



Sarah C Campbell

Photographer

Author

&

Julie Owen

## Fibonacci Folding Book Project

Book List

Whole Schools Summer Institute, July 15-19, 2012

### Nonfiction books illustrated with photographs

books by Sarah C. Campbell with photographs by Sarah C. Campbell and Richard P. Campbell:

- *Growing Patterns: Fibonacci Numbers in Nature*
- *Wolfsnail: A Backyard Predator*

any of several books written and illustrated by Nic Bishop:

- *Lizards*
- *Butterflies and Moths*
- *Frogs*
- *Spiders*

### Biographical Tale

- *Blockhead: The Life of Fibonacci* by Joseph D'Agnesse and illustrated by John O'Brien

### Poetry

any of several written by Joyce Sidman:

- *Swirl by Swirl: Spirals in Nature*
- *Dark Emperor and Other Poems of the Night*
- *Ubiquitous: Celebrating Nature's Survivors*
- *Red Sings from the Treetops: A Year in Colors*
- *Butterfly Eyes and Other Secrets of the Meadow*
- *Song of the Water Boatman: Pond Poems*

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# Fibonacci Folding Book Project

Common Core State Standards

Whole Schools Summer Institute, July 15-19, 2012

The Fibonacci Folding Book Project can be implemented from Grade 3 through Grade 8. This document highlights the applicable Common Core State Standards in English Language Arts and Mathematics for Grade 3.

## Common Core State Standards for English Language Arts

### Reading Standards for Informational Text

RI-1. Ask and answer questions to demonstrate understanding of a text, referring explicitly to the text as the basis for the answers.

RI-7. Use information gained from illustrations (e.g. maps, photographs) and the words in a text to demonstrate understanding of the text (e.g., where, when, why, and how key events occur).

### Writing Standards

W-4. With guidance and support from adults, produce writing in which the development and organization are appropriate to task and purpose.

W-5. With guidance and support from peers and adults, develop and strengthen writing as needed by planning, revising, and editing.

W-6. With guidance and support from adults, use technology to produce and publish writing (using keyboarding skills) as well as to interact and collaborate with others.

W-10. Write routinely over extended time frames (time for research, reflection, and revision) and shorter time frames (a single sitting or day or two) for a range of discipline-specific tasks, purposes, and audiences.

### Speaking and Listening Standards

SL-4. Report on a topic or text, tell a story, or recount an experience with appropriate facts and relevant descriptive details, speaking clearly at an understandable pace.

SL-5. Create engaging audio recordings of stories or poems that demonstrate fluid reading at an understandable pace; add visual displays when appropriate to emphasize or enhance certain facts or details.

### Language Standards

L-1. Demonstrate command of the conventions of standard English grammar and usage when writing or speaking.

L-2. Demonstrate command of the conventions of standard English capitalization, punctuation, and spelling when writing.

L-3. Use knowledge of language and its conventions when writing, speaking, reading or listening.

## Common Core State Standards for Mathematics

### Standards for Mathematical Practice

4. Model with mathematics.

5. Use appropriate tools strategically.

### Content

3.OA Solve problems involving the four operations, and identify and explain patterns in arithmetic.

3.G Reason with shapes and their attributes.

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## Fibonacci Folding Book Project

National Subject Areas Standards

Whole Schools Summer Institute, July 15-19, 2012

In addition to meeting curriculum standards in mathematics and language arts, the Fibonacci Folding Book Project meets objectives in science, visual arts, and technology. This document highlights applicable standards from the relevant national associations.

### Science

NSTA

National Science Teachers Association

National Science Content Standards

[http://www.nap.edu/openbook.php?record\\_id=4962](http://www.nap.edu/openbook.php?record_id=4962)

I Unifying concepts and processes in science.

Change, constancy, and measurement.

II Science as Inquiry.

Skills necessary to become independent inquirers about the natural world.

IV Life Science

Levels K-4

Characteristics of organisms.

Organisms and environments.

Levels 5-8

Populations and ecosystems.

Diversity and adaptations of organisms.

### Visual Arts

ArtsEdge

National Standards for Art Education developed by Consortium of National Arts Education Associations

<http://artsedge.kennedy-center.org/teach/standards.cfm>

Content Standard 1

Understanding and applying media, techniques, and processes

Achievement Standard (K-4)

Students use different media, techniques, and processes to communicate ideas, experiences, and stories

Achievement Standard (5-8)

Students select media, techniques, and processes; analyze what makes them effective or not effective in communicating ideas; and reflect upon the effectiveness of their choices

Students intentionally take advantage of the qualities and characteristics of art media, techniques, and processes to enhance communication of their experiences and ideas

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## Content Standard 2

Using knowledge of structures and functions

Achievement Standard (K-4)

Students know the differences among visual characteristics and purposes of art in order to convey ideas

Students describe how different expressive features and organizational principles cause different responses

Students use visual structures and functions of art to communicate ideas

Achievement Standard (5-8)

Students generalize about the effects of visual structures and functions and reflect upon these effects in their own work

Students employ organizational structures and analyze what makes them effective or not effective in the communication of ideas

Students select and use the qualities of structures and functions of art to improve communication of their ideas

## Content Standard 3

Choosing and evaluating a range of subject matter, symbols, and ideas

Achievement Standard (K-4)

Students explore and understand prospective content for works of art

Students select and use subject matter, symbols, and ideas to communicate meaning

Achievement Standard (5-8)

Students integrate visual, spatial, and temporal concepts with content to communicate intended meaning in their artworks

Students use subjects, themes, and symbols that demonstrate knowledge of contexts, values, and aesthetics that communicate intended meaning in artworks

## Content Standard 6

Making connections between visual arts and other disciplines

Achievement Standard (K-4)

Students understand and use similarities and differences between characteristics of the visual arts and other arts disciplines

Students identify connections between the visual arts and other disciplines in the curriculum

Achievement Standard (5-8)

Students describe ways in which the principles and subject matter of other disciplines taught in the school are inter-related with the visual arts

## Technology

International Society for Technology in Education (ISTE)

National Educational Technology Standards

[https://www.iste.org/Content/NavigationMenu/NETS/ForStudents/2007Standards/NETS\\_for\\_Students\\_2007\\_Standards.pdf](https://www.iste.org/Content/NavigationMenu/NETS/ForStudents/2007Standards/NETS_for_Students_2007_Standards.pdf)

### 1. Creativity and Innovation

Students demonstrate creative thinking, construct knowledge, and develop innovative products and processes using technology.

Students:

b. create original works as a means of personal or group expression.

### 6. Technology Operations and Concepts

Students demonstrate a sound understanding of technology concepts, systems, and operations.

Students:

a. understand and use technology systems. b. select and use applications effectively and productively.

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## Fibonacci Folding Book Project

Mississippi Subject Area Standards

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In addition to meeting curriculum standards in mathematics and language arts, the Fibonacci Folding Book Project meets objectives in science and visual arts. This document highlights applicable Mississippi standards, using third grade as an example.

### Mississippi Science Framework

- 1. b. Describe familiar objects and events using the senses to collect qualitative (e.g., color, size, shape) information.
- 3. c. Investigate the relationships between the basic needs of different organisms and discern how adaptations enable an organism to survive in a particular environment.

### Visual Arts Framework

- 1.b. Use art materials and tools in a safe and responsible manner.
- 1.c. Develop increased manipulative skills while cutting, gluing, folding, drawing and painting.
- 1.d. Increase understanding and use of unique properties and potential of media, materials, and technologies while producing works of art.
- 1.e. Understand the importance of cleaning tools and work area.
- 1.f. Know the importance of recycling, conserving, and sharing art materials.
- 2.g. Know how to use combinations of figures/objects to express ideas, experiences, stories, or feelings.
- 2.h. Understand how to incorporate textures and patterns into artwork.
- 11.b. Know examples of various careers that require art training.
- 12.b. Know that math, language arts, social studies, and science share concepts with the visual arts (e.g., patterns in visual arts and math).

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# Fibonacci Folding Book Project

## Make a Frame

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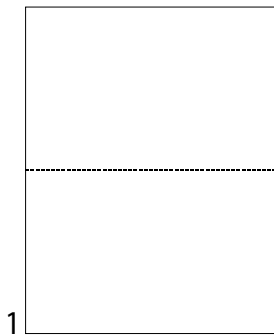
Presented with Julie Owen

### Materials and Instructions:

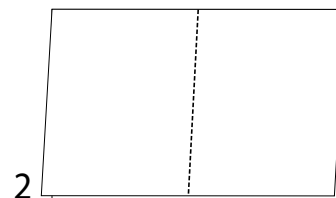
Paper (one 8.5 x 11 inch sheet for each child), slightly heavier than regular copy paper

Scissors Rulers Pencils

1. Fold paper in half. (figure 1)



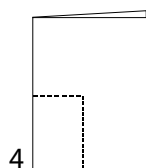
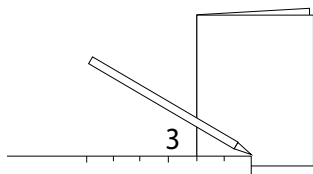
2. Fold in half again. (figure 2)



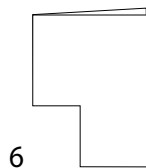
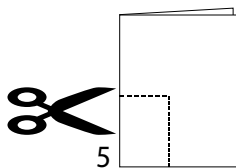
3. Find the corner with no unfolded edge.

4. Draw a line two inches from the folded edge on one side. (figure 3)

5. Draw a line three inches from the folded edge on the other side. (figure 4)



6. Cut along the lines. Stop cutting where the lines cross each other. (figures 5 and 6)



7. Open the folds to reveal an opening in the paper. (figure 7)

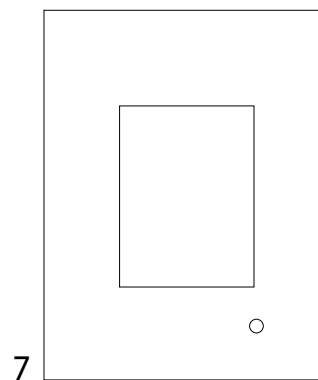
8. Draw a small circle under the opening. This will be the "shutter."

9. Measure the opening.

10. What shape is it?

11. Hold the frame up in front of your eyes.

12. Move your eyes around the room. Can you find some interesting pictures?



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## Fibonacci Folding Book Project

Digital Cameras

Whole Schools Summer Institute, July 15-19, 2012

Any brand of digital camera will work for this project. You will be printing photographs at 4" x 6" size. For a good quality print, you want a camera that is capable of taking images of at least five megapixels. Set the camera for fine or high quality images.

Many students are familiar with digital cameras and will be ready to take photographs. I recommend taking students out in groups of four to six. If you have six cameras, great! Otherwise, you can have the students share cameras. (If sharing, have all your students take their practice frames outside so they can practice framing shots when it isn't their turn with a camera. See Make a Frame handout.)

In order to keep track of which student took which pictures, follow this procedure. As you distribute the cameras, take a photograph of the student to whom you are handing the camera. A student's photographs should follow his/her image. When you are ready for a student to hand the camera off to the next person, snap a shot of the new photographer. This will help immensely in the selection process.

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# Fibonacci Folding Book Project

## How to Select Photos

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Photo selection works best with small groups of students (no more than 5 or 6 at a time). Allow approximately 30 minutes for each group.

### Supplies

index cards

pencils

computers (1 for each student)

jump drives holding student images (1 for each computer)

### Preparation

Save student images on a jump drive in a file structure that works like this:

teacher name

    group number

        student name

### Procedure

Students will work in windows explorer. They will need to know computer basics, such as using a mouse to select (both one-click and double-click), and navigating file structures to find and open files.

Before the students sit down, you should select the drive that corresponds to the relevant jump drive.

Instruct the students to double-click on the file with their teacher's name.

Then, to double-click on the file with their group number.

Then, to double-click on the file with their name.

At that point, they should see a list of the file names for the photographs they took.

You can instruct them how to display the files as thumbnails.

Ask the students to open the first image. This is typically an image of the student. (When I take students out in the field to take photographs, I take a photograph of the student right before I hand the student a camera. This makes it easier to identify the photographer of the images.)

Say: "Is it a picture of you?" Yes. "That's how we know we have the right images."

Ask the students to look in the upper left hand corner of the screen to find the file name of the image. Ask each one to read it aloud, and check over his/her shoulder. Tell them that this file name (or, more precisely, the last four digits of the file name) is the label to use to refer to any image they select.

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At that point, ask the students to look through all the images, one by one, and then select the three images they think best fit the assignment. Solicit from them characteristics of good images from two points of view: scientific and artistic. Some answers are: clear, shows several parts of plant or animal for identification purposes, interesting shapes, lines or colors.

Each student writes the three file names on an index card. Then, ask them to underline the file name of the image they think is best.

At that point, ask them to face away from the computers with their index cards in hand. Tell them that you will act as Art Director. Begin the “creative meeting” to choose the images that will go in the field guide (or other book). Ask each one to describe his/her image. If two students present photographs of the same plant or animal, ask both students to bring their images to the screen and ask all the students to take a look and express preferences, with reasons. Take a vote. (I feel comfortable expressing my preferences and giving my reasons because it models for the students how a photographer makes judgments about which images he/she will use. I ask that they articulate a reason, too, when they express a preference.)

### **Questions to Ask in Selecting Photographs**

What story do we want to tell?

Does this photograph help us tell the story?

Is this photograph interesting?

Does it include shapes?

Lines?

Colors?

Designs?

Emotions?

Is this photograph in focus?

Is this photograph too light?

Is this photograph too dark?



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## Fibonacci Folding Book Project

### How to Make a Fibonacci Accordion Book

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There are many ways to make accordion books. The folded pages in a Fibonacci accordion book are created using the first few numbers in the Fibonacci sequence: 1, 1, 2, 3, 5, and 8.

You Will Need:

a piece of paper 22 inches long by 5 inches tall.

a ruler

a pencil

a scissors



#### Step 1:



With paper lying horizontally, measure from the left edge of the paper and mark a dot at the top and bottom of the paper at 1 inch from the left edge.

#### Step 2:



Connect these dots with a straight line by aligning your ruler perpendicular to the paper.

#### Step 3:



Fold the paper on the folding line you just drew.

You have just made the first page in your Fibonacci accordion book!

#### Step 4:

You will repeat steps 1-3 for each page in the book. The only thing that will be different is the measurement. With the rest of the pages, be sure to measure, mark, and draw your folding line from the inside of the first folding line as in the photo to the right.



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page 2: measure, mark, fold 1 inch again  
page 3: measure, mark, fold 2 inches  
page 4: measure, mark, fold 3 inches  
page 5: measure, mark, fold 5 inches  
page 6: measure, mark 8 inches

**Step 5:** Cut along this line.

Congratulations! You have just measured and folded 6 pages based upon the Fibonacci sequence to make a Fibonacci accordion book.

If you are using your Fibonacci accordion book as a place to showcase a Fibonacci poem based upon a photograph, you will need the following items:

a photograph  
a Fibonacci poem with 6 lines  
an adhesive such as double-sided tape or glue dots  
a pencil  
supplies such as colored pencils or crayons to decorate or illustrate your book

**Step 1:**

Glue or tape the photo on the 8 inch page of the book.

**Step 2:**

Write each line of your Fibonacci poem on the appropriate page in the book. The first line with 1 syllable is written on the first page in the book. The last line of 8 syllables is written on the same page as the photo. So that all lines of the poem are visible from one direction, stretch out the folds to the left and write the words of your poem all on the same side of the paper.

**Step 3:**

Decorate and illustrate both sides of the pages if desired.

**Step 4:**

Display your Fibonacci poem book!



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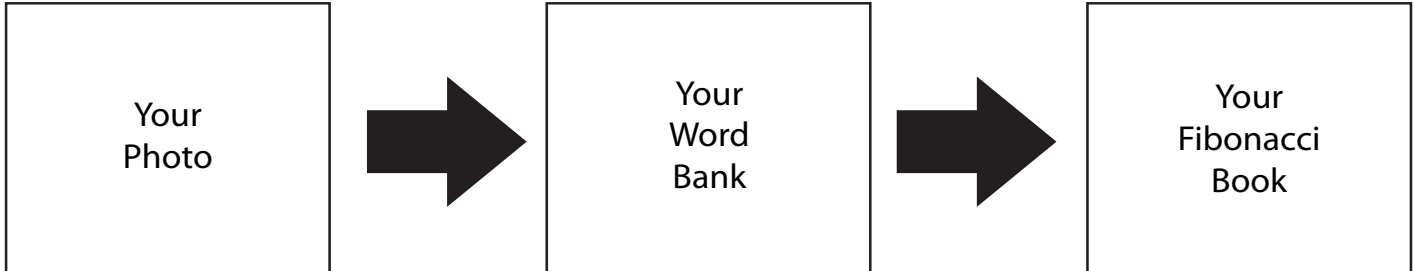


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# Fibonacci Folding Book Project

## Brainstorming Worksheet

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In this space, brainstorm words and phrases about your photo to create a “word bank” from which to write your Fibonacci poem. To start brainstorming, answer questions such as:

What colors, shapes, lines, and textures do you see in your photo?

What does your photograph make you think or feel?

What do you remember about taking your photograph? What was it like outside that day? What did you hear, smell, taste, see, and feel?

Does your photograph remind you of anything?

What do you know about the subject of your photo?

Are there any other words or phrases that come to mind?

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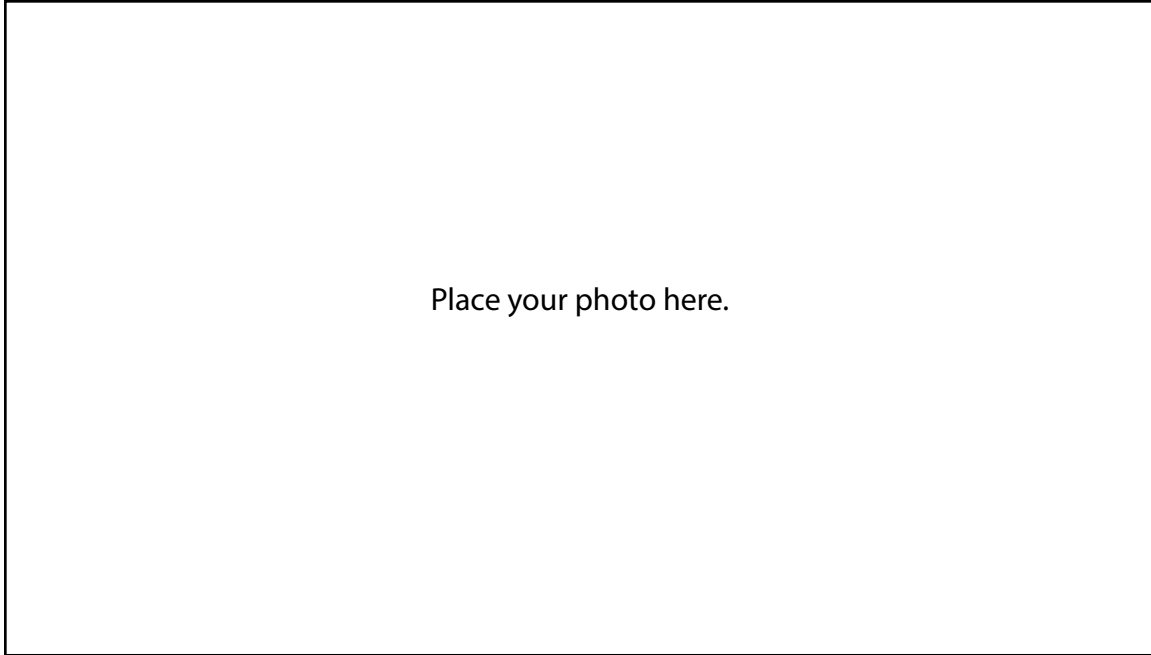
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# Fibonacci Folding Book Project

## Fibonacci Poem Template

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Place your photo here.

Line 1: \_\_\_\_\_

1 syllable

Line 2: \_\_\_\_\_

1 syllable

Line 3: \_\_\_\_\_

2 syllables

Line 4: \_\_\_\_\_

3 syllables

Line 5: \_\_\_\_\_

5 syllables

Line 6: \_\_\_\_\_

8 syllables

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A **Fibonacci** Poem is similar to a Haiku; the poem's structure is based on the number of syllables per line.

There are six lines in a Fib. The number of syllables per line is: 1, 1, 2, 3, 5, and 8.

Here's an example poem:

Rows (1 syllable)

Of (1 syllable)

Silent (2 syllables)

Silhouettes (3 syllables)

Awaiting the sun - (5 syllables)

A golden knife, slicing the gloom (8 syllables)

FibaWHAT?!

OK. Fair enough question. Here's a little background:

Leonardo Fibonacci was an Italian mathematician born in 1175. Among his many accomplishments, he is best known for introducing the "Fibonacci Sequence". The sequence is as follows:

0, 1, 1, 2, 3, 5, 8, 13, 21, 34, 55, 89, 144, 233, 377, 610, 987,...

In other words, you add the first two numbers to get the next number.

What's remarkable about this sequence is that it is also found in nature. For instance, flowers often have 34, 55 or even 89 petals (but NOT 35, 56, or 90). It's also found in nautilus shells, seed heads, pine cones, leaf arrangements and vegetables (number of spirals).

But how does this relate to poetry? Well, here is a Fibonacci poem composed by Gregory Pincus, a California writer who popularized this type of poetry a few years ago:

*One  
Small,  
Precise,  
Poetic,  
Spiraling mixture:  
Math plus poetry yields the Fib.*

See how it works?

**Example by Julie Owen**

Recital

arms  
legs  
graceful  
elegant  
pointed toes reaching  
ballerinas dancing music

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**Examples by Sarah C. Campbell**

Pink  
Shoes  
Blue skirts  
Fluffy net  
Girls ready to dance  
Fluttering like their butterflies

Share

Three  
Boys  
Reading  
Writing, too  
Just like Mom and Dad  
What's different is the whole world.

Peas,  
Beans,  
Eggplant,  
Tomatoes,  
Cucumbers, okra  
Drenched, battered, reaching for the sun.



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## Fibonacci Folding Book Project

### Fibonacci Fruit Skewers

Whole Schools Summer Institute, July 15-19, 2012

wooden skewers

cut fruit of at least four different kinds

- strawberries, cantaloupe, grapes, pineapples
- bananas, apples, orange segments

plates

napkins

Create an instruction sheet that says:

#### **Fibonacci Fruit Skewers**

**1, 1, 2, 3**

1 of one kind of fruit

1 of another kind of fruit

2 of another kind of fruit

3 of another kind of fruit



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