

ACTIVATING PRIOR KNOWLEDGE

At the beginning of an introductory psychology course, Mrs. Penley wrote the word psychology on the board. Then she asked students to tell her everything they knew about the term.

As students answered, she wrote key words on the board. Students analyzed the word itself (e.g., its root, its meaning, its basic definition). They also discussed their associations with the word. Students identified the following associations: Sigmund Freud, dream interpretation, therapy, and hypnosis.

By the end of the discussion, Mrs. Penley had a list of the basic knowledge students had about psychology. Throughout the course, Mrs. Penley used the information students already had learned about psychology as a springboard for helping them learn new information.

The strategies in the final category of instructional approaches all help students retrieve what they already know about a topic. In nontechnical terms, this is sometimes referred to as “activating prior knowledge.” Mrs. Penley was activating the prior knowledge of her students in an informal but effective way when she asked students to think about what they already knew about the word *psychology*. Cues and questions, as well as advance organizers, are techniques that teachers can use to activate students’ prior knowledge.

Cues and questions are very similar. Cues are “hints” about what students are about to experience. For example, a teacher is giving students a cue when she explains that the film they are about to watch on the functioning of the cell will provide some information they already know about the cell, but it will also provide some new information. The teacher has told students what the topic of the film is, which helps them to activate their prior knowledge. Also, the teacher has told them to expect some new information, which establishes expectations for students. Questions perform about the same function. For example, prior to watching the film on the functioning of the cell, the teacher might ask students questions that elicit what they already know about the topic.

Another way that teachers can help students use their background knowledge to learn new information is to present them with advance organizers. Advance organizers are organizational frameworks that a teacher presents in advance of learning. Advance organizers emphasize the essential ideas that the teacher plans to cover in a lesson or unit.

CUES AND QUESTIONS

1. Present Students with Explicit Cues.

(See Illustration 1)

Cues are very straightforward ways of activating prior knowledge. Teachers can give students explicit previews about what they are about to experience, as exemplified by Illustration 1.

2. Ask Questions that Require Students to Make Inferences About Content.

(See Illustration 2)

Even the best-designed lesson requires students to “fill in” a great deal of missing information. Questions can greatly aid students in this process, as exemplified by Illustration 2. To use questions, a teacher would identify things, people, actions, events, and states or conditions referred to in information students are learning and then ask questions such as those listed below.

Questions About Things or People

- How is this thing usually used? (*How is a hammer usually used?*)
- What is this thing (or person) part of? (*What is a piston part of?*)
- What is the process for making this thing? (*What is the process for making cotton?*)
- What action does this thing (or person) usually perform? (*What action does the U.S. Speaker of the House usually perform?*)
- What action is usually performed on this thing? (*What action is usually performed on a piano?*)
- Does this thing have a particular taste, feel, smell, sound? What is it? (*Do roses have a particular feel?*)
- What particular color, number (or quantity), location, or dimensionality does this thing have? (*What particular number of electrons, protons, and neutrons does hydrogen have?*)
- How is this thing usually sold? (*How are eggs usually sold?*)
- Does this person have a particular emotional state? What is it? (*What is the emotional state of Hamlet after his father’s death?*)
- Does this thing have a particular value? (*What is the value of a 5-carat diamond?*)
- When this thing is used, does it present a particular danger to other things or to people? What is it? (*What danger might a knife present to things or people?*)

Questions About Actions

- What thing or person usually performs this action? (*Who usually flies an F-18 fighter plane?*)
- What effect does this action have on the taste, feel, sound, or look of this thing? (*What effect does boiling have on the look of water?*)
- How does this action typically change the emotional state of a thing or person? (*How does a stressful situation at work typically change the emotional state of a person?*)
- How is the value of a thing changed by this action? (*How is the value of a river changed by building a dam?*)
- How does this action change the size or shape of a thing? (*How does freezing and thawing change the size or shape of a concrete sidewalk?*)
- How does this action change the state of a thing? (*How does raising interest rates change the state of the economy?*)

Questions About Events

- What people are usually involved in this event? (*What people are usually involved in a legal trial in the United States?*)
- During what season or time of year does this event usually take place? (*During what season or time of the year is the shortest day of the year?*)
- On what day of the week does this event usually take place? (*On what day of the week does the stock market usually open?*)
- At what time of day does this event usually take place? (*At what time of day do fish usually eat?*)
- Where does this event usually take place? (*Where do sessions of the U.S. Congress usually take place?*)
- At what point in history did this event take place? (*At what point in history did the death of Socrates take place?*)
- What equipment is typically used in this event? (*What equipment is typically used in a debate?*)
- How long does this event usually take? (*How long does a volcanic eruption usually take?*)

Questions About States

- What is the basic process involved in reaching this state? (*What is the basic process involved in hypothermia?*)
- What are the changes that occur when something reaches this state? (*What are the changes that occur when someone becomes hypothermic?*)

3. Present Students with Questions that Require Them to Analyze What They Are Studying in Complex Ways. (See Illustration 3)

Some questions require students to analyze information that is presented to them, as exemplified by Illustration 3. To facilitate this type of questioning, it is useful for students to be able to use analytical skills such as the following, each of which can be cued by one or more specific questions:

Analyzing Errors: Identifying and articulating errors in the logic of information.

What are the errors in reasoning in this information?

How is this information misleading?

How could it be corrected or improved?

Constructing Support: Constructing a system of support or proof for an assertion.

What is an argument that would support the following claim?

What are some of the limitations of this argument or the assumptions underlying it?

Analyzing Perspectives: Identifying and articulating personal perspectives about issues.

Why would someone consider this to be good (or bad or neutral)?

What is the reasoning behind his or her perspective?

What is an alternative perspective, and what is the reasoning behind it?

ILLUSTRATION 1: GIVE EXPLICIT CUES

Romeo and Juliet

Ms. Baker's English class was about to begin a Shakespeare unit. One of the plays students were going to read was *Romeo and Juliet*. To introduce the play, Ms. Baker presented the following cues:

- The play takes place in a town in Europe.
- The country is shaped like a boot.
- The main characters are "star-crossed lovers."
- The male lead gives a romantic monologue under his lover's balcony.
- The play has a tragic end.

Ms. Baker then asked students to talk in pairs about the cues and what they already knew about *Romeo and Juliet*.

ILLUSTRATION 2: ASK QUESTIONS THAT ELICIT INFERENCES

the Federal Reserve System

Ms. Bodrova assigned a reading about U.S. monetary policy for homework. To focus students as they read, she asked them to be ready the next day to discuss three questions:

1. What actions does the Federal Reserve System usually perform?
2. How is monetary policy usually used?
3. How does monetary policy affect inflation in the United States?

Juan took notes on each of the questions so he would be ready for the next day's discussion:

What actions does the Federal Reserve System usually perform?

We usually just think that the Federal Reserve System raises or lowers interest rates — which they do, but not directly. The “Fed” uses “tools” to affect interest rates:

*open market purchases or selling government securities
increasing the discount rate charged on loans it makes to commercial banks
raising or lowering reserve requirements for commercial banks*

How is monetary policy usually used?

The Federal Reserve System uses monetary policy to control the amount of money in circulation and the availability of credit in the financial system. Basically this means they do things to raise or lower interest rates and that affects demand for good and services (for individual consumers and businesses).

How does monetary policy affect inflation in the United States?

If monetary policy stimulates demand too much (so that labor and capital can't keep up in the long run), then salaries and prices will rise at faster rates. If monetary policy keeps short-term rates low, that will eventually cause higher inflation and higher interest rates. [But will this change permanently increase output or decrease unemployment? Better ask about this tomorrow!].

The questions helped students make sense of what they had read. The next day Ms. Bodrova used the questions to guide the class discussion and help students clarify misconceptions and fill in gaps in their understanding.

ILLUSTRATION 3: GIVE STUDENTS ANALYTICAL QUESTIONS

media and society

During a unit on the media, Mr. Brokaw asked his students to consider the question, Does the media *affect* society or *reflect* society? He then asked students to construct support for their opinions using facts, evidence, and examples.

As an additional step, he had students identify the limitations of their arguments. For example, if a student argued that the media reflect society, a limitation of her argument might be statistics regarding the higher percentage of violent acts on television compared to the percentage of violent acts in the United States.

Mr. Brokaw also asked students to analyze perspectives by finding a partner who held a perspective that was different from their own, identifying the reasons or logic behind that perspective, and then constructing support for that perspective. Finally, as students presented their arguments to the class, Mr. Brokaw asked the rest of the class to listen to the arguments and identify any errors in reasoning or ways in which the information was misleading. For example, one student said that a presenter used circular reasoning because the presenter argued that the media affect society by saying, “People are clearly influenced by what they see on television”— that is, he backed up his claim with a statement that was simply a restatement of the claim.

ADVANCE ORGANIZERS

1. Present Students with Expository Advance Organizers.

(See Illustration 1)

Expository advance organizers describe, in either written or verbal form, the new content students will be exposed to, as exemplified by Illustration 1. An expository advance organizer may simply provide students with the meaning and purpose of what is to follow. However, it may also give students more detailed information about what they will be learning or an example of what they will be learning, especially for information that may be difficult to understand. As with all advance organizers, an expository advance organizer emphasizes the important information in a lesson or unit.

2. Present Students with Narrative Advance Organizers.

(See Illustration 2)

A narrative advance organizer takes the form of a story. In Illustration 2, the teacher provides the essential ideas of the lesson or unit she plans to teach by telling a story that incorporates some of the key ideas. Advance organizers help students connect what they are about to learn to prior knowledge and focus on what is important.

3. Use Graphic Advance Organizers.

(See Illustration 3)

Graphic organizers were discussed in Chapter 6 as a type of nonlinguistic representation. They also can be effectively used as advance organizers, as exemplified by Illustration 3.

4. Use Skimming as an Advance Organizer.

(See Illustration 4)

Skimming information before reading can be a powerful form of advance organizer. When a teacher asks students to skim learning materials, he gives them the opportunity to preview the important information that they will encounter later by focusing on and noting what stands out in headings, subheadings, and highlighted information, as exemplified by Illustration 4.

ILLUSTRATION 1: EXPOSITORY ADVANCE ORGANIZER

field trip to a butterfly farm

Ms. MacKenzie's second grade class was going on a field trip to a butterfly farm. She prepared students for the trip by telling them that their guide would share some information with them about butterflies. She said that the guide would explain the life cycle of a butterfly, show them a big map explaining butterfly migration patterns, and show them where the butterflies live.

Ms. MacKenzie also told her students that the butterflies' home was completely covered with net to keep them from flying away and that they would see butterflies from all over the world and in every color of the rainbow. She asked students to count how many different kinds of butterflies they saw at the farm. Finally, she said if they were really lucky, they'd get to see some butterflies come out of their cocoons!

ILLUSTRATION 2: NARRATIVE ADVANCE ORGANIZER PERSONAL STORY

immigrating from Sweden

Before beginning a unit about the experience of immigrant groups who moved to the United States, Mr. Anderson told the story of his grandfather, who immigrated from Sweden:

"My grandfather Gustav came here from Sweden in the late 1800s. My name, Anderson, tells you right away that I have Swedish heritage. Anderson means the 'son of Anders.' The Danish use 'sen,' *Andersen*.

"Anyway, my Grandpa Gus came here with his cousin Nels. They were young kids, 18 or 19 years old. I've often thought what a spirit of adventure they must have had. They had

(Illustration continued on next page.)

ILLUSTRATION 2 (continued)

been farmers in Sweden, but there was a potato famine and thousands of Swedes immigrated to the United States around that same time.

“Somehow Grandpa Gus and cousin Nels made it to Minneapolis where Grandpa Gus met a girl named Brynhild, whom he married. Grandma Bryn was also from Sweden. When I was little, we would go to their house to celebrate Santa Lucia Day, near Christmas. One of my cousins would get to wear a beautiful white dress and a garland of lighted candles on her head. There was always a huge table full of food. There was one kind of fish that was very stinky, but there were also lots of delicious cookies and cakes. As a family we were celebrating our Swedish heritage, but also making new traditions in the United States.

“Gus and Nels encountered many obstacles trying to make it in the U.S., but they also had many opportunities here that they didn’t have back home in Sweden. We’ll talk about some of these obstacles and opportunities throughout this unit.”

ILLUSTRATION 3: GRAPHIC ADVANCE ORGANIZER

arthropods

Mr. Henry’s sixth grade class was about to watch a video about arthropods. Before showing the video, Mr. Henry gave students a graphic organizer with the main ideas filled in, which cued students about what they’d be seeing. He asked students to listen and watch carefully so they could add to the organizer as they watched the video. Specifically, he wanted students to add important information related to the ideas on the organizer and perhaps add other main ideas or topics.

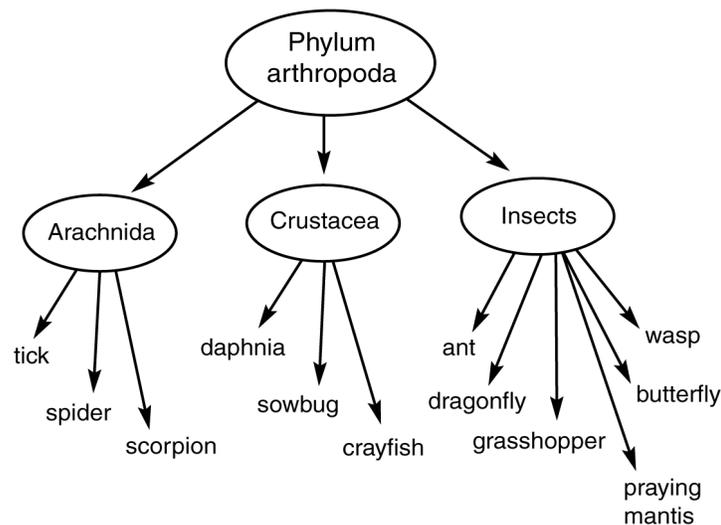


ILLUSTRATION 4: SKIMMING

Genesis space mission

Mr. Sutton's ninth grade science class was about to read an article on the Genesis space mission — a NASA mission that will send a spacecraft to collect pieces of the sun, called solar wind, to try to determine what the sun is made of.

Before students began reading, Mr. Sutton introduced them to a skimming strategy that involved previewing and questioning before reading to organize the information in the article.

Mr. Sutton asked his students to quickly read over the article about the Genesis space mission, paying careful attention to any headings, subheadings, and the topic sentence of each paragraph. He gave them only 60 seconds to skim the article and cautioned them not to get too bogged down in any one section.

Students made brief notes about the headings and subheadings and wrote down any questions that came to mind. Skimming the article and writing questions helped them to know what information they would encounter and what information to look for when they read the article more carefully.

THEORY AND RESEARCH IN BRIEF • • •
Activating prior knowledge

CUES AND QUESTIONS — Findings from some of the studies that have synthesized research on cues and questions are summarized in Table 10.1.

Table 10.1: Research Results for Cues and Questions

Synthesis Study	Focus	No. of Effect Sizes	Ave. Effect Size	Percentile Gain ^a
Ross, 1988	Cues	6	.41	16
Walberg, 1999	Questions	14	.26	10
Redfield & Rousseau, 1981	Questions	14	.73	27
Wise & Okey, 1983	Questions	5	.37	14
	Cues	38	.53	20
Stone, 1983	Cues	83	.75	27
Bloom, 1976	Cues	11	1.21	39
Crismore, 1985	Cues	231	.60	23
Hamaker, 1986	Question	100	.75	27
Guzzetti, Snyder, & Glass, 1993	Cues and questions	11	.80	29

^aThese are the maximum percentile gains possible for students currently at the 50th percentile.

ADVANCE ORGANIZERS — Findings from some of the studies that have synthesized research on advance organizers are provided in Table 10.2. As the data presented show, there is a fair amount of variability in the effect sizes for the studies we reviewed. Effect sizes range from a low of .09 to a high of .80. Of particular interest relative to classroom practice is the variety of advance organizers reported in the Stone (1983) study. Expository advance organizers had the largest effect, with skimming, narrative advance organizers, and illustrated advance organizers next in order of magnitude.

Table 10.2: Research Results for Advance Organizers

Synthesis Study	Focus	No. of Effect Sizes	Ave. Effect Size	Percentile Gain ^a
Walberg, 1999	General effects of advance organizers	29	.45	17
		16	.24	9
Hattie, 1992	General effects of advance organizers	387	.37	14
Lott, 1983 ^b	General effects of advance organizers	17	.09	3
		5	.77	28
Stone, 1983	Expository advance organizers	44	.80	29
	Narrative advance organizers	12	.53	20
	Skimming as an advance organizer	15	.71	26
	Illustrated advance organizers	15	.52	20

^aThese are the maximum percentile gains possible for students currently at the 50th percentile.

^bTwo effect sizes are listed for the Lott study because of the manner in which effect sizes were reported. Readers should consult that study for more details.

The activation of prior knowledge has been shown to be critical to learning of all types. Indeed, our background knowledge can influence what we perceive. This was demonstrated in a 1981 study by Brewer and Treyns.

Researchers brought 30 students individually into a room and told them that it was the office of a professor who was conducting an experiment. Each student was asked to wait for a short while. After 35 seconds, the students were taken to another room and asked to write down everything they could recall about the office. Brewer and Treyns hypothesized that students would remember those items they expected to see in a professor's office regardless of whether they were there or not. In other words, Brewer and Treyns hypothesized that students' prior knowledge would influence what they perceived. This is precisely what happened. Twenty-nine of 30 students remembered that the office had a desk and a chair, but only eight recalled that it had a bulletin board and a skull; and nine students recalled that the office had books, which it did not. The students remembered what they expected to see regardless of whether it was there or not. Use of prior knowledge can be a powerful learning tool.