 minutes that students spent researching their problems, have them move on to researching a solution to their problem.
 - Remind students to use their notes from researching their problem, along with their answers to the worksheet from the class before to help guide potential solutions.
 - Students will need to research supplies they may need, how much things will cost, and finding documentation that relates to their project (news articles about their topic, information on local websites and social media pages, local planning documents, and/or scientifically backed articles)
- As students work individually or with their groups, make sure to walk around the room and be available for them to ask you questions/for any help.

Closing (5 Minutes)

- To close this day out, have students write down on a sheet of paper whether they are working by themselves or in a group (if a group, then they should include the other group members' names), their topic (problem and potential solution), project format, potential cost and supplies, and list any documentation they found.
 - It is ok if students don't completely finish or have a fully-formed idea of what they want to do – just tell them to write what they can and then have them turn it in.

Day 3

Introduction (20 Minutes)

- To get students prepared for the day, begin with a speed dating-style discussion where students split into their project groups and the groups will form two circles – one inner and one outer.
- Every “round”, two groups will be paired up and each will discuss their project ideas for one minute (2 minutes per “round”).
- After both groups have shared in a 2-minute round, have the groups in the inner circle move to the left so the new group pairs can share.



7 - Write Your Proposal

The format for the proposal is a google form. Before you open up the form, think about the following:

1. What is your topic?
2. Have you settled on a format?
3. Can you prepare a written description of your project. It needs to be a detailed description. Ask yourself, "Self, with what I am going to write, could someone else take my idea and make it happen?" Think Who, What, Where, When, Why, and How
4. Do you need any special resources or help to accomplish your project
5. Will you need any special permissions to carry out your project
6. Do you require funding to help complete your project? If so how much and how will it be used?
7. What will you learn by completing this project?
8. Can you document that your community needs this? What are the benefits of this project. The benefits to you and to your community
9. How will you measure your success? Are there opportunities for reflection and revision.

Complete the Student Science & Solutions Google Proposal

Student Science & Solutions Proposal

- Applicant and Mentor Info
- Tell Me About It
- Budget
- Needs and Benefits
- Learning Opportunities
- Celebration



(Fig. 5 – In slides)

Exploration (40 Minutes)

- Explain to students that the main goal for today is to start working on the writing of their project proposal.
- The proposal is a Google form that they will work on with their partners (if they have partners).
- Reassure students that they don't have to finish it today – there will be time to finish it up during the next class.
- Before students open and begin working on the form, tell them to think about the following:
 - What is their topic and what does it entail in terms of their project?
 - Have they settled on a format?
 - Can they prepare a written description of the project? Think "Who, What, When, Where, Why, and How".
 - Are there any special resources they need to help accomplish their project?
 - Will they need special permissions to complete the project?
 - Do they need funding to complete the project – if so how much and how will it be used?
 - What will they learn by completing this project?
 - How can they show that their community needs this? What are the benefits of this project for both them and the community?
 - How will they measure success for their project?
- Allow students the rest of class to work on their proposals. While they work, circulate around the room to ensure students are on task and that they can ask you questions if needed.
 - While circulating, make sure that you emphasize the completion of an annotated bibliography and budget for the project.



- Also make sure to tell students that even if they complete the proposal in class today, they will not submit it – they will be doing peer reviews next class.

Day 4

Introduction (10 minutes)

- When students arrive to class, make sure they pair up with their project groups immediately.
- Explain to students that when they are finished with their proposal, they will need to have at LEAST one person review it (peer, parent, teacher that is not you, another adult) and leave comments on their worksheet. After this review, students will revise their proposal accordingly.
 - Only after review and revising will they submit the Google form.
- Let students know that after they submit their proposal, they must put together a very short (about 3 minute) presentation proposal.
 - Hand out the rubric
- Presentations will need to include:
 - Title of project
 - Student involvement in the project
 - Beginning and end dates
 - Description of the project
 - Community partner interactions
 - How much the project will cost
 - The benefits the project will have on the community
 - The learning benefits the project will have
 - How students will celebrate their achievements



Student Science & Solutions Rubric

	1	2	3	4
Title	Student stated title of project			
Student Involvement	Few than 10 students are involved in the project	Entire class is involved in project	Entire Grade is involved in project	Entire School is involved in project
Start/End Date	Student provided dates	Student provided dates and these dates are realistic		
Project Description	Student provided a basic description that was difficult to follow	Student provided a clear description but the description was not detailed	Student provided a detailed description but you're not sure anyone could recreate the project from just the description	Student provided a detailed description other people could use to recreate the project for their own use
Community Partners				Student proposes partnerships with community organizations
Funding	Student is requesting more than \$100	Student is requesting between \$50 and \$100	Student is requesting less than \$50	Student is not requesting any funding
Benefits	Student has demonstrated limited benefit of the project to the community			Student has demonstrated the project will have a measurable benefit to the community
Learning	Student has demonstrated limited learning will occur from this project			Student has demonstrated students will grow and learn through completion of this project
Celebration	Student has described how they will share their results and celebrate their achievements			

(Fig 6 – In materials)

Exploration (45 minutes)

- Give students plenty of time to continue working.
- Make sure you are walking around and checking in with different groups on their progress – students should get at least 1 in-class peer review today.
- Make sure their presentations are not too long – the goal is to give the info needed in the rubric and it shouldn't be longer than 3 minutes.

Closing (5 minutes)

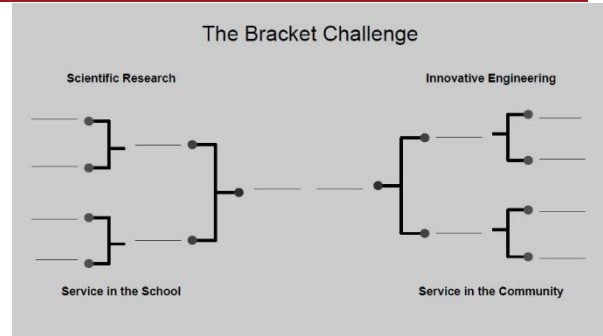
- For an exit ticket, have each group take out a sheet of paper. They will need to write down all group member names, their project format (scientific research, innovative engineering, service in school, or service in the community), what they accomplished today, and what they need to accomplish before their presentation of their proposal for the next day of class.
 - Have students turn this end to you before they leave so you can get a good idea of where all the groups are at, progress-wise.



Day 5

**Prior to the start of class, you will need to:*

- Create brackets for your student groups based on their project format. It should end up looking like the bracket to the right.
- Each student should receive a bracket with the project titles and a rubric for each presentation. They will judge all projects other than those in their own category.



Introduction (5 minutes)

- Explain to students that today is presentation day for their projects. Today students will both present their/their group's project proposal along with score other groups' proposals based on the rubric.
- Students will be going head-to-head against other proposals in the same format as theirs. Each judge will grade the rubric and determine a winner (who will move to the next bracket) by voting. In the event of a tie ONLY, you (the teacher) will pick the better project to move on to the next round.
- For each bracket round, they will be organized in the following way:
 - Team #1 Presents (3 minutes)
 - Team #2 Presents (3 minutes)
 - Team #1 explains why their project is better than the other team's (1 minute)
 - Team #2 explains why their project is better than the other team's (1 minute)
 - Judges score rubrics (during presentations)
 - Moderator asks how many votes (highest rubric score) for Team #1
 - Moderator asks how many votes (highest rubric score) for Team #2
 - * In the event of a tie, the teacher will choose a winner*
 - Winning team's title is written in the next bracket slot

Presentations (55 minutes)

- Follow the bracket organization above for each set of groups.
- You will act as a moderator for the presentation. Make sure that all groups are respectful to one another – especially in their 1-minute rebuttals.
 - You will likely not get through the whole bracket, but no worries – there will be extra time during the next class to finish up.

Day 6

Presentations (30 minutes)



- Allow the other groups to finish up their competitions. Follow the same procedures from the last class period.
- As you move through the bracket, the students that have previously presented will present a brief synopsis of their project proposal just to remind the class of their ideas.

Worksheet Activity (20 minutes)

- Have students complete the Closing Worksheet (in materials).
- While students finish the worksheet, you review the bracket results, taking into account available class time and budget to see which ones could be incorporated into class time. Bracket results should be the primary focus, however.
- You will then figure out a top 3 projects to award, with first place being something you can definitely use in class, and the other two as potential projects you can use in class time.

Closing/Awards (10 minutes)

- Announce to the class the top 3 winners overall for the project proposal competition.
 - Explain that the criteria you used was primarily the brackets, but budget and classroom integration were also considered.
 - Begin with 3rd place and go up to 1st place.
- Make sure to collect the worksheets before the end of class.

Differentiation

- Allow students to work individually or with a group depending on their abilities.
- For students with difficulties reading, provide verbal explanations of any instructions or questions that are only written out.
- For students who are visually impaired, provide larger printed text.
- For ELL students, provide translations of material in their first language and in English.
- Provide assistance to students that need help filling out the proposal survey.
- Have digital and physical copies of worksheets, exit tickets, and project proposal for students that struggle with handwriting or typing

Assessment

Formative

- Planning Worksheet
- Exit Tickets
- Discussion Answers

Summative

- Project Proposal Survey



- Proposal Presentations
- Closing/Peer Review Worksheet

Materials Folder –

<https://drive.google.com/drive/folders/1YNXw4gSnv-4BquueyNFPyrb5yw8zftyf?usp=sharing>

Slide Presentation -

<https://docs.google.com/presentation/d/1cSO9DXldVDUAzohABunTcrXBfG3rWq2Ysp0vjGVHAqA/edit?usp=sharing>

Planning Worksheet -

https://docs.google.com/document/d/1Tcw4ezu188_hbT7qVnHYLmGQ6Ta0pemlowalBI1e7ZM/edit?usp=sharing

Proposal Form -

https://docs.google.com/forms/d/e/1FAIpQLSfZ0YbDFNGZNUX8EzKoAkdLFgtWENIVhoyT_AkoFlqzBtG-SQ/viewform?usp=sharing

Rubric for Project Proposals –

https://docs.google.com/document/d/1v6W2uLqKj-4eEY_5eWQdTODRzb7wj8b_wogCN9zbOkM/edit?usp=sharing

Closing and Peer Review Worksheet -

<https://drive.google.com/file/d/154dXt8SaZPvj3vytLDnNe5BQ88HjA5se/view?usp=sharing>

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Name:

4. Peer Review – Below, list all of your group members and give them a rating between 1 (did not help/contribute meaningfully to the project and proposal) and 5 (went above and beyond to help/contribute meaningfully to the project and proposal). After you give them a rating, explain why.

Name:

Student Science & Solutions Planning **Worksheet**

Time and Resources - Describe what time and resources you have available to accomplish your project	
<u>Time</u>	<u>Resources</u>

Expectations - Describe what you want to get out of this experience

Format - Describe the format you are most interested in and why

Name:

Topics - What two topics interest you most and why	
Topic 1: _____	Topic 2: _____

What Can I Accomplish - In the space below, list your goals and your resources. In the middle, compare them and write down a reasonable idea of what you can actually accomplish		
<u>Goals</u>	<u>What Can I Accomplish</u>	<u>Resources</u>

Student Science & Solutions

Allowing teens to identify community problems and create and implement solutions

1. Email *

Introduction

About the Student Science & Solutions program:

Career and technical education has developed a reputation for serving the community and providing innovative solutions to problems. CTE students are often called upon to help with community projects and when given the opportunity, encouragement, and resources, rise to the challenge.

How YOU can participate:

Work with your friends and classmates to:

- Identify problems in the community
- Brainstorm solutions to these problems

OR

- Identify research questions that would increase scientific awareness and knowledge in your community

- Plan a scientific investigation to help answer the question

As a participant in the Student Science and Solutions you have access to school resources, mentors, and a potential funding source.

Project Guidelines

Projects must clearly be tied to the local community and target either new research about an existing area of interest or the development of a solution to a community problem

Projects must be student-driven. Students will be the ones developing, planning, and implementing the project.

Projects may request funding up to \$250.00. Funds can be used for the purchase of supplies, equipment, and possibly travel. The use of funds for matching other grants and seed money for other fundraisers will also be considered. Grant funds cannot be used for wages, dinners/banquets, donations to other organizations, or similar events.

Post-project evaluation forms will be required for all approved and/or funded projects.

Applications that show matching funding, in-kind donations, and follow the practice of recycling/reusing/upcycling will be given preference to help extend available funds. Projects that show a creative use of materials and resources or use resources already available through the school are also given preference.

Applications must be submitted on forms provided for review. Incomplete forms or forms submitted after the application deadline will not be considered.

Grant recipients must use the grant money provided to them no later than xxxxxxx

Grant applications are due no later than xxxxxxx

2. Do you understand and agree to adhere to these project guidelines?

Mark only one oval.

Yes

No

Applicant Information

Use the following questions to tell us a little about yourselves.

3. Applicant's Name (if multiple people involve, choose a team leader)

4. Applicant's School Email Address

5. Names of other students involved in planning the project

6. Will other students be involved in implementing (not just planning) the project? If so, how many?

7. Name of adult sponsor/mentor

8. Adult sponsor/mentor's email

Tell Me About It

Use the following questions to tell us about your proposed project.

9. Project Title

10. Project Topic

Check all that apply.

- Science
- Technology
- Engineering
- Math
- Environmental Literacy
- Social Issues

11. Format Type

Mark only one oval.

- Scientific Investigation
- Innovative Engineering
- Service Learning in the School
- Service Learning in the Community

12. Describe your project idea. Be detailed and specific. The more information we have the better we can evaluate your idea.

13. Explain where your project will take place.

14. Project Start Date

Example: January 7, 2019

15. Project End Date

Example: January 7, 2019

16. Community partners are an important element of this type of project. Partners help focus thoughts, review ideas, and identify and solve problems. List three potential partners for your proposed project.

- 17. Will you need additional advice, assistance, or funding to help complete this project? If so, what kind?

- 18. List any special permission slips, approvals, or permits required for you to undertake this project

I Want Money, Lots and Lots of Money

This section is all about money. It's unfortunate, but money is necessary to do a lot of great things in this world. And there is only so much to go around. So to help us figure out who gets it and how much we can give, please answer the following questions.

- 19. How much are you requesting from Student Science and Solutions?

- 20. How much money will your project cost in total?

21. Who will oversee the use of these funds?

22. Who is responsible for keeping receipts and submitting the final financial report?

23. Using the following EXAMPLE, prepare a budget and submit a shareable link to your budget below.

Student Science & Solutions Grant Budget

Note: Include ALL expenses in your budget and highlight where the Students Science & Solutions money will be spent.

Project Title	
Team Leader	
Equipment	
Item	Cost
Consumable Supplies	
Item	Cost
Other Expenses	
Item	Cost

Benefits of the Project

This is the part where you get to convince us that your project will have an impact on the community. This is where you convince us that your work is important. This is the part where you get to tell us why we should show you the money!!

- 24. **COMMUNITY SOLUTIONS QUESTION:** How will this project benefit the community? In your answer, include how many people will benefit directly and indirectly from this project.

- 25. **SCIENTIFIC RESEARCH QUESTION:** How will this project add to the existing body of scientific knowledge? In your answer, explain how this knowledge can be applied to the real world and why it is important to your community.

- 26. How did your group come up with this idea?

- 27. Prepare an annotated bibliography that shows the importance of your project and documents what other research has already been done in this area. Provide a shareable link to your bibliography below.

Learning Opportunities

At the end of the day y'all are still students. And this is a learning opportunity. So tell us how YOU will grow and learn through completion of this project.

- 28. What do you hope to learn about your community from your project?

- 29. What do you hope to learn about science from your project?

30. What reflection activities will you use during you project to be aware of your progress? In other words, how will you know if you are on the right track and things are going well and how will you know if you need to step back and address a speedbump?

Celebration

When the job is done and done well, you need to celebrate. In this section you will be explaining how you will celebrate your accomplishments.

31. When the project is complete, how will you measure your success?

32. How will you share and communicate the results of your project with other people?

33. How will your group celebrate its success? Be sure to address not just your planning group but the people that helped implement the project as well.

Stick A Fork In Me - I'm Done

By clicking and initialing below, you acknowledge that you have completed this form to the best of your ability and all information is correct to the best of your knowledge

34. This form has been completed to the best of my/our ability (initials of all involved)

35. The information contained in this form is correct to the best of my/our knowledge (initials of all involved)

36. This form is complete and ready for review

Mark only one oval.

Yes

No

This content is neither created nor endorsed by Google.



Student Science & Solutions



- Day 1 - Introducing Student Science & Solutions
- Day 2 - Planning Your Project
- Day 3 - Planning Your Project
- Day 4 - Planning Your Project
- Day 5 - The Bracket Challenge
- Day 6 - Awarding Student Science & Solution Projects

Student Science & Solutions

Introduction

About the Student Science & Solutions program:

Career and technical education has developed a reputation for serving the community and providing innovative solutions to problems. CTE students are often called upon to help with community projects and when given the opportunity, encouragement, and resources, rise to the challenge.

How YOU can participate:

Work with your friends and classmates to:

- Identify problems in the community
- Brainstorm solutions to these problems

OR

Identify research questions that would increase scientific awareness and knowledge in your community

Plan a scientific investigation to help answer the question

As a participant in the Student Science and Solutions you have access to school resources, mentors, and a potential funding source.

Project Guidelines

Projects must clearly be tied to the local community and target either new research about an existing area of interest or the development of a solution to a community problem

Projects must be student-driven. Students will be the ones developing, planning, and implementing the project.

Projects may request funding up to \$250.00. Funds can be used for the purchase of supplies, equipment, and possibly travel. The use of funds for matching other grants and seed money for other fundraisers will also be considered. Grant funds cannot be used for wages, dinners/banquets, donations to other organizations, or similar events.

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1 - Think About What Time and Resources You Will Invest

Time

- How much time do I have
- When do I have time to work on this project
- Am I willing to devote time to this project

Resources

- Do I have resources at home or do I need to rely on school resources
- Can I/Should I/Will I spend any money on this project
- Do I have reliable transportation

On your worksheet, reflect on the time and resources you can dedicate to your project.

<u>Table 4</u> No time	<u>Table 5</u> Some Time	<u>Table 6</u> Lots of Time
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<u>Table 1</u> No money No resources	<u>Table 2</u> No Money Some Resources	<u>Table 3</u> No Money Lots of Resources
<u>Table 4</u> Some Money No Resources	<u>Table 5</u> Some Money Some Resources	<u>Table 6</u> Some Money Lots of Resources
<u>Table 7</u> Lots of Money No Resources	<u>Table 8</u> Lots of Money Some Resources	<u>Table 9</u> Lots of Money Lots of Resources

2 - Think About What You To Get Out Of This Experience

Experience

- You want to get experience you can use for other classes or on a resume
- You want the satisfaction of knowing you accomplished something good
- You want to help other people

Knowledge

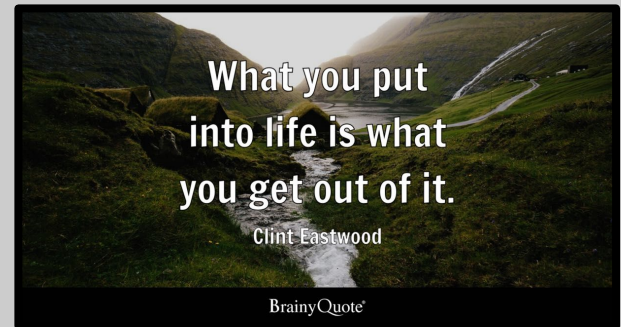
- You want to learn something new

A Grade

- You really, honestly, are just doing this for the grade. And you'll be happy with a passing one at that

On your worksheet, reflect on what you hope to get out of this experience.

<u>Table 1</u> A good experience	<u>Table 2</u>	<u>Table 3</u> Do good for the community
<u>Table 4</u>	<u>Table 5</u> Some Combination	<u>Table 6</u>
<u>Table 7</u> Knowledge - I want to learn	<u>Table 8</u>	<u>Table 9</u> I'm only doing this for a grade



3 - Choose a Format

On your worksheet, write down the kind of format you are interested in and why you chose that format

<p><u>Science Investigation</u></p> <ul style="list-style-type: none">You are interested in planning and carrying out your own scientific investigation. You want to do your own experiment and learn something new that you can share with others.This could be done independently or as part of a science fair event (local science fair, FFA AgScience, etc)	<p><u>Innovative Engineering</u></p> <ul style="list-style-type: none">You are interested in designing and building and want to create a new product that can improve some aspect of societyThis could be done independently or as part of a STEM competition
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<p><u>Service in the School</u></p> <ul style="list-style-type: none">You are interested in providing service within the school that is related to STEM or the environment.Examples include planning a recycling program, constructing a rain garden, starting a STEM club, or creating material that promotes STEM and CTE	<p><u>Service Outside the School</u></p> <ul style="list-style-type: none">You are interested in providing service in the community outside of the school.Examples include serving as youth representative on a local environmental or public health organization, making improvements at a local wildlife refuge, or planning an awareness event for a local cause
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<p><u>Table 1</u> Science Investigation</p>	<p><u>Table 2</u></p>	<p><u>Table 3</u> Innovative Engineering</p>
<p><u>Table 4</u></p>	<p><u>Table 5</u></p>	<p><u>Table 6</u></p>
<p><u>Table 7</u> Service In The School</p>	<p><u>Table 8</u></p>	<p><u>Table 9</u> Service Outside The School</p>

4 - Choose a Topic

A topic isn't a project. It's a big idea. It is a place to start looking for ideas FOR a project and something that is broad and open-ended. For our purpose, topics include:

<u>Table 1</u> Science	<u>Table 2</u> Technology	<u>Table 3</u> Engineering
<u>Table 4</u>	<u>Table 5</u>	<u>Table 6</u>
<u>Table 7</u> Math	<u>Table 8</u> Environmental Literacy	<u>Table 9</u> Social Issues

On your worksheet, write down two possible topics and explain why you find them interesting

<u>Topics</u>	<u>Explanation</u>
Science	Study of the natural world - biology, chemistry, geology, physics
Technology	Study of or use of tools to make the world a better place - computers, medicine, cooking, are all technologies
Engineering	Designing and building - goes hand in hand with technology. Cooking is technology but inventing a new recipe is engineering
Math	Math is... well, math. Chances are you will use math in whatever idea you decide to pursue for a project. But maybe you want to just do a plain old math project like statistics or graphing.
Environmental Literacy	Environmental science technically falls under technology. And is based on the sciences. And is explained using math. But environmental literacy is all about awareness and appreciation for the environment.
Social Issues	When we talk about social or environmental justice, homeless, hunger, access to medicine, etc we are talking social issues

5 - Identify Goals and Resources



On your worksheet, complete this Venn Diagram. In one circle, list all the things you would like to accomplish with your project. In the second circle, list all of your resources, including people. Where they meet make it realistic. Based on the resources you have available, what can you realistically hope to accomplish.

6 - Brainstorm

It's time to start brainstorming. Think about your topic, your format, available resources, and what you want to get out of this project. Then start coming up with ideas. Write them ALL down. Ask your friends, family, and supervisor for ideas. Come up with as many ideas as you can. And don't do this just once. Keep coming back to it. You'll be amazed how a youtube video, class discussion, or random thought while walking down the street will spark an idea.



On your worksheet, write down all of your ideas, no matter how silly they might seem

Write down at least ten. You can always go back and add to the list later if you have a great idea

If your stuck:

Look to some of these resources for ideas

- Investigations
 - Look at this list of [Science Fair Project](#) ideas
 - Look at the website [SciStarter](#) for community science projects
 - Research local science competitions like Envirothon, Science Olympiad, Odyssey of the Mind, FFA, and 4-H
- Innovative Engineering
 - Look for things that are broken in your community and then brainstorm ways to remake them... but better
 - Research local STEM design and build competitions like TSA (Technology Students Association) and Science Olympiad
- Service Learning
 - Read the requirements for a [Boy Scout Merit Badge](#) or [Girl Scout Badge](#) related to your topic
 - Take a look at [4-H projects](#)
 - Look for an online list of not-for-profit organizations in your community

7 - Write Your Proposal


The format for the proposal is a google form. Before you open up the form, think about the following:

1. What is your topic?
2. Have you settled on a format?
3. Can you prepare a written description of your project. It needs to be a detailed description. Ask yourself, "Self, with what I am going to write, could someone else take my idea and make it happen?"
Think Who, What, Where, When, Why, and How
4. Do you need any special resources or help to accomplish your project
5. Will you need any special permissions to carry out your project
6. Do you require funding to help complete your project? If so how much and how will it be used?
7. What will you learn by completing this project?
8. Can you document that your community needs this? What are the benefits of this project. The benefits to you and to your community
9. How will you measure your success? Are there opportunities for reflection and revision.

Complete the Student Science & Solutions Google Proposal

Student Science & Solutions Proposal

- Applicant and Mentor Info
- Tell Me About It
- Budget
- Needs and Benefits
- Learning Opportunities
- Celebration



**If you're not
ready, do
some more
prep work**

8 - Peer Review

This proposal has a lot going on. And it's important. It's going to be the guide for when you actually go out and DO science. How well you follow the proposal is actually an important part of the assignment. So let's make sure the proposal is as good as we can get it.

- Have a peer read it.
- Have a parent read it.
- Have another peer read it.
- Have a teacher (not me) read it.
- Have another adult (preferably your “supervisor”) read it.
- Have them all put comments on your worksheet.
- Use those comments to revise your proposal.

Once it's ready, and not until it's ready, click the **I'm Done** button in the google form and turn it in.

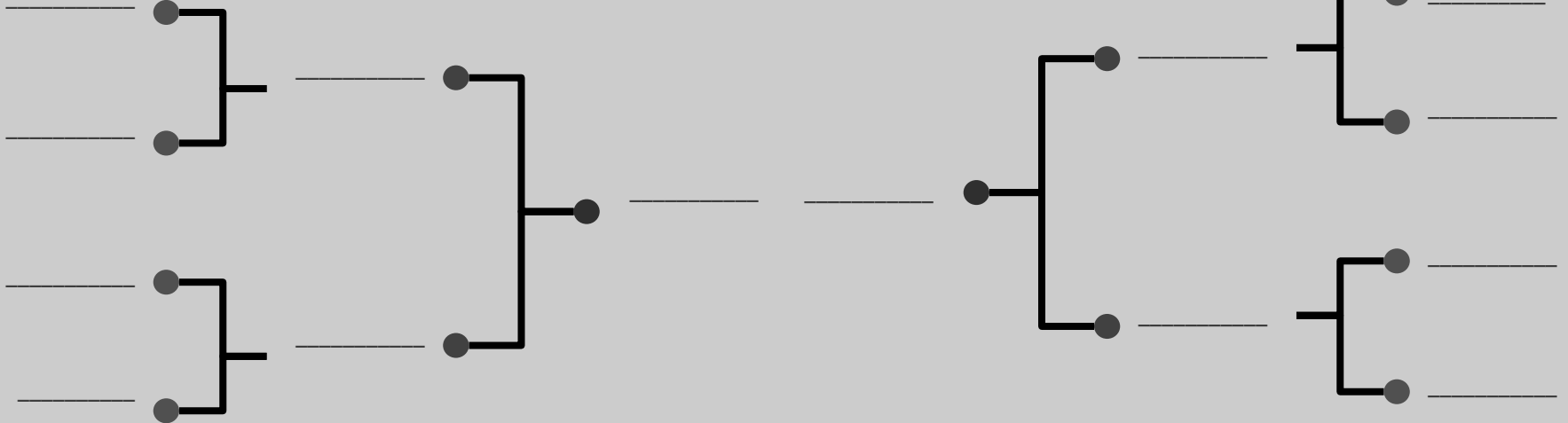
Have at least one person read through your proposal. Give them your worksheet and ask them to write down any comments they have

If you're not ready, make revisions

The Bracket Challenge

Scientific Research

Innovative Engineering



Service in the School

Service in the Community

Awarding Student Science & Solution Projects

