

Topic 1: Scientific Method – 1d. Hypothesis Card Game

Resources: Handouts and PowerPoint attached

Building on: Excellent review of previous knowledge of scientific method from grade school and middle school

Links to Chemistry and Physics: Activity is applicable to all areas of science and can be used at any level: middle school, honors, basics, etc.

Stories: This is a very engaging activity that teaches the scientific process far better than by lecturing! Most high school students have some familiarity with the scientific method from their grade school and middle school experiences. This game will make the process come alive for them in a new way.

Lab Instructions and Materials for the Teacher:

1. Two decks of cards (with different colored backs) and Nature's Law cards for each lab group are needed.
2. Explain the rules to the students and practice using the PowerPoint demo.
3. Then have the students start playing by using one of the simpler Nature's Law cards.
4. As the students discover how the game works, challenge them with harder and harder Nature's Law cards.
5. The game works well if spread over two instructional days: one to introduce the rules and play a simple Nature's Law, and the second day to try more moderate to difficult Nature's Law cards.

A Couple Words of Caution:

1. Make certain that your students know what the Nature's Law card is saying and that they know how to play the proper card for the law! If not, you will have one confused scientist!! I often try to quiz the students ahead of time. I'll say, "If the scientist throws a 2 of clubs, you'll throw a _____."
2. Make sure that your students are playing each hand to its conclusion (when the scientist has a working theory). One group of students was asking me for a new card every couple of minutes until I finally questioned them as to how they were solving the game so quickly; to which they replied, "We didn't. That card was too hard, so we gave up! Can we have a new one?"
3. This activity provides a great launching point for the rest of the year. One of the phrases that has come out of the game is "Nature never tells!" In November or beyond, a student will ask me, "I got ____ data; is that right?" To which another student will blurt out, "Nature never tells!" and they get the idea that it is for them to discover.

Hypothesis Card Game

Purpose: The purpose of this investigation is to make students more familiar with the scientific method.

Materials: 2 decks of cards (different colors helpful)
2 players (one scientist and one nature)
Nature's Law cards - available from your instructor

Procedures:

1. Each set of partners get two different sets of cards. Count the cards. There should be 2-10 in all of the suits (clubs, diamonds, spades, hearts), aces (which count as one) in all of the suits and jacks (which count as zero) in all of the suits. You may discard any kings, queens or jokers; you will not need them. There will be 44 cards in all. "NATURE" must shuffle her deck.
2. Decide who will be the "SCIENTIST" and who will be "NATURE." You will change roles as you play several hands.
3. The player who will be "NATURE" should find the teacher and obtain a "NATURE'S LAW" card. Do **NOT** show the "SCIENTIST" the card and **NEVER** tell the "SCIENTIST" what the "NATURE'S LAW" card says. This is part of the fun of the game. After all, nature cannot talk!

"NATURE" - Be sure you understand the pattern before you start playing cards!

- The "NATURE'S LAW" cards have been designed to be in one of three categories: easy, hard, and "mind blowers." But remember, any card that you cannot figure out what it is would be "hard" to you and any one you can solve is "easy" to you.
 - The pattern on the card may have something to do with numbers, suits, colors, odds or evens. It is the "SCIENTIST'S" job to figure out the pattern by playing cards and then seeing how "NATURE" responds.
4. Start the game by having the "SCIENTIST" play a card or two from his deck. "NATURE" should respond by playing a card that follows the pattern on the "NATURE'S LAW" card (one for each card that the "SCIENTIST" plays). Continue playing cards until the "SCIENTIST" thinks he sees a pattern. The "SCIENTIST" may play cards in any pattern he wishes. "NATURE" can only respond by following the pattern on the "NATURE'S LAW" card and should play with a poker face 😊 (and **never** tell the "SCIENTIST" anything about the pattern!!).

HINT: Play your cards in an organized fashion so that the pattern will be easier to see.

A 2 3 4 9 10 SCIENTIST'S CARDS

2 3 4 5 10 X NATURE'S CARDS

5. When the "SCIENTIST" thinks that he has discovered a pattern, he should write an understandable, concise hypothesis in the space provided. "NATURE" does not respond in any way.
6. The "SCIENTIST" will then test his hypothesis by laying out at least three more cards and predicting what "NATURE" will play before he plays it! If the three predictions are correct, the "SCIENTIST" has a valid **theory**. If incorrect, continue playing cards until the pattern is discovered!
7. Once a valid theory is established, "NATURE" should return the "NATURE'S LAW" card to the teacher without showing or telling the "SCIENTIST" what it says! The two players should then switch roles and play another hand of the Hypothesis Card Game.

Final Notes and Instructions:

- "NATURE" should always hold her cards, shuffled and face up in her hand. She must always play the **first** card in the deck that fits the "NATURE'S LAW" pattern. Those cards that do not fit the pattern should go into the bottom of the deck. "NATURE" may not create false patterns in order to confuse the "SCIENTIST" more.
- If "NATURE" cannot play a card that fits the "NATURE'S LAW" pattern, she should play a card face down to indicate "NO DATA."
- "NATURE" may replay a card from the table if she runs out of cards that fit the pattern.
- "NATURE" is unfeeling and should not hint or help the "SCIENTIST" out, and "NATURE" never tells the "NATURE'S LAW!" Did you get that instruction, yet?

GOOD LUCK!

Results:

Write your hypotheses here for the hands in which you were the "SCIENTIST."

- 1.
- 2.
- 3.

Were your hypotheses correct? Then you have a valid THEORY. Mark these with an *.

Analysis and Conclusions:

1. Why does the “SCIENTIST” have to start the game by playing cards? (In other words, what is he attempting to do?)
2. Is a wrong hypothesis of any value to a scientist? Explain why or why not.
3. Why doesn't “NATURE” ever tell the “SCIENTIST” whether or not he is correct?
4. Write a short conclusion in which you state several reasons why the Hypothesis Card Game is similar to a scientist solving a problem in real life. (NOTE – A good Conclusion section includes a summary of what you did [procedures], what you found [results] and why [analysis]?)

Nature's Laws: (NOTE: Do NOT share these with the students; put them on the back of a “Nature's Law” card and distribute to one student per team).

Easy:

Always match the scientist's number. Play any color.

Play the first card in your deck that is the same number, but an opposite color.

Play a card that is the same number and color as the scientist's.

Always add one to the scientist's number; always play black cards.

Always add two to the scientist's number; always play red cards.

Always play the first card in your hand that is less than the scientist's number.

Play black cards on black and red cards on red.

Play black on even numbers, red on odd.

Always make the sum of his card and your card equal to eight.

Always make the sum of his card and your card equal to nine; always play black.

Always make the sum of his card and your card equal to ten; always play red.

Medium Difficulty:

If his number is five or larger, subtract one; if less than five, add one.

If his number is five or larger, add two; if less than five, subtract two.

If his number is greater than five, play black; if five or less, play red.

Always make the sum of his card and yours an even number.

Play spade on diamonds; club on hearts; heart on clubs; and diamond on spades.

If his number is:

0, 1, or 2 – play hearts.

3, 4, or 5 – play diamonds.

6, 7, or 8 – play clubs.

9 or 10 – play spades.

Mind Blowers:

If he plays black, you play 7 or higher.

If he plays hearts, play 4, 5, or 6.

If he plays diamond, you play 3 or less.

The pattern is, there is no pattern! Not much at least . . . always play the top card in your hand no matter what the scientist plays.

Make the sum of your card and his first card an even number; make the sum of every other card an odd number.

Play any card and then tap your foot lightly as many times as his number is (don't give it away!)

Play a card face down on his first card. Then on the next card, play a card that is one lower than his first card. Keep this pattern up, always playing on each new card by reacting to the card before.

Play the fourth card down in your hand and blink your eyes as many times as his number is.

If his card is greater than five, cover it with your first card. If his card is five or less, lay your card alongside his card.

Play any card and then rub your nose lightly after you play your card (be subtle!).

Always play the card that is the same number down in the deck as the card the scientist plays. For example: If he plays a two, you play the second card down in your deck.