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The Colour Spinning Disk

Pedagogical guidelines and construction instructions

This guide includes:

- How a Colour Spinning Disk can be used to learn STEM subjects
- How to construct a Colour Spinning Disk

How a Colour Spinning Disk can be used to learn STEM subjects

What is Colour Spinning Disk

The Colour Spinning Disk is based on a physics experiment, usually called the Newton disk. This is a rotating disk whose surface is divided into different colours, that appear to be white or grey when it is spun quickly. The colours are the primary colours blue, red, and yellow and its variants, green, orange, violet. It can be implemented using only two primary colours, e.g. red and yellow, or red and blue, or blue and yellow.

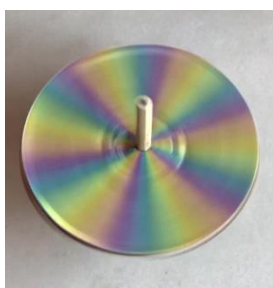


Figure 1. Spinning disk all colours



Figure 2. Spinning disk red and yellow

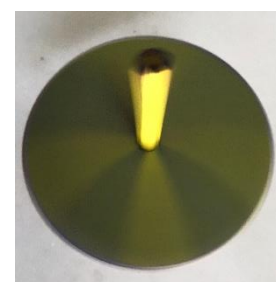


Figure 3. Spinning disk blue and yellow

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Here are some ideas on how to introduce STEM concepts when constructing the Colour Spinning Disk. The teacher can adapt these suggestions to their own class and context, and plan their own activity (see Plan template).

Target group

The Colour Spinning Disk described here is designed for children from 4 to 7 years old. Teachers can adapt the ideas to other ages.

A teacher can decide depending on their knowledge of the children whether the children should work in groups or individually.

Learning goals

When constructing the Spinning Disk several learning goals can be achieved:

- To learn about Physics, namely:
 - Properties of light and colour.
 - History of science
 - Mechanisms - rotation mechanisms
 - Forms of energy -mechanical and wind.
 - Perception mechanisms (persistence of vision).
- To learn Mathematical concepts - including shapes, circles and triangles, numbers, and equal parts
- To develop engineering competences
- To develop competences of analysis and construction.

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Pedagogical guide to introduce STEM concepts when constructing the Colour Spinning Disk

The suggestions to explore STEM contents while constructing the Colour Spinning Disk are based on the pedagogical approach and general steps in the Step by Step guide.

Observing, formulating questions

You can start by showing a prototype of the Spinning Colour Disk (made before the lesson). Firstly, without motion and then rotating and ask the children: What happens?

Children watch the Colour Spinning Disk and make comments and ask questions about how it works.

Exploring and learning physics

Taking in to account the children's ideas the teacher can explain in a simple way the characteristics of colour mixing and the history of science. The Colour Spinning Disk is related with Newton's discovery of primary colours and the principles of light, although it is not certain that he used the spinning disk to illustrate those principles, as it is not recorded.

Starting to construct, continuing observing, learning maths and physics

The construction and use of the Colour Spinning Disk allows the teaching of a number of mathematical concepts within the construction process. The shape of the disk and its parts, the different colours and the colour sequence.

The teacher can ask the children What is the shape of the disk? The disk is a *circle* and is divided in 6 equal parts (other divisions may be considered).

The teacher can guide the children how to draw the slices of the circle or can use the template circle with the pre-drawn lines, the teacher can decide.

The children paint each slice using two primary colours, e. g. red and yellow, or red and blue, or blue and yellow.

The children make a hole in the center with a short pencil or a similar tool.

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Playing with the Colour Spinning Disk and learning about physics and visual perception

After constructing the Colour Spinning Disk, children can play with it.

Teacher can talk again about the characteristics of colour mixing and also about visual perception. The spinning disk also illustrates a mix of light stimuli called temporal optical mixing. The concept that human visual perception cannot distinguish the details of high-speed movement is known as the persistence of vision.

The teacher can also ask questions about the mechanisms that triggers the movement. Other examples can be shown, e.g. a wind spinner, that moves with air.

Variations of Newton Spinning Disk

Other themes and characters can be used as **scenarios** for the activity instead of the Colour Spinning Disk. It could be a toy wind spinner, a rainbow or a prism that shows the properties of light.

Narratives and stories can also be used.



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How to construct the Colour Spinning Disk

Parts and tools required

- Template to be printed in A4 standard printing paper – Templates 1 and 2
- Sheet of cardboard
- Scissors
- Glue stick
- Coloring pencils/markers
- A short pencil or similar
- Ruler
- Pen

Method

1. Print the template
2. Cut out the circle
3. Draw lines across the middle of the circle as shown in the video <https://www.youtube.com/watch?v=RBWsihpcfco>
4. You can add more lines across the circle if you want to divide it further. The more lines across there are, the better the end result.
5. Colour the paper circle with the triangles following the sequence of two primary colors.
6. Place the cut out circle on the cardboard and with a pencil draw around the circle.
7. Cut out the circle on the cardboard
8. Stick the paper circle on to the cardboard circle with glue
9. Make a hole in the centre of the paper circle that goes all the way through the cardboard one as well
10. Push a pencil into the centre of the circles. The hole should be just big enough for the pencil to go through.
11. Place some sticky tape on the pencil just above the hole and the same below. This should be enough tape to stop the disk moving off the pencil
12. Spin the disk fast enough that the colours blur.

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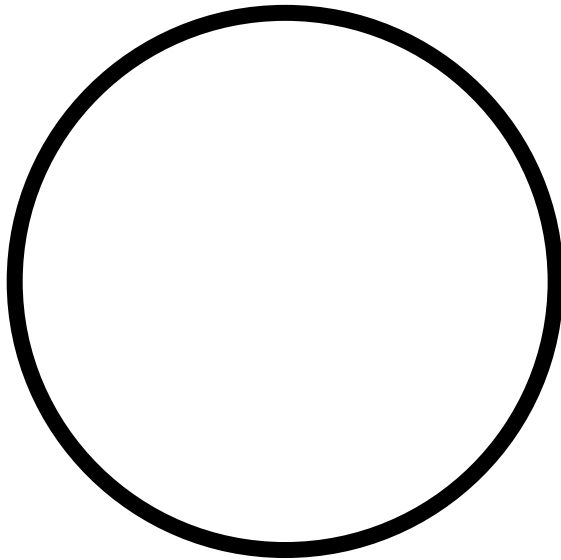
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Templates

Template 1. Colour Spinning Disk template



Template 2. For the youngest children Template with pre-drawn lines.



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