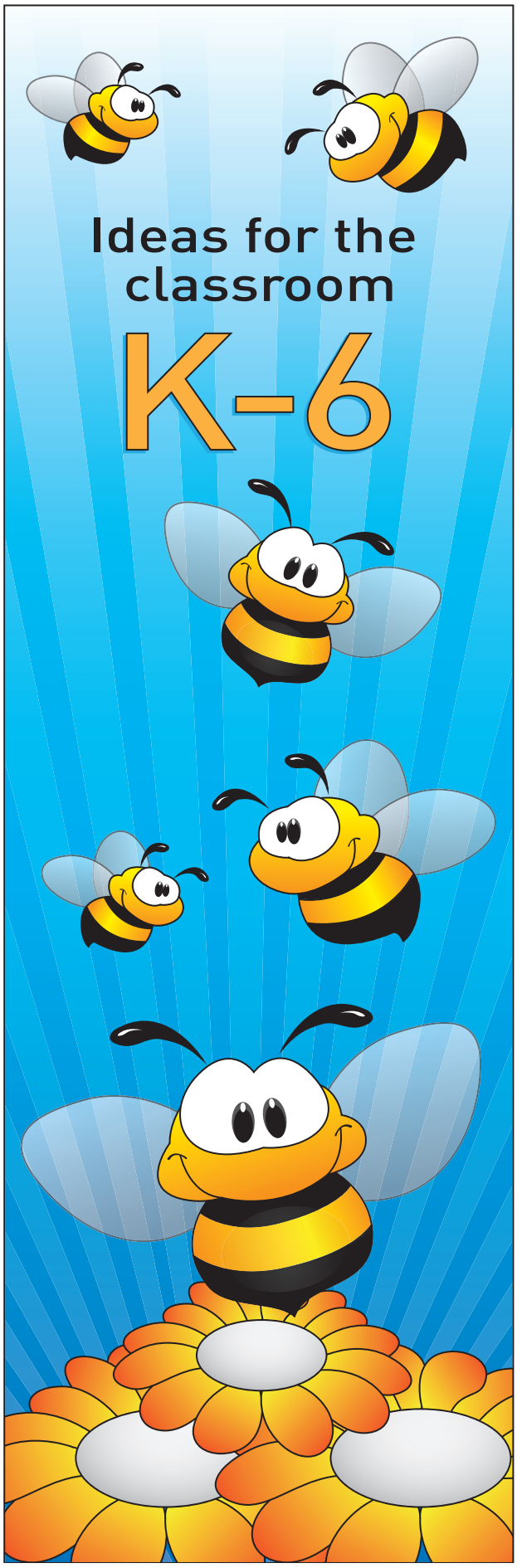


What if Science was a Game that everyone could Win?

By Marti Ellen, Director,
Sunshine Educational Pty. Ltd

When we are small and begin to learn Maths, we count and learn 1+1. When we learn to read, we start with the ABC's and put them together into words. But where does learning Science begin?

The game of Science

When you play a game of checkers, there are black checkers and red checkers. If you want to play the game, you need to know that the checkers only move forward, they become a king when they get to the other side of the board, etc. In the same way, we have basic pieces in the game of Science. In the case of Physics, long regarded as the most fundamental of all, they are Mass, Energy and Forces. We have to know the properties of Mass, Energy and Forces before we can play the game.

The reason some people say that science is "hard" is because we have made it hard. We trip over because we forgot to create the foundation.

My research for over 28 years has proven that we can go in and make it a fun game. And the Key to playing the game is that we first have to understand the playing pieces and the rules. We have to know the Keystones. Then we need to have experience that validates that we can win at the game. Once we have done this, creativity starts to flow. Once the pieces start to be fun, they stop being a problem.

When we go back to the basics, we build our foundation. Our building blocks are Mass, Energy and Forces. Use them like bricks and mortar to build tall buildings. Our methods are investigation and experimentation. Feature these, and you'll have winning results. These pieces of the game are reliable, and whether you like it or not, they will act every time. Have you ever experienced something NOT dropping because it didn't suit you? It doesn't happen.

What I have discovered through many years of teaching physics to young children, is that if they

What if Science was a Game that everyone could Win? (continued)

do an activity and can see the answer, they will remember it. If they do several such activities in a row, they begin to develop a certainty and an understanding about the rules of the physical world, and a certainty about themselves as being capable. It works.

Very young children teach us the game

If you observe very young children, they constantly reach out to the physical world around them. They touch, taste, pull, and push all kinds of mass all day long (even if it is not good for them). They are dedicated and committed to investigation. Without thinking about it, they assume the viewpoint of the outside observer.

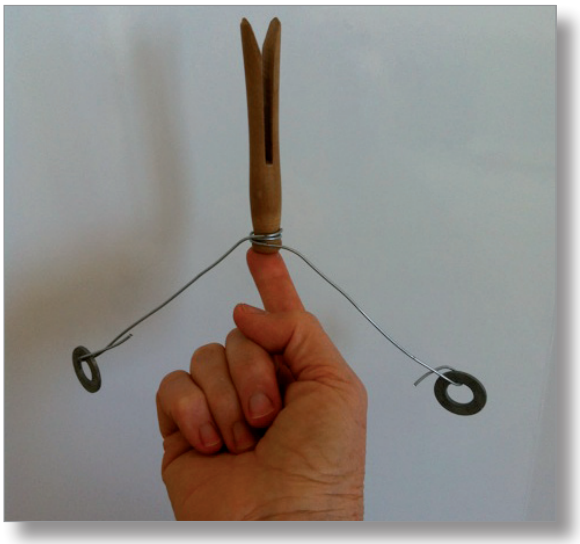
Who amongst us has not had the experience of a baby in a highchair dropping a spoon repeatedly on to the floor?

Many years ago I taught a physics class for pre-school children. One day I arranged for three nine-month-old babies to be seated in highchairs to carry out an experiment. Those babies dropped spoons off trays continuously for 45 minutes before I had to stop them due to the day finishing! And as they dropped them, each child watched their spoon fall.

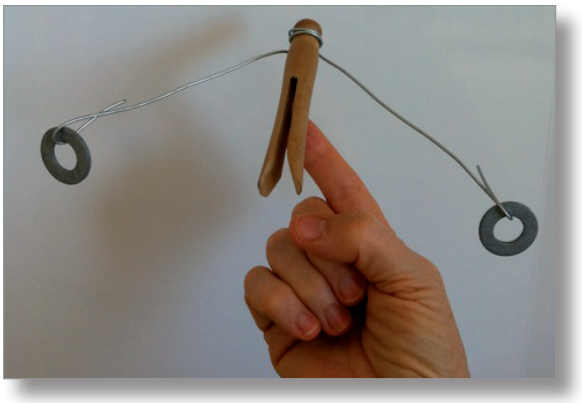
That's the power of our natural urge to investigate. But sometimes we can unwittingly suppress this exploration by telling a child that it is naughty to drop the spoon off the highchair.

Getting into the game

So let's create science as a game. Here is what my experience shows works most successfully. Start with Mass… the stuff that makes up the physical world. I am going to show you the method I use, and then you will be able to use this as a template to determine a few sequences of your own. I am going to suggest a starting point and then follow it with a series of activities that flow logically and move forward along a through line in very small increments. The result is a deep understanding of the topic, and a sound, certain platform.



Dolly peg balancing toy with arms below the peg



Dolly peg balancing toy with arms moved up alongside the peg. The centre of Mass also moves up, so the peg balances at a point further up the peg.

Example:

Begin with 'Mass', the physical stuff. Have each child do each activity.

Identify that Mass has observable properties. (STe-9ME) (ACSSU003)

- Put numerous objects of different sizes and types of material in a large cardboard box, with a hole cut for a hand to fit through. As each object is pulled out, students observe the qualities of the different types of Mass, what is similar and what is different about each. They can discuss, group, and draw them. (critical and creative thinking) (ACSIS011, ACSHE013, ACSIS233) (I) (WS)

What if Science was a Game that everyone could Win? (continued)

- Observe that one property of Mass is that it takes up space. (STe-9ME) (ACSSU003)
  - Start with one flat coin, or counter. Add more on top, one-by-one, so that a tall pile forms. Repeat to make several piles. Observe that a pile of coins takes up more space than an individual coin. Count the number of coins in each pile to determine how many times more space the pile takes up than the single coin. (numeracy) (critical and creative thinking) (ST1-4WS)
- Observe that another property of Mass is that it has volume. (numeracy) (ACSSU005) (STe-9ME) (ST1-4WS)
  - Fill a small container with marbles. Pour them into a larger container. Repeat until the larger container is full. How many times does the small container get filled in order to fill the larger one? Which container has more volume? Draw a diagram to show your result. (numeracy) (literacy) (I) (ST1-4WS)
- Observe that a further property of Mass is that it has a centre on which it balances (centre of Mass). (ACSSU005) (STe-9ME)
  - Balance various objects on your finger. (work and enterprise) (STe-6NE)
  - Make a balancing toy out of a dolly peg, stiff wire, and two washers (see photos). Balance it on your finger. Change the position of the wires. Again balance it on your finger. What do you observe? Explain. (literacy) (STe-6NE) (work and enterprise) (critical and creative thinking) (ST2-4WS)
- Observe that one more property of Mass is that it has density. (ACSSU003) (STe-9ME)
  - Get equal sized squares of paper and aluminium foil. Squeeze each of them into a ball as tightly as possible. Compare them. Which one can be packed most tightly or densely? Explain why you think this happens. (ST2-4WS) (STe-9ME) (critical and creative thinking) (literacy)
  - Chew a small piece of pumpernickel bread and a small piece of white bread. Which one is more dense? Explain why. (STe-9ME) (critical and creative thinking) (ST2-4WS)
- Observe that Forces act on Mass. (STe-9ME) (ACSSU003) (ST1-7PW) (ST2-7PW)
  - Friction acts when two masses are in contact with each other. (work and enterprise) (ST1-7PW) (ST2-7PW) (STe-6NE)
- Slide a small, flattened ball of dough along a table. What do you observe? Explain and draw a diagram. (ST2-7PW) (critical and creative thinking) (literacy) (ST2-4WS) (I)
- Use a crayon, pencil and chalk to draw on a piece of paper, then a piece of waxed paper, and finally a piece of sandpaper. What do you observe? Explain. (critical and creative thinking) (literacy) (ST2-7PW)(ST2-4WS)
  - Gravity acts on Mass over a distance. (literacy) (STe-6NE) (ST2-7PW)
- Slide a small ball of dough along the table until it drops off the edge. What do you observe? Why do you think this happens? (literacy)(critical and creative thinking)(STe-6NE) (STe-9ME)(ST2-7PW)(ST2-4WS)
- Drop a large ball of dough from 30 cm. What happens to its shape? Now carefully stand on a chair and drop the ball from the height of your extended arms. What happens to its shape? Why do you think this happens? (work and enterprise) (literacy)(critical and creative thinking)(ST2-7PW)(ST3-4WS)
- Drop two marbles of the same size at the same time (practice letting go at the same time). What happens? Now drop a large and a small marble at the same time. What happens? Does size of the Mass make a difference? (critical thinking) (literacy)(STe-6NE)(STe-9ME)(ST3-4WS) (ST1-7PW)
- Drop a marble and a tissue at the same time. What happens? Now, scrunch up the tissue and drop them both at the same time. What happens? Does the shape of the Mass make a difference? (critical and creative thinking)(literacy)(STe-6NE)(STe-9ME)(ST1-7PW)(ST3-4WS)

Once you get the idea of moving in very small increments, along a logical path, using the basic pieces, you have the Key to the Science game. Be sure to have plenty of awards and stickers on hand. You'll need them because you will create many winners.