Key concept

Fibonacci Series in Nature

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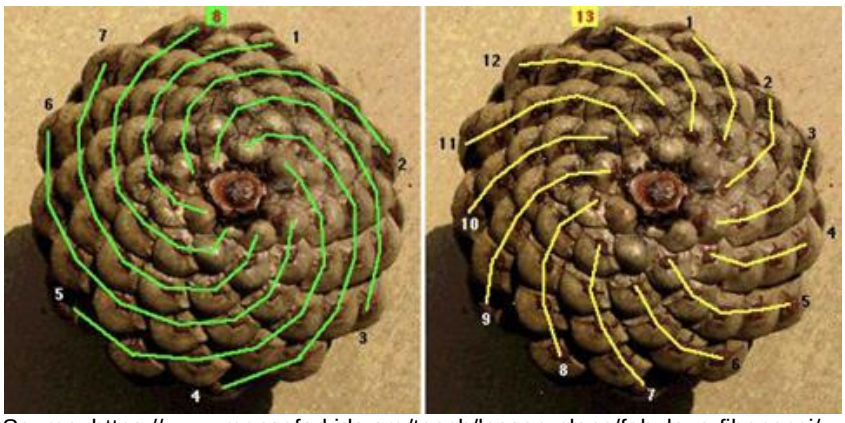
CONCEPT: **Fibonacci Series in Nature**

1- BRIEF DESCRIPTION OF THE CONCEPT

The **Fibonacci numbers** are a **series** of **numbers** in mathematics named after Leonardo of Pisa, known as Fibonacci. The sequence starts with 0 and 1, and each number after is found by adding the two previous numbers (0, 1, 1, 2, 3, 5, 8, 13, 21, 34, 55...) The Fibonacci series/sequence often expresses the mathematical make-up of **plants**. When learning Permaculture design, the Fibonacci series is essential, not only in understanding the structure and role of the plant but also in obtaining some clues on the possibility to mimic the pattern and the impact this pattern will have in the design of a system. With this concept, the students will appreciate mathematics in a funnier way. The students are challenged to carefully observe the Fibonacci sequence in the plants- leaves, flowers, in the branching of trees, or in the many elements that they can find in nature. Their film will trace and explain this each time they identify the Fibonacci series.



Source: https://www.mensaforkids.org/teach/lesson-plans/fabulous-fibonacci/

2- Activities of the LivingStem project that may be related to this concept

The filming can best be combined with "**Permaculture and the Fibonacci Series in Nature" and/or "The Golden ratio, the Bees & Permaculture Design**" in the Gamified System of LivingSTEM.

Possible ideas in the content production may touch on the following:

1) Filming of different flowers (or leaves or trees) that clearly depicts the Fibonacci series while learning the Fibonacci during the above-mentioned games.

2) The golden ratio visible in nature usually demonstrates the Fibonacci number: in shells, the seeds of sunflowers and pinecones that are twisting in opposing spirals of the Fibonacci numbers, or even on the sides of an unpeeled banana—and the number of ridges on a peeled banana will usually be a larger Fibonacci number.

3) This concept can also be linked with the **Ideal Menu Game** when the students learn to appreciate healthy food from their fruits and vegetables. During the preparation of their Healthy Plate, which is part of the activities in **Ideal Menu Game**, they can create and film their own interpretation of the Fibonacci series.

4) In the **LivingSTEM manual**, the importance of patterns in permaculture are explained. The teacher can use this lesson to integrate mathematics and nature thereby encouraging the students to creatively film their new knowledge of math and science through the trees, the bees and the flowers in nature.

3- Methodology proposal for the implementation of the activity described above

Instructions to the students:

1. During the Fibonacci and Golden ratio game/s, your teacher will share Fibonacci concept with you. You may explore the topic further through kid-friendly resources that you can search in the internet and discover other young children your age, from all over the world, who are explaining or sharing their views on Fibonacci.

2. Decide which of the unlimited examples in nature your team wishes to work on for your video project.

3. Write the story idea of your film, the script, the storyboard (how your video will unfold shot by shot) and then create the production schedule. Make sure that your film will not only present a panorama of examples but also some basic explanation of what you film- based on your observations or research.

4. Simply follow the general guidelines in making a video that your teacher has provided.

4- Children involvement in the activity:

This film-making activity fosters a very rich exchange between students whether they are the right or left-brain types. The mathematically inclined students will immediately capture the concept from the math perspective while the artistically inclined students will be fascinated by the aesthetics in the natural world. It will be an easy-fun game with math subtly injected- a learning method that would change the children's perception of mathematics. The decision-making will be shared among the students, the research can be

divided and the filming can be carried out as a group. This concept played & learned in the LivingSTEM Gamification System will be reinforced in this video-making. The students will appreciate that permaculture is not just growing a garden but also learning math and appreciating the works of the best architect in the world: nature.

5- Links between this concept and science (STEAM) and permaculture:

Related STEAM subjects:

- Mathematics (basic comprehension & appreciation of the Fibonacci sequence and the golden ratio)
- Biology (linking plant life with their mathematical construct),
- Arts (deriving inspiration from the natural world & integrating that with math and science; writing skills)
- Technology (film-production, can be extensive depending on the subject chosen)
- Engineering (planning and realizing output)

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Developed Skills:

- Mathematical perspective through integrative skills
- Scientific skills through observation and research.
- Skills in planning, organization, script writing, interpersonal communication, team building
- Technological skills in media literacy
- An integrated STEAM understanding of Mathematics and their role in Permaculture and life.