MERIDIAN
PUBLIC SCHOOL DISTRICT
MOLDING PROFICIENT SCIENTISTS DAILY

THE KIRKLAND GROUP

From Paper to Practice: Unpacking Science Standards



Presenter:
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Science Academic Coach

MPSD Mission Statement

- Builds upon a rich tradition of academic excellence and a strong community work ethic
- Provides equitable access to learning opportunities for all students
- Embraces and celebrates the diversity within the community

MPSD Vision Statement

MPSD prepares ALL students, in a parent and community partnership, to be literate, self-directed learners with the confidence and character to compete in a complex and ever-changing world.

Learning Outcomes

Participants will be able to:

- understand key differences between the *Mississippi Science Framework (2010)* and the *College and Career Readiness Standards for Science (2018)*
- identify the components of The Kirkland Group College and Career Curriculum Document (TKG C_3D)
- utilize the pacing guide and supporting documents to create 5E modeled lessons
- outline shifts in science instruction as a result of implementation of the *College and Career Readiness Standards for Science (2018)*

Introductions

Jump in, jump out
Turn yourself about.
Jump in, jump out,
Introduce yourself:

*My name is **NAME**.....*[Yeah!]
*I'm from **SCHOOL**.....*[Yeah!]
*I teach **nth GRADE** (or) I lead **GRADES**.....*[Yeah!]
*I like to **ACTIVITY + DANCE MOVE**.....*[She/he likes to ____!]

Overview



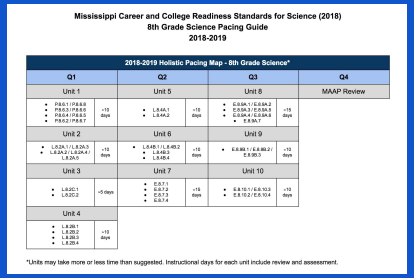
MSF ‘10



MCCRSS ‘18



TKG C_3D


Mississippi Career and College Readiness Standards for Science (2018)
8th Grade Science Pacing Guide
2018-2019

2018-2019 Holistic Pacing Map - 8th Grade Science*			
Q1	Q2	Q3	Q4
Unit 1	Unit 5	Unit 8	MAAP Review
• P.8.6.1 / P.8.6.8 • P.8.6.3 / P.8.6.6 • P.8.6.4 / P.8.6.5 • P.8.6.2 / P.8.6.7 — ~10 days	• L.8.4A.1 • L.8.4A.2 — ~10 days	• E.8.8A.1 / E.8.8A.2 • E.8.8A.3 / E.8.8A.5 • E.8.8A.4 / E.8.8A.6 • E.8.8A.7 — ~15 days	
Unit 2	Unit 6	Unit 9	
• L.8.2A.1 / L.8.2A.3 • L.8.2A.2 / L.8.2A.4 / L.8.2A.5 — ~10 days	• L.8.4B.1 / L.8.4B.2 • L.8.4B.3 • L.8.4B.4 — ~10 days	• E.8.9B.1 / E.8.9B.2 / E.8.9B.3 — ~10 days	
Unit 3	Unit 7	Unit 10	
• L.8.2C.1 • L.8.2C.2 — ~5 days	• E.8.7.1 • E.8.7.2 • E.8.7.3 • E.8.7.4 — ~10 days	• E.8.10.1 / E.8.10.3 • E.8.10.2 / E.8.10.4 — ~10 days	
Unit 4			
• L.8.2B.1 • L.8.2B.2 • L.8.2B.3 • L.8.2B.4 — ~10 days			

*Units may take more or less time than suggested. Instructional days for each unit include review and assessment.



5E Model of Instruction



Unpacking Standards

Desired Outcomes: 1) reduced teacher/administrator anxiety about new science standards; 2) improved science instruction; 3) increased student achievement in science

SCIENCE STANDARDS: OLD V. NEW

- **Mississippi Science Framework (2010)**

LIFE SCIENCE

3. **Compare and contrast the structure and functions of the cell, levels of organization of living things, basis of heredity, and adaptations that explain variations in populations.**

   a. Analyze how adaptations to a particular environment (e.g., desert, aquatic, high altitude) can increase an organism's survival and reproduction and relate organisms and their ecological niches to evolutionary change and extinction. (DOK 3)

1. [redacted]
2. [redacted]
3. [redacted]
4. [redacted]

- **Mississippi Career and College Readiness Standards for Science (2018)**

GRADE EIGHT: Life Science

L.8.2 Reproduction and Heredity

Conceptual Understanding: Organisms reproduce, either sexually or asexually, and transfer their genetic information to their offspring. The process of passing genetic information to offspring is inheritance. During sexual reproduction, genetic information is passed to offspring resulting in similarities and differences between parental organisms and their offspring. There are advantages and disadvantages of the two types of reproduction.

L.8.2A **Students will demonstrate an understanding of how sexual reproduction results in offspring with genetic variation while asexual reproduction results in offspring with identical genetic information.**

L.8.2A.1 *Obtain and communicate information about the relationship of genes, chromosomes, and DNA, and construct explanations comparing their relationship to inherited characteristics.*

L.8.2A.2 *Create a diagram of mitosis and explain its role in asexual reproduction, which results in offspring with identical genetic information.*

L.8.2A.3 *Construct explanations of how genetic information is transferred during meiosis.*

L.8.2A.4 *Engage in discussion using models and evidence to explain that sexual reproduction produces offspring that have a new combination of genetic information different from either parent.*

L.8.2A.5 *Compare and contrast advantages and disadvantages of asexual and sexual reproduction.*

What Has Changed?



MCCRSS ‘18





MSF ‘10

#1: Formatting



LIFE SCIENCE ← STRAND

3. Compare and contrast the structure and functions of the cell, levels of organization of living things, basis of heredity, and adaptations that explain variations in populations. ← COMPETENCY

a. Analyze how adaptations to a particular environment (e.g., desert, aquatic, high altitude) can increase an organism's survival and reproduction and relate organisms and their ecological niches to evolutionary change and extinction. (DOK 3) ← OBJECTIVE & DEPTH OF KNOWLEDGE

b. Compare and contrast the major components and functions of different types of cells. (DOK 2)
   - Differences in plant and animal cells
   - Structures (nucleus, cytoplasm, cell membrane, cell wall, mitochondrion, and nuclear membrane)
   - Different types of cells and tissues (e.g., epithelial, nerve, bone, blood, muscle)

Major Dimensions of the MS CCRS for Science



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Disciplinary Core Ideas

(This is the organization of the three content strands for Grades K-8.)

Life Sciences

1. Hierarchical Organization
2. Reproduction and Heredity
3. Ecology and Interdependence
4. Adaptations and Diversity

Physical Sciences

5. Organization of Matter and Chemical Interactions
6. Motions, Forces, and Energy

Earth and Space Science

7. Earth's Structure and History
8. Earth and the Universe
9. Earth Systems and Cycles
10. Earth's Resources

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GRADE EIGHT: Life Science

L.8.2 Reproduction and Heredity

DISCIPLINARY CORE IDEA

Conceptual Understanding: Organisms produce, either sexually or asexually, and transfer their genetic information to their offspring. The process of passing genetic information to offspring is inheritance. During sexual reproduction, genetic information is passed to offspring resulting in similarities and differences between parental organisms and their offspring. There are advantages and disadvantages of the two types of reproduction.

L.8.2A **Students will demonstrate an understanding of how sexual reproduction results in offspring with genetic variation while asexual reproduction results in offspring with identical genetic information.**

STANDARD

L.8.2A.1 *Obtain and communicate information about the relationship of genes, chromosomes, and DNA, and construct explanations comparing their relationship to inherited characteristics.*

L.8.2A.2 *Create a diagram of mitosis and explain its role in asexual reproduction, which results in offspring with identical genetic information.*

PERFORMANCE OBJECTIVES

L.8.2A.3 *Construct explanations of how genetic information is transferred during meiosis.*

L.8.2A.4 *Engage in discussion using models and evidence to explain that sexual reproduction produces offspring that have a new combination of genetic information different from either parent.*

L.8.2A.5 *Compare and contrast advantages and disadvantages of asexual and sexual reproduction.*

What Has Changed?



MCCRSS ‘18





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#2: Inquiry

a. Design, conduct, and analyze conclusions from an investigation that includes using experimental controls. (DOK 3)
b. Distinguish between qualitative and quantitative observations and make inferences based on observations. (DOK 3)
c. Summarize data to show the cause and effect relationship between qualitative and quantitative observations (using standard, metric, and non-standard units of measurement). (DOK 3)
    - Tools (e.g., English rulers [to the nearest one-sixteenth of an inch], metric rulers [to the nearest millimeter], thermometers, scales, hand lenses, microscopes, balances, clocks, calculators, anemometers, rain gauges, barometers, hygrometers, telescopes, compasses, spring scales, pH indicators, stopwatches, graduated cylinders, medicine droppers)
    - Types of data (e.g., linear measures, mass, volume, temperature, area, perimeter)
    - Resources (e.g., Internet, electronic encyclopedias, journals, community resources, etc.)
d. Analyze evidence that is used to form explanations and draw conclusions. (DOK 3)
e. Develop a logical argument defending conclusions of an experimental method. (DOK 3)
f. Develop a logical argument to explain why perfectly designed solutions do not exist. (DOK 3)
g. Justify a scientist's need to revise conclusions after encountering new experimental evidence that does not match existing explanations. (DOK 3)
h. Analyze different ideas and recognize the skepticism of others as part of the scientific process in considering alternative conclusions. (DOK 3)



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the process strands are not listed throughout the framework, these strands should be incorporated when presenting the content of the curriculum. **Science as Inquiry** is listed as a separate strand in order to place emphasis on developing the ability to ask questions, to observe, to experiment, to measure, to problem solve, to gather data, and to communicate findings. **Inquiry is not an isolated unit of instruction and must be embedded throughout the content strands.**

SOURCE: http://mdestream.mde.k12.ms.us/se/MSCCRS_for_Science_Introduction.mp4

Science and Engineering Practices



The practices work together – they are not separated!

1. Asking questions and defining problems
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 and designing solutions
7. Engaging in argument from evidence
8. Obtaining, evaluating, and communicating information

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Major Dimensions of the MS CCRS for Science



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Science and Engineering Practices

(These represent a more complete, holistic and accurate view of scientific activity.)

- Ask questions and define problems
- Develop and use models
- Plan and conduct investigations
- Analyze, interpret, graph, and present data
- Using mathematical and computational thinking
- Construct explanations and design solutions
- Engage in scientific argument from evidence
- Obtain, evaluate, and communicate information

Disciplinary Core Ideas

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What Has Changed?



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#3: Making Connections



Q: How long would it take the Earth to complete four revolutions around the Sun?

A. 1461 days
B. 1460 days
C. 366 days
D. 365 days

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Crosscutting Concepts



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- Addresses the "fragmented" approach to science lessons especially in K-8 (i.e., unit on ecosystems, then motion, then weather – What are the connections?)
- Can help students see connections between ideas in different disciplines

K-2	3-5	6-8	9-12
Patterns: Observed patterns in nature guide organization and classification and prompt questions about relationships and causes underlying them.			
• Patterns in the natural and human designed world can be observed, used to describe phenomena, and used as evidence.	• Similarities and differences in patterns can be used to sort, classify, communicate and analyze simple rates of change for natural phenomena and designed products. • Patterns of change can be used to make predictions. • Patterns can be used as evidence to support an explanation.	• Macroscopic patterns are related to the nature of microscopic and atomic-level structure. • Patterns in rates of change and other numerical relationships can provide information about natural and human designed systems. • Patterns can be used to identify cause and effect relationships. • Graphs, charts, and images can be used to identify patterns in data.	• Different patterns may be observed at each of the scales at which a system is studied and can provide evidence for causality in explanations of phenomena. • Classifications or explanations used at one scale may fail or need revision when information from smaller or larger scales is introduced; thus requiring improved investigations and experiments. • Patterns of performance of designed systems can be analyzed and interpreted to reengineer and improve the system. • Mathematical representations are needed to identify some patterns. • Empirical evidence is needed to identify patterns.

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Major Dimensions of the MS CCRS for Science



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Science and Engineering Practices

(These represent a more complete, holistic and accurate view of scientific activity.)

- Ask questions and define problems
- Develop and use models
- Plan and conduct investigations
- Analyze, interpret, graph, and present data
- Using mathematical and computational thinking
- Construct explanations and design solutions
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- Obtain, evaluate, and communicate information

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Earth and Space Science

7. Earth's Structure and History
8. Earth and the Universe
9. Earth Systems and Cycles
10. Earth's Resources

Crosscutting Concepts

(These are the unifying concepts across all science content strands.)

- Patterns
- Cause and effect: Mechanism and explanation
- Scale, proportion, and quantity
- Systems and system models
- Energy and matter: Flows, cycles, and conservation
- Structure and function
- Stability and change

SOURCE: http://mdestream.mde.k12.ms.us/se/MSCCRS_for_Science_Introduction.mp4

What Has Changed?



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#4: Vertical Alignment



3rd a. Identify questions and predict outcomes that can be examined through scientific investigations. (DOK 3)

2nd a. Formulate questions about objects and organisms and predict outcomes in order to conduct a simple investigation. (DOK 2)

1st a. Demonstrate an understanding of a simple investigation by asking appropriate questions about objects, organisms, and events. (DOK 2)

K a. Demonstrate an understanding of a simple investigation by asking questions. (DOK 2)

Progression for Disciplinary Core Idea: Organization of Matter

Ideas build through the grade levels to become successively more sophisticated.



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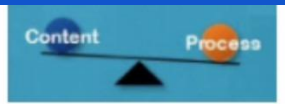
Highest level

By the end of Physical Science or Chemistry	Atomic Structure Model – investigate reactions of matter and conservation of mass
By the end of 7th grade	Atomic/Molecular Model – explore the properties and density of matter with changes in heat and pressure
By the end of 5th grade	Particle Model –investigate physical properties of matter (volume, shape, movement, spacing of particles)
By the end of 2nd grade	Macroscopic Model – classify matter as solid, liquid, or gas

Lowest level

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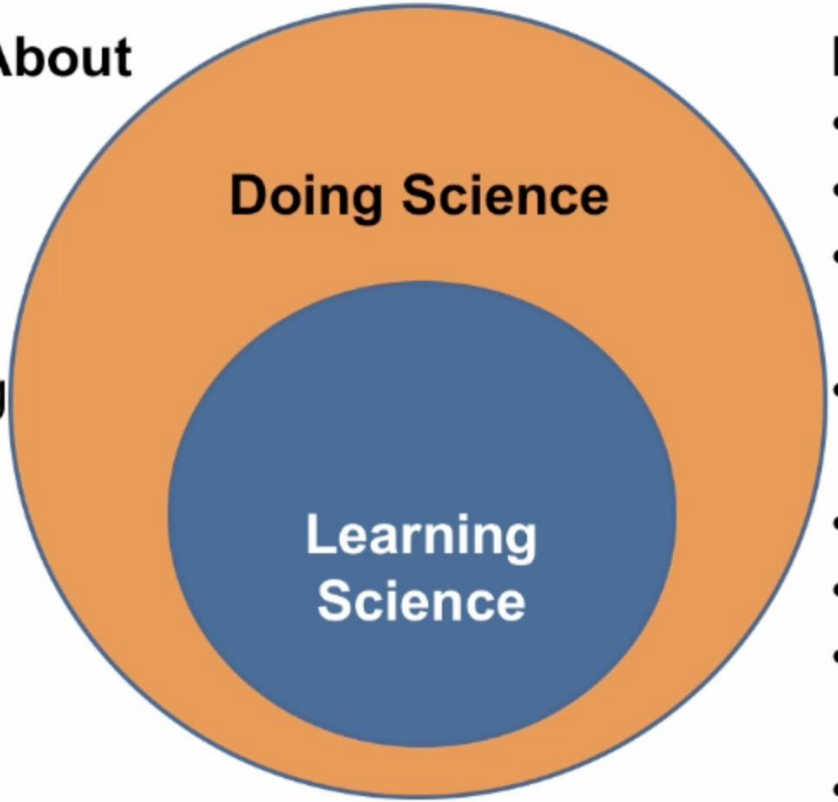
Process and Content Balance



Young students need to **do** science in order to **learn** science:

Learning About Science

- Reading
- Writing
- Listening
- Speaking
- Viewing



Doing Science

- Predict & Observe
- Record
- Measure & Collect Data
- Analyze & Interpret
- Model
- Draw Conclusions
- Recognize Patterns
- Report Results

SOURCE: http://mdestream.mde.k12.ms.us/se/MSCCRS_for_Science_Introduction.mp4

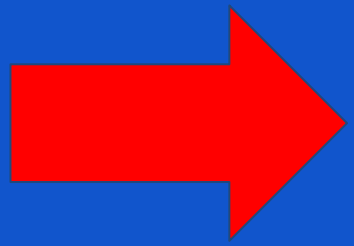
How Will My Instruction Change?



That was a lot! How will I teach all of this?



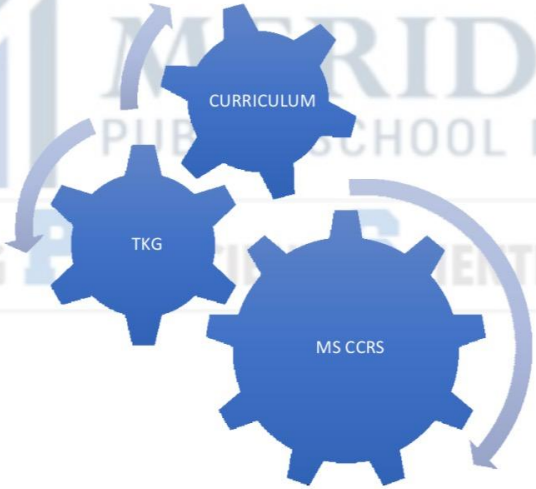
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TKG C_3D

MS COLLEGE & CAREER READINESS STANDARDS
5th Grade SCIENCE
TKG C_3D



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Last Edited: July 1, 2018



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5TH GRADE – HOLISTIC PACING MAP
TKG C3D

School Year: 2018 -2019

First Nine Weeks		Second Nine Weeks		Third Nine Weeks		Fourth Nine Weeks	
Unit 1: Photosynthesis		**Unit 4: Astronomy**		**Unit 7: Mixtures and Solutions**		**Unit 10: End of Year Review**	
• P.5.3A.1 • P.5.3A.2	≈10 Days	• E.5.8B.4 • E.5.8A.1 • E.5.8A.2 • E.5.8A.3 • E.5.8A.4	≈10 Days	• P.5.5B.1 • P.5.5B.2 • P.5.5B.3 • P.5.5B.4 • P.5.5C.3	≈10 Days	• REVIEW	≈30 Days
Unit 2: Food Webs		**Unit 5: Earth, Sun, and Moon**		**Unit 8: Chemical and Physical Changes**			
• P.5.3B.1 • P.5.3B.2 • P.5.3B.3 • P.5.3B.4	≈15 Days	• E.5.8B.1 • E.5.8B.2 • E.5.8B.3	≈10 Days	• P.5.5C.1 • P.5.5C.2	≈10 Days		
Unit 3: Human Interaction with Earth		**Unit 6: Properties of Matter**		**Unit 9: Newton's Laws of Motion**			
• E.5.10.1 • E.5.10.2	≈10 Days	• P.5.5A.1 • P.5.5A.2 • P.5.5A.3 • P.5.5A.4 • P.5.5A.5	≈15 Days	• P.5.6.1 • P.5.6.2 • P.5.6.3 • P.5.6.4 • P.5.6.5 • P.5.6.6	≈15 Days		

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DAILY

60 Minute Science Instructional Routine

Instructional Routine	Time Frame	Description
Spiral Review	5 minutes	• Review previously taught standards.
Fluency Drills	5 minutes	• Provide drills that promote fluency; e.g., Science Jeopardy, Around the World, I Have You Have, Science Bingo, etc.
Bell Ringer	5 minutes	• Choose questions from Problem-Attic, quizlet.com, etc. • Based on time, limit to one question.
Lesson	40 minutes	• Ensure lesson is aligned with at least one science practice. • Categorize and organize needed learning targets for prerequisites, reference C3D. • Choose learning target(s) for lesson and create plan. • Modeling and Guided Practice (15 minutes) • Independent Practice (25 minutes)
Homework	5 minutes	• Provide homework related to the day's lesson or previously taught standards.
Closure		• Use to summarize or close out the lesson; e.g., Exit Ticket, Writing Prompt, 3:2:1, Fishbowl, Tell Me One Thing You Learned, etc.

Notes:

- Anticipatory sets can replace the spiral review, fluency, and/or bell ringer time.
- Quizzes can replace the spiral review, fluency, and/or bell ringer time.
- Assessments can replace the spiral review, fluency, bell ringer and/or lesson time.
- Performance tasks should be included regularly during lessons.
- Workstations can replace the spiral review, fluency, bell ringer and/or lesson time.



MS – COLLEGE AND CAREER READINESS CURRICULUM DOCUMENT SCIENCE

TKG UNIT INSTRUCTIONAL GUIDE

First Nine Weeks	5th Grade	(Units 1 - 3)	School Year 2018 - 2019	Suggested Instructional Days: 35-40

First Nine Weeks				
Unit 1: (10 Days)				
Day 1: L.5.3A.1/L.5.3A.2	**Day 2:** L.5.3A.1/L.5.3A.2	**Day 3:** L.5.3A.1/L.5.3A.2	**Day 4:** L.5.3A.1/L.5.3A.2	**Day 5:** L.5.3A.1/L.5.3A.2
Day 6: L.5.3A.1/L.5.3A.2	**Day 7:** L.5.3A.1/L.5.3A.2	**Day 8:** L.5.3A.1/L.5.3A.2	**Day 9:** Review	**Day 10:** Unit Assessment
Unit 2: (15 Days)				
Day 1: L.5.3B.1	**Day 2:** L.5.3B.1	**Day 3:** L.5.3B.1	**Day 4:** L.5.3B.1	**Day 5:** L.5.3B.1
Day 6: L.5.3B.2/ L.5.3B.3/ L.5.3B.4	**Day 7:** L.5.3B.2/ L.5.3B.3/ L.5.3B.4	**Day 8:** L.5.3B.2/ L.5.3B.3/ L.5.3B.4	**Day 9:** L.5.3B.2/ L.5.3B.3/ L.5.3B.4	**Day 10:** L.5.3B.2/ L.5.3B.3/ L.5.3B.4
Day 11: L.5.3B.2/ L.5.3B.3/ L.5.3B.4	**Day 12:** L.5.3B.2/ L.5.3B.3/ L.5.3B.4	**Day 13:** L.5.3B.2/ L.5.3B.3/ L.5.3B.4	**Day 14:** Review	**Day 15:** Unit Assessment
Unit 3: (10 Days)				
Day 1: E.5.10.1/E.5.10.2	**Day 2:** E.5.10.1/E.5.10.2	**Day 3:** E.5.10.1/E.5.10.2	**Day 4:** E.5.10.1/E.5.10.2	**Day 5:** E.5.10.1/E.5.10.2
Day 6: E.5.10.1/E.5.10.2	**Day 7:** E.5.10.1/E.5.10.2	**Day 8:** E.5.10.1/E.5.10.2	**Day 9:** Review	**Day 10:** Assessment



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First Nine Weeks	Unit 1	Suggested Instructional Days: 10 Days

Disciplinary Core Idea:

L.5.3 Ecology and Interdependence

Standard:

L.5.3A Students will demonstrate an understanding of photosynthesis and the transfer of energy from the sun into chemical energy necessary for plant growth and survival.

Performance Objectives:		**Science/Engineering Practice(s):**
L.5.3A.1	*Research and communicate the basic process of photosynthesis that is used by plants to convert light energy into chemical energy that can be stored and released to fuel an organism's activities.*	SEP (a) SEP (g) SEP (h)
L.5.3A.2	*Analyze environments that do not receive direct sunlight and devise explanations as to how photosynthesis occurs, either naturally or artificially.*	SEP (a) SEP (c) SEP (g) SEP (h)

SEP (a)	**Ask Questions (science) and Define Problems (engineering)**	**SEP (b)**	**Develop and use Models**	**SEP (c)**	**Plan and Construct Investigations**	**SEP (d)**	**Analyze and Interpret Data**
SEP (e)	**Use Mathematical and Computational Thinking**	**SEP (f)**	**Construct Explanations (science) and Design Solutions (engineering)**	**SEP (g)**	**Engage in Scientific Argument from Evidence**	**SEP (h)**	**Obtain, Evaluate, and Communicate Information**

CORE ELEMENTS

Cross Cutting Concepts

a. Patterns✓
b. Cause and effect: Mechanism and explanation✓
c. Scale, proportion, and quantity
d. Systems and system models
e. Energy and matter: Flows, cycles, and conservation✓
f. Structure and function✓
g. Stability and change

First Nine Weeks	Unit 1	Suggested Instructional Days: 10 Days

Scientific Inquiry
Suggested application includes but is not limited to: • Development of Research Skills • Design experiments • Communication of results and conclusions

Rigor	
Knowledge **Facts, processes students will know**	▪ Know the process of photosynthesis. ▪ Know that usable energy is captured from sunlight by chloroplasts and is stored through the synthesis of sugar from carbon dioxide.
Reasoning **Conclusions, judgments, and/or inferences students will understand**	• Discussion about the substances necessary for plants to survive, and how plants obtain those substances. • Describe how energy from light is absorbed during photosynthesis and what happens to the energy after it is absorbed.
Demonstration **What students will be able to do**	▪ Draw the process of photosynthesis. ▪ Practice growing plants or engage in some other type of agricultural activity to investigate the process of photosynthesis.



MS – COLLEGE AND CAREER READINESS CURRICULUM DOCUMENT SCIENCE TKG C_3D

First Nine Weeks | **Unit 1** | **Suggested Instructional Days: 10 Days**

DECONSTRUCTION OF THE STANDARDS

Performance Objective:

L.5.3A.1	*Research and communicate the basic process of photosynthesis that is used by plants to convert light energy into chemical energy that can be stored and released to fuel an organism's activities.*

LEARNING TARGETS:	ESSENTIAL VOCABULARY:		PRE-REQUISITES:
• Recognize the importance of photosynthesis to all living things. • Describe the basic process involved in the three steps of photosynthesis. • Construct a photosynthesis model. • Describe environmental factors that affect the rate of photosynthesis.	• Research • Communication	• Photosynthesis • Pigments • Stomata • Glucose • Oxygen • Water • Carbon Cycle • Atmosphere • Cells • Chlorophyll • Molecules • Convert • Light • Solar Energy • Chemical Energy • Stored • Released • Fuel • Sun • Carbon dioxide • Reactions • Autotrophs • Heterotrophs	Examine evidence to communicate information that the internal and external structures of plants function to support survival, growth, behavior and reproduction.

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INSTRUCTIONAL STRATEGIES	
Performance Objective: *L.5.3A.1*	
Strategy 1:	**Concept Focus:**
Teacher will ask students to imagine that they are leaves applying for a job in a photosynthesis company. Students should create their "resume", explaining their job qualifications and describing how they will efficiently get the job done. Descriptions must include key vocabulary such as stomata, water, carbon dioxide, light, energy, chlorophyll, and chloroplast.	Plant leaf cells are unique in that they also contain special components called chloroplasts. Chloroplasts are filled with a green substance called chlorophyll. It is this substance, which gives plant leaves their green appearance and enables them to absorb sunlight. When plant cells have water, carbon dioxide and sunlight the chemical process of photosynthesis occurs.
Strategy 2:	**Concept Focus:**
Select students to participate in the photosynthetic process. Each student assumes a role in the process of photosynthesis. The roles are: the sun, the plant, water, carbon dioxide, energy, sugar and narrator. The sun shines in the center of the room. Plants are surrounded by energy, water and carbon dioxide, which walk around them and then sit down. Sugar and oxygen then take a turn to walk around the plants. The narrator describes the process as it happens. Animals can also be included giving off carbon dioxide and receiving oxygen. The students might wish to repeat the process over and over to show how the relationship continues. **Note**: Students learn by modeling.	Photosynthesis is the process by which plants convert energy from sunlight into energy for food. This process also requires water and carbon dioxide.

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Technology Integration

The Science Classroom:

1) National Science Teacher Association's Safety in the Science Classroom, accessible at http://www.nsta.org/docs/SafetyInTheScienceClassroom.pdf
2) List of safety resources: http://www.nsta.org/safety/.
3) General resources for teaching science and sample activities: http://undsci.berkeley.edu/
4) Science in the News (Evolution): http://evolution.berkeley.edu/evolibrary/home.php
5) Simulations for science concepts: https://phet.colorado.edu/en/simulations/category/new
6) Advanced tools for teaching and interacting with Earth science: https://serc.carleton.edu/eet/index.html
7) Interactive activities (some free/ some paid): http://edheads.org/
8) Current scientists (science in the news): http://www.smithsonianeducation.org/scientist/index.html
9) NewsELA (science in the news): https://newsela.com/articles/#/rule/latest?needle=science
10) National Oceanic and Atmospheric Administration: https://noaa.gov

YouTube – Various Science Videos:

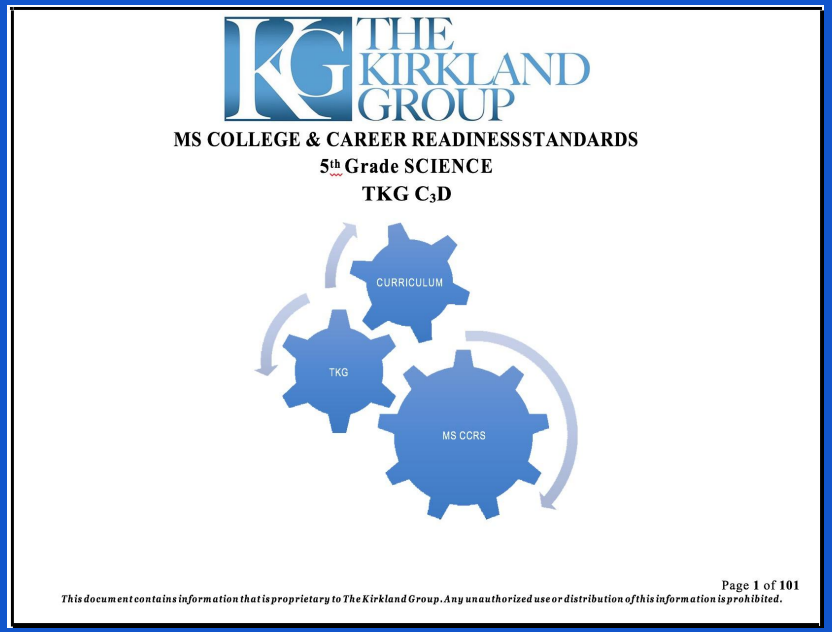
1) Amoeba Sisters
2) SciShow
3) Science Channel
4) Bozeman Science

Software Applications for Management & Assessment Strategies:

1) Plickers
2) Kahoots
3) Socrative
4) Edmodo
5) Class Dojo

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OK! So what does this look like?



TKG C_3D



5E Model of Instruction

Madeline Hunter Model



Madeline Hunter Model



- Set the stage
  - State objectives
  - Anticipatory set (“Hook”)
- Direct Instruction
  - Modeling
  - Check for understanding
  - Guided practice
- Independent Practice
  - Homework or Activity with feedback
  - Closure

BSCS 5E Model



Hunter Model

Hook

Check for Understanding/ Prior Knowledge

Modeled/Guided Instruction

Independent Practice

Closure

Table 1. Summary of the BSCS 5E Instructional Model

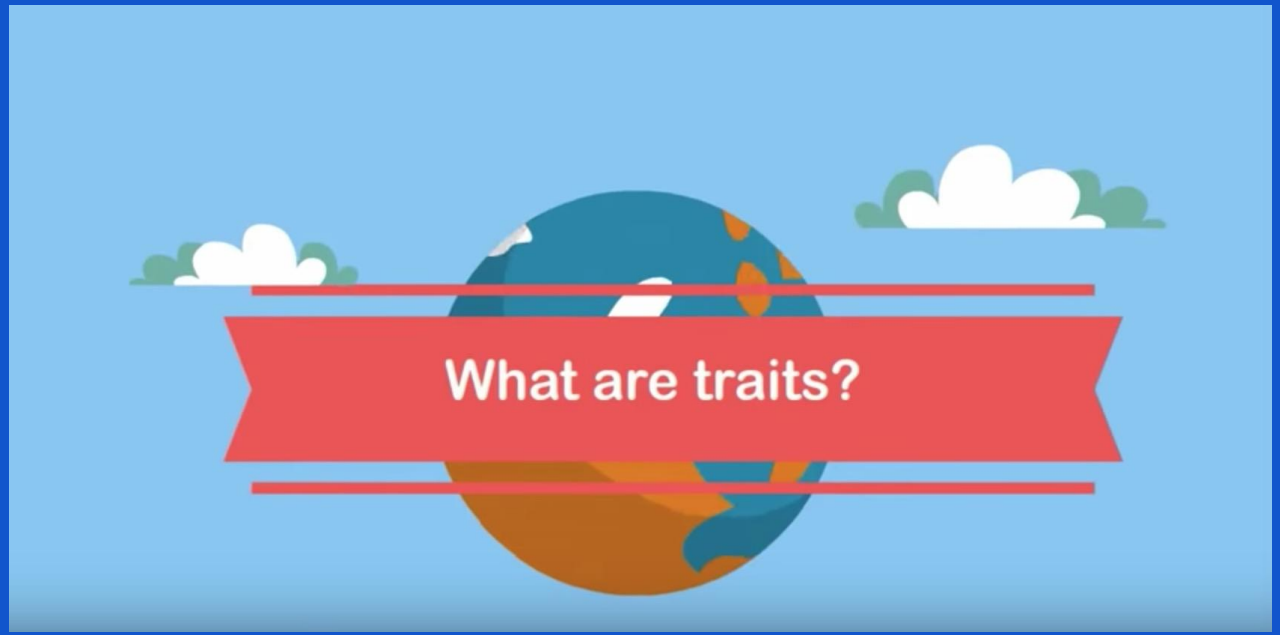
Phase	Summary
Engagement	The teacher or a curriculum task accesses the learners' prior knowledge and helps them become engaged in a new concept through the use of short activities that promote curiosity and elicit prior knowledge. The activity should make connections between past and present learning experiences, expose prior conceptions, and organize students' thinking toward the learning outcomes of current activities.
Exploration	Exploration experiences provide students with a common base of activities within which current concepts (i.e., misconceptions), processes, and skills are identified and conceptual change is facilitated. Learners may complete lab activities that help them use prior knowledge to generate new ideas, explore questions and possibilities, and design and conduct a preliminary investigation.
Explanation	The explanation phase focuses students' attention on a particular aspect of their engagement and exploration experiences and provides opportunities to demonstrate their conceptual understanding, process skills, or behaviors. This phase also provides opportunities for teachers to directly introduce a concept, process, or skill. Learners explain their understanding of the concept. An explanation from the teacher or the curriculum may guide them toward a deeper understanding, which is a critical part of this phase.
Elaboration	Teachers challenge and extend students' conceptual understanding and skills. Through new experiences, the students develop deeper and broader understanding, more information, and adequate skills. Students apply their understanding of the concept by conducting additional activities.
Evaluation	The evaluation phase encourages students to assess their understanding and abilities and provides opportunities for teachers to evaluate student progress toward achieving the educational objectives.

Visualizing the 5E Model

UNIT 5: Natural Selection [DCI L.8.4 - Adaptation and Diversity]			
Performance Objective	**Science and Engineering Practices**	**Essential Vocabulary**	**The Learner Will Be Able To**
L.8.4A.1 - *Use various scientific resources to analyze the historical findings of Charles Darwin to explain basic principles of natural selection*	• Ask questions and define problems • Engage in scientific argument from evidence • Obtain, evaluate, and communicate information	• Scientific resources • Historical findings • Charles Darwin • Basic • Principles • Natural selection	• Explain how evolution by natural selection works • Apply scientific thinking processes to develop your understanding of Darwin's Theory of Evolution • Explain how a species can evolve through natural selection
L.8.4A.2 - *Investigate to construct explanations about natural selection that connect growth, survival, and reproduction to genetic factors, environmental factors, food intake, and interactions with other organisms*	• Develop and use models • Plan and construct investigations • Construct explanations and design solutions	• Explanations • Natural selection • Growth • Survival • Reproduction • Genetic factors • Environmental factors • Food intake • Interactions • organisms	

ENGAGE

MooMoo Math and Science: What is a trait?



EXPLORE

- Darwin’s Adaptations





EXPLAIN

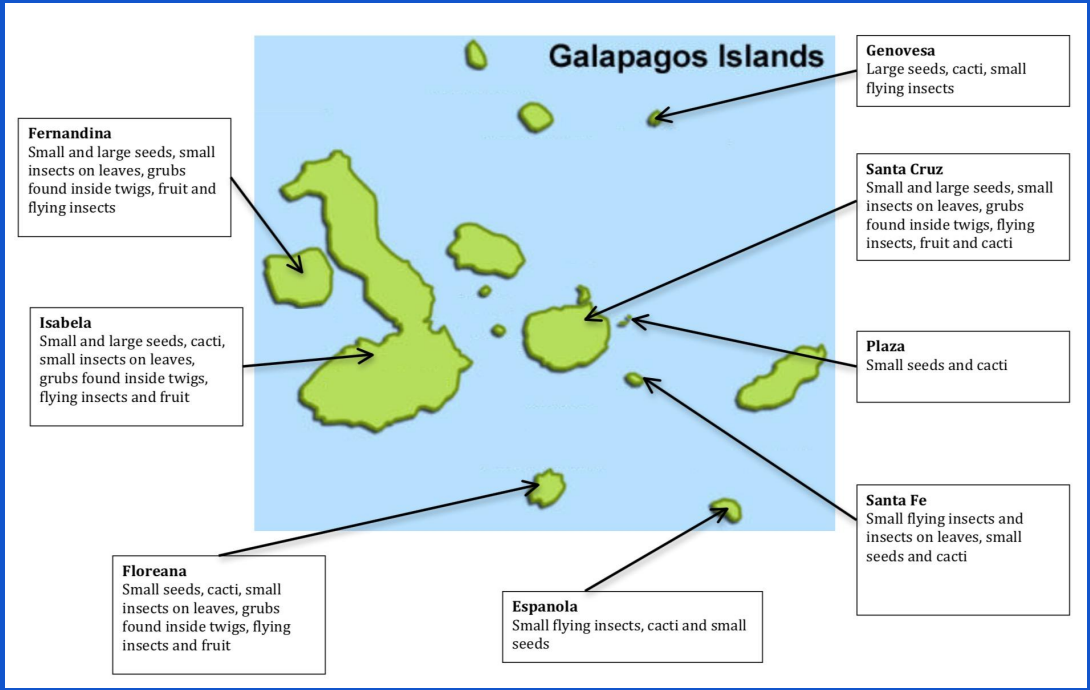
- Darwin's Adaptations Discussion

1. Based on the activity, what do you think "survival of the fittest" means?

2. We have learned that alleles are the different versions of a trait. What were the alleles present in this activity?

ELABORATE

- Galapagos Real Estate



EVALUATE

- Natural Selection Presentation



Thanks for all these resources, Steve! How will my lessons be as awesome as yours?!



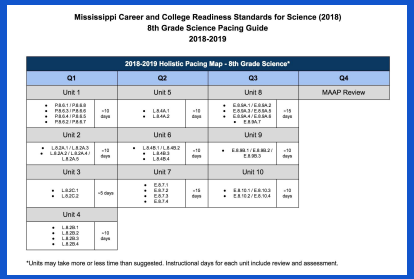
MSF ‘10



MCCRSS ‘18



TKG C_3D


Mississippi Career and College Readiness Standards for Science (2018)
8th Grade Science Pacing Guide
2018-2019

2018-2019 Holistic Pacing Map - 8th Grade Science*							
Q1		Q2		Q3		Q4	
Unit 1		Unit 5		Unit 8		MAAP Review	
• P.8.6.1 / P.8.6.6 • P.8.6.3 / P.8.6.5 • P.8.6.4 / P.8.6.5 • P.8.6.2 / P.8.6.7	~15 days	• L.8.4A.1 • L.8.4A.2	~15 days	• E.8.8A.1 / E.8.8A.2 • E.8.8A.3 / E.8.8A.5 • E.8.8A.4 / E.8.8A.6 • E.8.8A.7	~15 days		
Unit 2		Unit 6		Unit 9			
• L.8.2A.1 / L.8.2A.3 • L.8.2A.2 / L.8.2A.4 / L.8.2A.5	~10 days	• L.8.4B.1 / L.8.4B.2 • L.8.4B.3 • L.8.4B.4	~10 days	• E.8.9B.1 / E.8.9B.2 / E.8.9B.3	~10 days		
Unit 3		Unit 7		Unit 10			
• L.8.2C.1 • L.8.2C.2	~5 days	• C.8.7.1 • C.8.7.2 • C.8.7.3 • C.8.7.4	~15 days	• E.8.10.1 / E.8.10.3 • E.8.10.2 / E.8.10.4	~10 days		
Unit 4							
• L.8.3B.1 • L.8.3B.2 • L.8.3B.3 • L.8.3B.4	~10 days						

*Units may take more or less time than suggested. Instructional days for each unit include review and assessment.



5E Model of Instruction



Unpacking Standards

Unpacking Standards

- **What it is:** creating focused, effective lessons that are standards-based and hit learning targets precisely by deconstructing standards.

- **What it is not:** creating lessons that are loosely related to the standard and are “cute”, “fun”, or “easy”.

Essential Question:

How will [insert activity] help students demonstrate their understanding?

THE CHEAT SHEET

Unpacking the Mississippi Career and College Readiness Standards for Science (2018)

Performance Objective			
MCCRSS; C3D; Pacing Guide			
What do students need to know? [NOUNS]	Disciplinary Core Ideas	*What do students need to be able to do?* [VERBS]	Science and Engineering Practices
Identify nouns in the performance Objective	-MCCRSS -C3D -Pacing Guide	Identify verbs in the performance Objective	-MCCRSS -C3D -Pacing Guide
Essential Question [What's the BIG idea?]		**Learning Target(s) [*I can…; Did I…?*]**	
-MCCRSS -What does the standard want students to know after this group of Performance objectives?		-C3D -Create by deciding what students will do to show they understand/Mastered this objective.	

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THE CHEAT SHEET

Unpacking the Mississippi Career and College Readiness Standards for Science (2018)

Performance Objective			
MCCRSS; C3D; Pacing Guide			
What should students already know? [PRIOR KNOWLEDGE]	*How will students achieve learning targets?* [5E INSTRUCTION]		*How will students demonstrate their understanding/mastery at this point?* [ASSESSMENT]
-C3D -What would you need to understand before mastering the performance objective?	ENGAGE		
	EXPLORE	What activities/resources will I use to facilitate my students' learning of this performance objective?	
	EXPLAIN		
	ELABORATE		
	EVALUATE		

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Paper to Practice: Unpacking Standards

With your school teams, begin to unpack the first standard you will teach in August.

Use the provided resource list and documents in our padlet.

Keep our essential question in mind:
How will [insert activity] help students demonstrate their understanding?

Thanks for your participation today! I look forward to the great work we will do together.

Let me know how I did today by filling out the survey in our padlet.



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