Teaching Through Inquiry
OSLN PD Webinar Series

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Checklist—before we start

- This webinar is being recorded
- Please mute your microphone and raise hand to speak
- A certificate of attendance will be emailed to you
- You will be automatically sent to and from breakout rooms
- Use the Zoom chat to communicate with Mackenzie (moderator)

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Objectives

- *Strengthen understanding of science inquiry*
- *Enhance pedagogical knowledge of science teaching*

Session 1: *Teaching Science Through Inquiry*

Session 2: *Examples of Subtle Shifts for Promoting Student Inquiry*

Session 3: *Incorporate More Student Inquiry in Your Science Lesson*

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Today's Agenda

- Review of framework for understanding scientific inquiry and related pedagogy
- Collaborate with peers to share ideas for subtle shifts to a lesson plan that intend to increase student inquiry
- Q&A

What is Scientific Inquiry?

The process skills of science

- asking questions
- planning and conducting experiments
- analyzing data to draw conclusions
- communicating results to others

The guiding principles for *Ohio's Learning Standards and Model Curriculum for Science* include:

Scientific and Engineering Practices

1. Asking questions (for science) and defining problems (for engineering)
2. Developing and using models
3. Planning and carrying out investigations
4. Analyzing and interpreting data
5. Using mathematics and computational thinking
6. Constructing explanations (for science) and designing solutions (for engineering)
7. Engaging in argument from evidence
8. Obtaining, evaluating, and communicating information

Ohio | Department of Education

National Research Council. 2012. A Framework for K-12 Science Education: Practices, Crosscutting Concepts, and Core Ideas. Washington, DC: The National Academies Press.

The guiding principles for *Ohio's Learning Standards and Model Curriculum for Science* include:

Table 1: Nature of Science

Nature of Science One goal of science education is to help students become scientifically literate citizens able to use science as a way of knowing about the natural and material world. All students should have sufficient understanding of scientific knowledge and scientific processes to enable them to distinguish what is science from what is not science and to make informed decisions about career choices, health maintenance, quality of life, community and other decisions that impact both themselves and others.	
Categories	**K-2**
Scientific Inquiry, Practice and Applications All students must use these scientific processes with appropriate laboratory safety techniques to construct their knowledge and understanding in all science content areas.	• Apply knowledge of science content to real-world challenges. • Plan and conduct simple scientific investigations using appropriate safety techniques based on explorations, observations and questions. • Employ simple equipment and tools to gather data and extend the senses. • Use data and mathematical thinking to construct reasonable explanations. • Communicate with others about investigations and data.
Science is a Way of Knowing Science assumes the universe is a vast single system in which basic laws are consistent. Natural laws operate today as they did in the past, and they will continue to do so in the future. Science is both a body of knowledge that represents a current understanding of natural systems and the processes used to refine, elaborate, revise and extend this knowledge.	• The world is discovered through exploration. • Exploration leads to observation. Observation leads to questions. • Natural events happen today as they happened in the past. • Events happen in regular patterns and cycles in the natural world.
Science is a Human Endeavor Science has been, and continues to be, advanced by individuals of various races, genders, ethnicities, languages, abilities, family backgrounds and incomes.	• Everyone explores the world which generates questions. • The answer is not always as important as the process. • Questions often lead to other questions. • Discoveries are communicated and discussed with others. • People address questions through collaboration with peers and continued exploration. • Everyone can see themselves as scientists.
Scientific Knowledge is Open to Revision in Light of New Evidence Science is not static. Science is constantly changing as we acquire more knowledge.	• It is essential to learn how to identify credible scientific evidence. • Ideas are revised based on new, credible scientific evidence.

*Adapted from Appendix H – Understanding the Scientific Enterprise: The Nature of Science in the Next Generation Science Standards

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How Do Students Develop Inquiry Skills?

Through PRACTICE!!!!!

Teaching through inquiry is any strategy gives students responsibility for applying the process skills of science

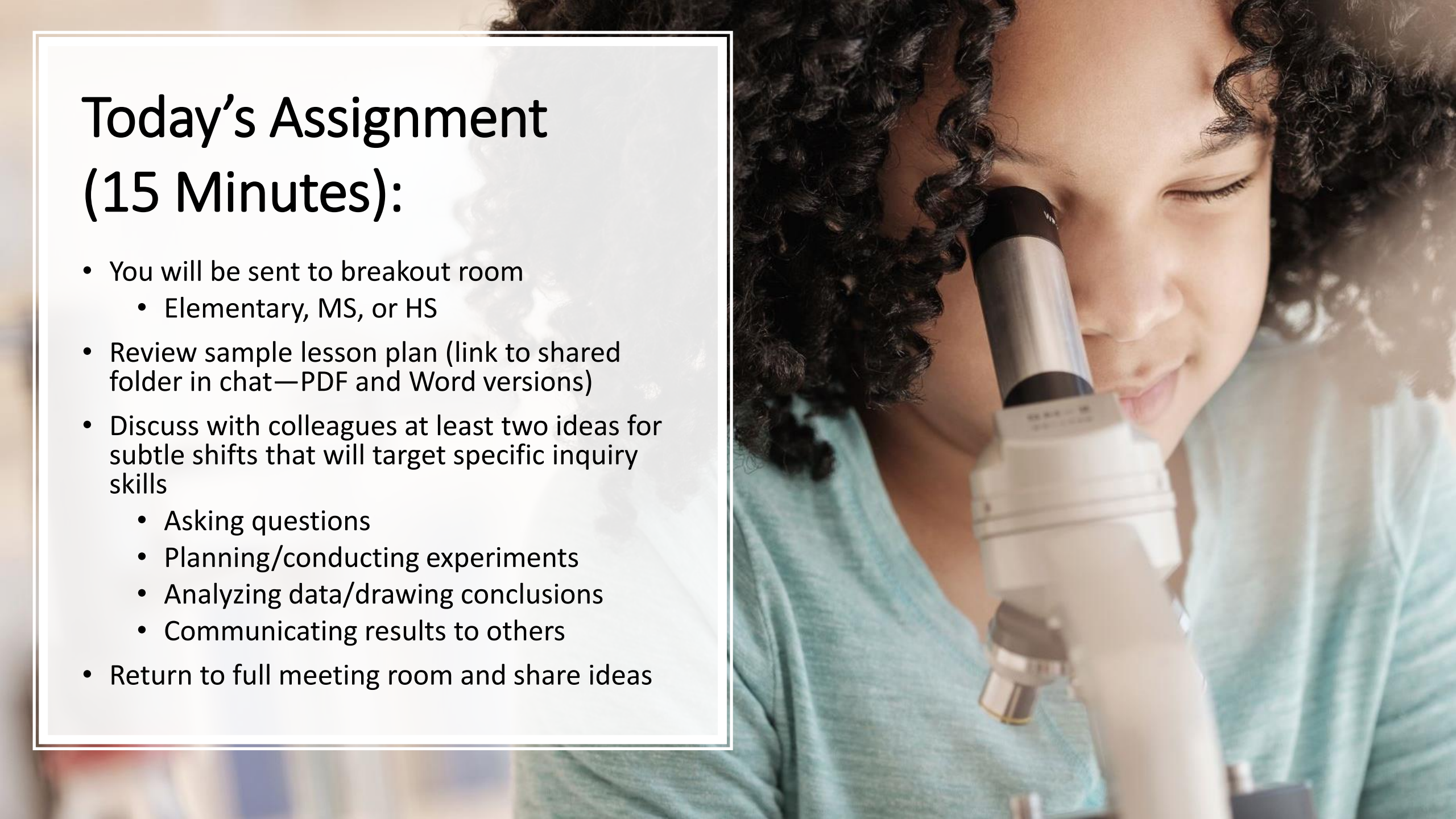
- asking questions
- planning and conducting experiments
- analyzing data to draw conclusions
- communicating results to others

Pedagogical Considerations

- **Teaching through inquiry is NOT dichotomous**
  - For any given science lesson, the degree of student inquiry should be considered as existing across a continuum (Session 1)
- **To help learners develop the abilities to do scientific inquiry, teachers need to give students responsibility for using the process skills of science**
  - Teachers can make small shifts in existing activities to help learners strengthen the process skills needed for scientific inquiry (Session 2)

Today's Assignment (15 Minutes):

- You will be sent to breakout room
  - Elementary, MS, or HS
- Review sample lesson plan (link to shared folder in chat—PDF and Word versions)
- Discuss with colleagues at least two ideas for subtle shifts that will target specific inquiry skills
  - Asking questions
  - Planning/conducting experiments
  - Analyzing data/drawing conclusions
  - Communicating results to others
- Return to full meeting room and share ideas



Asking Questions: Ideas for Shifts

- Provide students with several Qs to choose from
- Identify researchable Qs from a list of Qs
- As a post-experiment task, identify which Q the procedure helps to answer

Planning/Conducting Experiments: Ideas for Shifts

- Provide students with several procedures to choose from
- Leave out one step of procedure for students to determine how to do on their own
- Allow students to plan experiment using only provided materials

Analyzing Data/Drawing Conclusions:
Ideas for Shifts

- Avoid confirmational approach, don't state expected results
- Combine results from several groups or entire class before drawing conclusions
  - Were results reproducible?
  - Generalities and trends?
- Swap and interpret results from other groups/classes
- Describe limitations of study

Communicating Results to Others: Ideas for Shifts

- Require students to construct their own data sheets/data tables
- Give students flexibility in communication mode (verbal, written, data tables, visualizations)
- Gallery walks

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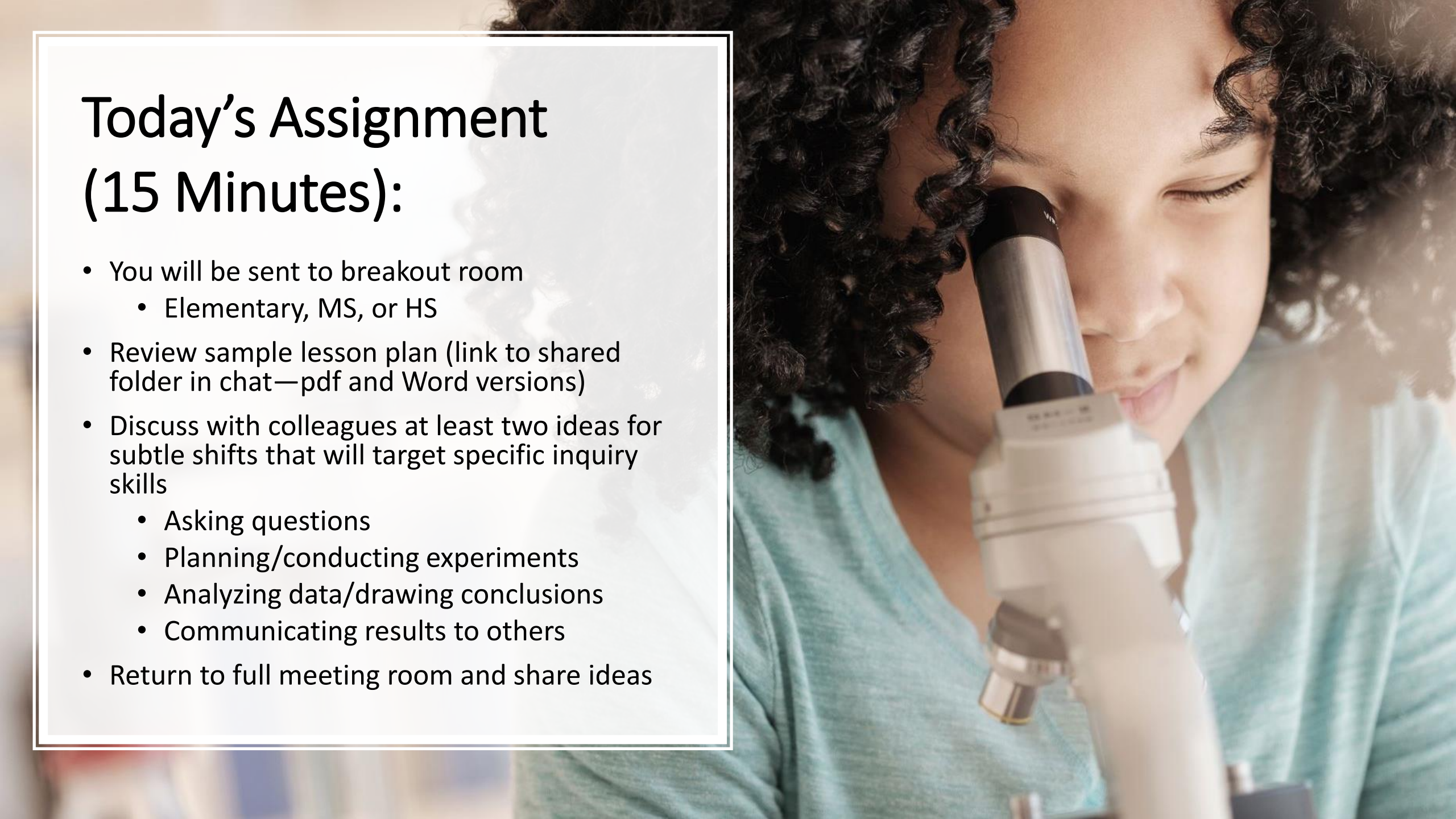

Shift Sharing

What inquiry skills did your group target?

What shifts did your group discuss that would better target these skills?

THANK YOU!!!

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