



FAIRY TALE FLIPBOOK

CHALLENGE ACTIVITY

Today’s challenge is to make a flipbook to create your own animated cartoon. Choose a scene from your favorite fairy tale or make-up your own story.

Video link: <https://youtu.be/UXye1vvzYT4>

GETTING READY

Summary:

Have you ever been tricked by an **optical illusion**? Optical illusions can be fun, but they are also quite scientific. In this activity, you will investigate **apparent motion** by making your own flipbook animations.

Note: There are two parts to this activity. Part 1 will allow you to practice and understand how to make an animation before you create your own in Part 2.

Active Time:

- Part 1: 20-30 minutes
- Part 2: 20-30 minutes

Total Project Time:

- 40-60 minutes

Key Concepts:

Animation, Perception, Optical Illusions, Apparent Motion

MATERIALS

You will need:

- 50 lined 3 X 5 inch index cards (or 50 3 X 5 inch cards cut from cardstock or paper)
- 25 (unlined preferred) 3 x 5 inch index card (or 25 3 x 5 inch cards cut from cardstock or paper)
- Ruler
- Scissors
- Two binder clips
- Colored markers, highlighters, pencils or crayons

BACKGROUND

When you perceive an object visually, an image of that object is projected onto the back of your eye (specifically, the retina). This information is sent to the brain (via the optic nerve) where it is processed and interpreted, forming the image that you see.

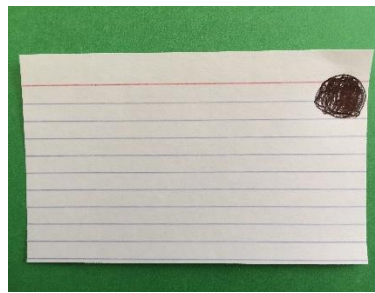
One **optical illusion** that has had a huge impact on our culture is the illusion of **apparent motion**. This might sound complicated, but you experience this illusion every time you watch cartoons. You perceive that the characters on the screen are moving fluently, but in fact, you are seeing many still pictures flashing rapidly before your eyes.

How does this work? Basically, our brains are trying to make sense of what we are looking at by "smoothing out" the individual images that make up a cartoon into one continuous, but changing scene. To do this, scientists believe that our brains put all of the pieces together and fill in blanks, or missing images, based on what we have already seen. Thus, our minds create the illusion of movement. Our brains not only do this when we are watching cartoons or movies—they actually do this all the time, such as when we blink.

PART 1: INSTRUCTIONS

*Use 50 index cards or 50 cards cut from paper to be 3x5 inches for Part 1 (used lined cards if possible)


1. Divide the cards into two stacks of 25 cards each.
2. **On one of the stacks**, draw a small circle (about $\frac{1}{4}$ inch diameter) on the top card on the right end of the top line.




3. On the next card in the same stack, draw a similar-size circle just as far to the right, but on the next line space down. Continue drawing circles on each card, each time on the line space right below the circle on the previous card, until you reach the bottom of a card. If your cards do not have lines, draw the first circle $\frac{1}{4}$ inch from the top of the card, the second $\frac{1}{2}$ inch from the top, the third $\frac{3}{4}$ inch from top and so on, each time $\frac{1}{4}$ inch further down until you reach the bottom of the card.
4. Then on the next card draw a circle (just as far to the right) on the next line space *up* from the previous circle (or $\frac{1}{4}$ inch up) and continue this until you reach the top of a card.
5. Repeat this entire pattern (making a series of "animated dots" going up and down along the right edge of the cards) until you reach the end of the stack.
6. **On the second stack**, again draw a small circle on the top card on the far-right end of the top line. On the next card in the stack, draw a similar-size circle just as far to the right, but four line spaces down (skipping three line spaces). On the next card, draw a circle four line spaces down from the previous circle. If your cards do not have lines, draw a circle on the top card $\frac{1}{4}$ inch from the top of the card, on the second card $1\frac{1}{4}$ inch from the top, and on the third card, $2\frac{1}{4}$ inch from top of the card.
7. Then, on the next card in that stack, draw a circle (just as far to the right) four line spaces *up* from the previous circle (again skipping three line spaces, or 1 inch up if the cards have no lines), and continue this until you reach the top of a card.
8. Repeat this entire pattern until you reach the end of the second stack.
9. Neatly stack each deck. Tap the circled edge of each card stack on a flat surface so that none of the cards' edges are sticking out (or in) from the rest in the stack.
10. Clip a binder clip on the opposite edge of each stack.

EXPLORE


In a moment you will flip through your book.

 How do you think the flipbooks will look when flipped? Will there be a difference between your two books?


Flip through each book to make sure almost every card shows as you flip. If you need to, remove the binder clip, re-tap the cards edges so the circled edges all line up perfectly, and replace the clip. Try again to make sure almost every card shows as you flip.

 Was your prediction correct? Why do you think this happens?

Ask a family member to flip through the first flipbook, the one in which no lines were skipped in between cards, and then to flip through the second book.

 To them, does it look like the circles move to the bottom of the card, then back to the top, and so on, going up and down? Or does the circle appear to move differently, such as by jumping around or flashing? The **optical illusion** where you **perceive** something as moving while in fact you are seeing many still pictures flashing rapidly before your eyes is called **apparent motion**.

In this activity, you tested whether the distance between objects has an effect on apparent motion, but there are other variables you can test, such as the speed at which the books are flipped and the size of the circles (or pictures) on the cards. You can also test what happens when you make the cards larger.

 How does flipping the cards in the flipbook faster or slower affect your results? Does using larger or smaller circles change the results? What if you use larger cards?

EXPLAIN

When no lines are skipped as in the first flipbook, the circles in the flipbook should have clearly appeared to move down, then up, then back down again. Our brains can easily fill in some blanks and make sense of this motion when such a relatively short distance is skipped between images. In the second flipbook, however, three lines were skipped between images and this was probably too great a distance for the brain to decide the motion should be a smooth up-and-down one. Instead, the circles may have appeared to jump around or even flash, especially if not every card was viewed when flipping. In other words, the brain **perceived apparent motion** with one flipbook, but most likely did not perceive this **apparent motion** with the other flipbook.

PART 2: INSTRUCTIONS

*Use 25 index cards or 25 cards cut from paper to be 3x5 inches for Part 1 (used unlined cards if possible)

Now it's time to make your own Fairy Tale flipbook. Choose a scene from your favorite fairy tale or make-up your own story.

Tip: Use a simple design or even just one object from your fairy tale or your made-up story- this will be the object that “moves” as you flip the pages. Remember, you will have to draw the picture over and over on each page, but in a different position, to make the book work.

1. Make your flipbook using the same method as in Part 1, but do not draw the circle. The pages will be blank to start.
2. Now, draw your object or your scene from your story on the first card.
3. On the second card, draw the same scene but draw the moving object slightly moved to the right.
4. Continue to draw your object on each individual page of the book. Each time slightly move the object as you want it to move when flipped. Use your practice book with the circle as a guide for where to place your object.
5. Flip through the notepad and watch your animation come to life.

Adapted from: <https://www.sciencebuddies.org/stem-activities/flip-book?from=Blog>

Learn more about inventing and find more activities on our website: www.fuelthepark.org.