# Beanstalk

## A science education game for K-3 students

*Beanstalk* is a one-player game that teaches your K-3 grade students in three areas:

1. scientific principles of balance,
2. practices of scientific inquiry, and
3. socio-emotional skills

These objectives are drawn from the **National Research Council's** *Framework for K-12 Science Education* and **Pennsylvania's** Academic Standards. The game was created by a team of educational researchers and game designers at **Carnegie Mellon University** and **Sesame Workshop**.

To return a sad monster's teddybear, **players balance** on top of a giant beanstalk as it lifts them and the bear into the sky. To stay balanced, the player waters flowers on one side of the beanstalk to offset the bugs sitting on the other side. As the beanstalk grows, the player encounters more complex arrangements of bugs and flowers, challenging them to rethink previous solutions and advance their understanding.

During play, your students use scientific inquiry practices like *predict-observe-explain* to discover new principles of balance. Other characters in the game guide the player and are ready to help when called upon.

Research and development for *Beanstalk* continues as more kids play the game. **Playing *Beanstalk* in your classroom** helps your students learn, and helps improve the game. Students **playing at home** contribute, too. Your students can participate in a real scientific study, explore science concepts, and develop social-emotional skills—all while having fun!

**To learn more about—and play—*RumbleBlocks* and other educational games, visit:**

**etc.cmu.edu/engage**

## Educational Objectives

The principles of balance in *Beanstalk* are compatible with the *Motion and Stability* Core Idea (PS 2) from the NRC Framework, specifically:

| | | |
|---|---|---|
| PS2.A: | Forces and motion | (p. 114-116) |
| PS2.C | Stability and Instability in Physical Systems | (p. 118-120) |

The social-emotional skill development in *Beanstalk* are compatible with PA Standards *Subject Area 16: Student Interpersonal Skills*, specifically:

16.2.K.E: Ask for and accept offers of help when needed or appropriate.
16.2.5.E: Determine who, when, where, or how to seek help for solving problems.

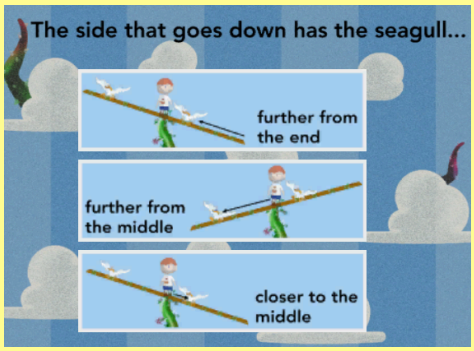
The scientific inquiry learning in *Beanstalk* is compatible with the *Scientific and Engineering Practices* from the NRC Framework, specifically:

Practice 6: Constructing Explanations and Designing Solutions (p. 67-71)

## Features

***Research-based*** gameplay using principles developed by Piaget, Siegler, and others, works to ensure students learn while they play. Research has demonstrated significant improvement in balance scale assessments for students in grades 1-3.

**Scientific Inquiry** is built right into the game. Players not only solve puzzles, but think about why the beam behaves as it does and form hypotheses to predict new solutions.




**Socio-emotional learning** opportunities are constantly presenting themselves as players interact with characters in the game. Some levels require players to ask for help or to cooperate with those characters to solve the puzzle.

# Incorporating the Beanstalk science education game into your classroom

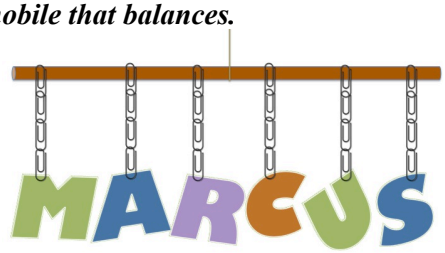
Playing *Beanstalk* can be an an easy and effective way for your students to learn important scientific concepts—and have fun doing it. As little as 20 minutes of playing has been demonstrated to increase students' understanding of balance and stability, one of the educational objectives in the National Research Council's *Framework for Science Education* as well as in many sets of science standards.

How long your students play depends on the time available. Allowing enough time, even over several sessions, for your students to reach the game's higher levels will give them the opportunity to work with the widest range of principles and apply those principles in different situations.

Here are a few activities that teachers use to effectively incorporate *Beanstalk* into their classrooms and improve student learning.

## Activity 1: Kinetic Art

***In this activity, your students hang letters from a straw to create a mobile that balances.***




**Supplies**

- construction paper or card stock paper
- straws
- paperclips
- scissors

**When**

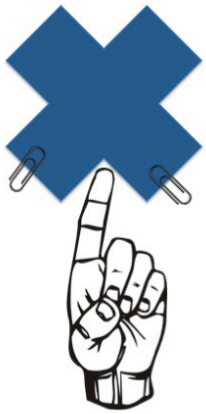
This activity could be done either as an introduction to playing *Beanstalk*, or as another way to reinforce and apply what the students learned while playing *Beanstalk*.

**Steps**

1. Supply students with heavy paper, plenty of paperclips, and straws (or something on which to hang the letters).
2. Working alone or in teams, have your students cut the letters of their name (or another word) out of the paper.
3. Each letter is then attached to the bottom of a chain of paperclips. Each chain could be the same length or a student could vary the number of paperclips to make longer and shorter chains. The top paperclip in the chain is hung on the straw.
4. Challenge the students to hang all of the letters from the straw so that the straw will balance when hanging from the ceiling. The different sizes of letters, total number of letters, and the lengths of chains will require different arrangements along the length of the straw.
5. Alternatively, students can work in teams to balance two or more names on a single straw. Student chains the letters of their names together using paperclips. Challenge the team to hang all the name-chains from the straw so that it balances when hanging from the ceiling.


## Activity 2: Shape Circus

***In this activity, your students balance irregular shapes on their fingers.***



**Supplies**

- poster board or tag board
- paperclips
- scissors

**When**

Though this activity can be used before students play *Beanstalk*, it may work better after students are better able to predict changes in stability.

**Steps**

1. Supply students with paperclips and paper board.
2. Have your students cut large shapes from the paper. These shapes do not have to be standard or symmetrical. In fact, shapes with acute angles and large protrusions can be easier to work with.
3. Challenge your students to stand their paper shape on the tip of one finger and balance it as long as they can.
4. Then allow them to attach paperclips anywhere on the shape to help them balance it. If students continue to attach paperclips symmetrically, remind them how, when playing *Beanstalk*, they added weight on only one side to balance the beam.
5. Next, have students cut out a shape they think would be easier to balance on one finger. Challenge them to use fewer paperclips than they did with the previous shape to balance the shape on their finger.
6. Finally, allow students to share their two shapes with classmates and try to perform "tricks" of balance. Balancing a valentine shape on its tip, for example, is difficult but looks impressive.