13. What do I typically do to help students reflect on their learning?

The teacher engages students in activities that help them reflect on their learning and the learning process.

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Element 13: What do I typically do to help students reflect on their learning?

Strategies

Reflective journals

Students use a portion of their academic notebooks to respond to reflection questions such as the following:

- What predictions did you make about today’s lesson that were correct? Which predictions were incorrect?
- What information in today’s lesson was easy for you to understand? What information was difficult?
- How well do you understand the major ideas we are studying?
- What did you do well today?
- What could you have done better today?

Think logs

Students reflect on specific cognitive skills (for example, classification, drawing inferences, decision making, creative thinking, and self-regulation) that were emphasized during a lesson. Students can respond to prompts such as the following:

- How might you explain classification to a friend?
- Describe an inference you drew today.
- With what aspects of the decision-making process are you most comfortable? With what aspects are you least comfortable?
- What might be the components of a self-regulation plan for your own learning?

Exit slips

At the end of a lesson, students respond to specific reflective questions before they leave the room. Examples of questions students might respond to include the following:

- What do you consider the main ideas of today’s lesson?
- What do you feel most and least sure about?
- Do you have specific questions about today’s lesson?
- With which aspects of today’s classwork were you successful?
Knowledge comparison

Students compare their current levels of knowledge on a topic, or levels of competence with a procedure, to their previous levels of knowledge or competence. Students can use diagrams or flowcharts to show the progression of their knowledge gain.

Two-column notes

Students use two-column notes as an extended reflection activity at the end of a lesson. In the left-hand column, students record facts or other information that they found interesting from the lesson. In the right-hand column, they record their reactions, questions, and extended ideas related to the facts or information in the left-hand column.

Technology Links

- Use a class website, blog, or wiki to capture and post ideas generated in class.
- Use an online survey tool (such as www.surveymonkey.com) to collect student reflections.
- Encourage students to post their reflections using websites such as www.wifiti.com or www.todaysmacet.com. Websites such as www.photobucket.com allow students to post pictures that exemplify what they have learned.
Design Question 2
What Will I Do to Help Students Effectively Interact with New Knowledge?

Module 6

Helping Students Elaborate on New Content, Summarize and Represent Their Learning, and Reflect on Their Learning

This module continues our exploration of strategies for helping students interact with new knowledge. In the previous two modules we addressed strategies for identifying critical-input experiences, previewing new content, presenting new content in small chunks, organizing students into small groups, and facilitating interaction about new content. In this module we address asking questions that require students to elaborate on new knowledge, having students write out their conclusions and represent their learning nonlinguistically, and having students reflect on their learning.

Reflecting on Your Current Beliefs and Practices

Before examining the strategies in this module, take some time to examine your current beliefs and practices by answering the following questions:

1. How do you use questions to help your students process new information, skills, and procedures?
2. How do you use questions and follow-up probes to encourage students to elaborate on insights and inferences they have drawn in response to new knowledge, particularly new content they have learned in critical-input experiences?

3. To what extent do you have students write out their conclusions about their experiences?

4. How do you use nonlinguistic representations such as graphic organizers as tools for students’ elaboration on new knowledge?

5. To what extent are students in your classroom actively engaged in self-reflection and self-monitoring about their acquisition and application of new knowledge?

**Recommendations for Classroom Practice**

This module addresses the following strategies for Design Question 2:

- Asking questions that require students to elaborate on information
- Having students write out their conclusions
- Having students represent their learning nonlinguistically
- Having students reflect on their learning
Asking Questions That Require Students to Elaborate on Information

Questioning techniques have always been considered one of the most robust tools in a teacher's arsenal. Here we address two general categories of questions: (1) general inferential questions and (2) elaborative interrogations.

General Inferential Questions

General inferential questions come in two types: default questions and reasoned inference questions. Default questions ask students to fall back on (i.e., default to) their own background knowledge. At the conclusion of a videotaped introduction to deserts, for example, students might be asked to draw on their knowledge of deserts as living systems: *What kinds of organisms do you think we will find there? How do these plants and animals survive in this harsh environment? What are some things you know about deserts?* Questions involving reasoned inferences require students to use information from critical-input experiences to speculate on what is likely to be true about something they have studied. For example, students who have listened to a brief introduction to romanticism in English poetry might be asked questions such as this: *Based on what you heard in this introduction, what do the terms “romanticism” and “romantic” mean?* When answering this question, students would be expected to explain which parts of the introduction led them to their answer. With these types of questions, students are describing the inferences behind their answer—hence the name “reasoned inference.” The answer to a question is not something they already know. Rather, it is constructed from information provided in the critical-input experience. To answer a reasoned inference question, students must point out the information that led them to the conclusion.

Elaborative Interrogations

Elaborative interrogations extend reasoned inference questions to a level that requires students to provide logical support for their conclusions. With the reasoned inference questions described earlier, students simply point out the information they used to construct their answers. However, when answering elaborative interrogations, students must explain and defend their logic. Elaborative interrogation questions have the following forms:

- Why do you believe this to be true?
- Why do you think that is so?
- What are some typical characteristics or behaviors you would expect of ________?
- What would you expect to happen if ________?
To illustrate, as students provide answers to questions about a historical figure they have been studying, a social studies teacher might ask questions such as these: Why do you believe this to be true about the historical figure? What is the evidence supporting your conclusions? As part of this process, the teacher attempts to clarify and articulate the thinking process he has heard the student use to arrive at the inference. Similarly, during a chemistry lab, the teacher might ask students to respond to the following question: Based on what you have observed in previous labs, what would you expect to happen if we combine the following chemicals? When students provide their answers, the teacher would ask them to justify the supporting logic.

Examples

High School Composition. After having students study the writing process and use it to compose well-written essays, the teacher asks students the following question: What generalizations about effective writing can you make? Explain the facts that support your generalizations. Because the teacher does not ask students to justify the reasoning behind their answers, this is not an elaborative interrogation. However, it is a reasoned inference question because students must state the information that led to their conclusions.

Elementary Mathematics. After studying the concepts of area and perimeter, the teacher poses the following question: If you change the dimensions of a square but keep it as a rectangle with the same unit area, how will its perimeter change? Explain why your answer has to be true based on what we know about the relationship between area and perimeter. This elaborative interrogation question requires students to show their logic and defend why it is accurate.

Activity Box

Construct one general inferential question and one elaborative interrogation question you might use in class.

Having Students Write Out Their Conclusions

As students extend and refine their knowledge of new content, they can more deeply process the new information by participating in a variety of writing tasks. Here we emphasize note-taking strategies and student notebooks.
Note-Taking Strategies

Students benefit enormously by using a combination of note-taking strategies, including taking purposeful running notes combined with summaries and nonlinguistic representations of key ideas, concepts, and processes. We emphasize the interactive nature of effective note taking, allowing students to process what they are hearing or observing. During a series of critical-input experiences, for example, when the instructor deliberately chunks key information, students can be encouraged to write down key ideas, terms, and generalizations.

One important recommendation we support is that students not try to take notes while new information is being presented in small chunks (see Module 5). When information is new to students, they should be allowed to concentrate on understanding it. Trying to take notes will distract them and decrease their comprehension. After students have had a chance to process the small chunks of content, they can turn their attention to taking notes.

When students start taking notes, we recommend that they be afforded a great deal of flexibility and variety in the way they take notes. The following are some options for note taking.

**Informal Outline.** When using the informal outline, students use indentation to indicate big ideas and the ideas that support them. This approach is depicted in Figure 6.1.

| FIGURE 6.1 |
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| Periodic Table of Elements |
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**FIGURE 6.1**
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**Periodic Table of Elements**

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  - Some groups contain elements with very similar properties
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**Figure 6.2**
Example of a Free-Flowing Web

Combination Notes, Pictures, and Summary. In this approach, students record their written notes in the left-hand panel; they draw pictures or pictographic representations of the content in the right-hand panel; and they write a summary in the panel at the bottom. This technique is depicted in Figure 6.3.
### FIGURE 6.3
Example of Combination Notes, Pictures, and Summaries

<table>
<thead>
<tr>
<th>Human Reproduction</th>
<th>Birth</th>
</tr>
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<tbody>
<tr>
<td>Humans have a life cycle—birth, growth, reproduction, and death.</td>
<td>[Diagram of Circle of Life: Birth, Death, Growth, Reproduction]</td>
</tr>
<tr>
<td>Human babies are born to a male and female.</td>
<td></td>
</tr>
<tr>
<td>All humans grow at individual rates.</td>
<td></td>
</tr>
<tr>
<td>Reproduction happens when a male and female engage in sexual intercourse and the male sperm fertilizes the female egg. Some humans do not reproduce, either by choice or circumstance.</td>
<td></td>
</tr>
<tr>
<td>A boy or girl is born within about 9 months of conception.</td>
<td></td>
</tr>
<tr>
<td>The human life span varies greatly, some living past 100 years old.</td>
<td></td>
</tr>
</tbody>
</table>

Human beings are unique. They share a common life cycle, though the specific duration and details of the life cycle vary.

### Academic Notebooks

Academic notebooks can function as a compilation of entries that provide partial records of instructional experiences students have had. These notebooks can help students reflect on and assess their evolving thinking as they progress through a grading period or an academic year. By providing a sequential record of students' understanding of content, academic notebooks allow students to make corrections in their own thinking.

Students in all content areas can use academic notebooks to record their growing knowledge related to the course or grade-level content they are studying. In a middle school mathematics class, for example, students can divide their notebook into sections that parallel specific classroom tasks and activities. They may have a section devoted to introductory learning tasks (i.e., critical-input experiences) in which they date entries that summarize their reactions, questions, and growing understanding of key unit content. Another section may be devoted to two-column notes in reaction to class lectures and presentations. As part of this section, they may include periodic review and reflection activities in which they assess what they have learned, how they have progressed, and emerging questions they need answered. Their teacher may also require them to keep a reflective journal as part of their academic notebook. In this section, students would enter
end-of-class, lesson, and segment reflections on their conclusions, reactions, and insights related to key content they study. Overall, their work with their notebooks becomes an organic and living interaction with the knowledge they are acquiring.

Examples

*High School History.* In a unit on the American Revolution, students are encouraged to devote a section of their academic notebook to a running record of their evolving knowledge, skills, and understanding. At key juncture points in the unit, their teacher has them pair with another student to compare their growing insights, conclusions, and questions based upon their shared notes. Periodically, students are asked to synthesize what they conclude about changes in their thinking related to the revolution, using their notes as a kind of archival record of their growth and progress.

*Elementary School.* As an activity in most of her critical-input lessons, this elementary school teacher has students work in pairs or triads to develop notes with pictures and summaries on sheets of chart paper. Each pair or triad then explains its notes to the whole class.

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**Activity Box**

Which of the strategies for note taking described in this section most closely matches how you have used note taking in the classroom? What are some new ideas you might try?

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**Having Students Represent Their Learning Nonlinguistically**

As educators we might have a tendency to underemphasize students' ability to use signs and symbols to process their experiences and visualize how they are internalizing new knowledge. Graphic organizers and other visual representations greatly enhance students' processing of information, skills, and procedures. They are also highly effective ways to assess students' accuracy and depth of understanding about key concepts. Students should use a range of graphic organizers (e.g., characteristic patterns, sequence patterns, process-cause patterns, problem-solution patterns, and generalization-supporting detail patterns) to help them deepen their insight and understanding. The use of a wide range of graphic representations also enhances students' reading comprehension and critical reasoning skills. Figure 6.4 shows common types of graphic organizers.
Similarly, students' participation in dramatic enactments can contribute significantly to their retention of knowledge and their cognitive processing of it. In effect, students can become human representations of key concepts they are studying. This process is both engaging to learners and highly memorable.
Finally, students' retention of key information can be enhanced through their use of a variety of mnemonic devices using imagery. We recommend two especially effective strategies: (1) rhyming pegwords—associating items in a list with imagery assigned to numbers (e.g., 1 = bun, 2 = shoe, and so on); and (2) link strategies—linking symbols and substitutes together in a chain of events or a narrative.

The *rhyming pegword method* is a simple system that can be used to remember information organized in a list. The method uses a set of words easily remembered because they rhyme with the numbers 1 through 10:

1 is a bun  
2 is a shoe  
3 is a tree  
4 is a door  
5 is a hive  
6 is a stack of sticks  
7 is heaven  
8 is a gate  
9 is a line  
10 is a hen

The pegwords *bun, shoe, tree,* and so on are easy to remember and are also concrete and easy to picture. If a student wanted to connect information to pegword 1 (*bun*), she would form a mental image of the bun interacting with that information. For example, if a student wanted to remember the steps involved in a specific mathematical proof, she would visualize the first step occurring in a large hot dog bun; she would visualize the second step occurring in a shoe, and so on. (For a more detailed discussion, see *The Art and Science of Teaching*, Marzano, 2007, p. 55.)

The *link strategy* is a mnemonic device that involves linking symbols and substitutes together in a chain of events or a narrative story. To illustrate, assume that a unit of instruction focuses on the 13 original American colonies: Connecticut, Delaware, Georgia, Maryland, Massachusetts, New Hampshire, New Jersey, New York, North Carolina, Pennsylvania, Rhode Island, South Carolina, and Virginia. A football jersey represents New Jersey, and the Empire State Building is used as a symbol for New York. The name *George Washington* sounds like *Georgia,* and the words *Christmas carols* provide good reminders for the two Carolinas; dinnerware is used as a symbol for Delaware, and so on. Students link the mental images for each of the 13 original colonies into one story. For example, students picture George Washington (Georgia) wearing a football jersey (New Jersey). Next, students imagine George holding dinnerware (sounds like Delaware) as he stands on top of the Empire State Building (New York) and sings two Christmas carols (North and South Carolina). With his left hand, George is using the dinnerware to cut into a Virginia ham (Virginia and New Hampshire). In his right hand, George is holding a pen
(Pennsylvania) and connecting dots (Connecticut) on a puzzle. These dots join to form a picture of a road (Rhode Island), and Marilyn Monroe (Maryland) is riding on this road on her way to Mass (Massachusetts).

**Examples**

*Graphic Organizers.* Students engaged in a unit on John Steinbeck's novel *Of Mice and Men* use a variety of graphic organizers (as shown in Figure 6.4) to track and monitor their reactions to the novel and their changing conclusions about its structure and meaning. They include these graphic organizers in a section of their academic notebooks and modify the representations as they read Steinbeck's work. They use descriptive pattern organizers (a variation of Characteristic Pattern) to record key aspects of characterization. The large circle contains the name of a specific character, and the spoke-and-ball extensions represent character attributes (e.g., motivation, physical appearance, relationships). They identify key components of plot structure using the Sequence Pattern organizer, and they analyze cause-effect patterns in the novel using the Process-Cause Pattern graphic. Finally, as they prepare for an assessment in which they will create an analytical essay, they use the Generalization Pattern graphic to establish their thesis statement and supporting claims and assertions.

*Dramatic Enactments.* In this 5th grade history unit on the Industrial Revolution, the teacher periodically engages students in dramatic enactments. She assigns each of them a poster with the name of an individual or an event associated with the era. Larger posters are placed throughout the room, identifying significant historical trends and outcomes. Students are asked to form cause-and-effect lines, visually and physically depicting their perceptions about how the individual or event they represent is aligned with or contributed to the larger trends and outcomes. Students are asked to give a “headline” explanation of what their individual poster represents and why they placed themselves in the particular location in the room that they did. Their teacher has them revisit this process multiple times throughout the unit, culminating in a final composition and short presentation synthesizing what they perceive to be the most significant cause-effect patterns associated with this important historical era.

*Mnemonic Devices Using Imagery.* Elementary science students are asked to memorize a list of significant scientific concepts associated with important processes in the human body. For each process, their teacher asks them to create a mnemonic device to store and access key information. To remember systems in the human body, they are asked to create symbols that will substitute for each system and help them to make each system's formal name memorable to them. As students learn about important structural features within each system, their teacher has them use a link system to memorize the features in the cause-effect order in which they are found within each system. As students progress through the unit, they are periodically asked to share mnemonic devices they have created to memorize significant content knowledge in the unit. At the conclusion of the unit, their
teacher asks them to reflect in their academic notebooks on which mnemonic devices and related imagery were the most effective in helping them store key information—and why.

**Activity Box**

Describe how you have used or might use graphic organizers, dramatic enactments, and mnemonic devices.

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**Having Students Reflect on Their Learning**

The final step in a comprehensive approach to actively processing information is student self-reflection, which is particularly useful at the end of critical-input experiences. Once again, we stress the importance of questioning as a catalyst for success in this process. Questions that might be asked include these: *What were you right and wrong about? How confident are you about what you have learned? What did you do well during your learning experience and what could you have done better?*

In a broader sense, using reflective questions and other strategies can enhance students’ capacity for metacognitive introspection. Specifically, all learners benefit from being asked to self-monitor and self-regulate, including continually examining how well they comprehend what they are learning and why they are learning it. Students should also play a central role in assessing their own progress toward proficiency relative to identified learning goals, asking questions such as these: *How am I doing? What do I understand better now? What am I still confused about? How could I have completed this task differently?* Here we consider three ways to stimulate student reflection.

**Reflective Questions and Journals**

At the end of a lesson or key unit segments, students can be asked to return to the section of their academic notebooks that functions as their reflective journal. As a closure activity, the teacher would ask them to respond in a four- to five-minute free write to a reflective question she poses. Here are some examples: *What were you right about in today’s lesson? Which aspects did you get wrong or have trouble with? How well do you understand the major ideas we are studying in this unit? What did you do well today? What could you have done better?*
Think Logs

A variation of reflective questions and reflective journal entries is a more specialized form of student self-reflection. A think log can be a part of a reflective journal or a separate section of students' academic notebooks. Each entry in a think log asks students to reflect on their understanding and use of a key cognitive skill. The teacher selects the focus of a particular think log entry based on what she emphasized with students during a particular lesson or unit segment. Here are some examples: 

- How would you explain classification to a friend? 
- How comfortable are you with drawing inferences? 
- What aspects of the decision-making process we used in class did you feel most—and least—comfortable with? 
- How well did you use your creativity and self-regulation habits of mind today? 

Periodically, students can also be asked to share think log entries and compare their responses with those of their classmates.

Exit Slips

A simple but effective self-reflection strategy is the closure activity called an “exit slip.” At the conclusion of a lesson or a class period, students are asked to respond to a specific reflective question that the teacher feels is particularly relevant to that lesson. As their title implies, exit slips are required for students to leave the class. Typically, students respond on a half-sheet of paper or a note card, reacting to a variety of questions such as these:

- What do you consider the main ideas of today's lesson? Why? 
- As we are moving through this unit, what do you feel most and least sure about? 
- What suggestions could you make for helping us get the most out of this unit? 
- Do you have specific questions about this content that you would like answered? 
- Which aspects of your class work today do you consider most successful? Are there things you might do differently in the future to improve your performance?

Examples

Primary Language Arts. In this 1st grade class the teacher frequently ends a critical-input lesson by asking the students to stand up one at a time and tell the class something new they have learned during the class. She also asks them to state a question they have about what they learned.

Secondary Science. This science teacher has students create a reflection section in their academic notebooks. Systematically, she gives students time to record their thoughts in this section. She invites them to share their thoughts with the rest of the class or to give her their notebooks to take home and read if students have a private communication they want to express.
Activity Box
Describe how you have used or might use reflective questions and journals, think logs, and exit slips.

Checking for Understanding
Use the following rating scale to assess your current understanding and comfort level regarding key strategies and processes presented in this module:

4 = I understand and already fully implement this strategy in my classroom.
3 = I understand this strategy, but I need to practice using it in my classroom.
2 = I can explain this strategy, but I am not fully confident that I can use it.
1 = I do not understand this strategy, and I do not currently use it in my classroom.

1. Using general inferential questions
   Based on my rating, I may need to revisit the following:
   
2. Using elaborative interrogation questions
   Based on my rating, I may need to revisit the following:
   
3. Using a variety of ways for students to write out their conclusions
   Based on my rating, I may need to revisit the following:
4. Having students represent their learning nonlinguistically
   Based on my rating, I may need to revisit the following:

5. Having students reflect on their learning
   Based on my rating, I may need to revisit the following: