Questioning Anticipation Guide

1. Write the BEST question a student has ever asked you. (Best can be funniest)

2. What percentage of your professional learning focused on Questioning?

   Of that, what percentage focused on students asking/writing questions?

3. Select one of the following quotes and write a short reflection:

"Judge a man by his answers rather than his questions." Voltaire

"Take the attitude of a student, never be too big to ask questions, never know too much to learn something new." Og Mandino

"To solve any problem, here are 3 questions to ask yourself: First, what could I do? Second, what could I read? Third, who could I ask?" Jim Rohn

"I never learn anything talking. I only learn things when I ask questions." Lou Holz

Characteristics of Highly Effective Teaching and Learning ~ Common to all Content Areas

The following statements represent characteristics that are common to all content areas.

Instructional Rigor and Student Engagement: a teacher supports and encourages a student's commitment to initiate and complete complex, inquiry-based learning requiring creative and critical thinking with attention to problem solving

Teacher Characteristics:

___A - Teacher instructs the complex processes, concepts and principles contained in state and national standards using differentiated strategies that make instruction accessible to all students.

___B – Teacher scaffolds instruction to help students reason and develop problem-solving strategies.

___C - Teacher orchestrates effective classroom discussions, questioning, and learning tasks that promote higher-order thinking skills.

___D -Teacher provides meaningful learning opportunities for students.

___E -Teacher challenges students to think deeply about problems and encourages/models a variety of approaches to a solution.

___F -Teacher integrates a variety of learning resources with classroom instruction to increase learning options.

___G -Teacher structures and facilitates ongoing formal and informal discussions based on a shared understanding of rules and discourse.

___H -Teacher integrates the application of inquiry skills into learning experiences.

___I -Teacher clarifies and shares with students learning intentions/targets and criteria for success.

Student Characteristics:

___A -Student articulates and understands learning intentions/targets and criteria for success.

___B - Student reads with understanding a variety of texts.

___C -Student applies and refines inquiry skills.

Instructional Relevance: a teacher's ability to facilitate learning experiences that are meaningful to students and prepare them for their futures.

Teacher Characteristics:

___A-Teacher designs learning opportunities that allow students to participate in empowering activities in which they understand that learning is a process and mistakes are a natural part of the learning.

___B-Teacher links concepts and key ideas to students' prior experiences and understandings, uses multiple representations, examples and explanations.

___C-Teacher incorporates student experiences, interests and real-life situations in instruction.

___D-Teacher selects and utilizes a variety of technology that support student learning.

___E-Teacher effectively incorporates 21st Century Learning Skills that prepare students to meet future challenges.

___F-Teacher works with other teachers to make connections between and among disciplines.

___G-Teacher makes lesson connections to community, society, and current events.

Student Characteristics:

___A-Student poses and responds to meaningful questions.

___B-Student uses appropriate tools and techniques to gather, analyze and interpret information from quantitative and qualitative evidence.

___C-Student develops descriptions, explanation, predictions, and models using evidence.

___D-Student works collaboratively to address complex, authentic problems, which require innovative approaches to solve.

___E-Student communicates knowledge and understanding in a variety of real-world forms.

___F-Student communicates knowledge and understanding for a variety of purposes.

Knowledge of Content: a teacher's understanding and application of the current theories, principles, concepts and skills of a discipline

Teacher Characteristics:

___A- Teacher demonstrates an understanding and in-depth knowledge of content and maintains an ability to convey this content to students.

___B- Teacher maintains on-going knowledge and awareness of current content developments.

___C- Teacher designs and implements standards-based courses/lessons/units using state and national standards.

___D- Teacher uses and promotes the understanding of appropriate content vocabulary.

___E- Teacher provides essential supports for students who are struggling with the content.

___F- Teacher accesses a rich repertoire of instructional practices, strategies, resources and applies them appropriately.

Student Characteristics:

___A- Student demonstrates growth in content knowledge.

___B-Student uses and seeks to expand appropriate content vocabulary.

___C-Student connects ideas across content areas.

___D- Student uses ideas in realistic problem solving situations.

http://www.education.ky.gov/KDE/Instructional+Resources/Highly+Effective+Teaching+and+Learning/HETL+Common+Characteristics.htm

Characteristics of Highly Effective Teaching and Learning ~ Common to all Content Areas

The following statements represent characteristics that are common to all content areas.

Learning Climate: a safe environment supported by the teacher in which high, clear expectations and positive relationships are fostered; active learning is promoted	**Classroom Assessment and Reflection:** the teacher and student collaboratively gather information and reflect on learning through a systematic process that informs instruction
Teacher Characteristics: ___A. creates learning environments where students are active participants as individuals and as members of collaborative groups ___B. motivates students and nurtures their desire to learn in a safe, healthy and supportive environment which develops compassion and mutual respect ___C. cultivates cross cultural understandings and the value of diversity ___D. encourages students to accept responsibility for their own learning and accommodates the diverse learning needs of all students ___E. displays effective and efficient classroom management that includes classroom routines that promote comfort, order and appropriate student behaviors ___F. provides students equitable access to technology, space, tools and time ___G. effectively allocates time for students to engage in hands-on experiences, discuss and process content, and make meaningful connections ___H. designs lessons that allow students to participate in empowering activities in which they understand that learning is a process and mistakes are a natural part of learning ___I. creates an environment where student work is valued, appreciated and used as a learning tool **Student Characteristics:** ___A. accepts responsibility for his/her own learning ___B. actively participates and is authentically engaged ___C. collaborates/teams with other students ___D. exhibits a sense of accomplishment and confidence ___E. takes educational risks in class ___F. Practices and engages in safe, responsible and ethical use of technology	**Teacher Characteristics:** ___A. Uses multiple methods to systematically gather data about student understanding and ability ___B. Uses student work/data, observations of instruction, assignments and interactions with colleagues to reflect on and improve teaching practice ___C. Revises instructional strategies based upon student achievement data ___D. Uncovers students' prior understanding of the concepts to be addressed and addresses students' misconceptions/incomplete conceptions ___E. Co-develops scoring guides/rubrics with students and provides adequate modeling to make clear the expectations for quality performance ___F. Guides students to apply rubrics to assess their performance and identify improvement strategies ___G. Provides regular and timely feedback to students and parents that moves learners forward ___H. Allows students to use feedback to improve their work before a grade is assigned ___I. Facilitates students in self- and peer-assessment ___J. Reflects on instruction and makes adjustments as student learning occurs **Student Characteristics:** ___A. Recognizes what proficient work looks like and determines steps necessary for improving his/her work ___B. Monitors progress toward reaching learning targets ___C. Develops and/or uses scoring guides periodically to assess his/her own work or that of peers ___D. Uses teacher and peer feedback to improve his/her work ___E. Reflects on work and makes adjustments as learning occurs

http://www.education.ky.gov/KDE/Instructional+Resources/Highly+Effective+Teaching+and+Learning/HETL+Common+Characteristics.htm

NCTM | NATIONAL COUNCIL OF TEACHERS OF MATHEMATICS

Assessment
Research Brief

Five "Key Strategies" for Effective Formative Assessment

In order to build a comprehensive framework for formative assessment, Wiliam and Thompson (2007) proposed that three processes were central:

1. Establishing where learners are in their learning
2. Establishing where they are going
3. Establishing how to get there

By considering separately the roles of the teacher and the students themselves, they proposed that formative assessment could be built up from five "key strategies."

1. Clarifying, sharing, and understanding goals for learning and criteria for success with learners

There are a number of ways teachers can begin the process of clarifying and sharing learning goals and success criteria. Many teachers specify the learning goals for the lesson at the beginning of the lesson, but in doing so, many teachers fail to distinguish between the learning goals and the activities that will lead to the required learning. ***When teachers start from what it is they want students to know and design their instruction backward from that goal, then instruction is far more likely to be effective (Wiggins and McTighe 2000).***

Wiggins and McTighe also advocate a two-stage process of first clarifying the learning goals themselves (what is worthy and requiring understanding?), which is then followed by establishing success criteria (what would count as evidence of understanding?). Only then should the teacher move on to exploring activities that will lead to the required understanding.

However, it is important that students also come to understand these goals and success criteria, as Royce Sadler (1989, p. 121) notes:

> The indispensable conditions for improvement are that the student comes to hold a concept of quality roughly similar to that held by the teacher, is continuously able to monitor the quality of what is being produced during the act of production itself, and has a repertoire of alternative moves or strategies from which to draw at any given point.

Indeed, there is evidence that discrepancies in beliefs about what it is that counts as learning in mathematics classrooms may be a significant factor in the achievement gaps observed in mathematics classrooms. In a study of 72 students between the ages of seven and thirteen, Gray and Tall (1994) found that the reasoning of the higher-achieving students was qualitatively different from that of the lower-achieving students. In particular, the higher-achieving students were able to work successfully despite unresolved ambiguities about whether mathematical entities were concepts or procedures. Lower-achieving students were unable to accept such ambiguities and could not work past them. By refusing to accept the ambiguities inherent in mathematics, the lower-achieving students were, in fact, attempting a far more difficult form of mathematics, with a far greater cognitive demand.

A simple example may be illustrative here. When we write $6\frac{1}{2}$, the mathematical operation between the 6 and the $\frac{1}{2}$ is actually addition, but when we write $6x$, the implied operation between the 6 and the x is multiplication, and the relationship between the 6 and the 1 in 61 is different again. And yet, very few people who are successful in mathematics are aware of these inconsistencies or differences in mathematical notation. In a very real sense, being successful in mathematics requires knowing what to worry about and what not to worry about. ***Students who do not understand what is important and what is not important will be at a very real disadvantage.***

In a study of twelve seventh-grade science classrooms, White and Frederiksen (1998) found that giving students time to talk about what would count as quality work, and how their work was likely to be evaluated, reduced the achievement gap between the highest- and lowest-achieving students in half and increased the average performance of the classes to such an extent that the weakest students in the experimental group were outperforming all but the very strongest students in the control group.

This is why using a variety of examples of students' work from other classes can be extremely powerful in helping students come to understand what counts as quality work. Many teachers have found that students are better at spotting errors in the work of other students than they are at seeing them in their own work. By giving students examples of work at different standards, students can begin to explore the differences between superior and inferior work, and these emergent understandings can be discussed with the whole class.

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As a result of such processes, students will develop a "nose for quality" (Claxton 1995) that they will then be able to use in monitoring the quality of their own work.

2. Engineering effective classroom discussions, questions, activities, and tasks that elicit evidence of students' learning

Once we know what it is that we want our students to learn, then it is important to collect the right sort of evidence about the extent of students' progress toward these goals, but few teachers plan the kinds of tasks, activities, and questions that they use with their students specifically to elicit the right kind of evidence of students' learning. As an example, consider the question shown in figure 1 below.

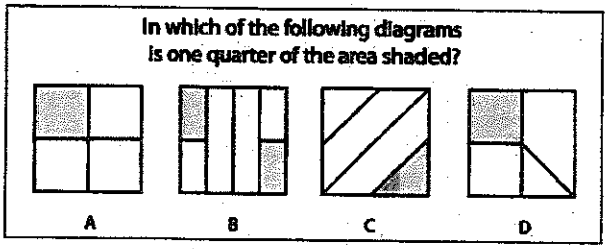

Fig. 1. Diagnostic item on elementary fractions

Diagram A is the obvious answer, but B is also correct. However, some students do not believe that one-quarter of B is shaded because of a belief that the shaded parts have to be adjoining. Students who believe that one-quarter of C is shaded have not understood that one region shaded out of four is not necessarily a quarter. Diagram D is perhaps the most interesting here. One-quarter of this diagram is shaded, although the pieces are not all equal; students who rely too literally on the "equal areas" definition of fractions will say that D is not a correct response. ***By crafting questions that explicitly build in the undergeneralizations and overgeneralizations that students are known to make (Bransford, Brown, and Cocking 2000), we can get far more useful information about what to do next.*** Furthermore, by equipping each student in the class with a set of four cards bearing the letters A, B, C, and D and by requiring all students to respond simultaneously with their answers, the teacher can generate a very solid evidence base for deciding whether the class is ready to move on (Leahy et al. 2005). If every student responds with A, B, and D, then the teacher can move on with confidence that the students have understood. If everyone simply responds with A, then the teacher may choose to reteach some part of the topic. The most likely response, however, is for some students to respond correctly and for others to respond incorrectly, or incompletely. This provides the teacher with an opportunity to conduct a classroom discussion in which students with different views can be asked to justify their selections.

Of course planning such questions takes time, but by investing the time before the lesson, the teacher is able to address students' confusion during the lesson, with the students still in front of him or her. Teachers who do not plan such questions are forced to put children's thinking back on track through grading, thus dealing with the students one at a time, after they have gone away.

3. Providing feedback that moves learning forward

The research on feedback shows that much of the feedback that students receive has, at best, no impact on learning and can actually be counterproductive. Kluger and DeNisi (1996) reviewed more than three thousand research reports on the effects of feedback in schools, colleges, and workplaces and found that only 131 studies were scientifically rigorous. In 50 of these studies, feedback actually made people's performance worse than it would have been without feedback. The principal feature of these studies was that feedback was, in the psychological jargon, "ego-involving." In other words, the feedback focused attention on the person rather than on the quality of the work——for example, by giving scores, grades, or other forms of report that encouraged comparison with others. The studies where feedback was most effective were those in which the feedback told participants not just what to do to improve but also how to go about it.

Given the emphasis on grading in U.S. schools, teachers may be tempted to offer comments alongside scores or grades. However, a number of studies (e.g., Butler 1987, 1988) have shown that when comments are accompanied by grades or scores, students focus first on their own grade or score and then on those of their neighbors, so that grades with comments are no more effective than grades alone, and much less effective than comments alone. The crucial requirement of feedback is that it should force the student to engage cognitively in the work.

Such feedback could be given orally, as in this example from Saphier (2005, p. 92):

> *Teacher:* What part don't you understand?
>
> *Student:* I just don't get it.
>
> *Teacher:* Well, the first part is just like the last problem you did. Then we add one more variable. See if you can find out what it is, and I'll come back in a few minutes.

Written feedback can support students in finding errors for themselves:

- There are 5 answers here that are incorrect. Find them and fix them.

- The answer to this question is ... Can you find a way to work it out?

It can also identify where students might use and extend their existing knowledge:

- You've used substitution to solve all these simultaneous equations. Can you use elimination?

Other approaches (Hodgen and Wiliam 2006) include encouraging pupils to reflect:

- You used two different methods to solve these problems. What are the advantages and disadvantages of each?
- You have understood ... well. Can you make up your own more difficult problems?

Another suggestion is to have students discuss their ideas with others:

- You seem to be confusing sine and cosine. Talk to Katie about how to work out the difference.
- Compare your work with Ali and write some advice to another student tackling this topic for the first time.

The important point in all this is that as well as "putting the ball back in the students' court," the teacher also needs to set aside time for students to read, respond to, and act on feedback.

4. Activating students as owners of their own learning

When teachers are told they are responsible for making sure that their students do well, the quality of their teaching deteriorates, as does their students' learning (Deci et al. 1982). In contrast, when students take an active part in monitoring and regulating their learning, then the rate of their learning is dramatically increased. Indeed, it is common to find studies in which the rate of students' learning is doubled, so that students learn in six months what students in control groups take a year to learn (Fontana and Fernandes 1994; Mevarech and Kramarski 1997).

In an attempt to integrate research on motivation, metacognition, self-esteem, self-efficacy, and attribution theory, Monique Boekaerts has proposed a dual-processing theory of student motivation and engagement (Boekaerts 2006). When presented with a task, the student evaluates the task according to its interest, difficulty, cost of engagement, and so on. If the evaluation is positive, the student is likely to seek to increase competence by engaging in the task. If the evaluation is negative, a range of possible outcomes is possible. The student may engage in the task but focus on getting a good grade from the teacher instead of mastering the relevant material (e.g., by cheating) or the student may disengage from the task on the grounds that "it is better to be thought lazy than dumb." ***The important point for teachers is that to maximize learning, the focus needs to be on personal growth rather than on a comparison with others.***

Practical techniques for getting students started include "traffic lights," where students flash green, yellow, or red cards to indicate their level of understanding of a concept. Many teachers have reported that initially, students who are focusing on well-being, rather than growth, display green, indicating full understanding, even though they know they are confused. However, when the teacher asks students who have shown green cards to explain concepts to those who have shown yellow or red, students have a strong incentive to be honest!

5. Activating students as learning resources for one another

Slavin, Hurley, and Chamberlain (2003) have shown that activating students as learning resources for one another produces some of the largest gains seen in any educational interventions, provided two conditions are met. The first is that the learning environment must provide for group goals, so that students are working as a group instead of just working in a group. The second condition is individual accountability, so that each student is responsible for his or her contribution to the group, so there can be no "passengers."

With regard to assessment, then, a crucial feature is that the assessment encourages collaboration among students while they are learning. To achieve this collaboration, the learning goals and success criteria must be accessible to the students (see above), and the teacher must support the students as they learn how to help one another improve their work. One particularly successful format for doing this has been the idea of "two stars and a wish." The idea is that when students are commenting on the work of one another, they do not give evaluative feedback but instead have to identify two positive features of the work (two "stars") and one feature that they believe merits further attention (the "wish"). Teachers who have used this technique with students as young as five years old have been astonished to see how appropriate the comments are, and because the feedback comes from a peer rather than someone in authority over them, the recipient of the feedback appears to be more able to accept the feedback (in other words, they focus on growth rather than on preserving their well-being). In fact, teachers have told us that the feedback that students give to one another, although accurate, is far more hard-hitting and direct than they themselves would

have given. Furthermore, the research shows that the person providing the feedback benefits just as much as the recipient because she or he is forced to internalize the learning intentions and success criteria in the context of someone else's work, which is less emotionally charged than doing it in the context of one's own work.

Conclusion

The available research evidence suggests that considerable enhancements in student achievement are possible when teachers use assessment, minute-by-minute and day-by-day, to adjust their instruction to meet their students' learning needs. However, it is also clear that making such changes is much more than just adding a few routines to one's normal practice. It involves a change of focus from what the teacher is putting into the process and to what the learner is getting out of it, and the radical nature of the changes means that the support of colleagues is essential. Nevertheless, our experiences to date suggest that the investment of effort in these changes is amply rewarded. Students are more engaged in class, achieve higher standards, and teachers find their work more professionally fulfilling. As one teacher said, "I'm not babysitting any more."

By Dylan Wiliam
Judith Reed, Series Editor

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3B - Questioning and Discussion Techniques • Quality of Questions • Discussion Techniques • Student Participation	Questioning and discussion are the only instructional strategies specifically referred to in the framework for teaching; this fact reflects their central importance to teachers' practice. But in the framework it is important that questioning and discussion are used as techniques to deepen student understanding are being used rather than serving as recitation or a verbal quiz. Good teachers use divergent as well as convergent questions, framed in such a way that they invite students to formulate hypotheses, make connections, or challenge previously held views. Students' responses to questions are valued; effective teachers are especially adept at responding to and building upon student responses and making use of their ideas. High- quality questions encourage student to make connections among concepts or events previously believed to be unrelated, and arrive at new understandings of complex material. Effective teachers also pose questions for which they do not know the answers. Even when a question has limited number of correct responses, the question, being non-formulaic, is likely to promote thinking by students. Class discussions are animated, engaging all students in important issues and in using their own language to deepen and extend their understanding. These discussions may be based on questions formulated by the students themselves. Not all questions must be at high cognitive level in order for a teacher's performance to be rated at a high level; that is, when exploring a topic, a teacher might begin with a series of questions of low cognitive challenge to provide a review, or to ensure that everyone in the class is "on board." Furthermore, if the questions are at a high level, but only a few students participate in the discussion, the teacher's performance on the component cannot be judged to be at a high level. In addition, in lessons involving student in small-group work, the quality of the student's questions and discussion in their small groups may be considered part of this component. In order for students to formulate high-level questions, they must have learned how to do so. Therefore, high-level questions from students, either in the full class, or in small group discussions, provide evidence that these skills have been taught.			
	Ineffective	***Developing***	***Accomplished***	***Exemplary***
	• Teacher's questions are of low cognitive challenge, require single correct responses, and are asked in rapid succession. • Interaction between teacher and students is predominantly recitation style, with the teacher mediating all questions and answers. • A few students dominate the discussion.	• Teacher's questions lead students through a single path of inquiry, with answers seemingly determined in advance. • Alternatively, the teacher attempts to frame some questions designed to promote student thinking and understanding, but only a few students are involved. • Teacher attempts to engage all students in the discussion and to encourage them to respond to one another, but with uneven results.	• **Although the teacher may use some low-level questions, he or she asks the students questions designed to promote thinking and understanding.** • **Teacher creates a genuine discussion among students, providing adequate time for students to respond and stepping aside when appropriate.** • **Teacher successfully engages most students in the discussion, employing a range of strategies to ensure that most students are heard.**	• Teacher uses a variety or series of questions or prompts to challenge students cognitively, advance high-level thinking and discourse, and promote metacognition. • Students formulate many questions, initiate topics, and make unsolicited contributions. • Students themselves ensure that all voices are heard in the discussion.
Critical Attributes	• Questions are rapid-fire, and convergent with a single correct answer. • Questions do not invite student thinking. • All discussion is between teacher and students; students are not invited to speak directly to one another. • A few Students dominate the discussion.	• Teacher frames some questions designed to promote student thinking, but only a small number of students are involved. • The teacher invites students to respond directly to one another's ideas, but few students respond. • Teacher calls on many students, but only a few actually participate in the discussion.	• Teacher uses open-ended questions, inviting students to think and/or offer multiple possible answers. • The teacher makes effective use of wait time. • The teacher effectively builds on student responses to questions. • Discussions enable students to talk to one another without ongoing mediation by the teacher. • The teacher calls on most students, even those who don't initially volunteer. • Many students actively engage in the discussion.	In addition to the characteristics of "accomplished": • Students initiate higher-order questions. • Students extend the discussion, enriching it. • Students invite comments from their classmates during a discussion.
Possible Examples	• All questions are of the "recitation" type such as "What is 3 x 4?" • The teacher asks a questions for which the answer is on the board; students respond by reading it. • The teacher calls only upon students who have their hands up.	• Many questions are of the "recitation" type, such as "How many members of the House of Representatives are there?" • The teacher asks: "Who has an idea about this?" but only the usual three students offer comments. • The teacher asks: "Michael can you comment on Mary's idea?" but Michael does not respond or makes a comment directly to the teacher.	• The teacher asks: "What might have happened if the colonists had not prevailed in the American war for independence?" • The teacher uses the plural form in asking questions, such as "What are some things you think might contribute to . . .?" • The teacher asks; "Michael, can you comment on Mary's idea?" and Michael responds directly to Mary. • After posing a question and asking each of the students to write a brief response and then share it with a partner, the teacher invites a few to offer their ideas to the entire class.	• A student asks, "How many ways are there to get this answer?" • A student says to a classmate: "I don't think I agree with you on this, because . . ." • A student asks of other students: "Does anyone have another idea how we might figure this out?" • A student asks, "What if . . .?"

FSLC Strategy

1. Formulate

2. Share

3. Listen

4. Create

Give One-Get One

What is one idea you could implement, in your classroom, that might move your questioning/discussion practice from Accomplished to Exemplary?

Home (Accomplished)	Vacation (Exemplary)	Give One	Get One	Get One More
Although the teacher may use some low-level questions, he/she asks the students questions designed to promote thinking and understanding.	Teacher uses a variety or series of questions or prompts to challenge students cognitively, advance high-level thinking and discourse, and promote metacognition.			
Teacher creates a genuine discussion among students, providing adequate time for students to respond and stepping aside when appropriate.	Students formulate many questions, initiate topics, and make unsolicited contributions.			
Teacher successfully engages most students in the discussion, employing a range of strategies to ensure that most students are heard.	Students themselves ensure that all voices are heard in the discussion.			

Types of Questions, Notes

Bloom

Thick & Thin

D.O.K.

Ciardello

QAR

Redeeming Closed Questions

Closed Questions imply that the teacher has a predetermined correct response in mind. These are nearly always concerned with the recall of facts or simple comprehension where the answers have previously been provided.

What's the value?

- They give you *facts*.
- They are *easy* to answer.
- They are *quick* to answer.
- They keep control of the conversation with the *questioner*.

EX:

- Have you read the book, The Hunger Games?
- Do you plan to see the movie?

Open Questions allow for a range of responses and make progressive cognitive demands on children. They encourage children to think beyond the literal.

What's the value?

- They ask the respondent to *think* and reflect.
- They will give you *opinions* and *feelings*.
- They invite a range of responses
- They make progressive, increasing demands on student thinking.
- They hand control of the conversation to the *respondent*.
- They encourage students to think of authentic uses for concepts.

EX:

- What makes The Hunger Games a successful story?
- What evidence do you have to justify your opinion?

Can a teacher's Closed Questions be easily redeemed to increase cognitive demand and encourage children to think critically? YES!

A Range of Answers:

Ask a question and give a range of answers for students to discuss with a partner or small group. Include a YES answer, a NO answer, and some ambiguous answers.

EX: *Which of these language features would you need to use if you were going to write a diary entry? Formal language, past tense, abbreviations, technical language, full names of people, present tense, informal language*

Impact on Students:

- Develops thinking skills
- Improves reasoning skills
- Promotes discussion and explanation
- Reveals misconceptions
- Encourages debate

A Statement:

Turn a question into a statement. Ask students to agree or disagree and to give reasons. Teachers can require students to give evidence to support their answer, if appropriate.

EX: *Glass is an excellent material for making a shelter. Agree or Disagree?*

EX: *Odd numbers multiplied by even numbers have odd answers. Is this statement always, sometimes, or never true? Give evidence for your answer.*

Impact on Students:

- Encourages open discussion and debate
- Develops critical thinking
- Reveals misconceptions and understanding
- Gives pupils confidence in expressing their opinions

Right and Wrong:

Present students with opposites. Tell them one is "right" and one is "wrong." Students have to decide why the one they decide is true.

EX: Rather than asking: ***What would you include in a healthy meal?,*** show two pictures of meals and ask: ***Which meal is the healthy meal? What makes it healthy?***

Impact on Students:

- Encourages problem solving
- Identifies the success criteria
- Stimulates curiosity and interest
- Reinforces previous learning
- Demands explanation

Starting From the Answer/End:

Give students the "answer" at the beginning and ask them what they think the question might have been, how that answer was obtained, or why they think it's correct.

EX: The answer is: Water, glass, the moon, and shiny material can all do this. What might the question have been?

Impact on Students:

- Promotes reasoning skills
- Elicits prior knowledge
- Reinforces and revisits learning objectives
- Good for assessment
- Inclusive, all students can come up with their own ideas and solutions

Opposing Standpoint:

Introduce a different point of view, not the conventional slant.

EX: Rather than asking, ***How did Cinderella feel about her stepmother?*** ask ***How could Cinderella have helped her stepmother become a better person?***

Impact on Students:

- Improves debating skills
- Encourages reasoning skills
- Develops respect for other points of view
- Teachers get pupils to substantiate their opinions
- Encourages lateral thinking

Adapted from: *Active Learning Through Formative Assessment by Shirley Clarke, Hodder Education, 2008*

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Practice Redeeming Closed Questions

Closed Question	Open Question
Is 16 an even number?	15 is an even number. Do you agree or disagree? Explain your thinking.
Name 3 impacts of the Industrial Revolution.	Which consequence of the Industrial Revolution most directly affects your life today?
What is photosynthesis?	If the process of photosynthesis does not occur, how might that impact our society?
Was Jacques Cousteau a conservationist?	What words, in the third paragraph, give you the impression that Jacques Cousteau was a conservationist?
It is customary to leave a 15% tip on a meal. How much should you leave if your meal cost $48?	
Why did Henry VIII have six wives?	
Which is a weed, a dandelion or a daffodil?	
What is a verb?	

Bloom's Taxonomy Verbs

Use verbs aligned to Bloom's Taxonomy to create discussion questions and lesson plans that ensure your students' thinking progresses to higher levels.

To Bloom's Taxonomy

Knowledge		Comprehend	
Count	Read	Classify	Interpret
Define	Recall	Cite	Locate
Describe	Recite	Conclude	Make sense of
Draw	Record	Convert	Paraphrase
Enumerate	Reproduce	Describe	Predict
Find	Select	Discuss	Report
Identify	Sequence	Estimate	Restate
Label	State	Explain	Review
List	Tell	Generalize	Summarize
Match	View	Give examples	Trace
Name	Write	Illustrate	Understand
Quote			

Apply		Analyze	
Act	Imitate	Break down	Focus
Administer	Implement	Characterize	Illustrate
Articulate	Interview	Classify	Infer
Assess	Include	Compare	Limit
Change	Inform	Contrast	Outline
Chart	Instruct	Correlate	Point out
Choose	Paint	Debate	Prioritize
Collect	Participate	Deduce	Recognize
Compute	Predict	Diagram	Research
Construct	Prepare	Differentiate	Relate
Contribute	Produce	Discriminate	Separate
Control	Provide	Distinguish	Subdivide
Demonstrate	Relate	Examine	
Determine	Report		
Develop	Select		
Discover	Show		
Dramatize	Solve		
Draw	Transfer		
Establish	Use		
Extend	Utilize		

Synthesize		Evaluate	
Adapt	Intervene	Appraise	Interpret
Anticipate	Invent	Argue	Judge
Categorize	Make up	Assess	Justify
Collaborate	Model	Choose	Predict
Combine	Modify	Compare & Contrast	Prioritize
Communicate	Negotiate	Conclude	Prove
Compare	Organize	Criticize	Rank
Compile	Perform	Critique	Rate
Compose	Plan	Decide	Reframe
Construct	Pretend	Defend	Select
Contrast	Produce	Evaluate	Support
Create	Progress		
Design	Propose		
Develop	Rearrange		
Devise	Reconstruct		
Express	Reinforce		
Facilitate	Reorganize		
Formulate	Revise		
Generate	Rewrite		
Incorporate	Structure		
Individualize	Substitute		
Initiate	Validate		
Integrate			

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Common Core State Standards
Standards for Mathematical Practice
Questions for Teachers to Ask

Make sense of problems and persevere in solving them	Reason abstractly and quantitatively	Construct viable arguments and critique the reasoning of others	Model with mathematics
Teachers ask: • What is this problem asking? • How could you start this problem? • How could you make this problem easier to solve? • How is ___'s way of solving the problem like/different from yours? • Does your plan make sense? Why or why not? • What tools/manipulatives might help you? • What are you having trouble with? • How can you check this?	*Teachers ask:* • What does the number ____ represent in the problem? • How can you represent the problem with symbols and numbers? • Create a representation of the problem.	*Teachers ask:* • How is your answer different than _____'s? • How can you prove that your answer is correct? • What math language will help you prove your answer? • What examples could prove or disprove your argument? • What do you think about _____'s argument • What is wrong with ____'s thinking? • What questions do you have for ____? **it is important that the teacher poses tasks that involve arguments or critiques*	*Teachers ask:* • Write a number sentence to describe this situation • What do you already know about solving this problem? • What connections do you see? • Why do the results make sense? • Is this working or do you need to change your model? **It is important that the teacher poses tasks that involve real world situations*
Use appropriate tools strategically	**Attend to precision**	**Look for and make use of structure**	**Look for and express regularity in repeated reasoning**
Teachers ask: • How could you use manipulatives or a drawing to show your thinking? • Which tool/manipulative would be best for this problem? • What other resources could help you solve this problem?	*Teachers ask:* • What does the word ____ mean? • Explain what you did to solve the problem. • Compare your answer to _____'s answer • What labels could you use? • How do you know your answer is accurate? • Did you use the most efficient way to solve the problem?	*Teachers ask:* • Why does this happen? • How is ____ related to ____? • Why is this important to the problem? • What do you know about ____ that you can apply to this situation? • How can you use what you know to explain why this works? • What patterns do you see? **deductive reasoning (moving from general to specific)*	*Teachers ask:* • What generalizations can you make? • Can you find a shortcut to solve the problem? How would your shortcut make the problem easier? • How could this problem help you solve another problem? **inductive reasoning (moving from specific to general)*

Effective Questions for Developing Mathematical Thinking

Problem Solving:
What information do you have?
What do you need to find out?
What strategies are you going to use?
Will you do it mentally?
Pencil/paper? Number line?
What tools will you need?
What do you think the answer will be?

Stuck Students:
How would you describe the problem?
What facts do you have?
What do you know that is stated in the problem?
Could you try it with simpler numbers?
Would it help to draw a picture, diagram, or make a table?
Can you guess and check?
Can you look at a model and see their strategy?

Activating Schema
How does this relate to...?
What strategies have we learned doing this problem?
What did you find in the newspaper last night that used mathematics?
Can you give an example of...?

Fostering Reflection
How did you get your answer?
Does your answer seem reasonable? Why?
Can you describe your method?
What if you started with... rather than...?
What have you learned today?
How can we answer the guiding question?

Effective Questions for Developing Mathematical Thinking

Build Confidence
Why is that true?
Does that make sense?
Can you make a model?
Mathematical Reasoning
Is that true for all situations? Explain
Can you think of a counterexample?
How would you prove that?
What assumptions are you making?

Checking Progress
How's it going?
How do you know?
Can you explain your work?
Why did you decide on this method?
Is there a more efficient strategy?
Why did you organize your results in that format?
Do you think this would work with other numbers?
Have you thought of all the possibilities?

Making Sense
What do you think about what _____ said?
Do you agree? Why/Why Not?
Does anyone have the same answer by a different strategy to explain it?
Can you convince the rest of us that your answer makes sense?

Conjecture
What would happen if ....?
Do you see a pattern?
Can you predict the next one? The last one?
What decisions do you recommend to your friend?

Talk Partners--

1. Students can be paired randomly or strategically, and can remain together for varying lengths of time.
2. Students need to have thinking time to answer a question (wait time), but discussing the question with a talk-partner during that time makes the thinking time more productive.
3. Talk-partner discussions need to be focused and short to avoid students getting off-task. Ex... "You have 2 minutes to decide what is wrong with this math calculation." "Take 30 seconds to tell your partner one way you are like Bud in this chapter."
4. Avoid asking for "hands up." If everyone has discussed with their talk-partner, everyone has an answer they can share. Everyone is expected to have an answer when randomly called on.
5. Randomly paired partners are most effective. Change partners every week of two. This is fair, and students know they have to learn to work with this person for a short duration of time. They are also exposed to a variety of points of view.
6. Set the stage for quality talk--being a good listener, respectfully disagreeing, etc....
7. Avoid asking closed recall questions and ask questions worthy of a discussion.
8. Model respect for others' opinions.

Students engage in higher quality discussions and learn how to rethink their own answers after being exposed to more opinions or solutions.

Low achievers, English Language Learners, and linguistically diverse students have the opportunity to try out their answer on one student before exposing themselves to the whole class. If they are not happy with their own answer, they may choose to use their partner's answer if called on to report to the class.

As the teacher "guides" discussion more than "leads" the discussion, there are more opportunities to formatively assess the students by listening to their answers.

Making Judgments

1 I believe _____ is (right/wrong) because _____.
2 I believe_____ did the (right/wrong) thing because____.
3 I believe _____ should have _____, because_____.
4 I believe_____ did the (right/wrong) thing, but _____ should have _____.

Collaborative Discussions

1. I think we should_____.
2. I think that___ would be a good symbol because it represents___.
3. Where should we put the _____?
4. I like your idea about _____.

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Coming to Consensus

Reaching an Agreement

1. I like _____'s idea because _____.
2. I prefer _____'s idea because _____.
3. I agree that _____ because _____.
4. I agree with you up to a point, but I think that _____.
5. I am willing to change my answer because _____.

Summarizing

1	_____ is _____.
2	_____ is _____, and the result is _____.
3	In summary, _____
4	The story is about _____. In addition, _____. Consequently, _____.

I disagree with ____ because ____.

I think ____ because ____.

I agree with ____ because ____.

I infer ____ because ____.

I predict____

because ____.

I question____

because ____.

My claim is____

because____.

My theory is____

because____.

Student Venn Diagram - Sentence Frames

My colleague and I discovered we were the same in that

_____ .

My colleague and I differed in that

_____ .

Some similarities that my colleague and I share are

_____ .

A similarity that my colleague and I share is

_____ .

One difference between my colleague and I is

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Four Strategies to Spark Curiosity via Student Questioning

BY KEVIN D. WASHBURN

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Kevin D. Washburn, (Ed.D.), has taught in elementary through graduate level classrooms. He is the Executive Director of Clerestory Learning, author of the Writer's Stylus instructional writing program, and author of The Architecture of Learning: Designing Instruction for the Learning Brain.

British archaeologist Mary Leakey described her own learning as being "compelled by curiosity." Curiosity is the name we give to the state of having unanswered questions. And unanswered questions, by their nature, help us maintain a learning mindset. When we realize that we do not know all there is to know about something in which we are interested, we thirst. We pursue. We act as though what we do *not* know is more important than what we do, as though what we do not possess is worth the chase to own it. How do we help students discover this drive?

Strategy One: Equip Students to Ask Questions

At its essence, curiosity is asking questions and pursuing answers. The brain does not like unanswered questions and will shift into seek-and-find mode to uncover and understand the unknown. Questions ignite curiosity.

We often ask students if they have any questions, but we rarely teach them how to ask advantageous questions. Like any skill, asking questions can be taught and practiced, and with technology enabling an increasing emphasis on self-directed learning, this skill is more important than ever. As Wendy Purcell explains, "The skill of question formulation — a thinking ability with universal relevance — can make all learning possible."[1] Students should be equipped to be inquisitive explorers, to pursue learning anytime, anywhere.

Strategy Two: Provide a Launch Pad

Even if students have mastered the full range of question forming, it is difficult to inquire about topics with which they have no familiarity. When this is the case, giving *just* enough information to launch inquiry can help. Limit the information to true basics, such as a general context and term definitions. Then challenge students to generate questions that, when answered, uncover additional information. (For a more creative approach to launching questions, try something similar to Dr. Judy Willis' inventive use of raisins![2]) Guide and prompt as needed to encourage questions that address deeper concepts, and connections that will help students construct understanding. If needed, eliminate duplicity by combining questions. Once the questions are articulated, let the search begin!

Strategy Three: Cast a Wide Net

During the information gathering phase of learning, the brain does its best work in an active and receptive state. (Neurologically, this is characterized by decreased frontal lobe activity but increased activity in the temporal, occipital and parietal lobes; and by increased alpha and theta wave activity, suggesting a relaxed and receptive mental state.[3]) Action associated with this neurological state includes searching and collecting that is both focused ("I know the topic I am pursuing") and open to discovery ("I do not know where I will find it or what else I may find in the process"). We can foster this by challenging students to "cast a wide net" as they gather information, striving for diversity in sources and source types. Not just a summary from

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Wikipedia, but also a poem that addresses some aspect of the topic; not just the labeled diagram, but also an artist's portrayal of the idea.

Keep the search active by praising student efforts to discover novelty. A new idea or perspective raises new questions, and since the brain does not like unanswered questions, curiosity continues to motivate the search.

Strategy Four: Avoid Cutting the Search Short

Curiosity cut off at its peak rarely regains its fervor, so allow ample time for students to thoroughly pursue answers and novel discoveries related to the topic or idea.

What is found — the answers to the questions — must eventually be sorted and related to known ideas or experiences for new knowledge and understanding to emerge. However, we can spark curiosity by engaging students in questioning and in pursuing answers. Learning "compelled" by questions is learning driven by curiosity.

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[2]*Washburn, K.D. (2010).* The Architecture of Learning: Designing Instruction for the Learning Brain. *Pelham, AL: Clerestory Press.*
[3]*Carson, S. (2010).* Your Creative Brain: Seven Steps to Maximize Imagination, Productivity, and Innovation in Your Life. *San Francisco: Jossey-Bass.*

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The Last Word

1. Write a quote that you consider important. Write a phrase, a whole sentence, whatever you need to get the meaning.

2. Write why you chose your quote.

3. Choose a backup quote in case someone chooses the same quote.

4. When it is your turn, tell everyone where your quote is and read it to them.
   Don't say anything else.

5. Each person responds to your quote, tells why they think you chose it.

6. You speak after everyone else has responded. Explain why you chose your quote.

7. This process continues until everyone has had a turn.

How Will I Recognize Effective Questioning When I See It?

Many walk-through instruments include questioning. But does this mean that our definition of effective questioning is consistent? Are we looking for the same types of questions as we observe not only teachers but students as well? Is questioning occurring frequently with feedback and encouragement?

The following checklist was taken from *Advancing Formative Assessment in Every Classroom, A Guide for Instructional Leaders*. This list can help guide the conversation between the district leadership team to reach a consensus on observing questioning in the classroom.

Strategic Teacher Questioning	• **Notice teachers' use of specific strategies to ensure appropriate wait time.** • **Listen for questions that are directly related to the lesson's learning target.** • **Listen for questions that focus student attention on important concepts and processes.** • **Listen for questions that encourage students to self-assess.** • **Listen for questions that encourage students to comment or elaborate on another student's response.**
Effective Student Questioning	• **Listen for student questions that go to the heart of important concepts or content rather that those that focus on the mechanics of an assignment or lesson.** • **Listen for students who ask their questions in ways that show confidence and competence.** • **Notice if teachers have intentionally planned to model and guide student question development.** • **Notice signs of structure and scaffolded inquiry – formats that shape and encourage effective questioning.**

INTRODUCING THIN AND THICK QUESTIONS

Note: If small-group guided reading is a regular routine for your students, the introduction to thin and thick questions could be done in that setting. However, carrying out the following steps is also viable in a whole-group setting.

1. Let students know that they can ask questions for many different reasons. Before reading a text, perhaps they are curious about something they might find out. During reading, asking questions can help them stay engaged with difficult or unfamiliar material. Stress the importance of stopping to consider what has been read along the way and let them know that turning the information into questions—even questions that they already know the answers to—leads them to reflect on and better comprehend what has been read.

2. Introduce the idea of two different types of questions: thin (or factual) and thick (or inferential). Describe thin questions as ones whose answers can be found in the text and that can be answered with a few words or short sentences. Describe thick questions as ones that readers have to think about more fully since the answers come from one's head, not solely from the text. Let students know that answers to thick questions are open to argument, but that the text should support the answer and, again, one's own reasoning comes into play.

3. Display the T-chart that you prepared with the columns labeled as 'Thin' and 'Thick.' Write a sample thin question in that column of the T-chart. Develop a question from a text your students already know, preferably one you have read recently. If, for example, you have read a *Captain Underpants* book by Dav Pilkey, a thin question could be: 'Who is Captain Underpants?' (Answer: Mr. Krupp, the principal)

4. Have students state more thin questions based on their knowledge of the book you have chosen. As you proceed, let other students answer the questions and discuss with students why these questions are thin ones.

   Point out that some thin questions may only have one answer, such as 'Which legs do frogs use to jump?' (Answer: The rear) Some, however, can have multiple answers, such as 'What are the colors of some frogs?' (Possible answers: Green, yellow, spotted, etc.)

5. Next, pose a thick question to the students. A good practice here is to *change* a thin question into a thick one. For instance, one could change the thin question 'Who is Captain Underpants?' into 'Why is the *principal* Captain Underpants so funny?' [Two possible answers: 1) Principals don't usually come to school in their underwear 2) It is funny to see a character who is normally an authority figure become ridiculous]

   You might ask how we know that these are truly thick questions. With both sample responses, the answer is not found completely in the book; rather, the person answering the question would have to

form an opinion or offer support in order to answer it.

6. Accept thick questions from students and allow other students to answer them. Make sure that students see that they are expressing something of their own mind for thick answers, not just recalling facts as they did with thin questions.

7. Post the list of question words near the T-chart for easy reference during the read-aloud.

8. Let students know they should write questions on sticky notes (one question per sticky note) as you read aloud. Students are not to interrupt the reading with oral questions at this sitting, just to listen and write their questions.

   Since they have some experience with thin and thick questions from the previous activity, they should be able to differentiate between the two types of questions; however, it is normally more difficult for students to compose thick questions initially as opposed to thin ones. Remind them that they can try changing their thin questions into thick ones.

9. Begin the read-aloud, pausing from time to time to model for students your thinking when you have a question about an important point in the material.

10. After the read-aloud, have students place their sticky notes on the T-chart under the appropriate headings and explain to the group what their questions are and why they are thin or thick. Remind students to make up their minds before they approach the chart, possibly writing 'thin' or 'thick' at the top of the sticky beforehand.

11. Have students give feedback to see if they agree with where classmates put the thin or thick questions (pointing thumbs up or down works well here). If repeated questions come up, organize them in groups so that when questions are answered, entire groups are addressed.

    It is not necessary to answer all the questions at this time. The primary purpose of generating questions is to give students practice in forming questions, hearing the questions of their classmates, and giving and receiving feedback.

Source: http://www.readwritethink.org/classroom-resources/lesson-plans/questioning-comprehension-strategy-small-408.html

Do you like the weekend?	How do you spend your time during the weekend?
Who is your hero?	How you like your hero?
Are you good at making friends?	Why are you good at keeping friends?
What is your favorite movie?	If you were going to write a sequel to your favorite movie, what would it be about?
Where was the location of your least favorite vacation?	How would you improve your least favorite vacation?
Do you hold grudges?	What are some things you can do to forgive others?

Have you ever exhibited bad manners at the table?	What do you consider to be bad table manners?
Do you have a pet?	How has an animal had an impact on your life?
What is your favorite food?	How do you prepare your favorite food?
What is your favorite song?	How has music impacted your life?
Do you ever watch television?	How has your television program changed your life?
What is the last movie you watched?	What did you like best about the last movie you watched?

What is the farthest distance you have been from your home?	How a trip has changed your life?
Do you consider yourself a good listener?	How could you improve your listening skills?
What was the setting in the last fictional book you read?	How was the setting crucial to the plot?
What was the problem in the last fictional story you read?	In the last fictional story you read, how did the main character cope with the problem?
Who is your favorite person?	How would you like to be more like your favorite person?
Are you prepared for earthquakes?	What would you do if there was an earthquake right now?

Classroom Strategies

Question-Answer Relationship (QAR)

The question–answer relationship (QAR) strategy helps students understand the different types of questions. By learning that the answers to some questions are "Right There" in the text, that some answers require a reader to "Think and Search," and that some answers can only be answered "On My Own," students recognize that they must first consider the question before developing an answer.

Share your examples!

Why use question–answer relationship?

- It can improve students' reading comprehension.
- It teaches students how to ask questions about their reading and where to find the answers to them.
- It helps students to think about the text they are reading and beyond it, too.
- It inspires them to think creatively and work cooperatively while challenging them to use higher-level thinking skills.

When to use:	Before reading	During reading	After reading
How to use:	Individually	With small groups	Whole class setting

How to use question–answer relationship

1. Explain to students that there are four types of questions they will encounter. Define each type of question and give an example.

   Four types of questions are examined in the QAR:
   - **Right There Questions**: Literal questions whose answers can be found in the text. Often the words used in the question are the same words found in the text.
   - **Think and Search Questions**: Answers are gathered from several parts of the text and put together to make meaning.
   - **Author and You**: These questions are based on information provided in the text but the student is required to relate it to their own experience. Although the answer does not lie directly in the text, the student must have read it in order to answer the question.
   - **On My Own**: These questions do not require the student to have read the passage but he/she must use their background or prior knowledge to answer the question.
2. Read a short passage aloud to your students.
3. Have predetermined questions you will ask after you stop reading. When you have finished reading, read the questions aloud to students and model how you decide which type of question you have been asked to answer.

Handout 1: QAR Question Types

In The Book Questions

Right There

The answer is in the text. The words used to make up the question and words used to answer the question are found in the same sentence. These are sometimes called literal questions because the correct answer can be found somewhere in the passage.

"Right There" questions sometimes include the words, "According to the passage..." "How many..." "Who is..." "Where is..." "What is..."

Think & Search

The answer is in the selection, but you need to put together different pieces of information to find it. The answer comes from different places in the selection. You will need to look back at the passage, find the information that the question refers to, and then think about how the information or ideas fit together.

"Think and Search" questions sometimes include the words, "The main idea of the passage..." "What caused..." "Compare/contrast..." "Summarize..."

In My Head Questions

Author and Me

The answer is not in the story. You need to think about what you already know, what the author tells you, and how it fits together. These type questions require you to use ideas and information not stated directly in the passage to answer; so, you must think about what you have read and formulate your own ideas or opinions.

"Author and Me" questions sometimes include the words, "The author implies...", "The passage suggests...", "The speaker's attitude..,"

On My Own

The answer is not in the text. You can answer the question without even reading the text. The answer is based solely on your own experiences and knowledge. You can answer the question without even reading the text. The answer is based solely on your own experiences and background knowledge on a topic.

"On My Own" questions sometimes include the words, "In your opinion..." Based on your experience..." "Think about someone/something you know..."

Handout 2

QAR Passage for Modeling

Once upon a time there was a piece of wood. It was not an expensive piece of wood. Far from it. Just a common block of firewood, one of those thick, solid logs that are put on the fire in winter to make cold rooms cozy and warm.

I do not know how this really happened, yet the fact remains that one day this piece of wood found itself in the shop of an old carpenter. His real name was Mister Antonio, but everyone called him Mister Cherry, for the tip of his nose was so round and red and shiny that it looked like a ripe cherry.

As soon as he saw the piece of wood, Mister Cherry was filled with joy. Rubbing his hands together happily, he mumbled to himself:

"This has come in the nick of time. I shall use it to make the leg of a table."

He grasped the hatchet quickly to peel off the bark and shape the wood. But as he was about to give it the first blow, he stood still with arm uplifted, for he had heard a wee, little voice say in a pleading tone: "Please be careful! Do not hit me so hard!"

QAR Questions for Modeling

Right There (RT), Think and Search (TS), Author and Me (AM), On My Own (MO)

- **Question 1** "Why was the carpenter called Mister Cherry?"

This is a Right There (RT) question because the words used in the question and answer are found in the same sentence in the text.

- **Question 2** "Describe the piece of wood found in the carpenter's shop."

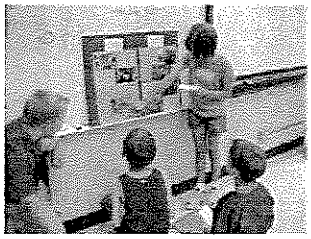
This is a Think and Search (TS) question because the information for the answer comes from different places in the text.

- **Question 3** "How could a block of wood make a cold room warm?"

This is an Author and Me (AM) question because clues in the text must be combined with background knowledge in order to answer the question.

- **Question 4** "Do you think being a carpenter is an important job? Why or why not?"

This is an On My Own (MO) question because the description of the carpenter is not found in the text. You must draw on your own experience and knowledge to answer the question.



Depth of Knowledge

What Does It Mean For Teachers & Students?

Search

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Alignment, Depth of Knowledge & Change
Unfinished Business: More Measured Approaches in Standards-Based Reform

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What is the DOK and Why Do We Need It?
The Depth-of-knowledge (DOK) was created by Norman Webb from the Wisconsin Center for Education Research.

The Depth of Knowledge is the degree of depth or complexity of knowledge standards and assessments require; this criterion is met if the assessment is as demanding cognitively as the expectations standards are set for students.

Completely aligned standards and assessments requires an assessment system designed to measure in some way the full range of cognitive complexity within each specified content standard. Norman Webb identified four levels for assessing the DOK of content standards and assessment items.

The DOK levels are ***Recall* (Level 1), *Skill* or *Concept* (Level 2), *Strategic Thinking*** (Level 3) and ***Extended Thinking* (Level 4)**. Of course to accurately evaluate the DOK level, each level needs to be defined and examples given of types of student behaviors.

DOK implies the interaction of how deeply a student needs to understand the content with different ways of responding and interacting with the content.
DOK Facts

- DOK levels are not related to the score points.
- DOK levels are a ceiling, not a target. **Why is this distinction between "ceiling" and "target" important?** If assessed only at the "target," all GLEs with a Level 3 as their highest demand would only be assessed at Level 3. This would potentially have two negative impacts on the assessment: 1) The assessment as a whole could be too difficult; and 2) important information about student learning along the achievement continuum would be lost.
- The level of a DOK item is determined by the task (*defined by complex thinking and reasoning skills*), not grade level or ability of the student.
  Therefore, the DOK of the task does not change with grade or ability of the student.
- Verbs alone do not determine the DOK's level of an assessment task. DOK's focus is on how deeply students need to know content for a given response.
- Multiple-choice questions can be written at a DOK 3 or 4 level; however, to design a question in this format is difficult. An Item at DOK level 3 or 4 requires complex reasoning, strategic and extended thinking about the concepts of the content and a real world context, and especially at a level 4 that requires research, investigation and application often over an extended period of time.
- "There are six dimensions to the alignment process and depth (DOK) was only one. The U.S. Department of Education issued guidelines that include six dimensions important for making judgments about the alignment between state standards and assessments. These dimensions include comprehensiveness, content and performance match, emphasis, depth, consistency with achievement standards and clarity for users.

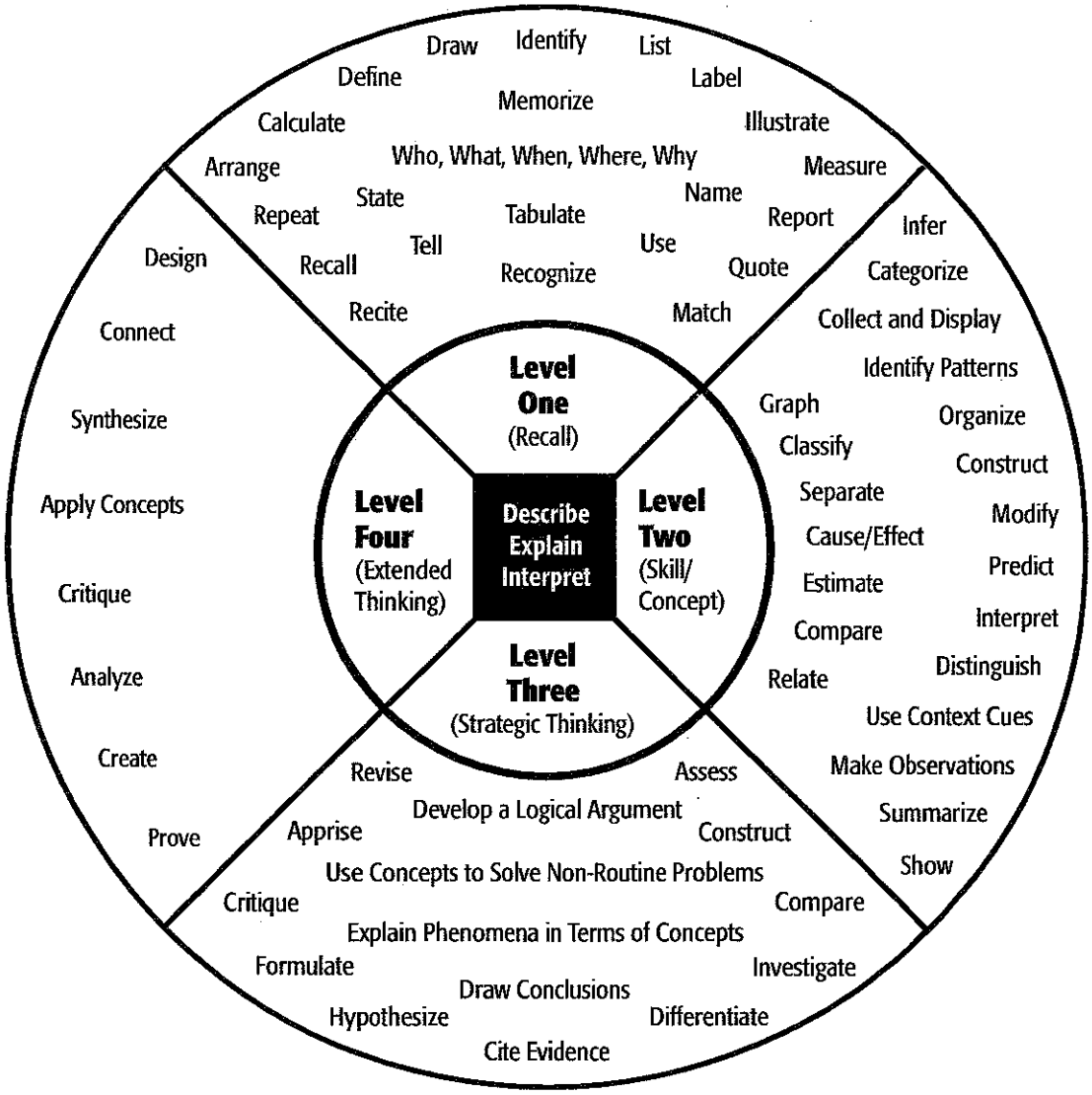
Snapshot

Themes:
Learning Theory

Focus Content Area:
Professional Development

Secondary Content Area:
Education

Depth of Knowledge (DOK) Levels



Level One Activities	Level Two Activities	Level Three Activities	Level Four Activities
Recall elements and details of story structure, such as sequence of events, character, plot and setting.	Identify and summarize the major events in a narrative.	Support ideas with details and examples.	Conduct a project that requires specifying a problem, designing and conducting an experiment, analyzing its data, and reporting results/ solutions.
Conduct basic mathematical calculations.	Use context cues to identify the meaning of unfamiliar words.	Use voice appropriate to the purpose and audience.	Apply mathematical model to illuminate a problem or situation.
Label locations on a map.	Solve routine multiple-step problems.	Identify research questions and design investigations for a scientific problem.	Analyze and synthesize information from multiple sources.
Represent in words or diagrams a scientific concept or relationship.	Describe the cause/effect of a particular event.	Develop a scientific model for a complex situation.	Describe and illustrate how common themes are found across texts from different cultures.
Perform routine procedures like measuring length or using punctuation marks correctly.	Identify patterns in events or behavior.	Determine the author's purpose and describe how it affects the interpretation of a reading selection.	Design a mathematical model to inform and solve a practical or abstract situation.
Describe the features of a place or people.	Formulate a routine problem given data and conditions.	Apply a concept in other contexts.	
	Organize, represent and interpret data.		

Webb, Norman L. and others. "Web Alignment Tool" 24 July 2005. Wisconsin Center of Educational Research. University of Wisconsin-Madison. 2 Feb. 2006. <http://www.wcer.wisc.edu/WAT/index.aspx>.

DOK Question Stems

DOK 1

- Can you recall_____?
- When did ____ happen?
- Who was ____?
- How can you recognize____?
- What is____?
- How can you find the meaning of____?
- Can you recall____?
- Can you select____?
- How would you write___?
- What might you include on a list about___?
- Who discovered___?
- What is the formula for___?
- Can you identify___?
- How would you describe___?

DOK 2

- Can you explain how ____ affected ____?
- How would you apply what you learned to develop ____?
- How would you compare ____? Contrast_____?
- How would you classify____?
- How are____alike? Different?
- How would you classify the type of____?
- What can you say about____?
- How would you summarize____?
- How would you summarize___?
- What steps are needed to edit___?
- When would you use an outline to ___?
- How would you estimate___?
- How could you organize___?
- What would you use to classify___?
- What do you notice about___?

DOK 3

- How is ____ related to ____?
- What conclusions can you draw _____?
- How would you adapt____to create a different____?
- How would you test____?
- Can you predict the outcome if____?
- What is the best answer? Why?
- What conclusion can be drawn from these three texts?
- What is your interpretation of this text? Support your rationale.
- How would you describe the sequence of____?
- What facts would you select to support____?
- Can you elaborate on the reason____?
- What would happen if___?
- Can you formulate a theory for___?
- How would you test___?
- Can you elaborate on the reason___?

DOK 4

- Write a thesis, drawing conclusions from multiple sources.
- Design and conduct an experiment. Gather information to develop alternative explanations for the results of an experiment.
- Write a research paper on a topic.
- Apply information from one text to another text to develop a persuasive argument.
- What information can you gather to support your idea about___?
- DOK 4 would most likely be the writing of a research paper or applying information from one text to another text to develop a persuasive argument.
- DOK 4 requires time for extended thinking.

From Depth of Knowledge – Descriptors, Examples and Question Stems for Increasing Depth of Knowledge in the Classroom Developed by Dr. Norman Webb and Flip Chart developed by Myra Collins

DEPTH OF KNOWLEDGE (DOK) LEVEL	DOK DEFINITION	DOK EXAMPLES
DOK-1 – Recall &Reproduction	Recall of a fact, term, principle, concept, or perform a routine procedure.	Recall elements and details of story; structure, such as sequence of events, character, plot and setting; Conduct basic mathematical calculations; Label locations on a map; Represent in words or diagrams a scientific concept or relationship. Perform routine procedures like measuring length or using punctuation marks correctly; Describe the features of a place or people.
DOK-2 - Basic Application of Skills/Concepts	Use of information, conceptual knowledge, select appropriate procedures for a task, two or more steps with decision points along the way, routine problems, organize/display data, interpret/use simple graphs.	Identify and summarize the major events in a narrative; Use context cues to identify the meaning of unfamiliar words; Solve routine multiple-step problems; Describe the cause/effect of a particular event; Identify patterns in events or behavior;Formulate a routine problem given data and conditions; Organize, represent and interpret data.
DOK-3 - Strategic Thinking	Requires reasoning, developing a plan or sequence of steps to approach problem; requires some decision making and justification; abstract, complex, or non-routine; often more than one possible answer.	Support ideas with details and examples; Use voice appropriate to the purpose and audience; Identify research questions and design investigations for a scientific problem; Develop a scientific model for a complex situation; Determine the author's purpose and describe how it affects the interpretation of a reading selection; Apply a concept in other contexts.
DOK-4 - Extended Thinking	An investigation or application to real world; requires time to research, problem solve, and process multiple conditions of the problem or task; non-routine manipulations, across disciplines/content areas/multiple sources.	Conduct a project that requires specifying a problem, designing and conducting an experiment, analyzing its data, and reporting results/solutions; Apply mathematical model to illuminate a problem or situation; Analyze and synthesize information from multiple sources; Describe and illustrate how common themes are found across texts from different cultures; Design a mathematical model to inform and solve a practical or abstract situation

Ciardiello's Four Levels of Questioning

	Memory	Convergent	Divergent	Evaluative
Signal Words	Who, What, Where, When?	Why, How, In what ways?	Imagine, Suppose, Predict, If/then	Defend, Judge, Justify, What do you think?
Cognitive Operations	Naming, Defining, Identifying, Designating	Explaining, Stating relationships, Comparing and contrasting	Predicting, Hypothesizing, Inferring, Reconstructing	Valuing, Judging, Defending, Justifying

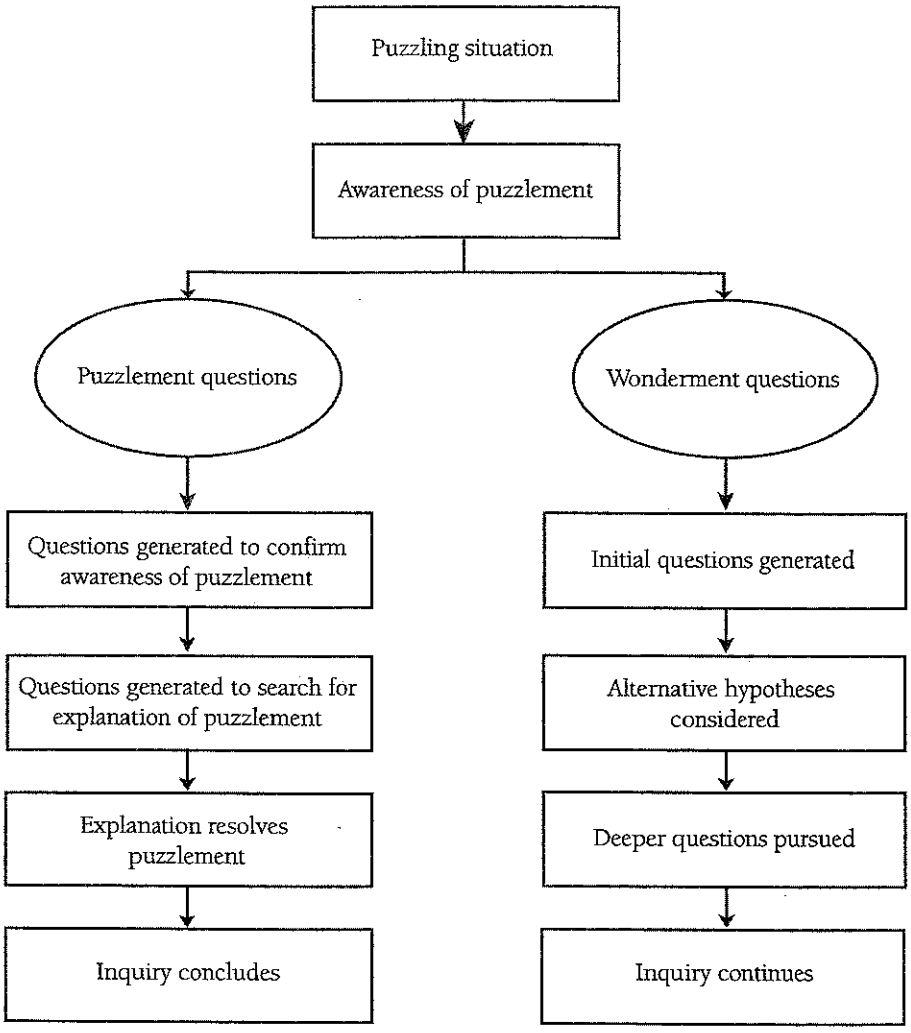
classroom instruction that involve not just finding prefabricated answers but finding authentic questions to ask. In this chapter, I hope to show how the question-finding strategy can help startle your students into a mode of generating questions.

The Question-Finding Strategy

Question-finding is a strategy in which a **discrepant** or **anomalous event** is presented to the student by the teacher in order to arouse curiosity or wonder to stimulate inquiry. (In this book, I use the terms *anomalous* and *discrepant* interchangeably, because they both refer to events that promote **puzzlement**.) The purpose of the strategy is to create a state of puzzlement by presenting information that conflicts with the student's prior knowledge and experiences. The student is prompted to search for questions that can help guide him or her in the quest to resolve the discrepancy. I call this process question-finding because these guide questions are often below the surface or "hidden" (figuratively speaking) within the discrepant event. Questions are naturally embedded within anomalies or discrepant events (Schank, 1988). These emerging questions need to be prompted and directed to the surface. "Hidden" questions are genuine information-seeking questions that probe for meanings beneath the surface of a discrepant event (van der Meij, 1998). For example, an unexpected event occurred during World War I in December 1914, when the soldiers of the opposing Allied powers (i.e., Great Britain, France, Russia, and the United States) and Central powers (i.e., Germany, Austria-Hungary, the Ottoman Empire, and Bulgaria) surprisingly stopped fighting on Christmas Eve (without the permission of their officers), sang carols together, played volleyball, and then began fighting again the day after Christmas. One "hidden" question beneath this discrepant event is, Why did both armies suddenly stop fighting, begin celebrating a holiday together, and then resume combat? The event prompts the learner to ask why the enemies acted in this strange way, thereby prompting the learner to try to explain the reasons for the discrepancy. If the student inquirer is successful, then the inquiry usually ends.

But that is not the only inquiry pathway that can be taken. The student can take a more open-ended stance and search for questions that lead to alternate responses that sustain the inquiry. In another example (noted below), my students traveled both inquiry paths: **convergent thinking** and **divergent thinking** routes. Convergent thinking routes lead to narrow or solution-oriented responses. Divergent thinking routes lead to open-ended or alternative avenues of thinking. When discussing World War II, I used a personal discrepant photograph of my spouse's family "celebrating" Victory in Europe (V-E) Day on their apartment rooftop in New York City on May 8, 1945 (see Figure 1). The army uniforms and "weapons"

FIGURE 2. Question-Finding Pathways



Adapted from Ciardiello, A.V. (2003). "To wander and wonder": Pathways to literacy and inquiry through question-finding. *Journal of Adolescent & Adult Literacy*, 47(3), 231.

The Second Stage: Framing Puzzlement and Wonderment Questions

I have found in my research and practice that many students are able to detect the nature of the puzzling situation but do not know how to put their puzzlement in the form of a clear and compelling question. One of my students expressed that sometimes he really didn't know what questions to write. Other researchers have

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TABLE 3. Types, Characteristics, and Samples of Questions Generated by Question-Finding

Types	Characteristics	Question Samples
Puzzlement (awareness type)	Perception of anomalies, recognition of ambiguity, question-sensing, intuitive, metacognitive	Why is the event a surprise? How does the idea conflict with...? How is the event different from what you expected?
Puzzlement (explanation type)	Explanatory, strategic planning, goal oriented, coherence-seeking, convergent thinking	How can you explain? What steps can you take to resolve puzzlement? What rationale can be given for...?
Wonderment	Generative, imaginative, speculative, exploratory, divergent thinking	What are some other ways? What if...? Can you imagine...?

discovered the same problem of student inability to frame questions to ask (Graesser & McMahen, 1993). Specifically, van der Meij and J.T. Dillon (1994) found that "becoming perplexed was not sufficient for question construction. Some students would begin phrasing a question and then stop suddenly before asking it. They were experiencing perplexity but couldn't put it into the proper words" (p. 278). Students need to be trained in the linguistic format of these question types. (See Table 4 for cue cards for question types.) They do not ask higher order thinking questions spontaneously. Indeed, "leaving questioning to chance is tantamount to leaving students' puzzlement undetected and this stifles further inquiry" (Alvermann, 2004, p. 232).

During the second stage, the question-finding process takes two necessary but alternate paths (see Figure 2, page 9). One path is narrow, leading to an explanation or resolution of the puzzle. Here students seek to find puzzlement questions (explanation type) that are embedded within the discrepant sources. These question types are convergent in nature, because they seek to elicit narrowly defined or focused objectives, namely, the explanation and resolution of the puzzling situation. For example, the student might ask, "Why is the subject acting in such a strange or puzzling way?" The student's—or question-finder's—objective is to explain away or resolve the anomaly or discrepancy. Here the teacher will demonstrate (using cue cards) how to construct puzzlement questions (explanation type). (See Table 4.)

Students can also follow a more open-ended path that is only limited by their imagination. Here the question-finder recognizes that there are questions to be found

TABLE 4. Procedural Prompts: Cue Cards for Question Types

Puzzlement Questions (awareness type)
Signal words/short question stems: why, how, in what ways
Cognitive operations: perceiving anomalies, recognizing ambiguity, developing awareness

Examples
Perceiving anomalies: In what ways does the scientific explanation of evolution conflict with my own beliefs?
Recognizing ambiguity: Why did the women's organization vote against the equal rights amendment?
Developing awareness: How does multiplication sometimes make the product smaller?

Puzzlement Questions (explanation type)
Signal words/short question stems: why, how, in what ways
Cognitive operations: explaining, seeking coherence, strategic planning (convergent thinking)

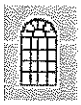
Examples
Explaining: Can you explain why the president holds two contradictory opinions about the hostage crisis?
Seeking coherence: What rationale can be given for teaching intelligent design in science class?
Strategic planning: How can I teach the implications of the whole-number bias to my mathematics class?

Wonderment Questions
Signal words/short question stems: imagine, suppose, predict, if...then..., how might..., can you create..., what are some possible consequences...?
Cognitive operations: hypothesizing, inferring, imagining, divergent thinking

Examples
Hypothesizing: How might life have been different without penicillin?
Inferring: What are some possible consequences of the rise of teen pregnancy?
Imagining: Can you imagine the possibilities of a world without violence?

Adapted from Ciardiello, A.V. (1998). Did you ask a good question today? Alternative cognitive and metacognitive strategies. *Journal of Adolescent & Adult Literacy*, 42(3), 214.

embedded within discrepant sources that cannot be explained or justified. These are **wonderment questions** that are divergent in nature and lead to alternative avenues of discovery (Opdal, 2001). These questions do not seek to resolve puzzlement but to generate **rival hypotheses** (Flower, Long, & Higgins, 2000). The thinking process is one of generating alternative questions. The student asks questions that begin with stems that indicate what Lindfors (1999) calls "tentativeness markers," or words that begin with *maybe*, *what if...*, *suppose*, *imagine*. (See Table 4.) These types of questions stimulate additional questions, or are self-propagating. As one of my students realized, there will always be questions, ones that have no answers.



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LEVELS AND TYPES OF QUESTIONS

Bloom's Taxonomy

Questioning should be used purposefully to achieve well-defined goals. An instructor should ask questions which will require students to use the thinking skills which he is trying to develop. A system exists for organizing those thinking skills. Bloom's Taxonomy (Benjamin Bloom (ed)., *Taxonomy of Educational Objectives: Handbook I Cognitive Domain* (New York: David McKay Co., 1956)) is a hierarchial system of ordering thinking skills from lower to higher, with the higher levels including all of the cognitive skills from the lower levels.

Below are the levels of the taxonomy, a brief explanation of each one, and examples of questions which require students to use thinking skills at each level.

- Knowledge - Remembering previously learned material, e.g., definitions, concepts, principles, formulas.
  - What is the definition of "verb"?
  - What is the law of supply and demand?
  - What are the stages of cell division?
- Comprehension - Understanding the meaning of remembered material, usually demonstrated by explaining in one's own words or citing examples.
  - What are some words which are commonly used as adjectives?
  - What does the graph on page 19 mean?
  - Explain the process of digestion.
- Application - Using information in a new context to solve a problem, to answer a question, or to perform another task. The information used may be rules, principles, formulas, theories, concepts, or procedures.
  - Using the procedures we have discussed, what would you include in a summary of Bacon's essay?
  - How does the law of supply and demand explain the current increase in fruit and vegetable prices?
  - Based on your knowledge, what statistical procedure is appropriate for this problem?
- Analysis - Breaking a piece of material into its parts and explaining the relationship between the parts.
  - What are the major points that E. B. White used to develop the thesis of this essay?
  - What factors in the American economy are affecting the current price of steel?
  - What is the relationship of probability to statistical analysis?
- Synthesis - Putting parts together to form a new whole, pattern or structure.

  - How might style of writing and the thesis of a given essay be related?
  - How are long-term and short-term consumer loan interest rates related to the prime rate?
  - How would you proceed if you were going to do an experiment on caloric intake?
- Evaluation - Using a set of criteria, established by the student or specified by the instructor, to arrive at a reasoned judgment.
  - Does Hemingway use adjectives effectively to enhance his theme in The Old Man and the Sea?
  - How successful would the proposed federal income tax cut be in controlling inflation as well as decreasing unemployment?
  - How well does the Stillman Diet meet the criteria for an ideal weight reduction plan?

Lower and Higher Level Questions

At times instead of referring to a specific level of the taxonomy people refer to "lower-level" and "higher-level" questions or behaviors. Lower level questions are those at the knowledge, comprehension, and simple application levels of the taxonomy. Higher-level questions are those requiring complex application (e.g., analysis, synthesis, and evaluation skills).

Usually questions at the lower levels are appropriate for:

1. evaluating students' preparation and comprehension.
2. diagnosing students' strengths and weaknesses.
3. reviewing and/or summarizing content.

Questions at higher levels of the taxonomy are usually most appropriate for:

1. encouraging students to think more deeply and critically.
2. problem solving.
3. encouraging discussions.
4. stimulating students to seek information on their own.

Typically an instructor would vary the level of questions even within a single class period. For example, an instructor might ask the synthesis question, "How can style of writing and the thesis of a given essay be related?" If she gets inadequate or incorrect student response to that question, she might move to questions at a lower level of the taxonomy to check whether students know and understand material. For example, the instructor might ask, "What is the definition of 'thesis statement'?" or "What are some variables in writing style?" If students cannot answer those questions, the instructor might have to temporarily change her teaching strategy, e.g., briefly review the material. If students can answer lower level questions, the instructor must choose a teaching strategy to help students with the more complex synthesis which the original questions requires, e.g., propose a concrete problem which can be used as a basis for moving to the more abstract synthesis. In the example used here, the teacher might direct students to Jonathan Swift's "Modest Proposal" and ask, "What is Swift's thesis?" and "What are some terms you can use to describe Swift's writing style?"

It is not essential that an instructor be able to classify each question at a specific level. The Taxonomy of Educational Objectives is introduced as a tool which is helpful for defining the kinds of thinking skills instructors expect from students and for helping to establish congruence between the instructor's goals and the questions he asks. Figure 1 provides a summary of the taxonomy and breakdown between lower and higher level questions. Another way to examine

questions is described in the next section.

Open and Closed Questions

In addition to asking questions at various levels of the taxonomy an instructor might consider whether he is asking closed or open questions.

A *closed* question is one in which there are a limited number of acceptable answers, most of which will usually be anticipated by the instructor. For example, "What is a definition for 'adjective'?" requires that students give some characteristics of adjectives and their function. While students may put the answer in their own words, correct answers will be easily judged and anticipated based on a rather limited set of characteristics and functions of adjectives.

An *open* question is one in which there are many acceptable answers, most of which will not be anticipated by the instructor. For example, "What is an example of an adjective?" requires only that students name "any adjective." The teacher may only judge an answer as incorrect if another part of speech or a totally unrelated answer is given. Although the specific answer may not be anticipated the instructor usually does have criteria for judging whether a particular answer is acceptable or unacceptable.

Both open and closed questions may be at any level of the taxonomy.

An open low-level question might be:

"What is an example of an adjective?"

An open high-level question might be:

"What are some ways we might solve the energy crisis?"

A closed low-level question:

"What are the stages of cell division?"

A closed high-level question:

"Given the medical data before you, would you say this patient is intoxicated or suffering from a diabetic reaction?"

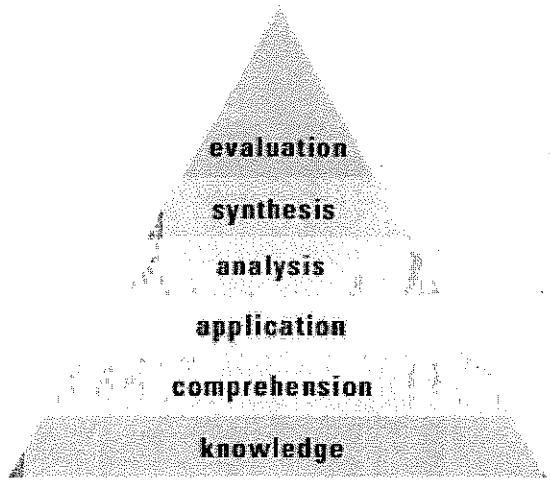
QUESTIONING CATEGORY	BLOOM'S CATEGORY	STUDENT ACTIVITY	TYPICAL STEM WORDS
LOWER LEVEL	Knowledge	Remembering: Facts Terms Definitions Concepts Principles	What? List Name Define Describe
	Comprehension	Understanding the meaning of material	Explain Interpret Summarize Give examples ... Predict Translate

	Application	Selecting a concept or skill and using it to solve a problem	Compute Solve Apply Modify Construct
HIGHER LEVEL	Analysis	Breaking material down into its parts and explaining the hierarchical relations.	How does ... apply? Why does ... work? How does ... relate to ...? What distinctions can be made about ... and...?
	Synthesis	Producing something original after having broken the material down into its component parts.	How does the data support ...? How would you design an experiment which investigates...? What predictions can you make based upon the data?
	Evaluation	Making a judgment based upon a pre-established set of criteria.	What judgments can you make about ...? Compare and contrast ...criteria for ...?

CONTENTS

Levels of Questions with Bloom's Taxonomy

(Image Credits)



Click a level of the pyramid to see questions and question prompts about the photograph that are appropriate to that level of thinking.

Level 1. Knowledge

- When was this picture taken?
- Where was this picture taken?

Question cues: List, define, tell, label

Level 2. Comprehension

- What is happening in this picture?
- Why are these boys dressed like this?

Question cues: Describe, name, identify, discuss

Level 3. Application

- How would you describe the photograph to others?
- What caption would you write for this photograph (say, in a newspaper)?

Question cues: Modify, solve, change, explain

Level 4. Analysis

- Why are these boys here and not in school?
- What do you know about their lives based on this photo?

Question cues: Analyze, separate, compare, contrast

Level 5. Synthesis

- What might these boys say about their work in an interview setting?
- What might they say about their future?

Question cues: Create, construct, plan, role-play

Level 6. Evaluation

- What is the significance of this photo for the time period depicted?
- Compare this photo with one of three boys from today of the same age. How are their lives similar? How are they different?

Question cues: Give opinion, criticize, discriminate, summarize

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Photo Credits

The photograph "Coal Breaker Boys" was taken in Kingston, Pennsylvania, between 1890 and 1910. It is available in the American Memory Collection Touring Turn-of-the-Century America: Photographs from the Detroit Publishing Company, 1880-1920, from the Library of Congress.

Cognitive Level of Question	Type of Feedback
Remember	**Let students know if the answer is correct or incorrect. Provide cues or clues to guide them to a correct answer.**
Understand, Apply	**Ask students to elaborate, explain their answers, expand on responses. Let students know if their answers are factually correct or incorrect.**
Analyze, Evaluate, Create	**Provide feedback on students' thinking. "Help me know how you arrived at that answer." Let students know if their answers are factually correct or incorrect.**