Signs, Symbols & Codes

Summary of Key Concepts

All **communication** is accomplished using symbols. A **symbol** is something used to convey a meaning. It could represent an idea, an action or an object. People are able to create symbols using written marks, such as punctuation, letters, numbers, and arithmetic operation signs; pictures; gestures or other body motions, such as tapping someone on the shoulder; and sounds, including both spoken language and non-verbal utterances, such as "mmm …" and "uh huh." There are also symbols generated by electrical or mechanical devices, such as horns, traffic lights, computers, radio transmitters, telephones and doorbells. Symbols generated electrically or mechanically are sometimes called **signals**. These include gestures; for example, putting a finger over one's lips is a signal for "Quiet!"

When people communicate, they have to use symbols, because these provide the only clues about what we are thinking. For communication to work, both the originator and the receiver have to agree on what the symbols mean. A language is a system of symbols with generally agreed-upon meanings. There are also graphic symbol systems, such as the set of symbols used on a map, for musical notation, to indicate chess pieces, to describe cross-stitching patterns, etc. A symbol system that does not use words is called a **code**. Some codes use numbers, such as Zip Codes and ISBN's, while others use gestures, such as the football referee's signaling system. Braille is a tactile code for representing letters and numbers. Bar codes are patterns designed to be read by optical scanning machines. A **key** shows the translation between a code and ordinary language.

How are the meanings of symbols established? There are two basic methods. Some symbols imply their own meaning, by using images or sounds that correspond in some way to the concepts they represent. For example, a "Wheelchair Access" symbol shows an icon of a wheelchair, which would be recognized by most people. Symbols of this kind we call **expressive symbols**. Other symbols, such as the letters of the alphabet, have no logical connection at all with the things they refer to. These we call **arbitrary symbols**. People can usually figure out expressive symbols for themselves, but arbitrary symbols simply have to be memorized.

Communication breaks down when the sender and receiver interpret the symbols differently. This can happen because a symbol has more than one meaning, more than one symbol has the same meaning, or the receiver simply hasn't learned the meaning in the same way as the sender. When a symbol has more than one meaning, the alternate meanings are called **homonyms**, by analogy with two words that sound the same but have different meanings. Homonyms can be confusing, because the sender may have intended one meaning for a symbol, while the receiver assumes another. If someone is unsure about the intended meaning of a symbol, they generally try to use clues from the environment, i.e., the **context**, to clear up the uncertainty. A more subtle problem occurs when more than one symbol has the same meaning. We call the alternate symbols **synonyms**, again by analogy with spoken or written language. The problem here is that the receiver may associate a particular synonym with the meaning, and not expect another. Here again, context is crucial in establishing that a particular symbol is being used to convey a particular meaning. Frequently, children lack the contextual clues assumed by adults, or vice versa, which can lead to a breakdown of communication between them. How many adults understand the shorthand language children use in on-line chats?

Much of education consists of learning to create messages in various symbol systems, and translating among them. For example, learning to read means learning to translate from written language both to spoken language and to the concepts represented by language. Arithmetic "word problems" require translation from written language to mathematical shorthand. Errors in translation often occur because math teaching focuses more on the **syntax** – the structure of the language – than on the **semantics** – what the symbols actually mean. For example, the statement "There are three times as many dogs as cats" is mistakenly translated syntactically as $3D = C$, while the correct equation would read $D = 3C$.

Symbols qualify as technology, because they are invented by people to solve problems. Like other forms of technology, they can be analyzed to see how well they accomplish their purposes, and redesigned if found wanting. An evaluation question for a symbol is: *"Does it convey the intended meaning?"* A typical symbol has a variety of elements that work together, and these elements can be identified and analyzed separately. For example, the commonly encountered "NO SMOKING" symbol includes a circle, a diagonal bar, a cigarette, and smoke. It uses particular colors, line widths, and sizes for the various parts. In analyzing a symbol, it is useful to ask how well each of the elements contributes to the overall goal.

Pre-Workshop Scavenger Hunt

Ask participants to find:

1. Symbols that are especially hard to figure out, and

2. Symbols that would be widely understood, even by people from different cultures.

Workshop Materials

❑ A collection of discarded newspapers and magazines

❑ Index cards

❑ Clear tape or glue stick

❑ Maps and floor plans from museums and/or zoos

❑ At least one secret message per group, written on an index card. These messages should be fairly easy to represent graphically, but not commonly found on signs, which would make them too easy. Sample messages are:
  - There is a hole in the sidewalk.
  - The toilet is broken.
  - Low ceiling -- don't bump your head.
  - No running in the hallways.
  - Please take a number and be seated.
  - Please knock before you enter.
  - This way to the exit.
  - Please stand on line.
  - Bicycle crossing.
  - Stairway closed for repairs.
  - Hole in the sidewalk -- be careful.
  - All turns from right lane.
  - No riding on luggage carts.
  - Quiet -- people studying.
  - No food or beverages.
  - No littering.
  - Caution -- wet floor.
  - Jacket and tie required
  - Do not close the window.

❑ Possible props for designing graphic instruction manuals, as available: yarn or string for knot tying, cat's cradle, weaving or braiding; construction paper; cardboard; scissors; a yo-yo; playing cards for card tricks; handkerchiefs or thin scarves for juggling; jump rope; rubber bands, barrettes or "scrunchies" for hair

braiding; strong lamp, slide projector, or overhead projector for making shadow animals; buckets for use as drums

❑ Overhead transparencies and markers (if projector is available)

❑ Copies of <u>Symbol Analysis Worksheet</u>, <u>Symbol Design Worksheet</u>, and <u>Graphic Instruction Manual Worksheet</u> (see next three pages).

Symbol Analysis Worksheet

Good Symbols	
Symbol	**What Makes it Good**

Bad Symbols	
Symbol	**What Makes it Bad**

Symbol Design Worksheet

Original Design	
Sketch your symbol	**Difficulties the testers had in using it:**

After Redesign	
Describe the features you added in each redesign:	**Remaining Difficulties with each redesign:**

Graphic Instruction Manual Worksheet

Original Design	
Point at which testers "got stuck"	**Problems that had to be addressed**

After Redesign		
Describe the features you added in each redesign:	**Point at which testers "got stuck"**	**Remaining Difficulties with each redesign:**

Directions to Participants

The following five pages provide a set of instructions for the workshop activities, suitable for copying to transparency films, PowerPoint slides, or chart paper, for use during the workshop.

SIGNS, SYMBOLS & CODES

1. Scavenger Hunt

- Look through some newspapers or magazines.

- Cut out and save any symbols you find.

- To avoid losing small ones, you can tape or glue them to index cards. MOUNT ONLY ONE SYMBOL PER CARD, so you can sort them later.

SIGNS, SYMBOLS & CODES

2. Guess my Categories!

- Sort your symbols according to SECRET CRITERIA.

- The other groups will have to guess these criteria.

3. The Good, the Bad & the Ugly

- Look through a museum floor plan, a zoo map and the symbols you have already collected to find:

  - A few whose meaning is obvious;

  - Some that are ambiguous or hard to interpret

- Decide:

  - What makes the good ones good?

  - What gets in the way of understanding the bad ones?

Show the good and bad symbols, and your conclusions about them, on the <u>Symbols Analysis Worksheet</u>.

<u>4. Design your own Symbol</u>

- Each group will receive a SECRET MESSAGE. Your task is to design a symbol that conveys this message USING NO WORDS.

- Then try it out on another group to see if they can figure out what it means.

- DO NOT REVEAL THE MEANING. Instead, listen closely to discover the features of your symbol that make it unclear.

- Redesign your symbol based on this data, and try it out again.

Use the <u>Symbol Design Worksheet</u> to record all data.

<u>5. Graphic Instruction Manuals</u>

- Select a task that a member of your group knows well, but that most people don't know how to do.

- Everyone in the group should learn the task. Then design a graphic instruction manual that teaches the task, USING NO WORDS.

- Ask another group to follow your manual, BUT DO NOT COACH THEM. Note carefully how and where they have difficulty.

- Now, redesign your manual to address the problems, and try it again.

Use the <u>Graphic Instruction Manual Worksheet</u> to record all data.

Sample Workshop Agenda

Introductions (10 min.)

Scavenger Hunt (10 min.)

Provide each group with a collection of discarded newspapers and magazines. Their task is to cut out and save as many symbols as they can find in these printed materials. To avoid losing small pieces, they can mount them on index cards with tape or glue. Only one symbol should be mounted on a card, so they can be sorted in the next activity. See Activity #1 in <u>Signs, Symbols & Codes</u>.

Sorting: Guess my Categories! (30 min.)

The groups should swap their collections of symbols, so that the symbols they use for this activity are not the same ones they have collected during the scavenger hunt. Then ask each group to sort its new set of symbols into several categories of their choice. They are to keep these categories secret from the other groups. After they have finished sorting, each group is to invite another group over to inspect their newly arranged symbols. The visiting group must try to guess the categories that were used.

Analysis: The Good, the Bad and the Ugly (30 min.)

This activity is based on Activity #4 in <u>Signs, Symbols & Codes</u>. Provide each group with a few maps or floor plans, for example, from a museum or zoo. Their task is to analyze several of the symbols used on these maps to determine how well they convey their intended meaning. They should also include any "bad symbols" and universal symbols they have found in the Pre-Workshop Activity. Would all people interpret these symbols the same way? Or do they assume some kind of background information, such as familiarity with written English, or with particular objects, such as a traditional-style telephone? Also, does each of the symbols represent the same idea in the same way? If not, which ones work better, and why? What elements of a symbol make it easy or hard to figure out? The <u>Symbol Analysis Worksheet</u> can be used to keep records.

Design I: Design your own Symbol (30 minutes)

Explain to each group that they must convey their message by creating a sign that does not use any words. The other groups will then test the sign by trying to figure out the original message, only by looking at the sign. The group that created the sign should not coach the testers in any way, but simply listen as they try to figure out what the sign means. Based on the difficulties the testers encounter, the designers should then redesign their sign, and try it out again. The <u>Symbol Design Worksheet</u> should be used to keep track of each design cycle. See Activity #5 in Signs, Symbols & Codes.

Design II: Graphic Instruction Manuals (45 minutes)

Make the groups aware of the props that are available for this activity, such as string, scissors, playing cards, tennis balls or handkerchiefs (for juggling), buckets (for drumming), construction paper, a yo-yo, etc. Each group is to select a task that one member of the group knows well, but that most people probably don't know how to do. The person who knows the task should first teach it to the rest of the group. Then the group should design a graphic instruction manual for performing this task. The manual may not include any words. Some tasks that could be used for this activity are:

- How to make a paper airplane or boat
- How to make a paper hat or mask
- How to do origami
- How to make a "fortune teller" from a sheet of paper
- How to make a house of cards
- How to make cardboard doll house furniture
- How to make a paper pop-up mechanism
- How to tie a special kind of knot
- How to braid or weave with yarn
- How to braid hair
- How to play cat's cradle
- How to do a yo-yo trick
- How to jump rope
- How to do sleight-of-hand with coins, currency or cards
- How to juggle
- How to execute a ritual handshake
- How to play a drum melody on overturned buckets
- How to do a dance step
- How to do a hand-slapping/finger-popping routine
- How to make shadow animals
- How to do an exercise routine

Once the manual has been developed, members of another group will attempt to perform the task, using only the graphic instruction manual as a guide. As in the previous design activity, the designers of the manual should not coach or prompt the testers in any way, but simply watch as the testers try to decode the instructions. Based on the difficulties they encounter, the creators of the manual should then redesign it, and try it out again, and repeat the redesign cycle as many times as needed. The Graphic Instruction Manual Worksheet will help participants organize their data. See the Extension to Activity #5 in Signs, Symbols & Codes.

Sharing (10 min.)

Each group should share the results of both their analysis and design. Encourage them to reflect on how they feel these activities would work in their classrooms, including modifications they would make.

Workshop Tips and Strategies

Scavenger Hunt

Symbols are extraordinarily commonplace, and they appear in a wide variety of guises. One objective of this activity is to broaden the teachers' thinking about what qualifies as a symbol. Encourage the teachers to be as inclusive as possible in their working definitions of "symbol."

Sorting

Because the world of symbols is so diverse, this activity requires considerable discussion and creativity. Here are some categories teachers have come up with:

❑ Commercial symbols

❑ Symbols that represent a nation, religion, or public institution

❑ Universal symbols; i.e., those designed to be recognized across culture and language barriers

❑ Implicit symbols in clothing, beverages or cars

❑ Self-evident symbols, such as arrows and "happy faces"

❑ Symbols that are part of written language, such as letters, numbers and punctuation marks

Often, these categories are not mutually exclusive, so that some items belong to more than one category. In other words, there may be an intersection set that includes items from two or more categories. Furthermore some categories may be further subdivided into subcategories, or subsets. Some participants have drawn Venn diagrams to show the relationships among the categories, which is an excellent math connection to this activity.

To speed up the process of determining whether or not the guesses were correct, some workshop leaders have suggested that participants write the name of each category on an index card, and leave it face down as other groups come around to guess their categories. After guessing a category, they can look at the index card to see if they were right.

Analysis

If teachers have difficulty getting started with this activity, it may be helpful to ask some focusing questions:

❑ What concept does this symbol represent?

❑ Does the symbol need to be learned, or is its meaning already obvious?

❑ What graphic devices does it use? (e.g., lines, arrows, arcs, circles, colors, punctuation marks, pictures) What meaning does each of these elements convey?

❑ Could this symbol have more than one meaning?

❑ Could another symbol have the same meaning as this one?

❑ Can you think of a way to make it clearer?

Design I

In this activity, participants design a symbol to convey a particular message, and then test it by seeing whether others can determine the message. In a professional design context, this would be called the "meaning-for-symbol test". The sign they create may not contain any words. Participants may ask whether letters, numbers or punctuation marks are allowed. The answer is "yes" in each case, because these are not words.

It is important to emphasize that the test is of the symbol, not of the people testing it. In other words, the purpose of the test is not to see how clever the testers are, but rather to evaluate the symbol itself, and gather data for redesigning it. Therefore, the designers should not provide any hints or clues, but instead should listen carefully as the testers try to figure out their design. Any misunderstanding or confusion provides valuable data for the next design cycle. If a group produces a sign that others are able to figure out immediately, provide them with another, more difficult message to convey.

Design II

Nearly everyone has some special kind of skill that most other people have never learned. In creating this instruction manual, they rely entirely on the use of graphic symbols to teach their skill to others. The designers of the manual will have to make some assumptions about the audience: which way they are facing, how nimble they are, how a two-dimensional representation of motion translates into three dimensions, etc. Assist the groups in coming up with appropriate tasks, but leave them pretty much on their own in their design of the manual. They will then test the manual by seeing if others can follow it. In the graphic design world, this is called the "function test."

As in Design I, emphasize that the test is of the manual, not of the testers, and that the purpose is to gather the data needed for redesigning it. The designers should watch carefully as others try to go through the motions they think they have communicated, and find out exactly where the instructions fail to convey their intended meaning. Most participants will be surprised at how difficult it can be to convey this kind of information graphically. The process of testing the manual usually makes reveals its shortcomings immediately. Using this information, they should then redesign the manual to try to correct its weaknesses, and try it out again.