Professional Development: New Science Gr. 2 Curriculum 4-20-16

(Notes by Cheryl Follmer)

Book Resource- "A Framework for K-12 Science Education-Research that led to the development of the science standards

Keys- Fewer topics, greater depth
No memorizing
Sequencing

(NGSS)- Next Generation Science Standards

Three Dimensional Learning: Acronyms
Science and Engineering Practices (SEP)
Disciplinary Core Ideas (DCI)
Crosscutting Concepts (CC)

Science and Engineering Practices
8 Practices- common throughout all grade levels

1. Ask questions, define problems
2. Develop, use models
3. Plan and carry out investigations
4. Analyze data
5. Use mathematics and computational thinking
6. Develop explanations, design solutions
7. Engage in arguments from evidence
8. Obtain, analyze, communicate data

PE's= Performance Expectations
They are the standards, written as end goals.

Each PE has a practice that has a SEP, DCI, CC.

When you see an (*), it means that engineering is embedded.

Analogy-Practices- Tools Core Ideas-Ingredients Crosscutting Concepts-Meal
*Stick to the Recipe the first time! Then, you can do things differently the next year.

Lessons will become available in GAFE in late August, and before each quarter the first year.

Quarter 1:

Structures and Properties of Matter (Physical Science Standards)
Journaling: Introducing the Journal
Science Notebooks (K-2) Resource pgs 1-4 all
Importance of Journaling
-used for every lesson (pictures, words, definitions)
Students and Journaling- Guidelines and Habits
Accountability-grading purposes

Grade 2 Entries Date and Title
Science Word/Everyday Word Within Journal or back of book glossary

Overarching Question-
Q1 How do the properties of matter relate to their uses?

Plan and conduct an investigation
Obtain data from testing different materials
Essential Questions component- These may be revised this summer following pilot.

Engineering Design Process EDP
Ask-Imagine-Plan-Create-Improve-Communicate (Teach Song)

Resource: In house field Trip Science Center - Program "What's the Matter?"

Quarter 2: Earth's Features (Earth Science)
(This quarter leads into Q3.)

Overarching Question-
Q2 What are the different landforms and bodies of water on Earth?
-focus on outer crust only

(Integration with maps unit)

Technology- Google Earth
Connects with (Q1, Matter)-water features on Earth
Connects with ELA (adjectives) to describe landforms
Technology- **Kids World Book online-** groups research different landforms

Landform Models need to be saved for Q3 continuation

Quarter 3: Earth's Changing Landscape

Overarching Question-
Q3 How does land change and what are some things that cause it to change?

Soil from home, comparing soil from different areas
Soil layers- Includes technology and research about layers
Making soil
Decomposing
Earth changes videos- i.e. volcanos, beach erosion, icebergs, glaciers

Small group landforms get applied to class tray for final performance task.

Quarter 4: Relationships in Habitats (Life Science)

What evidence can be collected through investigation and observation to determine the needs of plants and the impact of their environment on their survival?

Plants need water and sun to survive.
How do insect body parts work as a pollinator?
"Mariana Becomes a Butterfly"-book resource Create a hand pollinator
How do seeds travel?
Velcro- burdock plant, feather., fur, leather samples

Do not frontload vocabulary!
Review after the experiences. Allow students to work with materials first.
"Do you remember when we..."
Add to Science Word/Everyday word List

Book "One Small Square" Create an informational poster to describe plants and animals in their school environment. Collection- reversal tape

Butterflies are staying for now.
However, do not talk about life cycles. (That is 3rd grade.)

New focus- *observing the parts* Why do butterflies have to have nectar?
What do the wings and legs allow it to do?

Lessons:

Fully developed, Kits, Consumables

Parts of the lesson-

Teacher Background
Material List
Big ideas, key questions, connections to other grades

Long Range Planning and collaboration with team and related arts team is key!

EIE- Engineering is Elementary Examples:
Sail Unit (Physical Science)
Pollinator Unit (Life Science)

What to expect on Canvas:

Landing Page for each quarter
Unit overview page
Lessons
Essential Questions
Vocabulary
Teacher Background
Lesson Seeds
Materials
5E Lesson Plan
Linked documents and videos
Parent Preview Letter- Big Ideas, Vocabulary, Links, Requests for items to support science program

FAQ's

Scheduling- 1 lesson/day @45 minutes
Integration with ELA
Books- Some being purchased, some already located in the building
Grade levels may be receiving and giving
Kids World Book has tech to speech for BGL readers
Optimum Group Size- 4 students

Next Generation Science Standards- Relevant Science

2.Structure and Properties of Matter

2.Structure and Properties of Matter

Students who demonstrate understanding can:

2-PS1-1. Plan and conduct an investigation to describe and classify different kinds of materials by their observable properties. [Clarification Statement: Observations could include color, texture, hardness, and flexibility. Patterns could include the similar properties that different materials share.]

2-PS1-2. Analyze data obtained from testing different materials to determine which materials have the properties that are best suited for an intended purpose.* [Clarification Statement: Examples of properties could include, strength, flexibility, hardness, texture, and absorbency.] [Assessment Boundary: Assessment of quantitative measurements is limited to length.]

2-PS1-3. Make observations to construct an evidence-based account of how an object made of a small set of pieces can be disassembled and made into a new object. [Clarification Statement: Examples of pieces could include blocks, building bricks, or other assorted small objects.]

2-PS1-4. Construct an argument with evidence that some changes caused by heating or cooling can be reversed and some cannot. [Clarification Statement: Examples of reversible changes could include materials such as water and butter at different temperatures. Examples of irreversible changes could include cooking an egg, freezing a plant leaf, and heating paper.]

The performance expectations above were developed using the following elements from the NRC document *A Framework for K-12 Science Education*:

Science and Engineering Practices

Planning and Carrying Out Investigations
Planning and carrying out investigations to answer questions or test solutions to problems in K–2 builds on prior experiences and progresses to simple investigations, based on fair tests, which provide data to support explanations or design solutions.
- Plan and conduct an investigation collaboratively to produce data to serve as the basis for evidence to answer a question. (2-PS1-1)

Analyzing and Interpreting Data
Analyzing data in K–2 builds on prior experiences and progresses to collecting, recording, and sharing observations.
- Analyze data from tests of an object or tool to determine if it works as intended. (2-PS1-2)

Constructing Explanations and Designing Solutions
Constructing explanations and designing solutions in K–2 builds on prior experiences and progresses to the use of evidence and ideas in constructing evidence-based accounts of natural phenomena and designing solutions.
- Make observations (firsthand or from media) to construct an evidence-based account for natural phenomena. (2-PS1-3)

Engaging in Argument from Evidence
Engaging in argument from evidence in K–2 builds on prior experiences and progresses to comparing ideas and representations about the natural and designed world(s).
- Construct an argument with evidence to support a claim. (2-PS1-4)

Connections to Nature of Science

Science Models, Laws, Mechanisms, and Theories Explain Natural Phenomena
- Scientists search for cause and effect relationships to explain natural events. (2-PS1-4)

Disciplinary Core Ideas

PS1.A: Structure and Properties of Matter
- Different kinds of matter exist and many of them can be either solid or liquid, depending on temperature. Matter can be described and classified by its observable properties. (2-PS1-1)
- Different properties are suited to different purposes. (2-PS1-2),(2-PS1-3)
- A great variety of objects can be built up from a small set of pieces. (2-PS1-3)

PS1.B: Chemical Reactions
- Heating or cooling a substance may cause changes that can be observed. Sometimes these changes are reversible, and sometimes they are not. (2-PS1-4)

Crosscutting Concepts

Patterns
- Patterns in the natural and human designed world can be observed. (2-PS1-1)

Cause and Effect
- Events have causes that generate observable patterns. (2-PS1-4)
- Simple tests can be designed to gather evidence to support or refute student ideas about causes. (2-PS1-2)

Energy and Matter
- Objects may break into smaller pieces and be put together into larger pieces, or change shapes. (2-PS1-3)

Connections to Engineering, Technology, and Applications of Science

Influence of Engineering, Technology, and Science on Society and the Natural World
- Every human-made product is designed by applying some knowledge of the natural world and is built using materials derived from the natural world. (2-PS1-2)

Connections to other DCIs in second grade: N/A

Articulation of DCIs across grade-levels: **4.ESS2.A** (2-PS1-3); **5.PS1.A** (2-PS1-1),(2-PS1-2),(2-PS1-3); **5.PS1.B** (2-PS1-4); **5.LS2.A** (2-PS1-3)

Common Core State Standards Connections:

ELA/Literacy –

RI.2.1 Ask and answer such questions as *who, what, where, when, why,* and *how* to demonstrate understanding of key details in a text. *(2-PS1-4)*
RI.2.3 Describe the connection between a series of historical events, scientific ideas or concepts, or steps in technical procedures in a text. (2-PS1-4)
RI.2.8 Describe how reasons support specific points the author makes in a text. *(2-PS1-2),*(2-PS1-4)
W.2.1 Write opinion pieces in which they introduce the topic or book they are writing about, state an opinion, supply reasons that support the opinion, use linking words (e.g., *because, and, also*) to connect opinion and reasons, and provide a concluding statement or section. (2-PS1-4)
W.2.7 Participate in shared research and writing projects (e.g., read a number of books on a single topic to produce a report; record science observations). (2-PS1-1),(2-PS1-2),(2-PS1-3)
W.2.8 Recall information from experiences or gather information from provided sources to answer a question. (2-PS1-1),(2-PS1-2),(2-PS1-3)

Mathematics –

MP.2 Reason abstractly and quantitatively. *(2-PS1-2)*
MP.4 Model with mathematics. *(2-PS1-1),(2-PS1-2)*
MP.5 Use appropriate tools strategically. *(2-PS1-2)*
2.MD.D.10 Draw a picture graph and a bar graph (with single-unit scale) to represent a data set with up to four categories. Solve simple put-together, take-apart, and compare problems using information presented in a bar graph. *(2-PS1-1),(2-PS1-2)*

*The performance expectations marked with an asterisk integrate traditional science content with engineering through a Practice or Disciplinary Core Idea.

2.Earth's Systems: Processes that Shape the Earth

2.Earth's Systems: Processes that Shape the Earth

Students who demonstrate understanding can:

2-ESS2-2. Develop a model to represent the shapes and kinds of land and bodies of water in an area. [Assessment Boundary: Assessment does not include quantitative scaling in models.]

2-ESS2-3. Obtain information to identify where water is found on Earth and that it can be solid or liquid.

The performance expectations above were developed using the following elements from the NRC document *A Framework for K-12 Science Education*:

Science and Engineering Practices

Developing and Using Models
Modeling in K–2 builds on prior experiences and progresses to include using and developing models (i.e., diagram, drawing, physical replica, diorama, dramatization, or storyboard) that represent concrete events or design solutions.
- Develop a model to represent patterns in the natural world. (2-ESS2-2)

Obtaining, Evaluating, and Communicating Information
Obtaining, evaluating, and communicating information in K–2 builds on prior experiences and uses observations and texts to communicate new information.
- Obtain information using various texts, text features (e.g., headings, tables of contents, glossaries, electronic menus, icons), and other media that will be useful in answering a scientific question. (2-ESS2-3)

Disciplinary Core Ideas

ESS2.B: Plate Tectonics and Large-Scale System Interactions
- Maps show where things are located. One can map the shapes and kinds of land and water in any area. (2-ESS2-2)

ESS2.C: The Roles of Water in Earth's Surface Processes
- Water is found in the ocean, rivers, lakes, and ponds. Water exists as solid ice and in liquid form. (2-ESS2-3)

Crosscutting Concepts

Patterns
- Patterns in the natural world can be observed. (2-ESS2-2),(2-ESS2-3)

Connections to Engineering, Technology, and Applications of Science

Influence of Engineering, Technology, and Science on Society and the Natural World
- Developing and using technology has impacts on the natural world. (2-ESS2-1)

Connections to Nature of Science

Science Addresses Questions About the Natural and Material World
- Scientists study the natural and material world. (2-ESS2-1)

Connections to other DCIs in second grade: **2.PS1.A** (2-ESS2-3)

Articulation of DCIs across grade-levels: **K.ETS1.A** (2-ESS2-1); **3.LS2.C** (2-ESS1-1); **4.ESS1.C** (2-ESS1-1); **4.ESS2.A** (2-ESS1-1),(2-ESS2-1); **4.ESS2.B** (2-ESS2-2); **4.ETS1.A** (2-ESS2-1); **4.ETS1.B** (2-ESS2-1); **4.ETS1.C** (2-ESS2-1); **5.ESS2.A** (2-ESS2-1); **5.ESS2.C** (2-ESS2-2),(2-ESS2-3)

Common Core State Standards Connections:

ELA/Literacy –

RI.2.1	Ask and answer such questions as *who, what, where, when, why,* and *how* to demonstrate understanding of key details in a text. *(2-ESS1-1)*
RI.2.3	Describe the connection between a series of historical events, scientific ideas or concepts, or steps in technical procedures in a text. (2-ESS1-1),*(2-ESS2-1)*
RI.2.9	Compare and contrast the most important points presented by two texts on the same topic. (2-ESS2-1)
W.2.6	With guidance and support from adults, use a variety of digital tools to produce and publish writing, including in collaboration with peers. *(2-ESS1-1),(2-ESS2-3)*
W.2.7	Participate in shared research and writing projects (e.g., read a number of books on a single topic to produce a report; record science observations). (2-ESS1-1)
W.2.8	Recall information from experiences or gather information from provided sources to answer a question. (2-ESS1-1),(2-ESS2-3)
SL.2.2	Recount or describe key ideas or details from a text read aloud or information presented orally or through other media. (2-ESS1-1)
SL.2.5	Create audio recordings of stories or poems; add drawings or other visual displays to stories or recounts of experiences when appropriate to clarify ideas, thoughts, and feelings. *(2-ESS2-2)*

Mathematics –

MP.2	Reason abstractly and quantitatively. *(2-ESS2-1),(2-ESS2-1),(2-ESS2-2)*
MP.4	Model with mathematics. *(2-ESS1-1),(2-ESS2-1),(2-ESS2-2)*
MP.5	Use appropriate tools strategically. *(2-ESS2-1)*
2.NBT.A	Understand place value. (2-ESS1-1)
2.NBT.A.3	Read and write numbers to 1000 using base-ten numerals, number names, and expanded form. *(2-ESS2-2)*
2.MD.B.5	Use addition and subtraction within 100 to solve word problems involving lengths that are given in the same units, e.g., by using drawings (such as drawings of rulers) and equations with a symbol for the unknown number to represent the problem. *(2-ESS2-1)*

*The performance expectations marked with an asterisk integrate traditional science content with engineering through a Practice or Disciplinary Core Idea.

2.Earth's Systems: Processes that Shape the Earth

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Students who demonstrate understanding can:

2-ESS1-1. **Use information from several sources to provide evidence that Earth events can occur quickly or slowly.**
[Clarification Statement: Examples of events and timescales could include volcanic explosions and earthquakes, which happen quickly and erosion of rocks, which occurs slowly.] [Assessment Boundary: Assessment does not include quantitative measurements of timescales.]

2-ESS2-1. **Compare multiple solutions designed to slow or prevent wind or water from changing the shape of the land.***
[Clarification Statement: Examples of solutions could include different designs of dikes and windbreaks to hold back wind and water, and different designs for using shrubs, grass, and trees to hold back the land.]

The performance expectations above were developed using the following elements from the NRC document *A Framework for K-12 Science Education*:

Science and Engineering Practices

Constructing Explanations and Designing Solutions
Constructing explanations and designing solutions in K–2 builds on prior experiences and progresses to the use of evidence and ideas in constructing evidence-based accounts of natural phenomena and designing solutions.

- Make observations from several sources to construct an evidence-based account for natural phenomena. (2-ESS1-1)
- Compare multiple solutions to a problem. (2-ESS2-1)

Disciplinary Core Ideas

ESS1.C: The History of Planet Earth
- Some events happen very quickly; others occur very slowly, over a time period much longer than one can observe. (2-ESS1-1)

ESS2.A: Earth Materials and Systems
- Wind and water can change the shape of the land. (2-ESS2-1)

ETS1.C: Optimizing the Design Solution
- Because there is always more than one possible solution to a problem, it is useful to compare and test designs. *(secondary to 2-ESS2-1)*

Crosscutting Concepts

Stability and Change
- Things may change slowly or rapidly. (2-ESS1-1),(2-ESS2-1)

Connections to Engineering, Technology, and Applications of Science

Influence of Engineering, Technology, and Science on Society and the Natural World
- Developing and using technology has impacts on the natural world. (2-ESS2-1)

Connections to Nature of Science

Science Addresses Questions About the Natural and Material World
- Scientists study the natural and material world. (2-ESS2-1)

Connections to other DCIs in second grade: **2.PS1.A** (2-ESS2-3)

Articulation of DCIs across grade-levels: **K.ETS1.A** (2-ESS2-1); **3.LS2.C** (2-ESS1-1); **4.ESS1.C** (2-ESS1-1); **4.ESS2.A** (2-ESS1-1),(2-ESS2-1); **4.ESS2.B** (2-ESS2-2); **4.ETS1.A** (2-ESS2-1); **4.ETS1.B** (2-ESS2-1); **4.ETS1.C** (2-ESS2-1); **5.ESS2.A** (2-ESS2-1); **5.ESS2.C** (2-ESS2-2),(2-ESS2-3)

Common Core State Standards Connections:

ELA/Literacy –

RI.2.1 Ask and answer such questions as *who, what, where, when, why,* and *how* to demonstrate understanding of key details in a text. *(2-ESS1-1)*
RI.2.3 Describe the connection between a series of historical events, scientific ideas or concepts, or steps in technical procedures in a text. (2-ESS1-1),*(2-ESS2-1)*
RI.2.9 Compare and contrast the most important points presented by two texts on the same topic. (2-ESS2-1)
W.2.6 With guidance and support from adults, use a variety of digital tools to produce and publish writing, including in collaboration with peers. *(2-ESS1-1),(2-ESS2-3)*
W.2.7 Participate in shared research and writing projects (e.g., read a number of books on a single topic to produce a report; record science observations). (2-ESS1-1)
W.2.8 Recall information from experiences or gather information from provided sources to answer a question. (2-ESS1-1),(2-ESS2-3)
SL.2.2 Recount or describe key ideas or details from a text read aloud or information presented orally or through other media. (2-ESS1-1)
SL.2.5 Create audio recordings of stories or poems; add drawings or other visual displays to stories or recounts of experiences when appropriate to clarify ideas, thoughts, and feelings. *(2-ESS2-2)*

Mathematics –

MP.2 Reason abstractly and quantitatively. *(2-ESS2-1),(2-ESS2-1),(2-ESS2-2)*
MP.4 Model with mathematics. *(2-ESS1-1),(2-ESS2-1),(2-ESS2-2)*
MP.5 Use appropriate tools strategically. *(2-ESS2-1)*
2.NBT.A Understand place value. (2-ESS1-1)
2.NBT.A.3 Read and write numbers to 1000 using base-ten numerals, number names, and expanded form. *(2-ESS2-2)*
2.MD.B.5 Use addition and subtraction within 100 to solve word problems involving lengths that are given in the same units, e.g., by using drawings (such as drawings of rulers) and equations with a symbol for the unknown number to represent the problem. *(2-ESS2-1)*

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2.Interdependent Relationships in Ecosystems

2.Interdependent Relationships in Ecosystems

Students who demonstrate understanding can:

2-LS2-1. Plan and conduct an investigation to determine if plants need sunlight and water to grow. [Assessment Boundary: Assessmer is limited to testing one variable at a time.]

2-LS2-2. Develop a simple model that mimics the function of an animal in dispersing seeds or pollinating plants.*

2-LS4-1. Make observations of plants and animals to compare the diversity of life in different habitats. [Clarification Statement: Emphasis is on the diversity of living things in each of a variety of different habitats.] [Assessment Boundary: Assessment does not include specific animal and plant names in specific habitats.]

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Science and Engineering Practices

Developing and Using Models

Modeling in K–2 builds on prior experiences and progresses to include using and developing models (i.e., diagram, drawing, physical replica, diorama, dramatization, or storyboard) that represent concrete events or design solutions.

- Develop a simple model based on evidence to represent a proposed object or tool. (2-LS2-2)

Planning and Carrying Out Investigations

Planning and carrying out investigations to answer questions or test solutions to problems in K–2 builds on prior experiences and progresses to simple investigations, based on fair tests, which provide data to support explanations or design solutions.

- Plan and conduct an investigation collaboratively to produce data to serve as the basis for evidence to answer a question. (2-LS2-1)
- Make observations (firsthand or from media) to collect data which can be used to make comparisons. (2-LS4-1)

Connections to Nature of Science

Scientific Knowledge is Based on Empirical Evidence

- Scientists look for patterns and order when making observations about the world. (2-LS4-1)

Disciplinary Core Ideas

LS2.A: Interdependent Relationships in Ecosystems

- Plants depend on water and light to grow. (2-LS2-1)
- Plants depend on animals for pollination or to move their seeds around. (2-LS2-2)

LS4.D: Biodiversity and Humans

- There are many different kinds of living things in any area, and they exist in different places on land and in water. (2-LS4-1)

ETS1.B: Developing Possible Solutions

- Designs can be conveyed through sketches, drawings, or physical models. These representations are useful in communicating ideas for a problem's solutions to other people. *(Secondary to 2-LS2-2)*

Crosscutting Concepts

Cause and Effect

- Events have causes that generate observable patterns. (2-LS2-1)

Structure and Function

- The shape and stability of structures of natural and designed objects are related to their function(s). (2-LS2-2)

Connections to other DCIs in second grade: N/A

Articulation of DCIs across grade-levels: **K.LS1.C** (2-LS2-1); **K-ESS3.A** (2-LS2-1); **K.ETS1.A** (2-LS2-2); **3.LS4.C** (2-LS4-1); **3.LS4.D** (2-LS4-1); **5.LS1.C** (2-LS2-1); **5.LS2.A** (2-LS2-2),(2-LS4-1)

Common Core State Standards Connections:

ELA/Literacy –

W.2.7 Participate in shared research and writing projects (e.g., read a number of books on a single topic to produce a report; record science observations). (2-LS2-1),(2-LS4-1)

W.2.8 Recall information from experiences or gather information from provided sources to answer a question. (2-LS2-1),(2-LS4-1)

SL.2.5 Create audio recordings of stories or poems; add drawings or other visual displays to stories or recounts of experiences when appropriate to clarify ideas, thoughts, and feelings. *(2-LS2-2)*

Mathematics –

MP.2 Reason abstractly and quantitatively. *(2-LS2-1),(2-LS4-1)*

MP.4 Model with mathematics. *(2-LS2-1),(2-LS2-2),(2-LS4-1)*

MP.5 Use appropriate tools strategically. *(2-LS2-1)*

2.MD.D.10 Draw a picture graph and a bar graph (with single-unit scale) to represent a data set with up to four categories. Solve simple put-together, take-apart, and compare problems. *(2-LS2-2),(2-LS4-1)*

*The performance expectations marked with an asterisk integrate traditional science content with engineering through a Practice or Disciplinary Core Idea.

HOWARD COUNTY
PUBLIC SCHOOL SYSTEM

SCIENTIFIC AND ENGINEERING PRACTICES

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

National Research Council, (2012). *A Framework for K-12 Science Education: Practices, Crosscutting Concepts, and Core Ideas.* Committee on a Conceptual Framework for New K-12 Science Education Standards. Board on Science Education, Division of Behavioral and Social Sciences and Education. Washington, D.C: The National Academies Press.

Science Notebooks

INTRODUCTION

A scientist's notebook is a detailed record of his or her engagement with scientific phenomena. It is a personal representation of experiences, observations, and thinking—an integral part of the process of doing scientific work. A scientist's notebook is a continuously updated history of the development of scientific knowledge and reasoning.

NOTEBOOK BENEFITS

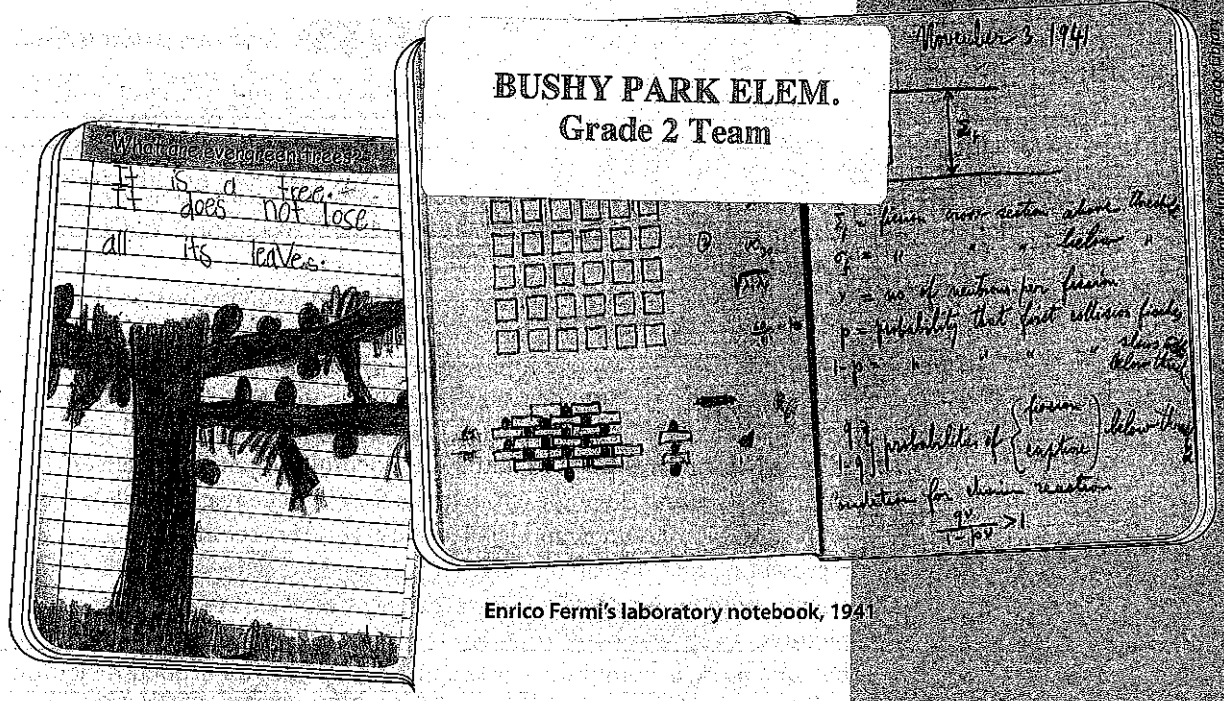
Engaging in active science is one part experience and two parts making sense of the experience. Science notebooks help students with the sense-making part. Science notebooks assist with documentation and cognitive engagement. For teachers, notebooks are tools for gaining insight into students' thinking. Notebooks inform and refine instructional practice.

GETTING STARTED

Starting in kindergarten, students are expected to make detailed, thoughtful records of their science inquiries. While this may seem like a lofty goal, with some patience and thoughtful support, both teachers and students can learn how to use science notebooks effectively.

A major goal for using notebooks is to establish habits that will enable students to collect data and make sense of them. Use of the notebook must be flexible enough to allow students room to grow and supportive enough for students to be successful from the start. The format should be simple and the information meaningful to students. The notebook includes student drawings, simple writing in the form of individual words and short phrases, and a variety of visual and tactile artifacts. When students thumb through their notebooks, they are reminded of the objects and organisms they observed and their interactions with them.

Class notebook. You can create a class notebook to document the investigation as a way to model the various notebook components. The class notebook should be accessible at all times for students to reference. You can use a chart-paper tablet, a paper notebook displayed under a document camera, or a computer.



Enrico Fermi's laboratory notebook, 1941

Student notebook from the Trees and Weather Module

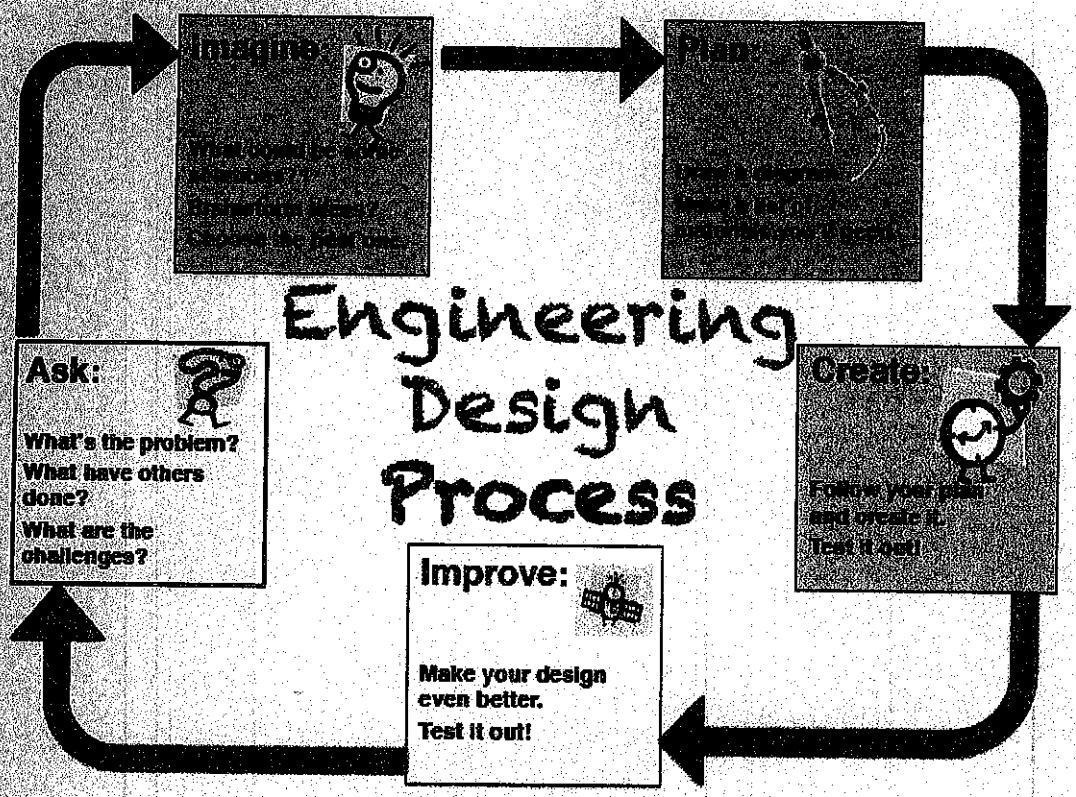
INTRODUCTION

A scientist's notebook is a detailed record of his or her engagement with scientific phenomena. It is a personal representation of experiences, observations, and thinking—an integral part of the process of doing scientific work. A scientist's notebook is a continuously updated history of the development of scientific knowledge and reasoning. FOSS students are young scientists; they incorporate notebooks into their science learning.

This chapter is designed to be a resource for teachers who are incorporating notebooks into their classroom practice. For teachers just beginning to use notebooks, the Getting Started section in this chapter suggests how to set up the notebooks, and the *Investigations Guide* cues you when to engage students with the notebooks during the investigation. For more information on specific types of notebook entries, the subsections in the Notebook Components sections include strategies to differentiate instruction for various ability levels.

Contents

BUSHY PARK ELEM.
Grade 2 Team



Composition

Cheryl Follmer

NORCOM

100 Sheets • 200 Pages
Wide Ruled
9 3/4 x 7 1/2 in.

HCPSS Science

Grade-Level Quarterly Units
2016 - 2017

	Quarter 1	Quarter 2	Quarter 3	Quarter 4
K	Scientists & Engineers *(NGSS)*	Weather *(NGSS)*	Pushes & Pulls *(NGSS)*	Relationships in Ecosystems *(NGSS)*
1	Plant & Animal: Structure & Function *(NGSS)*	Patterns in Space Systems *(NGSS)*	Light *(NGSS)*	Sound *(NGSS)*
2	Properties of Matter *(NGSS)*	Earth's Features *(NGSS)*	Earth's Changing Landscape *(NGSS)*	Relationships in Habitats *(NGSS)*
3	Weather & Climate *(NGSS)*	Forces & Interactions *(NGSS)*	Plant & Animal Survival *(NGSS)*	Life Cycles & Traits *(NGSS)*
4	Energy *(NGSS)*	Waves *(NGSS)*	Earth's Systems: Shaping the Earth *(NGSS)*	Structure, Function, & Information *(NGSS)*
5	Patterns in Space *(NGSS)*	Earth's Systems *(NGSS)*	Structure & Properties of Matter *(NGSS)*	Matter & Energy in Ecosystems *(NGSS)*

Practices in English Language Arts, Mathematics, Science, and Social Studies

English Language Arts			
E1. Demonstrate independence.	**M1. Make sense of problems and persevere in solving them.**	**S1. Ask questions (for science) and define problems (for engineering).**	**SS1. Develop questions and plan inquiry**
E2. Build strong content knowledge.	**M2. Reason abstractly and quantitatively.**	**S2. Develop and use models.**	**SS2. Apply disciplinary tools and concepts in civics, economics, geography, and history.**
E3. Respond to the varying demands of audience, task, purpose, and discipline.	**M3. Construct viable arguments and critique the reasoning of others.**	**S3. Plan and carry out investigations.**	**SS3. Gather and evaluate evidence.**
E4. Comprehend as well as critique.	**M4. Model with mathematics.**	**S4. Analyze and interpret data.**	**SS4. Develop claims and use evidence.**
E5. Value evidence.	**M5. Use appropriate tools strategically.**	**S5. Use mathematics, information and computer technology, and computational thinking.**	**SS5. Communicate and critique solutions.**
E6. Use technology and digital media strategically and capably.	**M6. Attend to precision.**	**S6. Construct explanations (for science) and design solutions (for engineering).**	**SS6. Take informed action.**
E7. Come to understanding other perspectives and cultures.	**M7. Look for and make use of structure.**	**S7. Engage in argument from evidence.**	
	M8. Look for and express regularity in repeated reasoning.	**S8. Obtain, evaluate, and communicate information.**	

*The Common Core English Language Arts uses the term "student capacities" rather than the term "practices" used in Common Core Mathematics, the Next Generation Science Standards, and the College, Career, and Civic Life Curriculum Framework.

CLOSING THOUGHTS

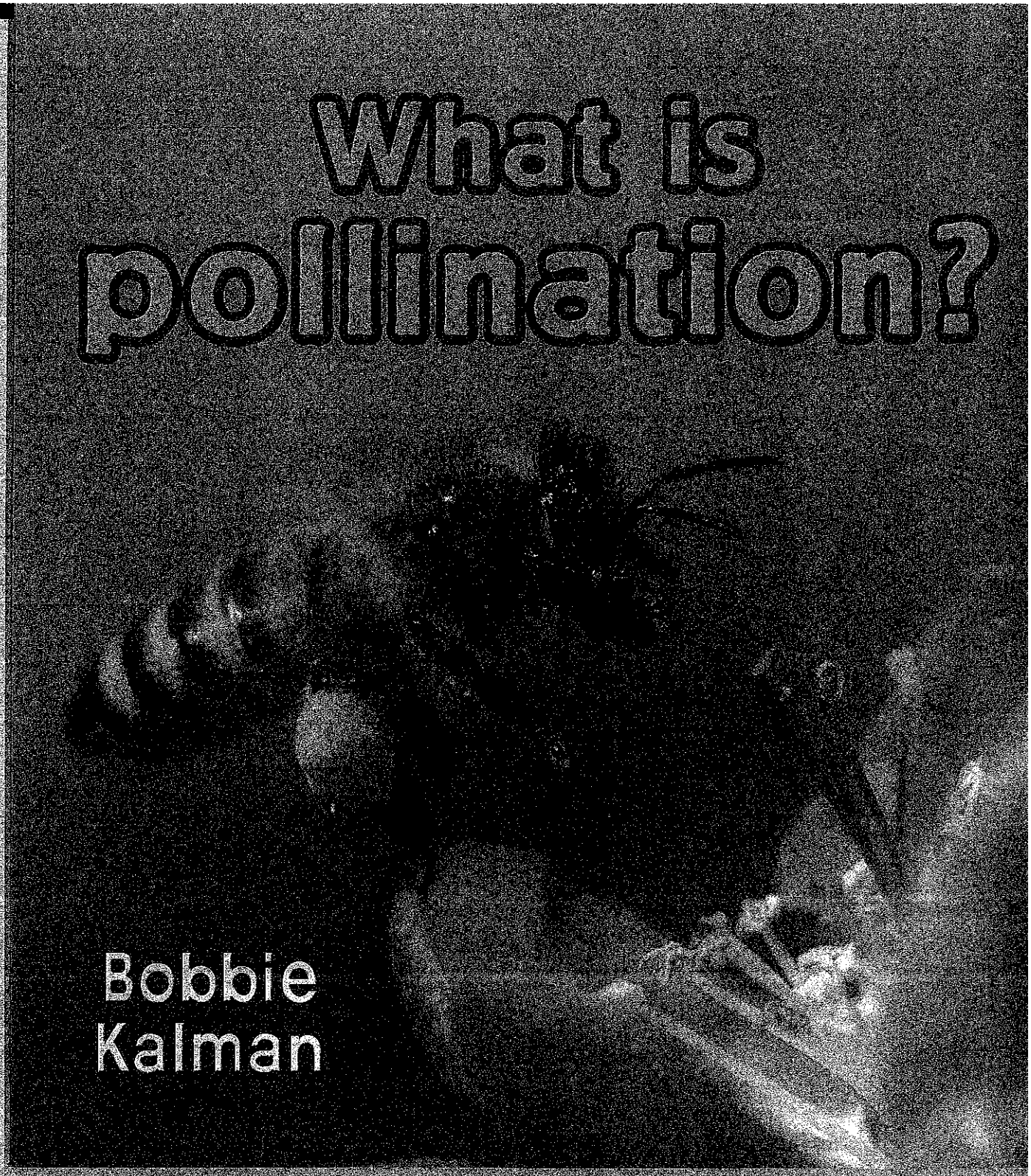
Engaging primary students in active science with notebooks provides a rich experience. Doing this successfully requires thoughtful interactions among students, materials, and natural phenomena. Initially, adding notebooks to your science teaching will require you to focus students' attention on how to set up the notebook, what types of entries students should make, and when students should be using their notebooks. You will establish conventions about where to record the date and title, where to keep notebooks, how to glue notebook sheets into notebooks, and when to record observations and thinking.

Once you are past these perfunctory issues, you can shift your focus to the amount of scaffolding to provide to students or to encouraging students to create their own notebook entries. During this time, you and your students are developing skills to improve the quality of notebook entries. These skills may include asking better questions to focus students' attention on a specific part of an organism or using color to enhance a drawing. Students begin to make entries with less prompting. They give more thought to supporting their responses to the focus question. When asked to make a derivative product, students thumb through their notebooks to find the needed information. The notebook becomes a tool for students to help recall their learning.

As students begin to document their thinking about focus questions and other queries, you may begin to wonder, "Should I be doing something with their notebooks?" This is when your focus shifts from the notebook as just something students use during science learning to the notebook as an assessment tool. Once everyone is comfortable recording the focus question and collecting data, you can take the next step of collecting notebooks and reading students' responses as a measure of not just how individual students are learning, but what the pervasive needs of students are. You choose next-step strategies that address students' needs before proceeding to the next investigation. The notebooks act as an assessment tool that lets you modify your science instruction.

This process will take time, discussions with colleagues, revisiting different sections of this chapter, and critical scrutiny of students' work before both you and your students are using notebooks to their full potential.

What is pollination?



Bobbie Kalman

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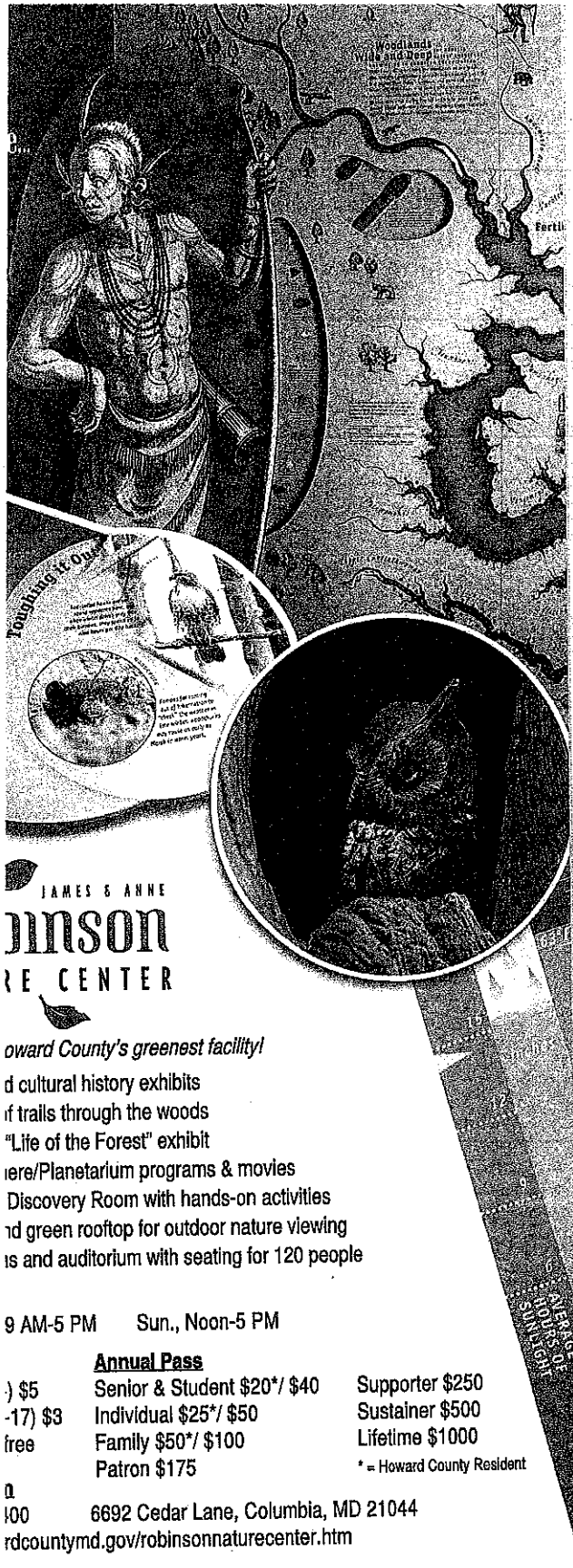

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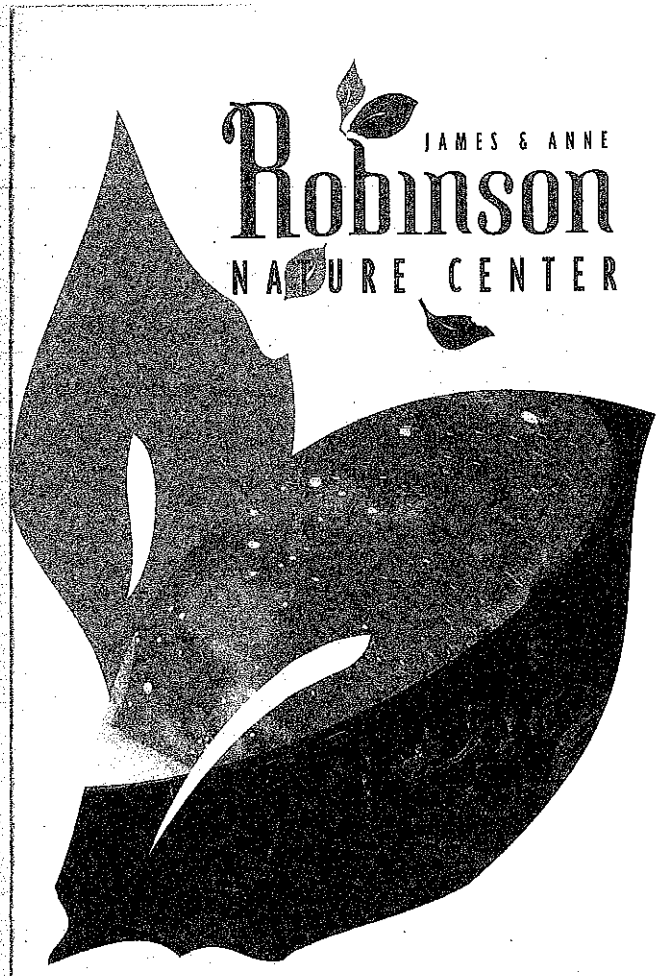

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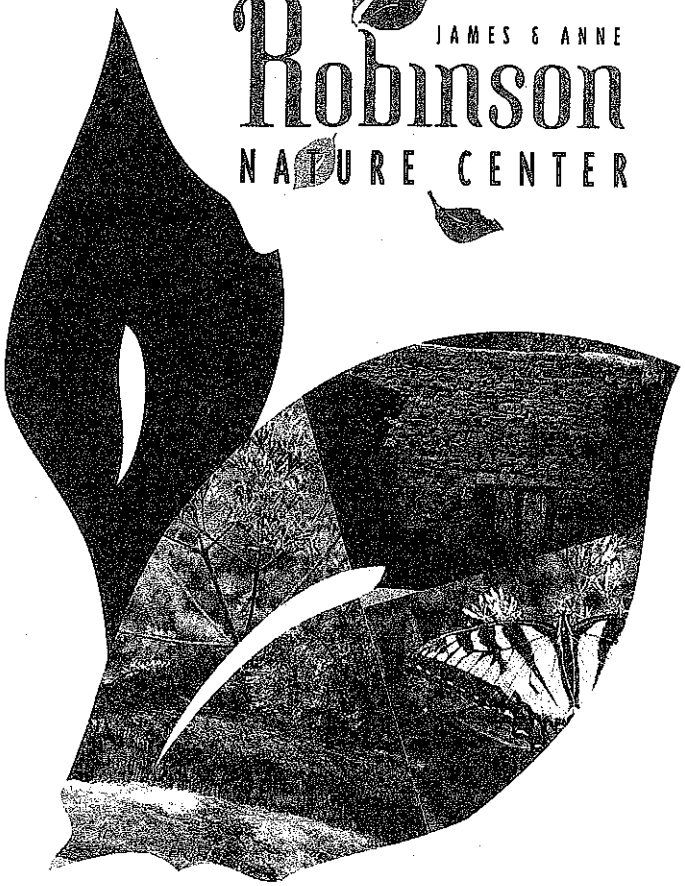

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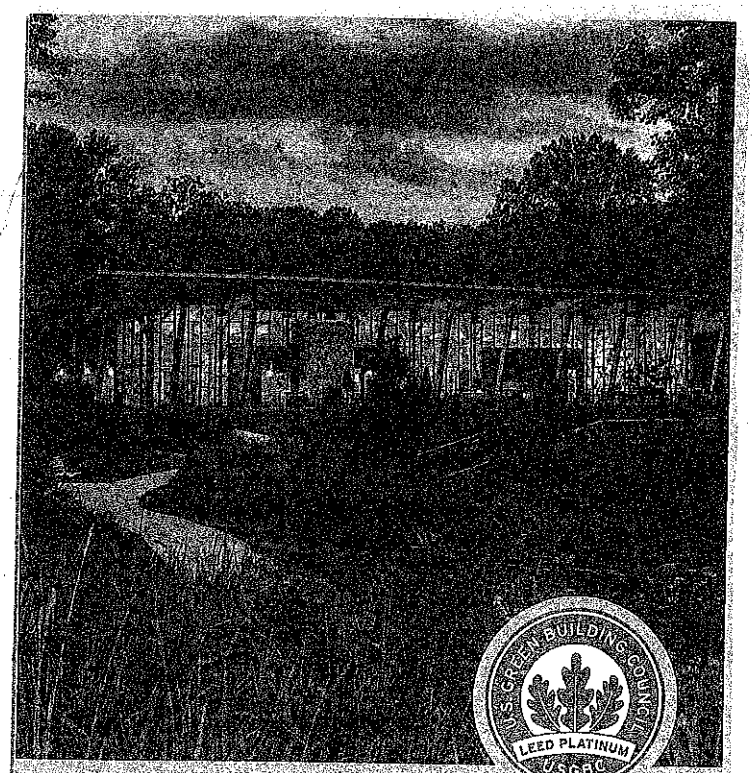

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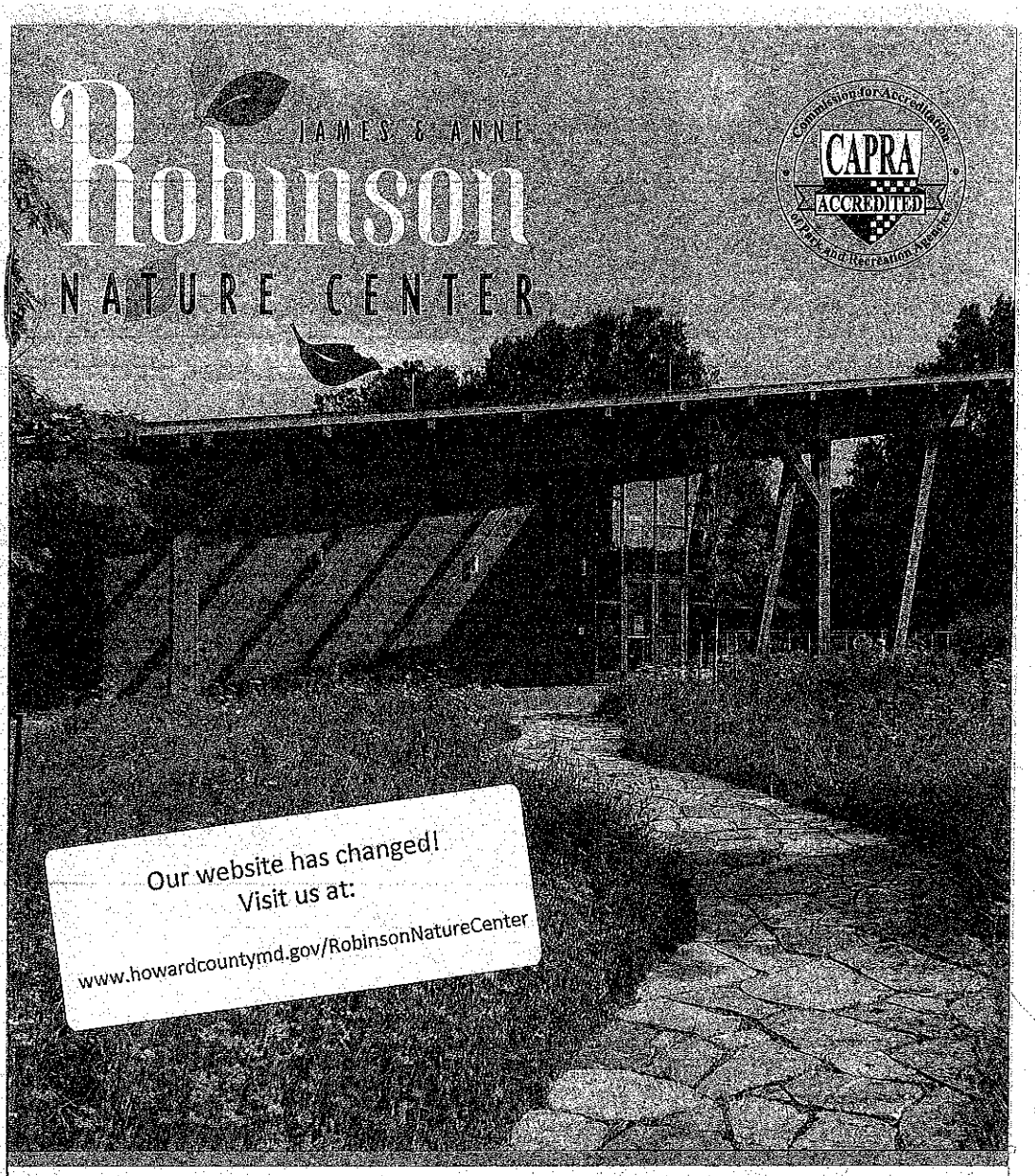

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