

Concept Comparison

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The Concept Comparison Table is a tool teachers can use to help students in diverse classrooms develop the higher-order thinking skills that are so important to academic success

Teachers and students at all levels face complex demands in today's classrooms. Increasing amounts of content, limited instructional time, and intensified academic demands related to the standards-based reform movement (McDonnell et al., 1997) can present daunting challenges.

One of the challenges educators and students alike face more frequently is found in the content standards many states have adopted. These standards emphasize higher-order thinking skills, such as making comparisons, in addition to the acquisition of factual information.

The *Concept Comparison Routine*, one of the University of Kansas Center for Research on Learning's Content Enhancement Routines, has been developed to help teachers and students together explore similarities and differences between two or more items of conceptual information.

The foundation of the *Concept Comparison Routine* is the Concept Comparison Table (see example in Figure 1 on page 2), a graphic device featuring shapes, numbers, and word cues that guide the student and teacher in exploring two or more items. The table is set up in a sequence that can be followed logically to analyze similarities and differences and summarize them in a concise statement. The table provides space for

- naming the concepts to be compared
- naming the larger concept
- listing characteristics of each concept
- identifying characteristics that are alike across concepts
- naming the larger category associated with each like characteristic

- identifying characteristics that are different across concepts
- naming the larger category associated with each pair of different characteristics
- summarizing the similarities and differences between and among items
- challenging students to extend their understanding

Cue-Do-Review

The *Concept Comparison Routine*, the instructional routine used with students to create the Concept Comparison Table, contains three instructional phases: "Cue," "Do," and "Review." The overall goal associated with these phases is to develop the table interactively to help students understand the information.

Although some parts of the routine are directly under the control of the teacher, such as announcing the items that will be compared, students should be actively involved in a learning partnership whenever possible while constructing the table.

Cue

The purpose of the Cue Phase is to get students ready to construct the Concept Comparison Table. First, the teacher names the conceptual information that will be compared. Then, the teacher cues students about the importance of understanding the information, instructs them to take notes, and explains that he or she will help them understand the information through the use of the Concept Comparison Table.

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>>>Do

The Do Phase of the *Concept Comparison Routine* involves the construction of the Concept Comparison Table by students, as much as possible, with teacher guidance. Following a series of steps, the teacher leads students through the logical cognitive process involved in making a comparison and creating a summary statement about that comparison.

Step 1: Communicate targeted concepts. In this step, the teacher names the concepts that will be compared. In Figure 1, the concepts to be compared are “birds” and “mammals.”

Step 2: Obtain the overall concept. In this step, the teacher names the overall concept category into which the items that will be compared fit. In our example, the overall concept into which “birds” and “mammals” both fit is “vertebrates.”

Step 3: Make lists of known characteristics. In the third step, students list all of the characteristics associated with the items they are comparing. For “birds,” for example, the list might include that birds are warm-blooded, they live worldwide, they have feathers, they have backbones, most fly, and their young hatch from eggs. Characteristics of “mammals” might include that most travel by foot, they are warm-blooded, they live worldwide, they have hair and backbones, and most of their young are born alive.

Step 4: Pin down like characteristics. In this step, the teacher and students identify the characteristics that are alike. For example, both birds and mammals are warm-blooded, live worldwide, and have backbones.

Step 5: Assemble like cat-

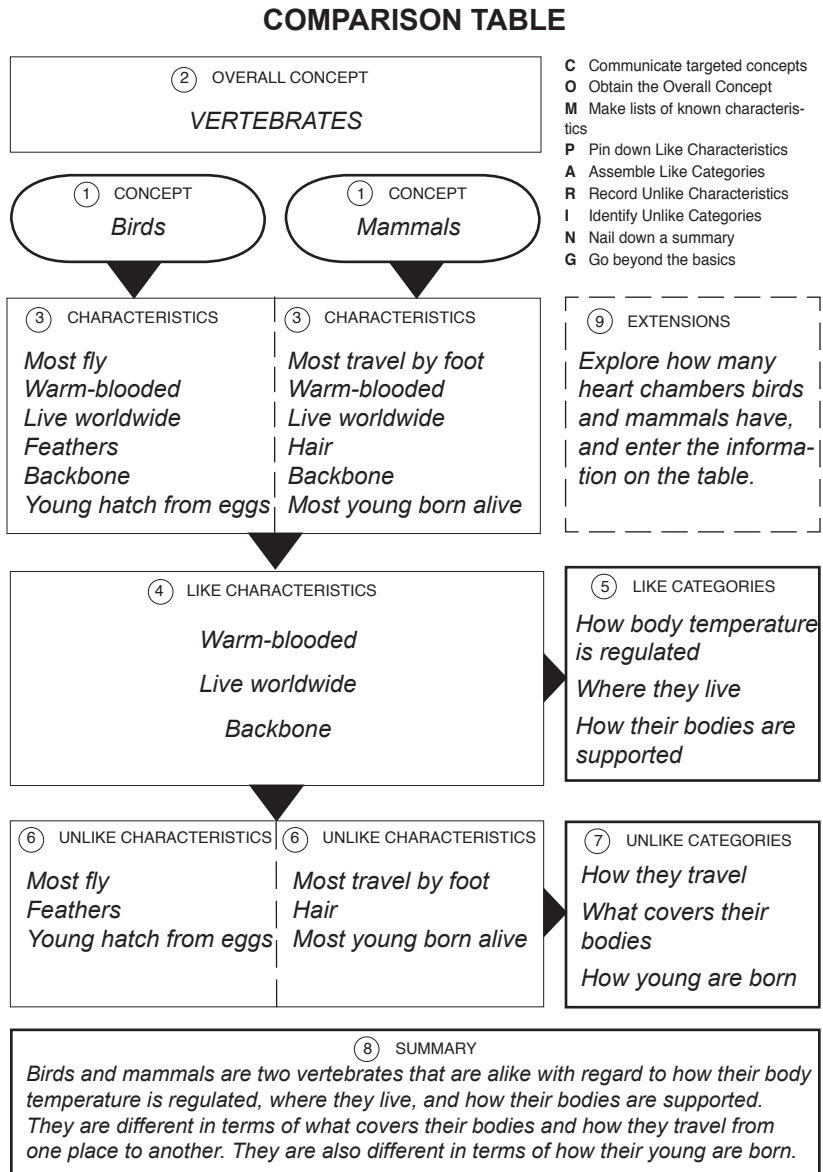


Figure 1

egories. The teacher and students identify the categories associated with the like characteristics. Birds and mammals, for example, are alike in how their body temperature is regulated (warm-blooded), where they live (worldwide), and how their bodies are supported (backbones).

Step 6: Record unlike characteristics. Next, the teacher and students identify the characteristics of the concepts they are comparing that are different. In our example, most birds fly,

while most mammals travel by foot. Birds have feathers, while mammals have hair. Baby birds hatch from eggs, while most mammals are born alive.

Step 7: Identify unlike categories. After identifying unlike characteristics, the teacher and students identify the categories associated with the pairs of unlike characteristics. Birds and mammals differ in how they travel (fly/by foot), what covers their bodies (feathers/hair), >>>

Powerful learning device

Sorting characteristics into categories is a powerful learning device. It helps students organize their memory load related to a specific concept more efficiently and encourages them to engage in higher-order thinking. See page 6 for more information about the power of the Concept Comparison Table and Routine to meet the needs of struggling students while encouraging all students to engage in higher-order thinking skills.

>>> and how their young are born (hatched from eggs/born alive).

Step 8: Nail down a summary. In this step, the students and teacher write a summary statement synthesizing what they have learned about the similarities and differences of the items they are comparing. In Figure 1, the summary statement is “Birds and mammals are two vertebrates that are alike with regard to how their body temperature is regulated, where they live, and how their bodies are supported. They are different in terms of what covers their bodies and how they travel from one place to another. They also are different in terms of how their young are born.”

Step 9: Go beyond the basics. In the final step, students respond to a challenge that requires extending their understanding of the conceptual information into new areas. This challenge is listed in the “extensions” box on the right side of the Concept Comparison Table. In our example, the challenge is “Explore how many heart chambers birds and mammals have, and enter the information on the table.”

The extension question serves at least two purposes. First, it is a good way to help students respond to a thinking challenge on their own—a challenge that educators and assessment ex-

perts emphasize more and more. Through a good extension question, such as the final challenge question on the Concept Comparison Table, students may solidify their understanding of the concepts they just studied, gain confidence in using that information, and generalize their understanding to real world situations. Second, it is a way for students and teachers to get the big picture of the ties among many of the Content Enhancement Routines. Unpacking and answering a critical question is the focal point of the *Question Exploration Routine*, the ultimate goal of the *Course, Unit and Lesson Organizers*.

COMPARING: Students and teachers can use the acronym “COMPARING” to remember the steps of the *Concept Comparison Routine*.

- Communicate targeted concepts
- Obtain the overall concept
- Make lists of known characteristics
- Pin down like characteristics
- Assemble like categories
- Record unlike characteristics
- Identify unlike categories
- Nail down a summary
- Go beyond the basics

Review

The Review Phase involves reviewing the information in

the table, checking students’ understanding of the information, and discussing the process involved in analyzing conceptual information to make meaningful comparisons. The purpose of this phase is to ensure that students not only can speak about the information in the table but also can explain the cognitive processes involved in analyzing a comparison and how those cognitive processes can be applied to other comparison tasks.

Research results

KU-CRL researchers conducted two studies related to the Concept Comparison Table and *Concept Comparison Routine*. In the first, they studied whether students in a controlled setting could benefit from use of the table and routine. The second study explored whether teachers of inclusive general education classes could incorporate the technique into regular classroom practice.

These studies provided support for the growing body of evidence that the Content Enhancement approach to instruction (Bulgren & Lenz, 1996) can yield positive results with regard to student learning in classes comprising diverse groups of learners. They also indicate that teachers can easily learn a complex teaching routine and are satisfied with such a routine.

Study 1

The first study measured students’ ability to recall individual characteristics and categories (Recall Score), to recall complete sets of characteristics and categories (Complete Set Score), and to recognize characteristics (Recognition Score). Researchers also looked at the students’ combined test scores (Total Score).

The results of this study >>>

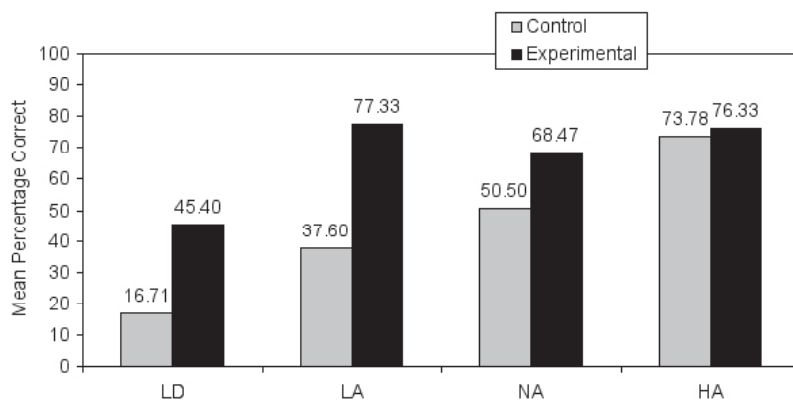


Figure 2: Mean percentage scores earned by students in control and experimental conditions on test designed to assess recall of individual characteristics and categories (Recall Score).

>>> indicated that normal-achieving (NA) and low-achieving (LA) students as well as students with learning disabilities can benefit from the use of the Concept Comparison Table and *Concept Comparison Routine*.

Students with LD in the experimental group scored significantly higher than students with LD in the control group on both recall measures and recognition measures. NA students in the experimental group scored significantly higher than NA students in the control group on the Complete Set Score.

The LA students seemed to get the biggest “boost” of all the subgroups in regard to learning. The mean recall scores of the LA control group were in the low failing range, and the recall scores of the LA experimental group were in the average (“C”) range. The mean recognition score of the LA control group was in the average (“C”) range, and the recognition score of the LA experimental group was in the superior (“A”) range. This indicates that use of the *Concept Comparison Routine* can enhance the performance of LA students on a variety of assessments.

The figures on this page and page 5 illustrate the mean percentage scores earned by students in control and experimental conditions on the four measures studied: Recall Score (Figure 2), Complete Set Score (Figure 3), Recognition Score (Figure 4), and Total Score (Figure 5). For all measures, students in the experimental group scored higher than students in the control group. The differences between experimental and control group scores for the NA, LA, and LD subgroups were statistically significant. However, there were no statistically significant differences in the scores of the high-achieving students in the

experimental and control groups. This may have been related to a “ceiling” effect since the control students’ mean Total Score was high.

Students’ Total Scores represented passing grades (scores above 60 percent) for the following percentages of students:

- Students with LD: 29.41 percent in the control group and 70.76 percent in the experimental group
- Low-achieving students: 50 percent in the control group and 83.33 percent in the experimental group
- Normal-achieving students: 87.5 percent in the control group and 94.12 percent in the experimental group
- High-achieving students: 100 percent in the control group and 91.65 percent in the experimental group

As these figures illustrate, Study 1 supported the notion that performance of NA, LA, and LD students on measures of higher-order thinking (recall of conceptually related information) can be improved through use of the Concept Comparison Table and Routine.

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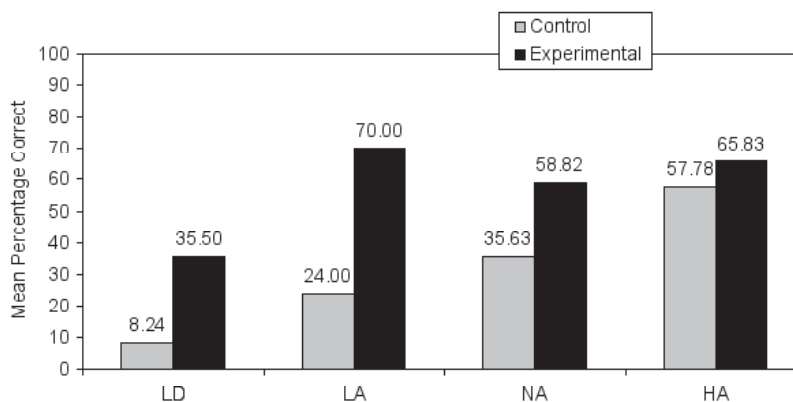


Figure 3: Mean percentage scores for students in control and experimental conditions on test designed to assess recall of complete sets of characteristics and categories (Complete Set Score).

>>> Study 2

In the second study, teachers attended a two-hour workshop that included a description of the Concept Comparison Table and the routine associated with the table, the rationales for using the Concept Comparison Table and Routine to present content information, a demonstration by researchers of the use of the table and routine, practice in developing the tables, and practice in presenting the routine. Teachers then selected conceptual information involving comparisons they judged important for students to understand, planned their instruction, and implemented the routine in their classes on their own schedules.

Researchers observed the teachers before the professional development workshop and after they implemented the routine in their classrooms. Before learning the routine, when teachers said they were going to present a lesson involving a comparison, they tended to teach the information sequentially and did not explicitly make comparisons. That is, they covered the first topic and then covered the second topic. Thus, although the teachers may have been identifying comparisons as a part of their instruction, they

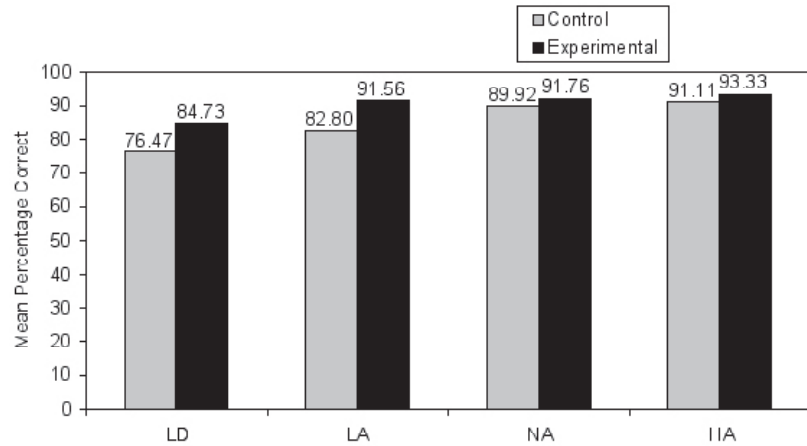


Figure 4: Mean percentage scores earned by students in control and experimental conditions on test designed to assess recognition of characteristics (Recognition Score).

were not focusing on those comparisons or teaching the students how to make comparisons.

After Concept Comparison training, teachers provided ways to understand similarities and differences between or among items in 100 percent of the researchers' observations.

Researchers also collected data to determine the total number of times teachers provided cues about the importance of understanding similarities and differences between or among conceptual items. Before Concept Comparison training, teachers provided cues that the information they were about to present

was important to understand only once (2.4 percent of the observations). After training, teachers cued the importance of understanding similarities and differences 31 times in 39 classes (79.5 percent).

Additionally, the teachers' satisfaction ratings indicated that they were satisfied with the routine and the graphic device in many areas. Therefore, the results of the study suggest that when an instructional innovation is well defined and teachers are provided explicit instruction and concrete examples for using it, their implementation of the innovation is likely to be successful.

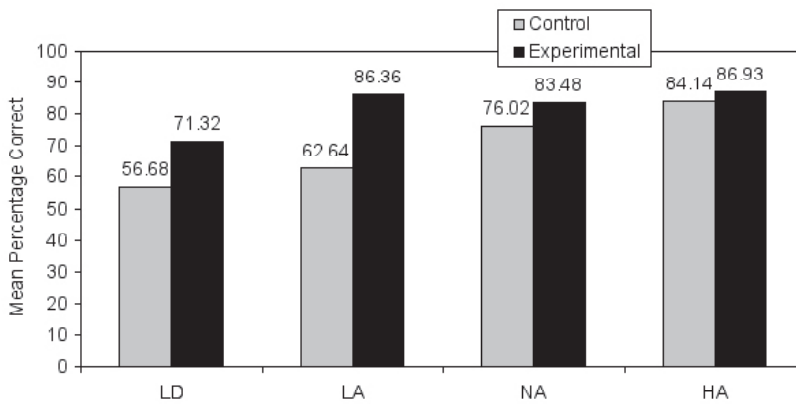


Figure 5: Mean percentage scores for students in control and experimental conditions on combined test scores (Total Score).

Conclusion

The Concept Comparison Table and *Concept Comparison Routine* are tools teachers can use to help students in diverse general education classrooms develop and hone the higher-order thinking skills that are so important to academic success in today's educational environment.

The *Concept Comparison Routine* manual, written by Janis A. Bulgren, B. Keith Lenz, Donald D. Deshler, and Jean B. >>>

Continued on page 7

All that a Venn Diagram is...and

The power of Content Enhancement Routines lies in the fact that they have been developed to add explicitness to instruction without diluting the learning experience for high-achieving students. The Comparison Table is a beautiful example of how this attention to the needs of students benefits both struggling students **and** high-achieving students.

The Comparison Table provides the same function as one of the tools teachers commonly use for making comparisons, the Venn Diagram. But whereas the Venn Diagram stops at naming the core concepts and associated details that are shared and unique to each concept, the Comparison Table goes beyond facts to encourage higher-order thinking skills.

In a typical Venn Diagram comparing two concepts, two overlapping circles represent the items to be compared (see example in Figure 1). Characteristics of each concept are listed within the circles; characteristics shared by the two concepts are listed in the overlapping area. To arrive at the characteristics that are unique to each and the characteristics they share requires a lot of “behind-the-scenes” steps, steps that are critical for students to be aware of if they are to gain a sound understanding of the concepts being compared **and** if they are to learn the *process* of independently using such a tool to make comparisons.

The use of just a Venn Diagram to explore comparisons requires a lot of assumed knowledge.

This is where most students who struggle get lost.

The Comparison Table, in contrast, makes this process explicit. In Figure 2 on page 7, the portion of the Comparison Table in the gray box represents the same information—the facts—you would

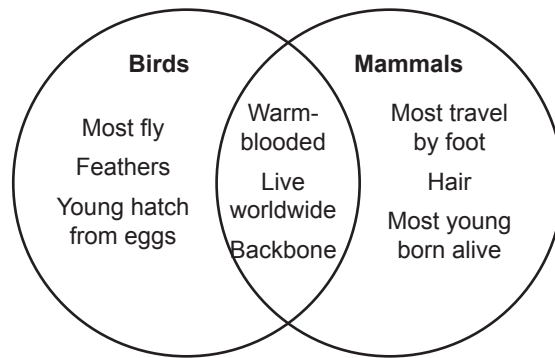


Figure 1: Venn Diagram

find in a Venn Diagram. Section 1 names the two concepts that will be compared. In Section 3, students list the characteristics of each concept. They identify which of the listed characteristics are shared and which are unique in Sections 4 and 6 of the table.

These sections of the table take care of the facts associated with the comparison of the two concepts. The sections of the Comparison Table surrounded by the dotted lines represent the higher-order thinking skills that increase understanding, facilitate learning, and give the language needed to talk about and use the information being compared. These sections move beyond the facts—and beyond the scope of a Venn Diagram.

Section 2: Overall Concept, for example, explicitly labels the two

items being compared, a piece of information missing from Venn Diagrams. This explicitness is critical for students with learning difficulties. Teachers cannot assume that these students will be able to make these connections independently nor that they will have the language to talk about the information being compared.

At the same time students with learning difficulties are benefiting from the explicitness of the Comparison Table, the table challenges gifted students to exercise their higher-order thinking skills.

In the sample Comparison Table, for example, “warm-blooded” is listed as a characteristic of both birds and mammals. A teacher using this table would encourage students to name the category to which this characteristic belongs. In other words, if “warm-blooded” is a cookie, what is the label on the cookie jar? In the sample table, the answer is “how body temperature is regulated.” The answer is written in the Like Categories section of the table. This process pushes students to come up with the category, which is an example of higher-order thinking.

When it comes time to put all

In the absence of these labels, the only things one can talk about are details or facts. This puts a tremendous load on memory.

the information together in a summary, the language we use to talk about things is generally the equivalent of the cookie >>>

Continued on page 7

Venn Diagram

(Continued from page 6)

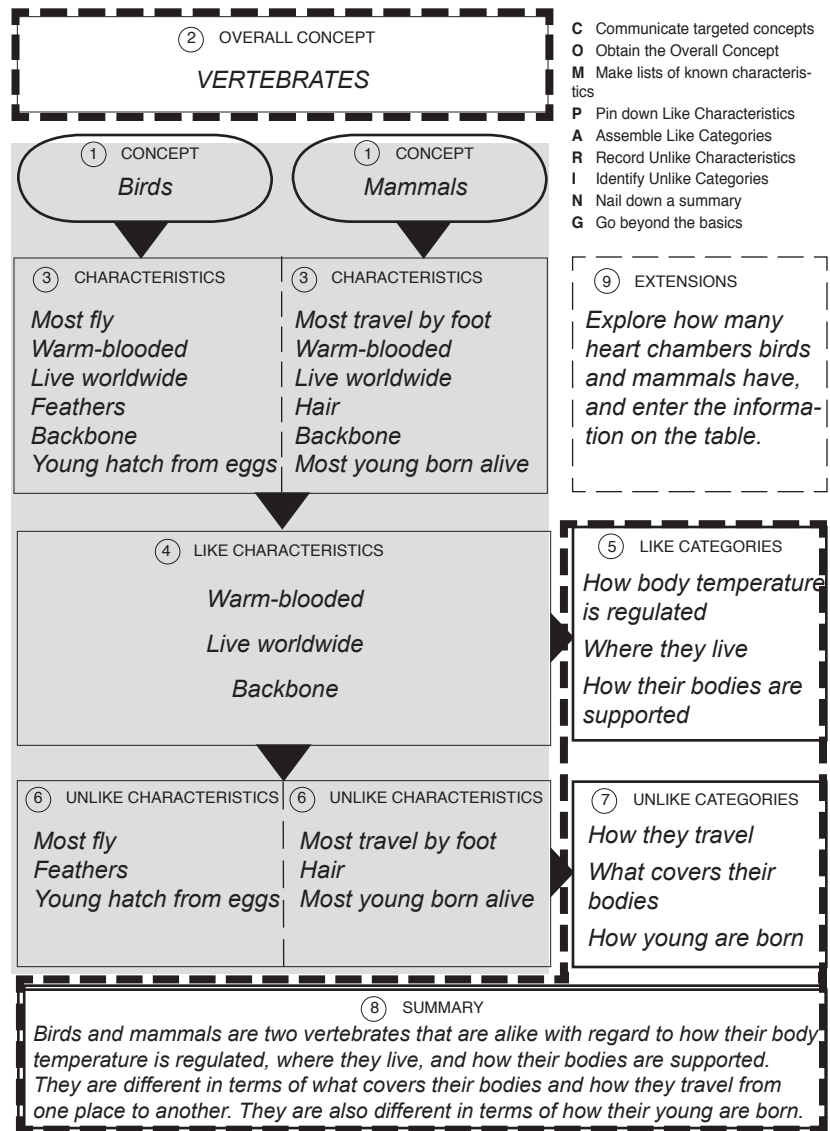
>>> jar labels. In the absence of these labels, the only things one can talk about are details or facts. This puts a tremendous load on memory.

We can help students and relieve some of the memory demands by pushing students to acquire the language—the labels—they can use to talk about the concepts and their related details in a comparative way.

The Comparison Table is just one example of how we can build on a traditional teaching tool—the Venn Diagram, in this case—and in the process help the lowest of the low-achieving students with explicit instruction and challenge the high-achieving students to acquire or sharpen their higher-order thinking skills. ●

—Don Deshler, KU-CRL

COMPARISON TABLE



- C Communicate targeted concepts
- O Obtain the Overall Concept
- M Make lists of known characteristics
- P Pin down Like Characteristics
- A Assemble Like Categories
- R Record Unlike Characteristics
- I Identify Unlike Categories
- N Nail down a summary
- G Go beyond the basics

Concept Comparison

(Continued from page 5)

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Figure 2: Comparison Table

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