Introduction to the Science Georgia Standards of Excellence Professional Learning Community

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Directions: This PLC approach includes 10 guided discussions that can be used throughout the year to learn more about the structure, background, and intended outcomes of the GSE to be implemented in 2017-18. Each discussion will include a topic such as 3-D Learning, Crosscutting Cutting Concepts, Phenomena and Assessment. Teachers are encouraged to work in a PLC with department or content/grade level groups to learn about different aspects of the standards. There will be an introduction through a video or reading, discussion questions, and additional resources if you want to learn more. The PLC's will take 20-30 minutes. It is recommended a different topic is introduced each month to give teachers time to process and start incorporating these ideas into their classrooms.

Topic 1: What is 3-D Learning?	Topic 6: Making Thinking Visible
Topic 2: What is a Phenomenon?	Topic 7: Working with Diverse Students
Topic 3: What are Crosscutting Concepts?	Topic 8: What about TKES?
Topic 4: What are Science and Engineering Practices?	Topic 9: Assessment
Topic: 5 What are Disciplinary Core Ideas?	Topic 10: Lessons & Units

	Topic & Info for Discussion Leader	Task	If you want to learn more, check out these resources:
1	**Intro to the New Standards** **What is 3-D Learning?** **Although it is based on the NGSS and Georgia did not adopt the NGSS, Georgia did adopt standards that are 3-Dimensional and integrate content with science and engineering practices and crosscutting concepts. These videos can help us understand the design of the standards. Note for discussion leader: the standards are more rigorous and move away from define, explain to the more engaging "construct an argument, use a model to explain", etc. We also notice the use of "obtain, evaluate, and communicate at the beginning of each standard.	1. Do a crosswalk of the revised standards with the current GPS. Georgia will implement in 2017-18. By the end of an instructional segment, students should be able to complete the standard as if it were a "science performance". 2. Watch the video: Vision 3. As you watch the video, think about the shifts in terms of content, instruction, student expectations, and teacher support needs. **Discussion:** ★ How are the standards similar? How are they different? ★ What science & engineering practices do you notice? ★ What crosscutting concepts do you notice? ★ What support do you need? ***Where can I find resources & lessons that are 3-D?*** ➢ NGSS Hub – NSTA's collection of videos of teaching practice and potential lessons that can be adapted – *click on classroom resources and search by topic* ➢ The Concord Consortium has an online tool *Find Your Path* that lets you find lesson ideas based on Core Idea, Crosscutting	Download these documents for free at the National Academies Press. ● *A Framework for K-12 Science Education* ● *Ready Set Science Putting Research to Work in K-8 Science Classrooms* ● *America's Lab Report: Investigations in High School Science (2005)* ● *Science Teachers' Learning: Enhancing Opportunities, Creating Supportive Contexts* NOTE: Georgia Standards are based on *A Framework for K-12 Science Education – Practices, Crosscutting Concepts, and Core Ideas (2012).* **GaDOE Resources** *Georgia Standards of Excellence* *Georgiastandards.org*

		Concept, and Science and Engineering Practices. ➢ Sample Classroom Tasks - Achieve	
2	**What is a Phenomenon?** Phenomena play an important role in the GSE. This PLC focuses on developing a deeper understanding of phenomena and how they can engage students deeply in the 3-dimensions.	The K-12 Framework calls for students to engage in three-dimensional learning as they work to explain natural phenomena. 1. Watch the first 2 minutes of the video, Planning For Engagement from the Tools from Ambitious Science Teaching 2. Individually brainstorm a few possible phenomena for your content area. 3. Share your ideas with your group. 4. As a group, brainstorm a list of qualities that make a good phenomenon to anchor a lesson or unit. 5. Now, read Qualities of a Good Anchor Phenomenon and compare your brainstormed list of qualities to those listed in this resource. 6. Reflection: How would you change your initial list of possible phenomena? Why?	You can find out more about how phenomena are used to develop units with Conceptual Storylines. • Conceptual Storylines • Phenomena Video: Using Phenomena NEW Resources! GSTA Phenomena Hub Using Phenomena in Lessons & Units
3	**What are Crosscutting Concepts?** Crosscutting concepts can be described as “bigger than big ideas” that help organize	1. Review the 3-D performance, Flag Waving written by Brett Moulding. What do you notice about the color coding? If you were given paper, tape, and wooden dowels, how would you complete this task?	NSTA Matrix of Crosscutting Concept includes details about these how concepts may vary across grade bands. It should be noted that not all of details are required for mastery, but

	scientific information. CCC cut across life, earth, and physical science. Scientists look for patterns and try to understand cause and effect across all disciplines.	2. Watch the Teaching Channel video: Crosscutting Concepts 3. Identify the core ideas, crosscutting concepts, and science & engineering practices from the task. 4. How have your ideas about crosscutting concepts changed? Check out this collection of graphic organizers developed by Jeremy and Amy Peacock.	it does provide an overview of how they may be used. ● Patterns ● Cause and effect: Mechanism and explanation ○ Causal Patterns ● Scale, proportion, and quantity ● Systems and system models ● Structure and function ● Energy and matter: Flows, cycles, and conservation
4	**How are the Science & Engineering Practices Different?** Much of our current practices include opportunities for student investigations. The research in America's Lab Report suggests that traditional labs that include filling out a data chart and answering questions in a prescriptive form are not effective in developing content knowledge. 3-D learning in the GSE include	1. Look at the list of practices. Which ones do you currently use? Which ones seems new? 2. Review the first 3 slides of the 3-D performance, Ball Bounce written by Brett Moulding. If you were given a golf ball and measuring tape how would you complete this task? 3. Watch the Teaching Channel video: Science and Engineering Practices 4. Review the rest of the slides - a CER argumentation framework was added to provide students with a way to organize their data. Note: the task occurred before the explanation. The argumentation resources from Katherine McNeill will provide more	NSTA Matrix of Science & Engineering Practices includes details about these how the practices may vary across grade bands. It should be noted that not all of details are required for mastery, but it does provide an overview of how they may be used. ● Asking questions (for science) and defining problems (for engineering) ○ Try Engineering ○ Teach Engineering ○ Engineering Lesson Ideas ● Developing and using models

	performances in which students integrate practices, content, and crosscutting concepts. Teachers may be wondering, what happened to inquiry? It turns out there has been a lot of confusion about what inquiry is. While the practices incorporate what we think of about inquiry, the term inquiry is not used. Here is an article that will give insight to why: What happened to inquiry?	insight to the CER framework. 5. Discuss: How could we modify an existing lab to be more 3-Dimensional? 6. Check out this graphic organizer that shows the overlap of the SEP with literacy and mathematics. Check out this graphic organizer that shows the overlap of the SEP with literacy and mathematics. Differentiating for K-5 Science Teachers This video series might be a good basis for discussing practices at the elementary level. It also highlights literacy connections. The graphic organizer that shows the overlap of the SEP with literacy and mathematics.	• Planning and carrying out investigations • Analyzing and interpreting data • Using mathematics and computational thinking • Constructing explanations (for science) and designing solutions (for engineering) • Engaging in argument from evidence ○ Argument Driven Inquiry ○ The Argumentation Toolkit ○ Dr. Katherine McNeill. Boston College ○ Inquiry and Scientific Explanations Book Chapter • Obtaining, evaluating, and communicating information
5	**Core Content** If time permits, have teachers compare the GSE content to the DCIs. When they align, the DCIs provide a nice summary of enduring understandings that we want students to develop. Where	1. Review the 3-D performance, Rocky Mountains written by Brett Moulding 2. Watch the Teaching Channel video: Disciplinary Core Ideas 3. Discuss: 4. Although GSE content was not drawn directly from the DCIs, how could we use the DCIs to inform our planning and instruction?	Matrix of Disciplinary Core Ideas in the Next Generation Science Standards. We need to be mindful that the Enduring Understanding in the GPS were drawn from the previous *National Science Education Standards* and *Benchmarks for Science*. The DCI's

	they do not align, *teachers would be alerted to take extra care in pulling NGSS resources or resources from other states.*		of the *Framework* and NGSS can be useful to use, but there is not always a direct correlation between the DCI's and the GSE.
6	**Making Thinking Visible** A shift in the new GSE is the importance of students making sense of science concepts. Because of this, we need to find ways to make students thinking visible. The resources in this PLC can be helpful.	Secondary 1. Discuss: How do we know what student are thinking? Why is important that we make student thinking visible? 2. Read the NSTA article: *Necessary Stepping Stones for Making Sense of the World* Elementary 1. Read Chapter 5 in *Ready Set Science*, Making Thinking Visible (Argumentation) 2. *What methods does Ms. Carter use to encourage talk and argument and support scientific thinking? How does she include all of her students in the conversation? Are her methods successful?*	Formative assessment probes can be used to engage students in content development.
7	**Working with Diverse Students** The *Framework* stresses that science is for ALL students. Appendix D of the *Frameworks* identifies seven	1. Read the article Addressing Student Equity and Diversity 2. Divide the NGSS diversity case studies linked below among group members. Read the case study and present information to	For more information about making science more accessible to ELL's, check out this edition of the BAM! Radio show "Making Science Accessible to ELL's" and the accompanying EdWeek blog responses.

	diverse populations and outlines specific strategies to meet the needs. The focus of this discussion is on how we can make science accessible for ALL students.	whole group about the diverse population and suggestions on ways to support them. NGSS Case Studies - What are the federally identified diverse student groups and what strategies work best to support their learning?	
8	**What about TKES?** 3-D science involves research based strategies that support student learning. The level of rigor involved in these tasks create an academically challenging environment and support most of the TAPS indicators through engaging instruction and assessment.	1. Consider the questions as a group: *What should your administrators observe in your science classroom? How does 3-D science meet the TAPS standards?* 2. Review the TAPS resources that that can help you and your administrator see the alignment. 3. Which TAPS indicators does 3-D science support? 4. Make a plan to start discussing these resources with your administrators.	Additional Resources to Review: Instructional Leadership for Science Practices
9	**Assessment** **How should assessment look different with the new standards?**	How should ideas about assessing students change in light of the GSE? 1. Watch the video: Teaching Channel EQuIP What new insights did you gain?	There are various universities currently working on developing assessments that align with 3-D learning. Here are a few you may want to check out:

		2. Watch a second video: Video: Evidence of Student Learning 3. Read this article about examining student work and discuss how we might incorporate these ideas into their work: Examining Student Work	Integrating Practices into Assessment Tasks Standard SNAP Project (developing 3D assessments; resources tab useful resources) Developing Assessments NEW Assessment Resources from GaDOE!! • EOG Assessment Guides • EOG Study Guides • EOC Assessment Guides • EOC Study Guides
10	**Planning Lessons & Units**	Now that you have learned more about the elements that support 3-D instruction in science, where do you go now? There are many lesson/unit plan formats that work well with the new GSE - Storylines, 5E, Learning Cycle are a few. The focus of the format you use should be one that engages students in making sense of concepts through the integration of content, practices, and crosscutting concepts. Designing Phenomenon-Based Instruction	Here are additional resources to help you go beyond the basics of 3-D: Conceptual Storylines Evidence Statements Bundling Standards NGSS Resource Library How do to GSE correlate to Project/Problem Based Learning? Check out these PBL resources: Project Based Science

		Devise a plan with your PLC with your next steps. Consider the following questions: 1. What strategies will you use to increase student engagement? 2. What strategies will you use to work with diverse student populations? 3. How will your unit planning and curriculum mapping change? 4. How will you sequence lessons to incorporate phenomena and coherence? 5. How will you assess students in light of 3-D learning?	PBL and STEAM Education GaDOE Resources Frameworks are being developed for all grade levels and GSE courses. As resources become available, they will be posted to georgiastandards.org