Let’s Be Scientists!

Confratute 2023

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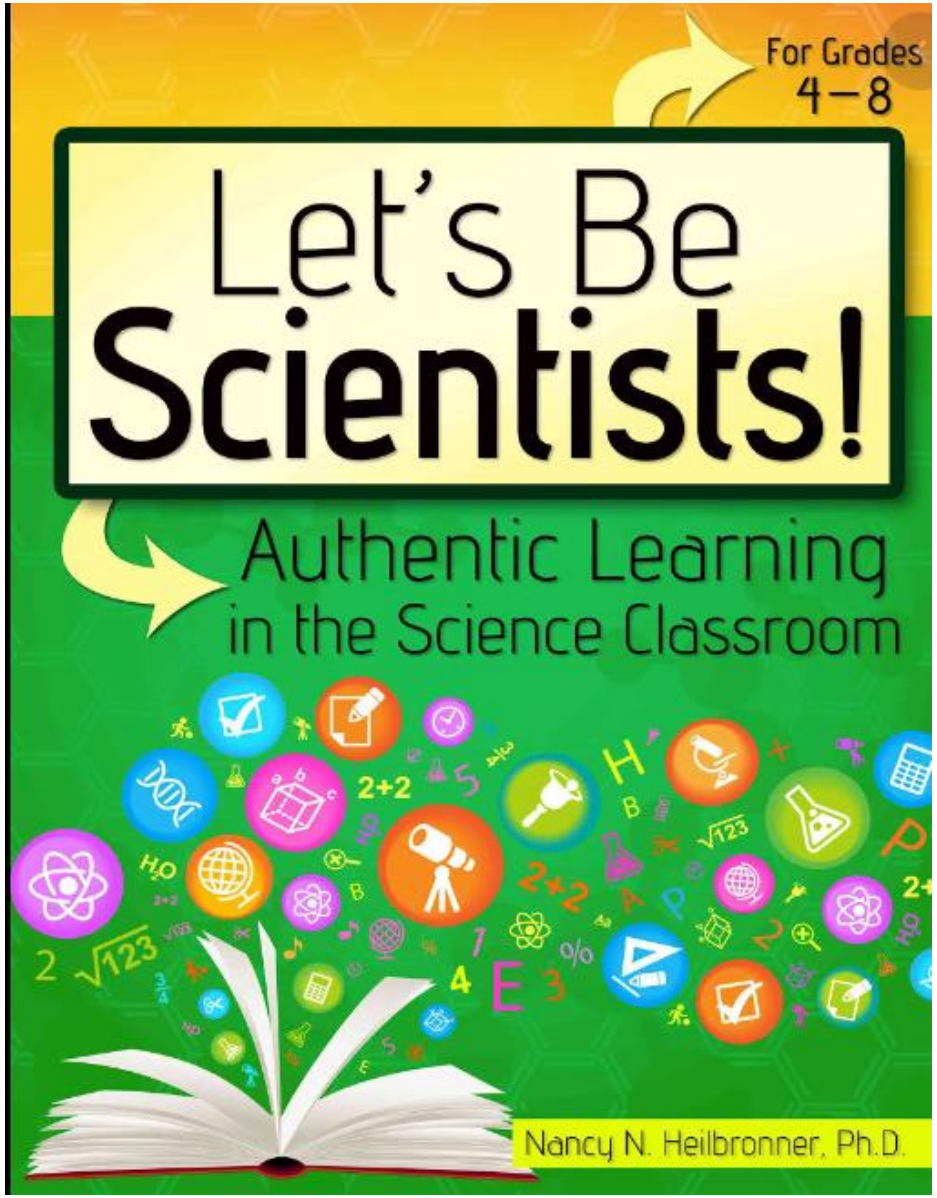

Purpose of the Strand

1. Discuss authentic practices in science –
   What do real scientists "do?"

2. Expand ways to introduce students to authentic practices.
   Consider ideas other than science fair.

3. Provide year-round structure and materials to teach science in an authentic manner.

Focused on grades 4-8.

Let's Be Scientists!

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Books – order by clicking links below:

Let's Be Scientists – order from Amazon

Schoolwide Enrichment Model in Science (co-authored with Dr. Joseph Renzulli) - order from Amazon

Articles by Dr. Heilbronner Available on Confratute Strand Site:

Mentoring Talented Science Students: Knowing the Options (Gifted Education International - Co-authored with Dr. Diana Payne)

Raising Future Scientists (Gifted Child Today)

Science Safaris (Science Scope)

Think Instruments, Think Apps (Science Scope)

All student and teacher handouts will remain in Day 1.

PowerPoints will be added to each day after the session.

Day 1 PowerPoint has been uploaded to Day 1.

Strand Agenda

- **Day 1** – Lay the groundwork for an alternative approach and provide an overview of that approach.
- **Day 2** – Work through the first part of the school year with an example.
- **Day 3** – Work through the final part of the school year with an example. If time permits, work on own ideas for projects.

Science: Love It or Hate It?

How Does It Work?

Week 1	Introduce the Science Portfolio
Week 2	Conduct an Interest Inventory
Weeks 3-10	STAR Topics
Weeks 11 - 34	GEM Topics
Week 35	Students Reflect

Weeks 3-5 - Form Science Topics Are Real (STAR) Interest Groups and Plan STAR Days.

- STAR groups are preliminary groups that will allow students to explore a topic of interest.
- Assign groups based on interest inventory or allow students to self-select.
- The group will “teach” the class about their topic.

Weeks 3-5 - Form Science Topics Are Real (STAR) Interest Groups and Plan STAR Days.

- In addition to the content lesson, students might plan one of the following:
  - Inviting an expert speaker.
  - Planning an engaging activity for the class.
  - Creating a game for the class to play based on the topic.
  - Planning a science demonstration related to the topic.
  - Giving a talk using technology (e.g., PowerPoint or Prezi).
- Facilitate discussion among groups about what is possible and what is not.
- Assist with arrangements.

Name

STUDENT HANDOUT 4

Science Topics Are Real (STAR) Day Planning Sheet

I am in a group with the following people:

It's fun to be the teacher! You get to select a science topic and help the class to learn about it. In this activity, you will plan a STAR Day that will help you and your class discover more about your topic.

Directions: Complete the following items below.

1. With your group, write down three of your interests in science:
   a.
   b.
   c.

2. Talk about these interests with your group and your teacher. Pick **one** interest that you would like present on a STAR Day. Write it here:

3. Now that you know your STAR topic, think of a name for your group (it should be something about your topic), and write it here:

   _____

4. Now think of ways that you could help your class to learn more about your STAR topic. Discuss the ideas below with your group and write down your thoughts about what you could do.
   a. Special speaker:

   b. Activity:

   c. Game:

   d. Demonstration:

5. Select **your top two ideas** for what you would like to do. Answer the questions for your top two ideas.

a. Special speaker

- Who will be the speaker?
- How do we contact the speaker?
- Does the speaker live nearby or out of town?
- Why is the speaker qualified to speak on your topic?

b. Activity

- What is the name of your activity?
- What will you need to conduct the activity?
- How will this help the class to learn about your topic?

c. Game

- What is the name of your game?
- How is the game played?

d. Demonstration

- What is the name of your demonstration?

- What will you need to do the demonstration?

- Who will bring which materials?

- How will you do the demonstration?

- How will the demonstration help the class to learn about your topic?

Turn this sheet in to your teacher. Don't forget to put your name and the names of all group members at the top.

Approved by: _____ Date of Group's STAR Day: _____

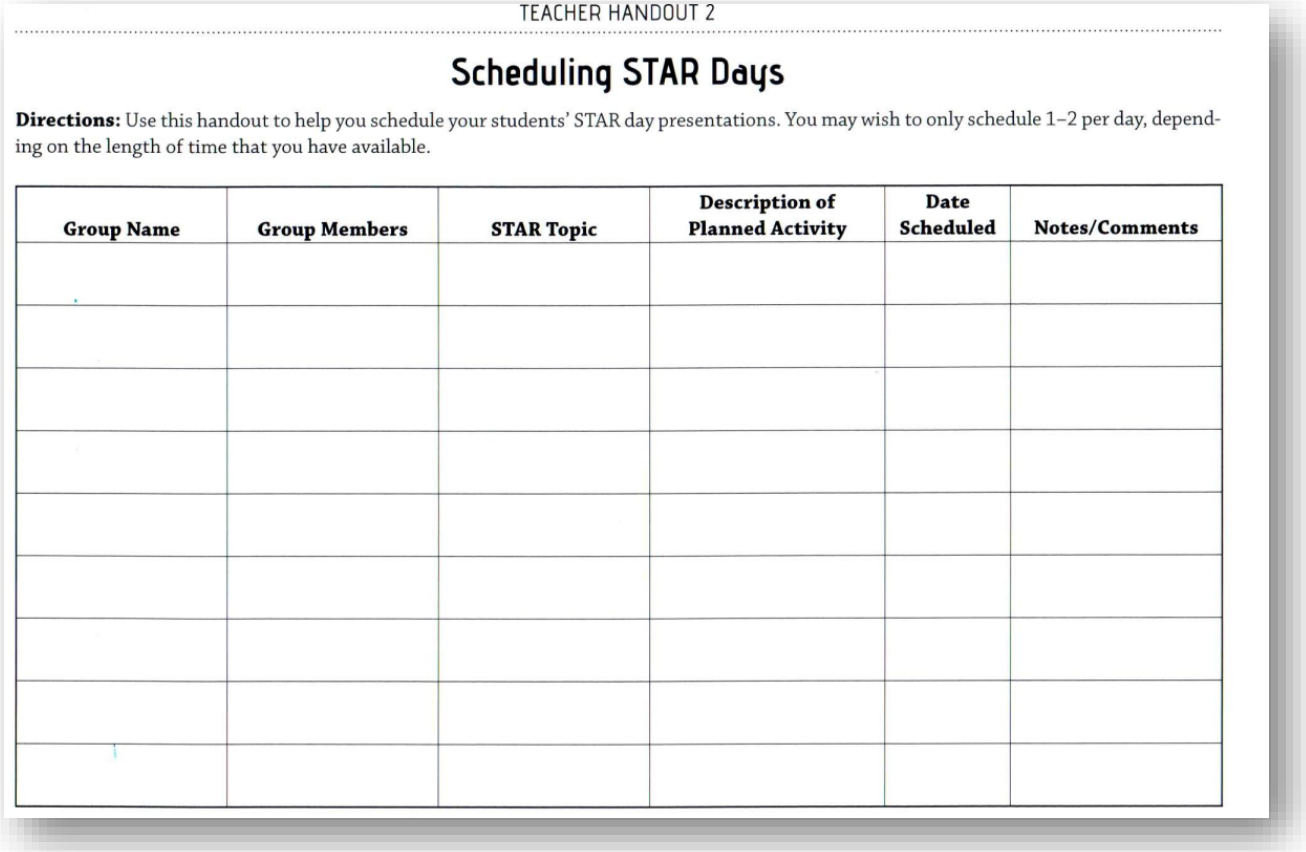
Weeks 6-10 – Students Conduct STAR Days

- These STAR presentations function as Type I activities.
- The idea is for students to learn and for other students to become interested in one or more topics.

Weeks 6-10 – Students Conduct STAR Days

Pacing Chart:

- Schedule STAR Days once a week
- 1-2 groups per week
- Students listen and let you know which topics they're most interested in!



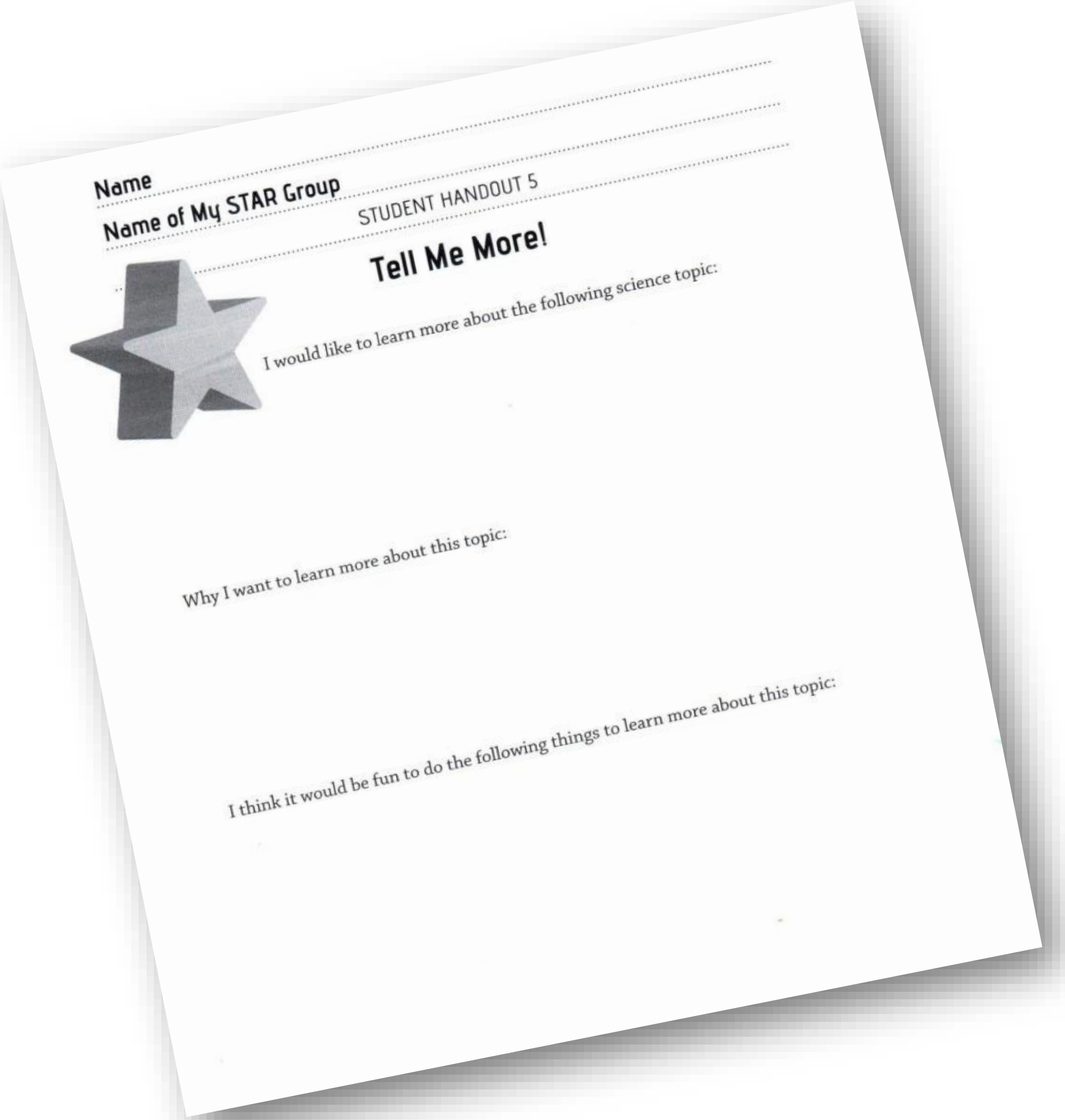
TEACHER HANDOUT 2

Scheduling STAR Days

Directions: Use this handout to help you schedule your students' STAR day presentations. You may wish to only schedule 1–2 per day, depending on the length of time that you have available.

Group Name	Group Members	STAR Topic	Description of Planned Activity	Date Scheduled	Notes/Comments

Weeks 6-10 – Students Conduct STAR Days



Name

Name of My STAR Group

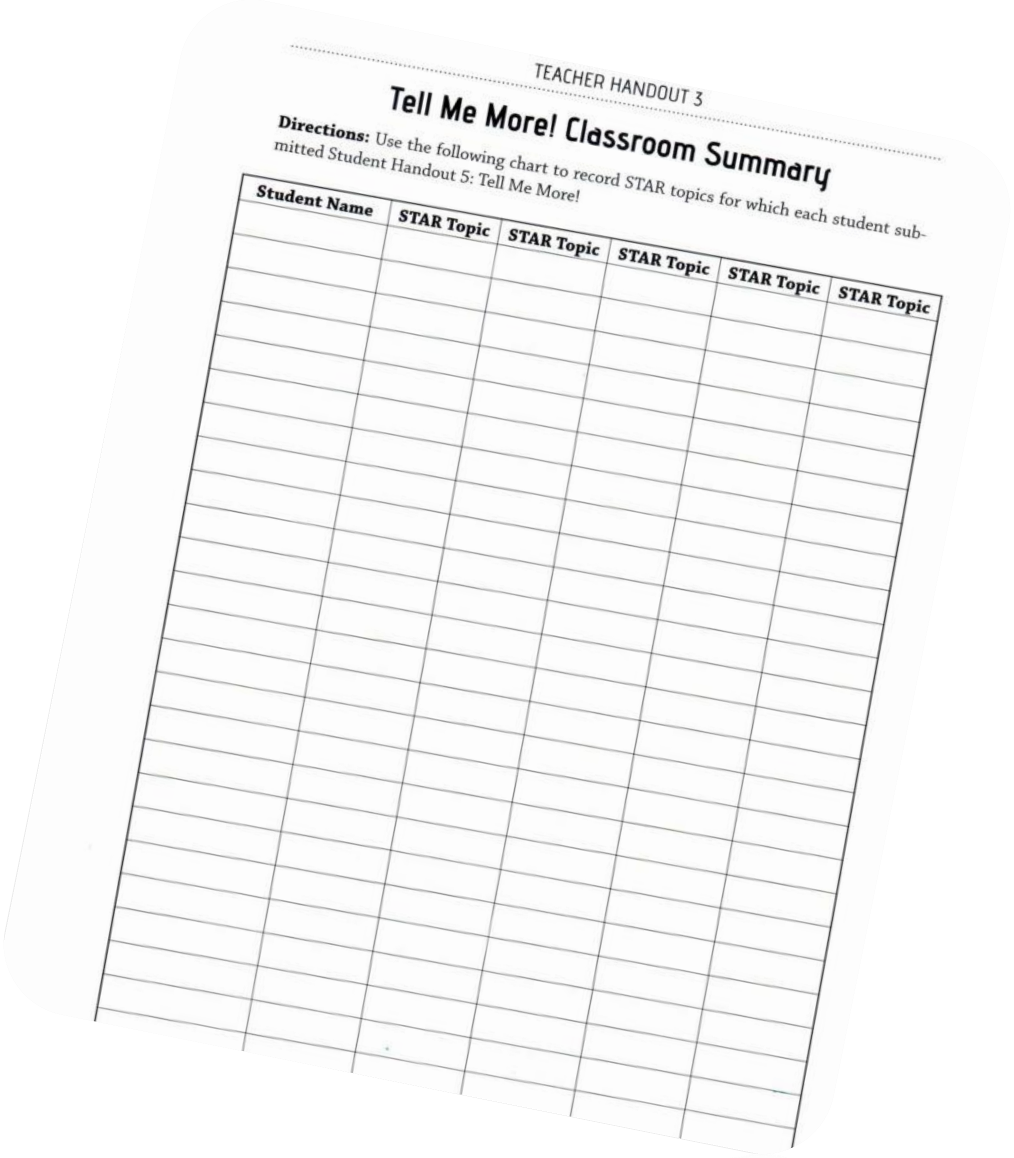
STUDENT HANDOUT 5

Tell Me More!

I would like to learn more about the following science topic:

Why I want to learn more about this topic:

I think it would be fun to do the following things to learn more about this topic:

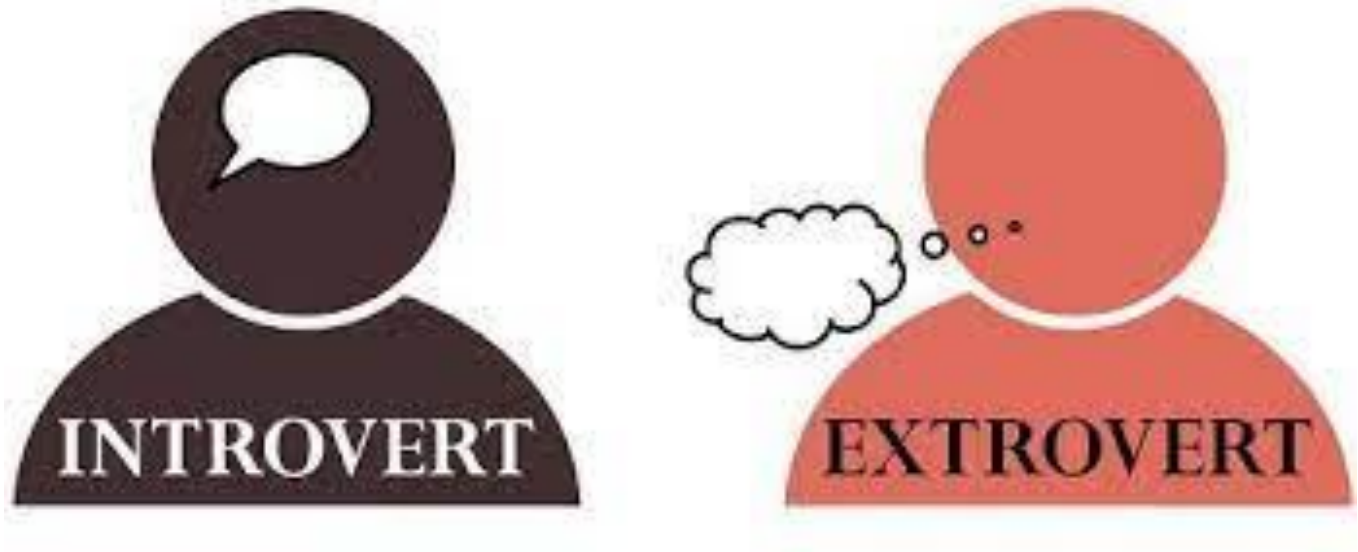


TEACHER HANDOUT 3

Tell Me More! Classroom Summary

Directions: Use the following chart to record STAR topics for which each student submitted Student Handout 5: Tell Me More!

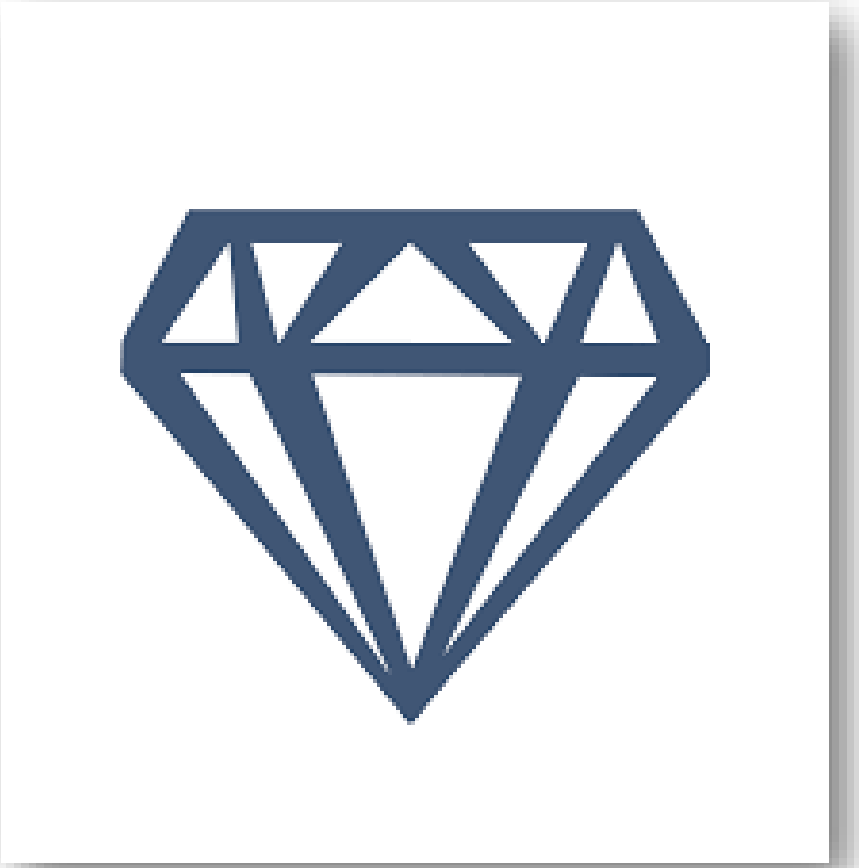
Student Name	STAR Topic	STAR Topic	STAR Topic	STAR Topic	STAR Topic



Poll: Introvert or Extrovert?

Week 11 – Students Select GEM Topics

- GEM = Great and Engaging Matter
- More in-depth exploration of a problem or topic
- Generated from STAR topics
- Unlike STAR topics, GEM topics include a “messy” problem.
- If you are working on a once-a-week schedule, students will work on these for the remainder of the school year!



What is a good “messy” problem?

- Interesting to the students
- Investigable using accessible materials
- Has no easy answers
- Of interest to an authentic audience – someone who might make use of the information. The audience should be accessible.

An Example

The noise level in the cafeteria at XYZ Elementary School is overwhelming! Students struggle to have conversations because they can't hear the person sitting next to them. Several students leave the cafeteria everyday after reporting a headache.

The students in Mrs. H.'s class want to understand why the cafeteria is so noisy, so they decide to investigate this topic. The problem is:

The cafeteria at XYZ Elementary School is so noisy? Why?

and

Can something be done about it?

Is This a Good GEM Topic?

- Interesting to the students?
- Investigable using accessible materials?
- Has no easy answers?
- Of interest to an authentic audience – someone who might make use of the information?

The cafeteria at XYZ Elementary School is so noisy? Why?

and

Can something be done about it?

Let’s Try This!

What about some of these topics? Can you come up with a “messy” problem that meets these criteria? Type the topic and a one sentence description of the problem into the chat box.

- Interesting to the students
- Investigable using accessible materials
- Has no easy answers
- Of interest to an authentic audience – someone who might make use of the information.

Topics:

- Aquatic Life
- Land Animals
- Medicine
- Global Warming
- Electricity
- Computers
- DNA
- Transportation
- Soil Conservation
- Solar Power
- Turbines
- Rain Forests

Name

STUDENT HANDOUT 6

Sign Me Up!

Directions: Write down STAR topics that interested you. After you have listed all topics, rate the three topics that interest you the most. Rate your most interesting topic 1, your next most interesting 2, and your third most interesting 3. Circle the topic that you would like to choose for your GEM project.

Topic	Rating (1, 2, 3)

Week 11 – Students Select GEM Topics

Weeks 12-13 – Students Write Introductions to Portfolios and GEM Research Questions

Name

STUDENT HANDOUT 7

Introduction to My Portfolio

Directions: Complete the items below.

1. What is the GEM topic you'll be working on?

2. Why are you interested in this topic?

3. Can you think of some **issues or problems** that are related to your GEM topic? It may help to think of how the issue is connected to your community. List some ideas for problems related to your GEM topic below.
   a.
   b.
   c.
   d.
   e.
   f.
   g.
   h.
   i.

4. Discuss these ideas with your teacher. With your group, select **one** that your group wishes to explore.

STUDENT HANDOUT 7, continued

5. Write your GEM-related issue below as a research question. For example, if one of your GEM-related issues is health of animals, you may wish to understand whether dogs in your community are healthy. You could write the question as, "Are dogs in our town healthy? Why or why not?"

   My GEM research question:

Weeks 14-17 – Facilitate Students' Knowledge About Their GEM Topics

Period of initial exploration

Be the "guide on the side," and not the "sage on the stage."

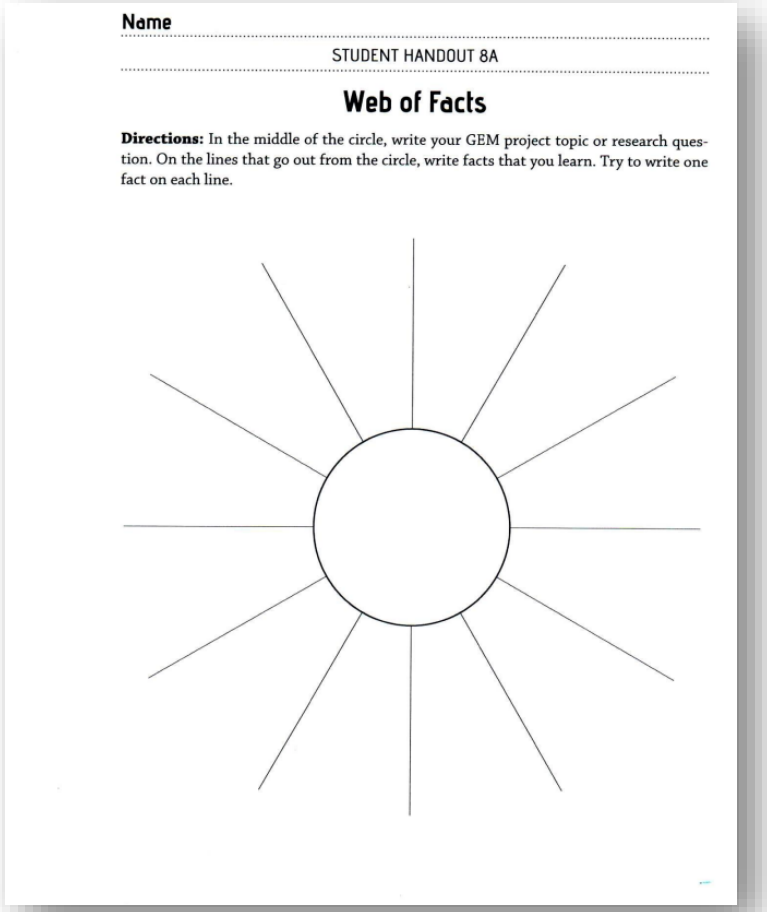
Students will be reading, researching, viewing videos, interviewing – anything to help them learn more about their topic!

Getting to Know You…

- I know you're from all over the country (not just the northeast).
- I know how many of you are extroverts, introverts, or confused about it.
- I know what you loved and hated about science.
- But I don't know this next thing…


Poll: Which Hogwarts' House Are You?

Weeks 14-17 – Facilitate Students' Knowledge About Their GEM Topics

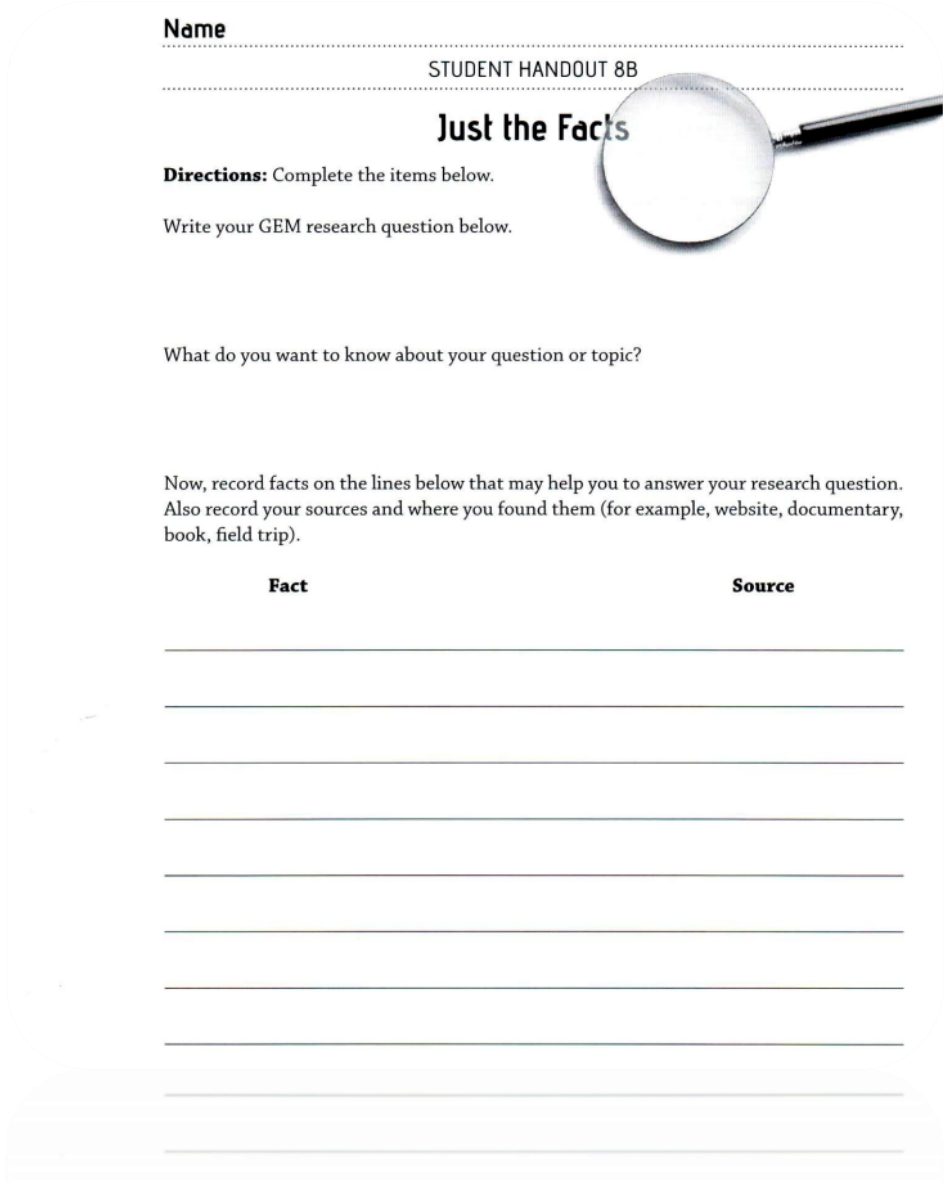


Name

STUDENT HANDOUT 8A

Web of Facts

Directions: In the middle of the circle, write your GEM project topic or research question. On the lines that go out from the circle, write facts that you learn. Try to write one fact on each line.



Name

STUDENT HANDOUT 8B

Just the Facts

Directions: Complete the items below.

Write your GEM research question below.

What do you want to know about your question or topic?

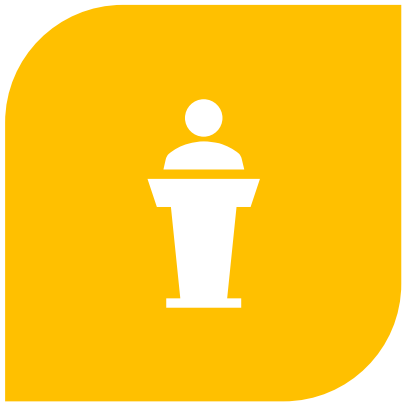
Now, record facts on the lines below that may help you to answer your research question. Also record your sources and where you found them (for example, website, documentary, book, field trip).

Fact	Source

Weeks 18-23 – Facilitate Students' Deeper Investigations About Their GEM Topics

STUDENT INVESTIGATIONS

SCIENCE SAFARIS



STUDENT DEBATES

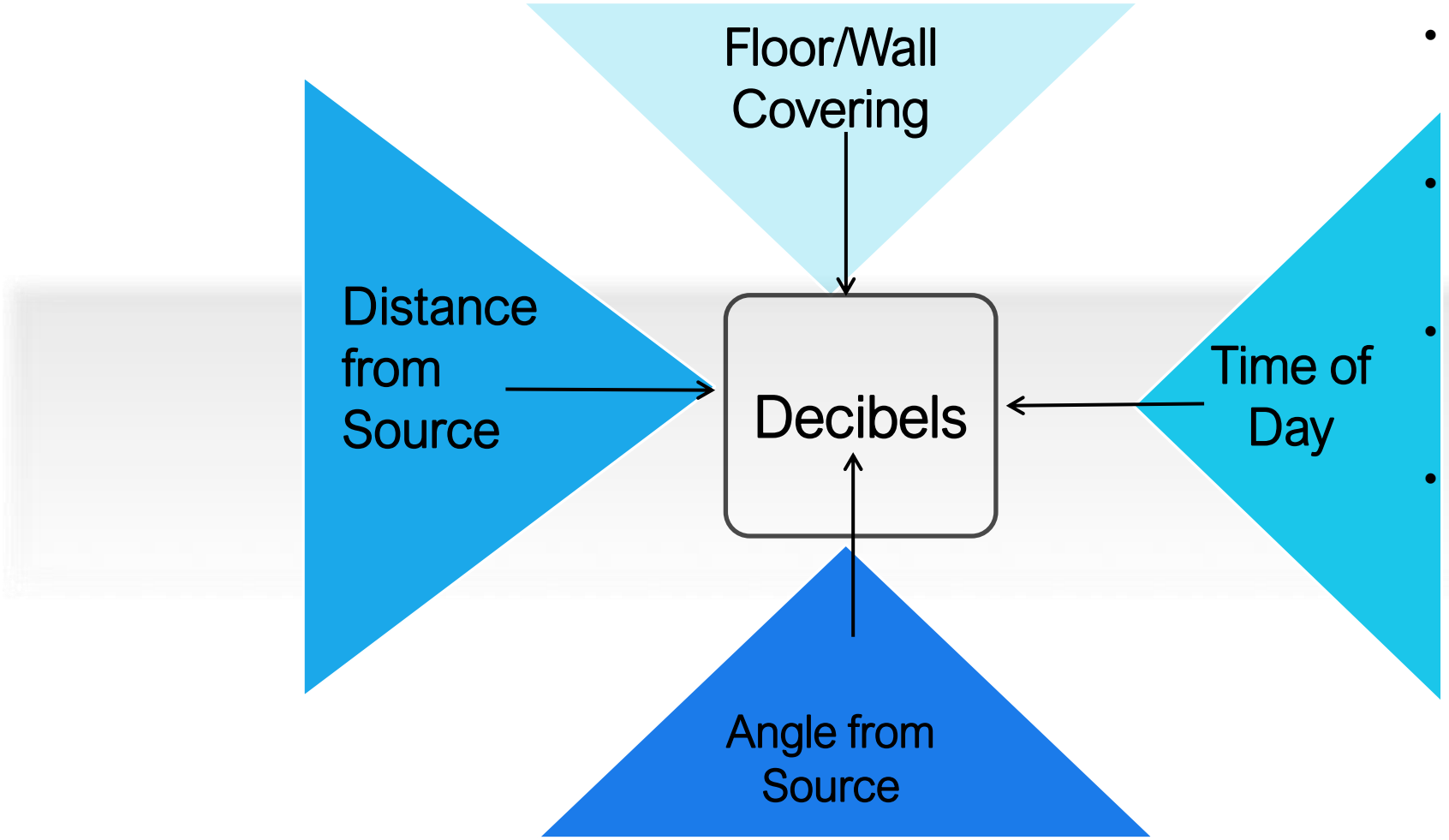
Turn the problem into something investigable.

- In our example, perhaps one of the STAR topics was on sound waves, so students are primed to be interested in sound waves.
- To solve the problem, students must:
  - Turn the problem into one or more investigable questions.
  - Dig deeper – learn more about the problem.
  - Carry out investigations and “solve” the problem.

Characteristics of Investigable Questions

- Availability of materials
- Availability of time
- Age appropriate
- Should be inherently personal to the students.
- Leads to taking action

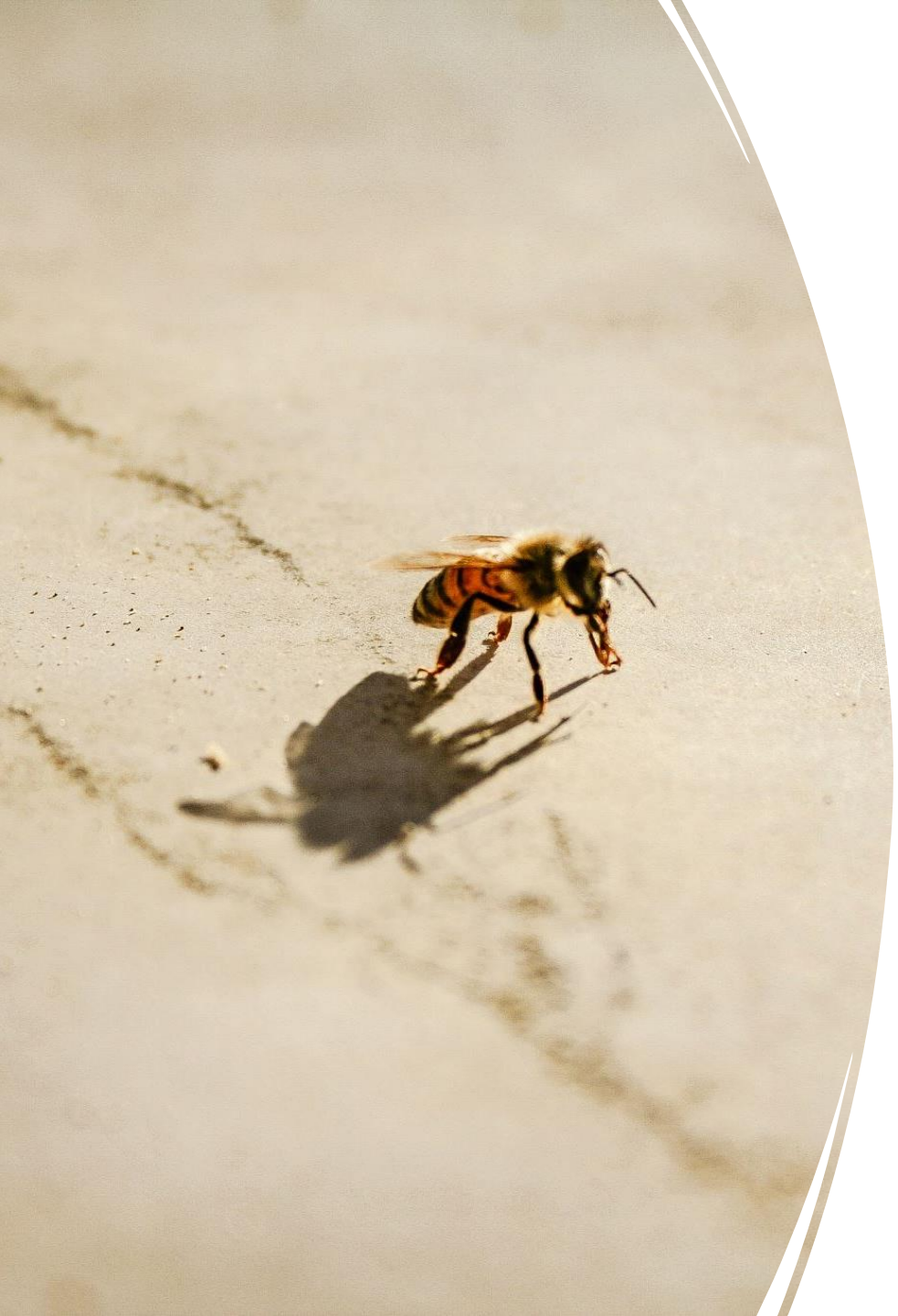
“Why” questions only get us started. From there, develop one or more research questions by using the word “affect.”



- **How do floor/wall coverings affect decibel levels in a room?**
- **How does distance from a source affect decibel levels in a room?**
- **How does the angle from a source affect decibel levels in a room?**
- **How does the time of day affect decibel levels in a room?**

Possible Investigable Questions

1. How do floor/wall coverings affect decibel levels in a room?
2. How does distance from a source affect decibel levels in a room?
3. How does the angle from a source affect decibel levels in a room?
4. How does the time of day affect decibel levels in a room?



Another Example

Let’s take another topic or issue:

- Problem - why are there so many stinging insects (e.g., bees, wasps, hornets) on the playground?
- Is this a “messy” problem that might be good to investigate?
- How might you use the word “affect” to turn the “why” into one or more investigable questions?

Activity

1. Think about all of the things that might “affect” the presence of bees on the playground.

2. Turn one or more of these into investigable questions with the word “affect.”

3. Type your best investigable question into the chat box.

Name

STUDENT HANDOUT 9

Student Investigation Plan

Directions: Complete the items below.

Investigation question:

What is known:

Hypothesis:

Procedure:

Dependent variable:

Independent variable(s):

Data table:

Conclusion:

What I learned from this investigation:

What I would do differently next time:

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