Teaching a concept

A model

by Ruth E. Schilberg
Gary R. McKenzie

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1. Introduction

When the proud Machiguenga teacher raised the Peruvian flag for the first time near the village school deep in the Amazon jungle, a woman observer asked, “Why is he putting that cloth up on the stick? Does he need to dry it out?”

The naive observer may laugh, but the problem is very real. How do we teach the concept of a flag when such symbolization does not exist? Or how do we communicate effectively when our definition of a specific concept differs from that of those with whom we are trying to communicate? Take time, for example. In Notes on Literacy Special Issue3, Patricia Davis points out:

Time systems vary from culture to culture. The Mundani of the Republic of Cameroon divide time into eight-day weeks. Some distance away, the Noni and Bubango conceive five-day and three-day weeks instead (Davis 1987:2).

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Davis went on to conclude that:

Effective educators will seek to identify and to accommodate the student’s conceptual framework as well as to employ traditional strategies for teaching, whenever possible. If a new concept or strategy is introduced, explanations will be provided, along with demonstrations, and time will be allowed for the student to internalize the procedure (1987:8).

This paper provides a model for teaching concepts that will help indigenous people to understand new concepts, enabling them to compare their cultural understanding of a concept with that of others. Because the model and teaching strategy remain the same, no matter how different the concept, indigenous teachers will find it easier to teach concepts, and that, in turn, will help the students.

The term *concept* has been used in a variety of situations in educational literature. For the purposes of this paper, *concept* will be defined as a

… particular kind of abstract idea which: (1) defines a category or type of object, action, or property, (2) is used to classify items as members or nonmembers of a category or to compare items across cases, (3) consists of a list of characteristics which are common to all examples of the concept and sufficient to distinguish examples from nonexamples, (4) is symbolized by a single word or pair of words" (McKenzie 1979:129).

2. Establishing a common concept base

Literacy workers everywhere realize the extreme importance of the meaning for comprehension of facts. Most of us are aware of the two levels of learning—surface and deep—in which surface level learning is memorization of facts while deep level learning is understanding the conceptual ideas that make facts meaningful by helping to organize them (Foster 1986). As literacy workers struggle to increase comprehension, they need to be aware of teaching on both levels, factual and conceptual. Concepts are influenced by the learner’s personal intellectual activity and by the cultural transmissions on the part of adults in their group (Goodman 1990). When communication, and especially learning, is attempted across cultural boundaries, problems often arise. Many of those problems are due to conceptual miscommunication Lancy (1983) feels that *formal* categorization “permits communication with those who do not share one’s daily experiences or actions” (1983:66). Lancy’s assumption is that a shared understanding in the form of a formal category or concept will enable understanding. This assumption is supported in an excellent article by Tennyson and Park (1980) in which they review literature directly related to the teaching of concepts. Tennyson and Park cite an article by Johnson and Stratten which indicates that “students who are given a definition perform significantly better on classification of new examples” (1980:57). Although this research relates to American school children, definitions would be even more necessary when there are vast cultural differences and thus, differences in definition.

Tennyson and Park propose a four-step process for concept teaching:

1. The taxonomic structure of the content should be determined. The three levels of concept structure—superordinate, coordinate, and subordinate—should be analyzed with identification of critical and variable attributes.

2. A definition of the concept should be prepared in terms of the critical attributes, and a pool of examples should be prepared on the basis of critical and variable attributes.

3. The examples should be arranged in rational sets by appropriate manipulation of the attributes.

4. The presentation order of the rational sets should be arranged according to the divergency and difficulty level among examples of the concept, and the presentation order of the examples within rational sets should be decided according to updated information about the learner’s knowledge state (1980:65–66).

3. The model

Using the proposed process from Tennyson and Park and others, and some rules for guiding study from Gagné (1985) and Rothkopf, McKenzie has developed an algorithm for teaching a concept (McKenzie 1992 class notes).

By using his step-by-step procedure which follows, establishing the taxonomic structure is relatively easy. Take our example of the flag. The superordinate, which McKenzie refers to simply as domain, would be a symbol. Coordinates would be items such as shields, emblems, and insignias. Instances are examples of the concept or individual flags in our example.

However, literacy workers may find it necessary to develop not only the Western taxonomic structure, but the indigenous one as well. Many such workers have discovered that these taxonomies are not the same. Too, some indigenous groups have a sense of a hierarchy, but no labels for them. While individuals might be able to agree on relationships of items, no vocabulary exists that shows the relationships. For example, a culture might group vertebrates separate from invertebrates yet not have words equivalent to vertebrate and invertebrate. An example is the Tzeltal taxonomy of plants explained by Berlin, Breedlove, and Raven (1968). Another problem encountered is that some indigenous groups, for example, the Kewa of Papua New Guinea, have categories, but they are not mutually exclusive and are not part of a hierarchy (Lancy 1983). In each case, the problem is to find a way to relate the new concept logically to a larger framework of terms in the learner’s mental filing system. Since these structures of knowledge vary between cultures, it is difficult to be more specific than to say the domain of the concept selected should relate to a class of thing known about already by the learner, with the new concept more specifically designated.

What follows is McKenzie’s model for teaching a concept. Each section includes the teaching strategy, an example, and a discussion of strengths, weaknesses, and ideas for implementation. A complete concept lesson plan teaching the concept of week is shown in the appendix.

3.1. Step 1: Definition of concept

3.1.1. Teaching strategy

Define the concept in writing, listing defining characteristics and using the following form:

State (concept)

A kind of (name domain) with:

1. List attribute 1
2. List attribute 2
3. List attribute 3

3.1.2. Example

Flag: a kind of symbol of a group:

1. Made of cloth
2. With colors that represent elements important to the group
3. With a design that represents the group

3.1.3. Discussion

When introducing a concept, the definition should be stated in a simple, easy-to-remember form like that above, which states the term, states the domain or superordinate to which it belongs, and lists the critical attributes or characteristics common to all members of the class. This allows the students to use the domain and critical attributes as a checklist, which is easier to understand than a traditional dictionary definition. The problem is that definitions are “rarely stated in this form in printed materials so the teacher will need to make up clearer definitions than are given” (McKenzie 1979:139). In cross-cultural situations, this will need to be done by the linguist or literacy worker. Do not expect teachers to be able to do this immediately. They may be able to do so after they have become familiar with the teaching strategy and have gained confidence in describing concepts by their attributes or characteristics.

Perhaps the hardest and most important step in the concept strategy is to state the meaning of the concept to be taught, by listing attributes that define the concept class. That is, you will have to list properties or characteristics that pupils can see in examples, which must be present in the example, and which distinguish the object from nonmembers of the class. And that is just as hard as it sounds. For example: What is the definition of city, and how is it distinguished from towns and metropolitan areas? (McKenzie 1979:139).
After listing some cases you know are examples of the concept, list the properties that are common to all the examples and distinguish them from nonexamples. For example, define city by thinking of some you know, and noncities.

A city is a kind of community that: is fairly large—certainly larger than a town of 10,000 people and has different areas in it—residential areas, business areas, industrial areas, and so forth, and they are incorporated into a governmental unit, and they have definite boundaries marked as city limits.

Now that may not be the world’s best definition, but it is workable and [students] can use it to decide if a given place is a city or not by checking population, neighborhood variety, governments and limits. Note that all cities do have houses—and must have houses—but that houses are not useful characteristics to mention in the definition since farms have houses and so do metropolitan areas—and houses are covered by community. Only list critical distinguishing attributes (McKenzie 1979:140).

3.2. Step 2: Statement of objective

3.2.1. Teaching strategy

State the objective to require classification on new examples.

When given examples and nonexamples of (concept) which have not been discussed and asked to classify them, students will classify 80 percent correctly (and be able to explain decisions by the definition).

3.2.2. Example

When given examples and nonexamples of flags which have not been discussed, students will be able to identify at least 80 percent of the cases (and be able to explain decisions by the definition).

3.2.3. Discussion

Learning a concept is more than just memorizing a definition. When students can use an idea to decide whether a new item is an example or not, understanding of the concept is demonstrated.

3.3. Step 3: Establishment of set

3.3.1. Teaching strategy

Set should inform students that they are to learn a list of characteristics and use them to classify new examples. This may be done by presenting a variety of unlabeled examples and nonexamples and telling (1993). Notes on Literacy, 19(2).
students that they will be asked to decide which are (the concept term) and which are not by checking to see if they have all the necessary characteristics (McKenzie 1979).

3.3.2. Example

“Today you will learn to tell whether a symbol is a flag or not by learning what to look for in deciding.”

3.3.3. Discussion

Set is the attention-getting device used with students that helps them know what they will have to learn in the lesson. In the concept lesson, they must remember a list of characteristics (not a list of objects) and be able to use them to classify new examples.

3.4. Step 4: Presentation of definition

3.4.1. Teaching strategy

Present the definition to pupils in the form stated in Step 1. Writing the definition on a chalkboard, posterboard or overhead transparency will be helpful to students.

3.4.2. Example

See example in Step 1.

3.4.3. Discussion

Though most people have a highly developed memory, providing the definition in checklist form is often helpful because the list form helps learners use the definition systematically in deciding if a new case is an example of the class. If the students are nonliterate or beginning readers, you may use pictorial symbols for each attribute that students can use as a checklist. See Chart 4.

There may still be a problem with the definition, and this is that the students may not understand the meanings of the words used in the list of characteristics and be able to recognize examples of these subconcepts in new instances. The problem is that concepts are defined in terms of other concepts. Obviously one should state attributes in the form of words [your students] understand—if possible. Unfortunately you never can assume students know a term, and sometimes it is not possible to find a term they do know. So you have to make sure they know what you mean by each term in the definition by teaching each one. This can be done rather efficiently (McKenzie 1979:142).

3.5. Step 5: Presentation of examples

3.5.1. Teaching strategy

To illustrate the meanings of the words in the definition show the ideal case and point out each attribute as it is named (Chart 1). Then repeat this procedure with a variety of examples of the concept to show extreme forms that examples may take, and point out the critical attributes by having the students fill in a comparison chart (Chart 2). Recording the attributes in a comparison chart helps learners recognize that all examples have the same attributes. It also gives the students practice with the definition, helps them detect characteristics and prove the pattern.

<table>
<thead>
<tr>
<th>Domain</th>
<th>+ Char. 1</th>
<th>+ Char. 2</th>
<th>+ Char. 3</th>
<th>= Concept</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ex. 1</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Ex. 2</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Ex. 3</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Ex. 4</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Chart 1

3.5.2. Example

<table>
<thead>
<tr>
<th></th>
<th>symbol</th>
<th>+ cloth</th>
<th>+ color/grp.</th>
<th>+ design/grp</th>
<th>= Flag</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ex. 1 Peru</td>
<td>X</td>
<td>X</td>
<td>red &amp; white</td>
<td>seal of Peru</td>
<td>flag</td>
</tr>
<tr>
<td>Ex. 2 Red Cross flag</td>
<td>X</td>
<td>X</td>
<td>red &amp; white</td>
<td>cross = first aid</td>
<td>flag</td>
</tr>
<tr>
<td>Ex. 3 USA</td>
<td>X</td>
<td>X</td>
<td>red, blue white</td>
<td>Stripes = 13 colonies</td>
<td>flag</td>
</tr>
<tr>
<td>Ex. 4 Brazil</td>
<td>X</td>
<td>X</td>
<td>green, blue yellow</td>
<td>Stars = States</td>
<td>flag</td>
</tr>
</tbody>
</table>

Page 7.
3.5.3. Discussion

Because concepts possess many attributes, students need to be shown numerous examples in order to prevent undergeneralization, or failure to recognize that other cases which have differing nonessential variables are also members of the set. A wide variety of extreme examples will help students to realize the breadth of the concept. Remember that pictorial symbols can be used effectively here, as in Chart 4.

3.6. Step 6: Presentation of nonexamples

3.6.1. Teaching strategy

When students seem to see the pattern, present a nonexample stating, “This is not a concept because one necessary characteristic is missing.” Fill out the chart in order for students to identify which characteristic is missing. Repeat to prove that each defining characteristic is necessary.

3.6.2. Example

See Chart 3 for a written example. For a pictorial example, see Chart 4.
<table>
<thead>
<tr>
<th>Example</th>
<th>Symbol</th>
<th>+ Cloth/Grp.</th>
<th>+ Color/Grp.</th>
<th>+ Design/Grp.</th>
<th>= Flag</th>
</tr>
</thead>
<tbody>
<tr>
<td>Peru 1</td>
<td>X</td>
<td>X</td>
<td>Red + blood shed</td>
<td>seal = government</td>
<td>flag</td>
</tr>
<tr>
<td>Red Cross flag</td>
<td>X</td>
<td>X</td>
<td>red &amp; white</td>
<td>cross = first aid</td>
<td>flag</td>
</tr>
<tr>
<td>USA 3</td>
<td>X</td>
<td>X</td>
<td>red, blue white</td>
<td>stripes = 13 colonies</td>
<td>flag</td>
</tr>
<tr>
<td>Brazil 4</td>
<td>X</td>
<td>X</td>
<td>green, blue yellow</td>
<td>stars = states</td>
<td>flag</td>
</tr>
<tr>
<td>Uniform 1</td>
<td>NO</td>
<td>X</td>
<td>school colors</td>
<td>school insignia</td>
<td>not a flag</td>
</tr>
<tr>
<td>USA 2 Quarter</td>
<td>X</td>
<td>NO</td>
<td>NO</td>
<td>American eagle</td>
<td>not a flag</td>
</tr>
<tr>
<td>Seal 3</td>
<td>X</td>
<td>NO</td>
<td>green, gold white</td>
<td>natural resources</td>
<td>not a flag</td>
</tr>
</tbody>
</table>

Chart 3
3.6.3. Discussion

Overgeneralization, or the extension of a concept beyond proper limits to call items that are not examples by the concept term, is as much a problem as undergeneralization. Overgeneralization can be overcome by giving a number of nonexamples. Ideally and logically, one should show a case in which all of the distinctive characteristics but one are correct. As you can see in the example above, that may not always be possible. If it is impossible, an option might be to make up a hypothetical case: for example, "Fernando took a piece of blue cloth to symbolize bravery and put it on a stick. He said the blue represented the Piro people. Why wouldn’t that be a flag for the Piro people?" (Elicit the answer that unless it has a unique design, it could represent many different groups.)

3.7. Step 7: Presentation of unlabeled cases

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3.7.1. Teaching strategy

When students have seen each characteristic proven, present a new, unlabeled case and ask the students to decide if it is or is not an example. Require each student to raise a hand to classify the example as representing the concept being studied. Ask why, and verify the correct answer. Repeat interchanging examples with nonexamples until the students make few errors.

3.7.2. Example

“Now students, let’s see if you can tell whether some new things are flags or not by using the checklist you have just learned. The French use a blue cloth with gold fleur-de-lis on it to symbolize their country. Raise your hand if you think that is a flag. (Pause, glancing around at answers.) Good. Almost everyone thinks it is a flag. why did you think that, Hig? (Elicit response.) Very good. It was a flag because it was a symbol of France, it was made of cloth, and had colors and designs that represent France.” Repeat interchanging examples with nonexamples until the students make few errors.

3.7.3. Discussion

The purpose of this step is to provide students with practice in using the definition to classify new cases. They will need to learn to use the chart carefully and prove that the definition extends to new cases. Except for the statement of the definition, the test-like event (Step 8) is the most important single step in a concept lesson. It forces the students to apply each idea in the definition to a new case and thus generalizes the students’ idea of what each term means. It trains them to use the definition as a checklist and provides feedback about what correct answers should be. By explaining why an item is an example or nonexample, individuals are allowed to clarify and correct any misapplications. It also allows the teacher to estimate informally which students have mastered the idea and allows him or her to isolate and correct errors, and most importantly, it assures that most students will score high on a final test by withholding the formal test until most students can classify the concept examples accurately.

3.8. Step 8: Formal evaluation

3.8.1. Teaching strategy

Test by using the same kind of questions as in Step 7, but without the feedback and with new examples. If students are literate, you might want to have them write down the concept if it is an example. If it is a nonexample, have them write No and name the missing characteristic.

3.8.2. Example

1. Flag
2. No, not cloth

3. Flag

3.8.3. Discussion

If the teacher does all of the other steps well, student scores should be quite high and they should feel quite successful.

Concept achievement tests can be made diagnostic by making about half of the new cases proper examples, and then making up two or more nonexamples which omit only the first characteristic, two or more nonexamples which include all but the second characteristic and so on. Then in grading, if the student misses all the nonexamples that omitted Characteristic 2, you know that he failed to notice or understand that particular characteristic, and you know how to help the student most efficiently (McKenzie 1979:148–149).

4. Conclusion

Introducing a new concept will never be an easy matter, but with the McKenzie model shared above, the concept lesson can become more than surface level memorization of facts. Instead, students will demonstrate deeper learning through the application of the definition in the form of a checklist to identify examples and nonexamples.

Preparation and development of materials may be more time consuming initially as one struggles with taxonomies and critical attributes, but the end result will be gratifying enough to compensate for that initial effort. Students will have a better understanding of the concepts and you may find that they learn them more rapidly as well.

Appendix A

A.1. Sample concept lesson: Week

A.1.1. Objective

When given new, short stories that measure time and asked to classify them as week or nonweek, students will be able to do so with 70 percent accuracy.

A.1.2. Set

Inform students that there are numerous ways to measure time. One of them is a week. The purpose of today’s lesson is to learn the definition of week and to be able to use that definition to decide whether a measure of time is a week or not.

(Display an item from the test-like events as a prequestion.) Explain: “At the end of the lesson, I’ll give you little stories like this and ask you to decide if it is a week. What you will have to do is remember a list of things that all weeks must have and use that list to check and see if the story has all the necessary parts. If it fits the list exactly, it is a week. If something is missing, it isn’t a week. How many of you think this is a week? How many of you think it isn’t? How many aren’t sure?”

A.1.3. Presentation

Display the following definition.

A week is a measure of time that
1. is of several days’ duration
2. is measured by days
3. repeats itself in a continuous cycle

Explain that the domain and attributes must all be true if a measure of time is to be a week.

A.1.4. Examples

The teacher explains the following examples of week and fills in the chart (Chart 5).

<table>
<thead>
<tr>
<th>Ex 1 West</th>
<th>Measure of time</th>
<th>+ Char. 1 Duration</th>
<th>+ Char. 2 Days</th>
<th>+ Char. 3 Cycle</th>
<th>− Week</th>
</tr>
</thead>
<tbody>
<tr>
<td>X</td>
<td>X</td>
<td>7</td>
<td>X</td>
<td>YES</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Ex 2 Bubango</th>
<th>Measure of time</th>
<th>+ Char. 1 Duration</th>
<th>+ Char. 2 Days</th>
<th>+ Char. 3 Cycle</th>
<th>− Week</th>
</tr>
</thead>
<tbody>
<tr>
<td>X</td>
<td>X</td>
<td>3</td>
<td>X</td>
<td>YES</td>
<td></td>
</tr>
</tbody>
</table>

Chart 5

1. In the western world, short lengths of time are measured in seven day cycles.
2. The Bubango people in Cameroon, West Africa, go to three different market towns on three consecutive days. They measure time by this short cycle.

A.1.5. Nonexamples


Page 13.
Explain that students must be careful, because if one part is missing, it is not a week. Give the examples and fill in the chart as shown in Chart 6.

<table>
<thead>
<tr>
<th>Example</th>
<th>Measure of time</th>
<th>+ Char. 1 Duration</th>
<th>+ Char. 2 Days</th>
<th>+ Char. 3 Cycle</th>
<th>- Week</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ex 1 West</td>
<td>X</td>
<td>X</td>
<td>7</td>
<td>X</td>
<td>YES</td>
</tr>
<tr>
<td>Ex 2 Bubango</td>
<td>X</td>
<td>X</td>
<td>3</td>
<td>X</td>
<td>YES</td>
</tr>
<tr>
<td>Ex 3 Month</td>
<td>X</td>
<td>NO</td>
<td>30-31</td>
<td>X</td>
<td>NO</td>
</tr>
<tr>
<td>Ex 4 Vacation</td>
<td>X</td>
<td>X</td>
<td>10</td>
<td>NO</td>
<td>NO</td>
</tr>
<tr>
<td>Ex 5 1 Day</td>
<td>X</td>
<td>X</td>
<td>NO</td>
<td>X</td>
<td>NO</td>
</tr>
</tbody>
</table>

Chart 6

Example 3. Time is often measured in cycles that are 30 or 31 days in length. But that is not a short duration, so it is **not** a week.

Example 4. The Walker family took a short vacation for 10 days. But a vacation is not a cycle so it is **not** a week.

Example 5. We can measure time in short cycles of 24 hours. But because it is not measured by days, it is **not** a week.

A.1.6. Test-like practice

Explain to the students that now you will present some new cases and that they will have to decide whether or not the example is a week. Instruct them to listen carefully, check the list of characteristics and then have them raise their hand to indicate whether or not they think it is a week. After each case has been identified, ask why, and confirm the correct answer.

1. “The Mundani people of Cameroon have market days on an eight-day cycle. They use this short cycle to measure time. Raise you hand if you think this is an example of a week.” (Pause, observe) “Why?” (Confirm a correct answer.)

2. “The Western world divides time by 5 days for work and two days for pleasure. Raise your hand if you think the two days are an example of a week.” (Pause, observe) “Why not?” (Confirm a correct answer.)

3. “The world revolves around the sun once every 365 days. This cycle repeats itself continually. Raise your hand if you think this is an example of a week.” (Pause, observe) “Why not?” (Confirm a correct answer.)

4. “The Noni people of Cameroon use a five-day cycle as a short measure of time. Raise your hand if you think this is an example of a week.” (Pause, observe) “Why?” (Confirm a correct answer.)

Repeat this process with more examples as needed. The teacher will be able to tell if more practice is necessary by watching the students’ responses.

A.1.7. Final evaluation

When most of the students can identify a week using the checklist given above, they are ready for a final evaluation.

References


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Citations


Citations

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Citations


Citations


Citations

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