Questions That Gather Information

Questions That Gather Information

Questions are key to learning. During the learning process, the brain is constantly asking questions, seeking answers, identifying more questions, and looking for more answers. The role of both the teacher and the learner is to ask questions that further the learning process. According to Charlotte Danielson (2011), "it is important that questioning and discussion are used as techniques to deepen student understanding" (p. 54).

There is a great deal of research on the use of questions in the classroom, their place in the learning process, various types of questions and their purposes, and the effective use of questioning to encourage the learner to think deeply and critically about the concept being learned. The research on questions and questioning is abundant and clear in its conclusions: certain types of questions serve specific purposes and planning particular questions to ask throughout a lesson and/or unit is critical for guiding students' learning. In fact, "According to Robert Marzano's book, Classroom Instruction That Works, 80 percent of what is considered instruction involves asking questions. It makes sense then, that if we want to improve our effectiveness at teaching, of course we would start by improving our questions" (Johnson, 2012).

Many authors have classified questions into any number of categories.

- The Types of Questions (n.d.) offer these types of questions: clarifying, convergent-thinking, cueing, divergent-thinking, evaluative, focus, and probing questions.
- Bloom's Revised Taxonomy identifies six levels of questions: Remembering, Understanding, Applying, Analyzing, Evaluating, and Creating.
- Leslie Owen Wilson (Types of Questions, n.d.) identifies five types of questions: factual, convergent, divergent, evaluative, and combinations of these four.
- R.W. Paul (Questioning to Promote Higher Order Thinking Skills, n.d.) outlines six types of Socratic Questions: questions for clarification, questions that probe assumptions, questions that probe reasons or evidence, questions about viewpoints and perspectives, questions that probe implications and consequences, and questions about the question.
- There are questions that invoke lower order thinking and questions that promote higher order thinking.
- Some questions are closed-ended and others are open-ended.
- A number of authors suggest that essential questioning allows students, through inquiry, to construct their own understandings.

This eBook will explore a number of types of questions, two different approaches to questioning, strategies for effective questioning, and student-led questioning approaches. Additionally, it will provide an overview of inquiry-based learning and suggest best practices related to questioning.

Information Alignment

Materials presented in this eBook align with the following:

Module Questions

- How could the use of basic questioning advance student learning?
- How could the use of specific questioning strategies foster students' understanding of content?
- How could student-led inquiry-based approaches impact student understanding?

Learning Outcomes

- Reflect upon your own questioning techniques.
- Explore the first level of questioning that advances student learning.
- Analyze questioning strategies and consider how they can facilitate student understanding of content and the gathering of information.
- Examine inquiry-based approaches that teach students how to ask and identify questions.

Topic Focus

Questions That Gather Information

- Types of Questions
- Overview of Questions for Life® Model
    - Higher Order vs. Lower Order Thinking Skills
    - Open vs. Closed Questions (Thick vs. Thin)
    - Divergent vs. Convergent Thinking and Questioning
    - Essential Questions
- Approaches to Questioning
    - Bloom's Taxonomy
    - Webb's Depth of Knowledge

Strategies for Effective Questioning

- Teacher Strategies
    - Planning key questions to provide lesson structure and direction
    - Posing clear and specific questions
    - Asking questions at a variety of levels
    - Wait time
- Student-led Questioning Approaches
    - Inquiry-based questioning
    - Critical thinking skills

Overview of Inquiry-based Learning

- 5 W's (Who, What, When, Where, Why, & How?)
- Best Practice Tips

Table of Contents

At time of publishing, all of the website information was accurate. Due to the nature of the internet, some of the website information may have changed or become unavailable. Please see the references section of the corresponding online module for the most up-to-date information.

Table of Contents

Questions That Gather Information

Types of Questions

Overview of Questions for Life Model
Questions for Life provides a model for teachers to use in developing and enhancing students' critical thinking skills. According to Steve Barkley (2009), "The Questions for Life model helps teachers to formulate the right questions—the stimulating questions that generate real thinking and uncover the learning that occurred" (p. 34). The model is based on framing questions around specific cue words that trigger particular thinking processes. For example, the cue word comparing (Same/Different), initiates a different thinking process than the thinking process associated with rating (Appraisal) (p. 34).

Teachers must ask both lower- and higher-order questions. Research has also shown that students who learn how to ask themselves and others higher-order questions show gains in student achievement: "When students know how to ask their own questions, they take greater ownership of their learning, deepen comprehension, and make new connections and discoveries on their own" (Rothstein & Santana, 2011). When questioning and thinking skills are only modeled, and not directly taught, students may incidentally learn the skills but not internalize them so that they can consciously be applied in other circumstances. The Questions for Life model encourages the implementation and modeling of the questioning and thinking skills by teachers as well as direct instruction, briefing, and debriefing with students (Barkley, 2009, p. 10).

Steve Barkley (2009) also writes that "being aware of the type of questions or thinking we are engaged in helps to clarify and crystallize our thinking" (p. 47). Deliberately posing particular kinds of questions requires an awareness of the types of thinking required for an intended instructional outcome. Cue words are useful in framing questions that achieve the intended thought processes that questions are meant to trigger. According to Barkley, "The cue words used in Questions for Life trigger awareness of thought processes (metacognition) in everyone, whether they are students, teachers, or people in other walks of life. This awareness empowers them to practice the thinking skills they already use, but which they may not have identified or articulated as thinking processes. Because Questions for Life is brain-compatible (i.e., it both follows and elicits our natural thinking patterns), practicing and internalizing its use need not be a grueling task" (pp. 35-36).

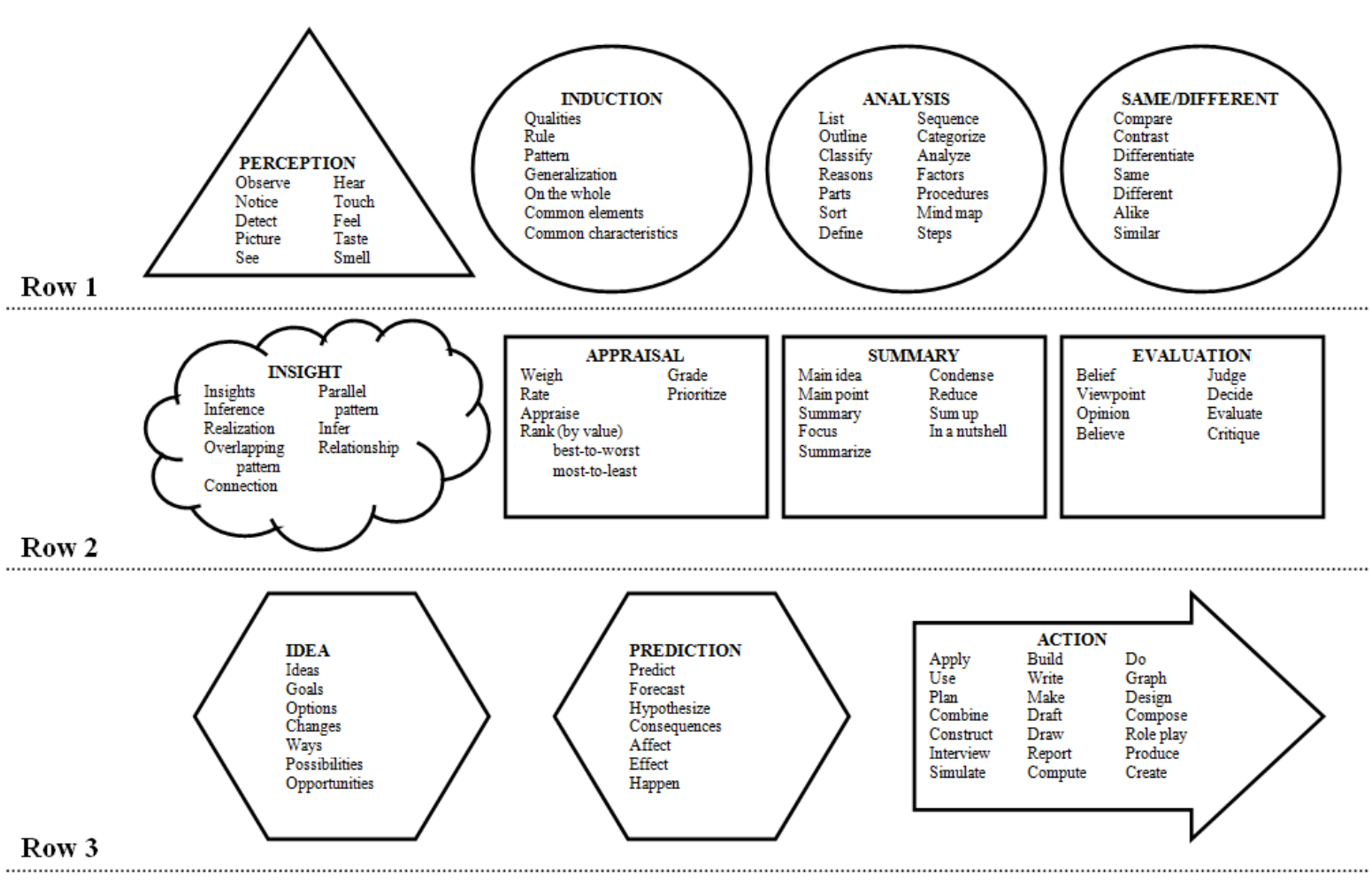

Figure 1. Questions for Life Model

Many teachers are familiar with Bloom's Taxonomy which focuses on a hierarchy of various types of questions used in teaching. Alternatively, the Questions for Life model focuses on the thinking processes embedded in the questions and

provides a tool for enabling teachers to differentiate based on individual student levels of understanding (Barkley, 2009, pp. 34, 38).

In the Questions for Life model, eleven thinking processes are organized into three rows of generalized questioning strategies. The focus of Row 1 is on Gathering Information. The four thinking processes in this row are Perception, Analysis, Induction, and Same/Different. Rows 2 and 3 reflect more complex questions. Row 2 involves thinking strategies that Work With Information. Thinking strategies associated with this row include: Insight, Appraisal, Summary, and Evaluation. Taking Action is the focus of Row 3 questions. Thought processes in this row are Idea, Prediction, and Action. Each of these thinking processes has associated cue words for building questions and statements. Cue words (bold in the questions below) should be used as often as possible in order to trigger the desired thinking processes and debriefed so as to increase metacognition.

> The questioning strategies in the first row focus on gathering data or information. As the information is collected, it may be analyzed and/or compared or contrasted to other data for better understanding. A generalization may then be formed. Some or all of these thinking processes might occur, but using any of the thinking in the first row always involves gathering information or data in one way or another:
>
> 'What flavors do you **taste** in this cookie?'
> 'What are common characteristics of Generation X?'
> 'What procedures should be followed to solve this type of problem?'
> 'Compare the two frogs' hind legs.'
>
> The second row involves thinking strategies that work with information, whether gathered by using the thinking processes in the first row or already available from prior experience or knowledge. We can work with the information by using the cue words in each questioning type:
>
> 'What **insights** do we get from the report provided?'
> 'How would you **rank** the suggestions people submitted in the report?'
> 'Summarize the main idea presented.'
> 'What do you believe about it?'
>
> In the second row we look to see if we want to gather more information or move to Action—in other words, move back to Row 1 or go on to Row 3. We decide if there is a reason to do something now that we have collected and worked with the information.
>
> The third row is driven by new thoughts and action, usually stemming from the information and thinking that prevailed in Rows 1 and 2. Action is physical and requires doing, building, drawing, graphing, etc. Its chances of success are greater when the thought processes in Row 3 have come into play: when new ideas have been created out of gathered information and when predictions have been made. Questions the thought processes in Row 3 might address include:
>
> 'What are some ways we might approach creating a model?'
> 'What do you think will happen when we use each of these approaches?'
> 'Can you construct a model based on our prior planning and research?' (Barkley, 2009, pp. 62-64)

Research indicates that most of the questions posed by teachers fit under the first and second rows (gathering and working with information), falling short of guiding students to the critical thinking associated with row three (taking action, making predictions, and developing new ideas). Students are capable of performing the required actions in row three which reflect the challenges of real life. Extending learning opportunities to include row three thinking processes demands a paradigm shift from merely amassing knowledge to using it in meaningful ways.

Row 1: Gathering Information

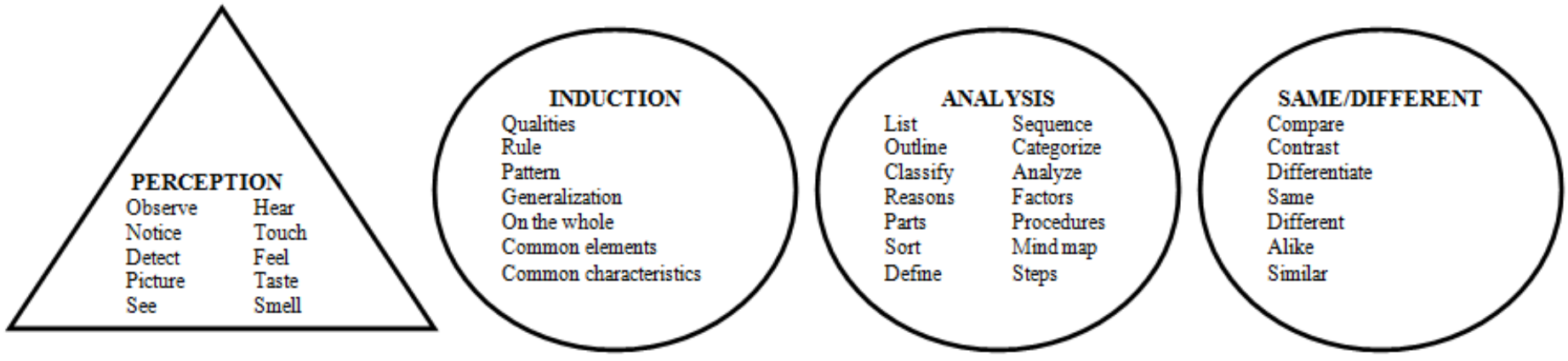

Figure 2. Questions for Life model Row 1: Gathering Information.

According to Barkley (2009):

The first row of the Questions for Life model comprises the most basic thinking skills. As we plow ahead to decide, act, or analyze, we forget to observe and hear what's right in front of us so we can really see what we're dealing with" (p. 68). Furthermore, "The cue words under Perception on the Questions for Life Cue Words chart focus our thinking on the concrete, the observable, and the literal. Being very clear about what we see, hear, smell, feel, touch, detect, and so on prevents us from making wrong assumptions based on a lack of concrete facts. With Perception, what we see is what we get, and what we do with what we see stems from the experience of our own senses. In the classroom or in any group, relying on observable data puts everyone on the same page (Barkley, 2009, p. 70).

Perception often gets overlooked in the classroom because we assume everyone *saw* or *felt* what we did. When we refer to something, we imagine everyone has had the same prior experience. For example, if we start asking questions about the ocean and there are students in the class who have never *seen, touched,* or *heard* an ocean, we have made an assumption that will immediately leave those students out of the ensuing thinking processes. Unless everyone recognizes the same or similar sensations (*hear, see, touch, feel,* etc.), the natural thought processes get derailed. To engage the students who have never experienced an ocean, we need to provide them with some tangible items from the ocean to hold and *observe*—perhaps show them a movie about the ocean or give them a shell that still has the scent of saltwater. We could also do a mental imaging, or visualization, about what an ocean looks like, sounds like, and smells like. In this way students who would otherwise be 'ocean-challenged' could acquire multisensory experiences similar to those of the other students. Sharing common perceptions, students could then move along the first row of questioning strategies together. Paying careful attention to Perception also allows us to shift our focus from how we see things to how others might see them (Barkley, 2009, p. 71).

Concrete, literal data falls in the realm of Perception, and the more we endeavor to start there, focusing on our perceptions, the more astute our assumptions and actions will be" (Barkley, 2009, p. 72). "Wanting to elicit perceptions involving the senses rather than accept a label, the teacher asks again, 'What do you *see?* What do you *notice* about its shape?' These are the questions that, taken literally, will elicit Perception. Answers that give a name or label instead of literally stating what is *seen, smelled, felt,* or *heard* move to Induction, jumping past Perception (Barkley, 2009, p. 73).

The thinking skills Induction, Analysis, and Same/Different are placed within the same geometrical shape in the Questions for Life model because they are often used simultaneously or in sequence. We are moving to Induction here for purposes of explanation only; thought processes do not follow an established order. Induction is the process of making a *generalization* or an assumption that is drawn from instances or experiences. Induction allows us to find *common characteristics* among multiple instances and discern a *pattern* or create a *rule* that applies to them all (Barkley, 2009, p. 75).

When we use Induction, however, our *generalizations* and assumptions can be wrong. There is no 'right' *generalization* or inductive answer, precisely because it is based on our own experiences, our own instances, and our own perceptions. We can, of course, add the experiences and instances of others to the mix, and doing so often improves our chances of arriving at a more accurate *generalization.* The more instances we have, and the more we scrutinize what we saw, heard, or felt in those instances, the more likely we are to arrive at a valid *generalization, rule,* or *pattern*. Such scrutiny helps to eliminate wrong thinking based on guesswork or misinformation (Barkley, 2009, pp. 75-76).

We often do an *analysis* or a *comparison* (Same/Different) before or after we arrive at a *generalization*. We can also perform these processes simultaneously. Every solution-seeking and thinking process has Analysis questions at its center. Analysis questions allow us to break an issue apart and look at its *parts* individually in order to gain a better understanding of all the nuances involved (Barkley, 2009, pp. 78-79).

Our brains naturally compare and contrast information during Analysis, and each analysis becomes richer and more in-depth as we determine similarities and differences among the individual elements we are considering. The comparison brings forth more details about each one, providing greater clarity and understanding. Analyses can be developed in countless different ways. Analysis appears in formats such as outlines, mind maps, classifications, lists, and categories. Where Perception or Induction questions might ask for a specific observation or generalization, Analysis questions ask for multiple perceptions or generalizations. Same/Different questions augment the Analysis (Barkley, 2009, p. 79).

In Questions for Life, Row 1's thinking processes and cue words guide our thinking to allow us to gather information. These four thinking processes—perception, induction, analysis, and same/different—are activated by cue words embedded in the questions we ask. Each thinking process generates different, and valuable, information which helps direct subsequent thinking. Intentionally crafting and asking questions which access specific thought processes builds the foundation for further and deeper learning.

Higher Order vs. Lower Order Thinking Skills
In a nutshell: lower-order questions require the respondent to remember, and higher-order questions require a respondent to think. Lower-order questions tend to demand the recall of facts and are often closed-ended. Frequently, there is one right answer and they often begin with one of these words: what, who, when, and where. Examples of lower-order questions include: *What time is the basketball game this evening? Who is our opponent ? Where is the game being held?*

Higher-order questions tend to require deeper thought and are usually open-ended with a number of potential responses. They often begin with *how, why, or which*. Examples of higher-order questions include: *Why is the other team favored to win? How could our team be better prepared to face this opponent? Which players on the opposing team do we have to pay attention to? Why?*

Each has its merits and usefulness. Lower-order questions are important for checking knowledge. Research has indicated that teachers tend to overuse lower-order questions and suggests that the balance between lower- and higher-order questions in the classroom be close to an even split. (Hastings, 2003)

Open vs. Closed Questions (Thick vs. Thin)
Closed questions can be answered with one-word or a single phrase. They are often called "thin" because they elicit facts and are easy to answer and the questioner keeps control of the conversation with closed-ended questions. Closed questions are useful in the following situations (*Open and Closed Questions*, n.d.): as opening questions in a conversation, for checking understanding, for setting up a frame of mind, and for achieving closure.

Conversely, open-ended questions are rarely answered simply. They often solicit a lengthy response. The respondent is required to think and reflect prior to answering an open-ended question. "Thick" questions may ask for opinions or arguments in addition to more involved facts. An open-ended question allows shared control of the conversation between the questioner and the respondent.

The Teaching Center at Washington University in St. Louis (*Asking Questions to Improve Learning*, 2009) suggests that teachers employ open questions to:

- assess learning,
- ask a student to clarify a vague comment,
- prompt students to explore attitudes, values, or feelings (when appropriate),
- prompt students to see a concept from another perspective,
- ask a student to refine a statement or idea,
- prompt students to support their assertions and interpretations,
- direct students to respond to one another,
- prompt students to investigate a thought process,
- ask students to predict possible outcomes,
- prompt students to connect and organize information,
- ask students to apply a principle or formula, and
- ask students to illustrate a concept with an example.

Divergent vs. Convergent Thinking and Questioning
Convergent questions are closed-ended and require direct answers. In its purest form, a convergent question has only one correct answer. Divergent questions are open-ended and elicit more elaborate answers. An infinite number of answers could exist in response to a divergent question. Realistically, most questions fall somewhere in between these two extremes.

St. Andrew's Episcopal Upper School Library (n.d. a, b) offers these definitions and examples of convergent and divergent thinking questions: "Convergent thinking questions are those which represent the analysis and integration of given or remembered information. They lead to an expected end result or answer." Associated thought processes include: explaining, stating relationships, and comparing/contrasting. Examples of convergent questions might include: Why was Richard III considered an evil king? How does gravity differ from electrostatic attraction?

Divergent thinking questions are those which encourage creativity, new directions and perspectives, problem solving, and critical thinking. The associated thought processes are predicting, hypothesizing, inferring, and reconstructing. Sample questions include: How might life in the year 2100 differ from today? In the love relationship between Romeo and Juliet, what may have happened had their families not been feuding?

Essential Questions
In an interview with Zmuda (2012), Dr. Grant Wiggins asserted that "essential questions are designed to make people think" and therefore are educational goals. Students come to realize that their job in school is to become better at and persist in asking important questions. This is an iterative process whereby thought-provoking questions are offered by teachers which leads to students asking many more questions.

Wiggins (2013) adamantly avers that essential questions should relinquish control of questioning from the teacher to the students. He offers a four-phase process for implementing essential questions:

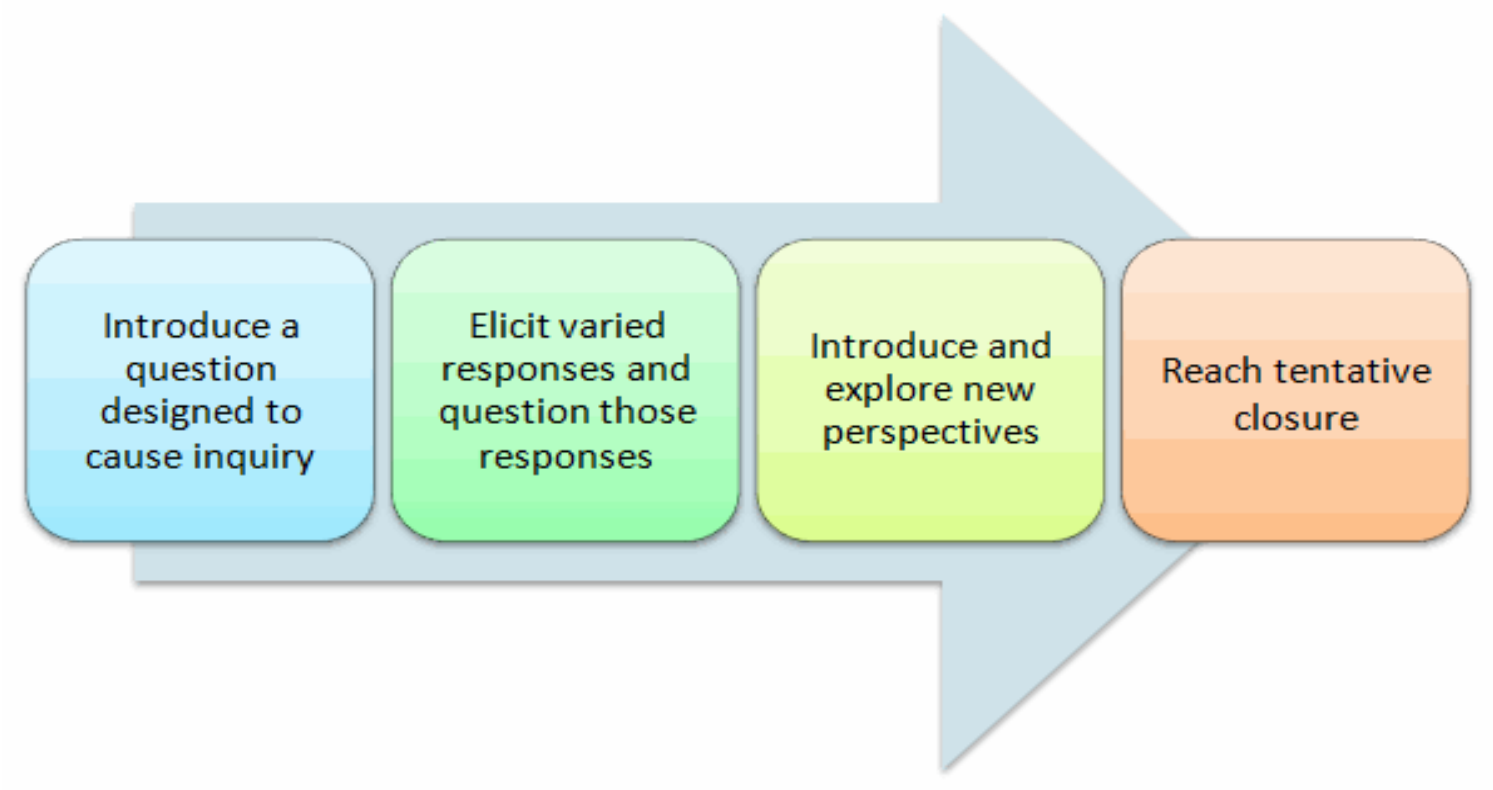

Figure 3. Wiggins' Four Phase Process

Wilhelm (n.d.) states "An essential question frames a unit of study as a problem to be solved. It should connect students' lived experience and interests to disciplinary problems in the world. And it should connect what they learn back to the real world, where they can put their new understandings to work."

Essential questions (EQ) should help students to uncover a topic. Wilhelm (n.d.) identifies three criteria for writing a good EQ. It should:

- be interesting and compelling to students,
- lure students into ongoing disciplinary debates and conversations, and
- require students to learn and use the same strategies, understandings, and knowledge of real field experts.

Dr. Jamie McKenzie (1996) identifies the attributes of sound essential questions. They should:

- have no one obvious answer;
- go to the heart of a discipline;
- recur throughout one's learning;
- be framed to provoke and sustain student interest, spark curiosity and wonder;
- link to other essential questions;
- reside at the top of Bloom's Taxonomy (evaluation, analysis, synthesis);
- engage students in real-life applied problem-solving; and
- encourage multidisciplinary investigations.

Wiggins (2013) offers these key elements:

- an intriguing and key question,
- inherent ambiguity,
- clearly different points of view, and
- shades of gray that will require careful questioning and discerning observation and research.

Because these authors all have their own opinions of what makes a good EQ, various examples from each of the above authors are offered below:

Elementary:

- What makes a good home? (Wilhelm, n.d.)
- What is courage? (Wilhelm, n.d.)
- What makes a family a community? (Wiggins & McTighe, 2005)

Secondary Science:

- What is science? How does it relate to or differ from common sense and religious view on empirical issues? (Wiggins, 2013)
- Is our society more advanced than those in the past? (McKenzie, 1996)
- What differentiates one nation's identity from another? (Wiggins & McTighe, 2005)
- What role does technology play in the history of a people? (Wiggins & McTighe, 2005)
- Do mathematical models conceal as much as they reveal? (Wiggins & McTighe, 2005)
- Do statistics always lie? (Wiggins & McTighe, 2005)
- Is history a history of progress? (Wiggins & McTighe, 2005)

Note that despite the subtle differences, each of these questions has no single,correct answer; has the potential to generate interesting conversations; and requires students to reflect on key concepts within disciplines in addition to factual knowledge.

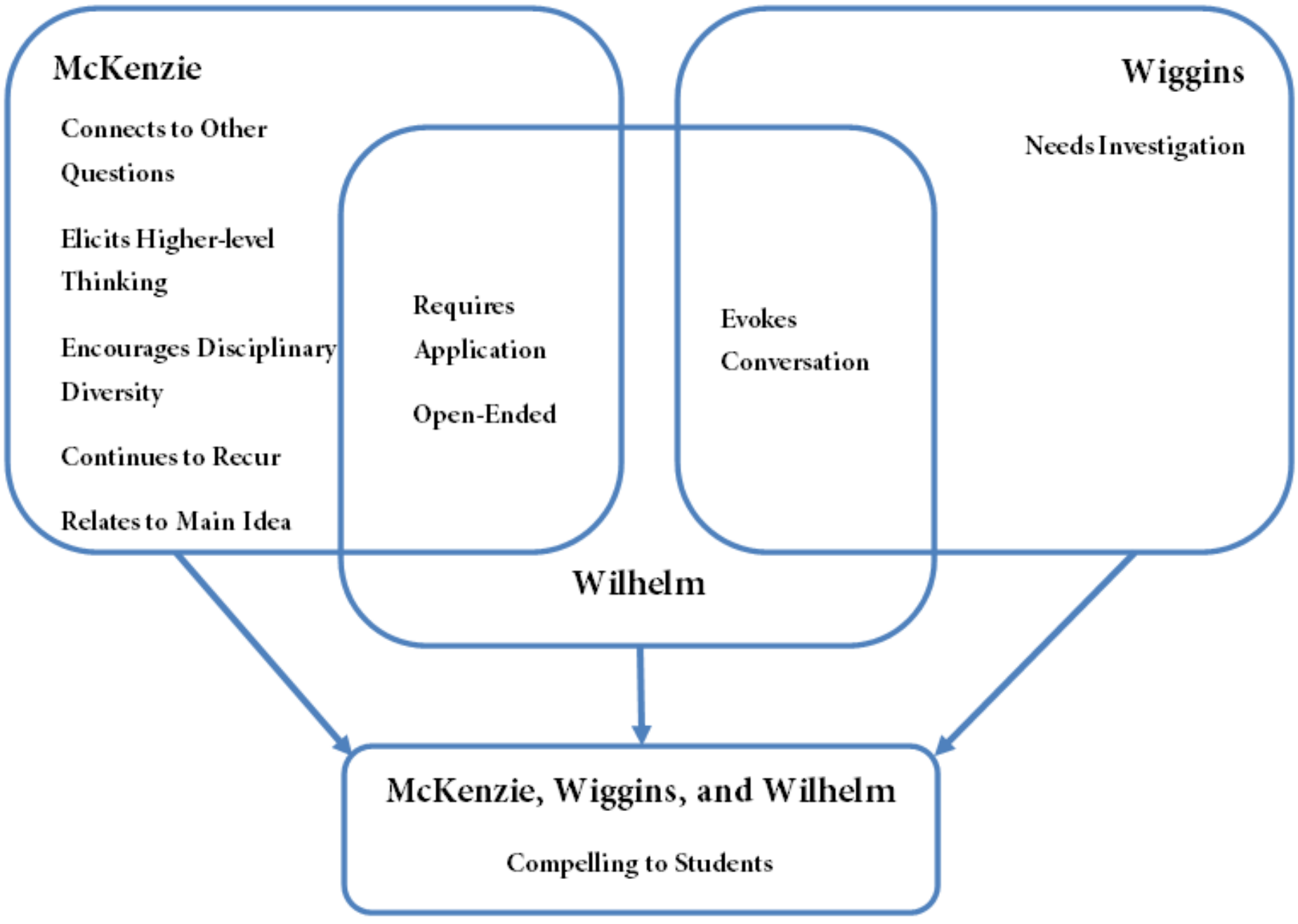

Figure 4. Elements of Essential Questions

Approaches to Questioning

According to Barkley (2009), "Questioning strategies are the educator's mainstay…Questions are designed to probe for further information, enhance understanding, and generate student thinking. As a strategy, questioning is as old as Socrates, who initiated its systematic use to stimulate critical thinking" (p. 38).

Bloom's Taxonomy
Bloom's Taxonomy was originally developed in 1956 by Benjamin Bloom to depict the hierarchy of cognitive skills on a continuum from lower- to higher-order thinking skills. In the 1990's, one of his students published an updated (and revised) version. This model, known as Revised Bloom's Taxonomy, is represented in this eBook. A basic tenet of Bloom's model is that students must master lower-level skills prior to moving on to the skills which require higher-order thinking. Bloom called this *mastery learning*.

The six levels cognitive levels in the Revised Bloom's Taxonomy are:

Level of Thinking	Level	Definition	Cognitive Processes
Higher-order thinking	Creating	Put elements together to form a coherent or functional whole; reorganize elements into a new pattern or structure	Designing, constructing, planning, producing, inventing
Higher-order thinking	Evaluating	Make judgments based on criteria and standards	Checking, critiquing
Higher-order thinking	Analyzing	Break material into its constituent parts and determine how the parts relate to one another and to an overall structure or purpose	Differentiating, organizing, attributing
Lower-order thinking	Applying	Applying a procedure to a familiar task	Implementing, executing
Lower-order thinking	Understanding	Construct meaning from instructional messages, including oral, written, and graphic communication	Interpreting, exemplifying, classifying, summarizing, inferring, comparing, explaining
Lower-order thinking	Remembering	Retrieve knowledge from long-term memory	Recognizing, recalling

Anderson, Krathwohl, & Bloom, (2001)

Representative questions for each level include:

- What happened next? (Remembering)
- What was the author trying to communicate? (Understanding)
- What aspects would you have to change for a left-handed person? (Applying)
- How is the American Civil War similar to current events in Egypt? (Analyzing)
- Defend your position on school uniforms. (Evaluating)
- Plan an event to acquaint school parents with the new math curriculum. (Creating)

Webb's Depth of Knowledge

In 1997, Norman Webb published the Depth of Knowledge model which provides both a process and criteria for analyzing the alignment between standards, curricula, and assessments. In the analysis, the intent is to assess the level of cognitive demand on students as they work on a task. It should be noted that the Depth of Knowledge level is determined by the depth of thinking required and reflects the level of work most students need to display in order for the response to be deemed acceptable. The assignation of a particular level represents the *complexity* of the task rather than the *difficulty* of the task (*Webb's Depth of Knowledge Guide*, 2009).

Depth of Knowldege Level	Title of Level	Definition	Representative Questions	Key Processes
1	Recall and Reproduction	Tasks that require students to recall or reproduce knowledge and/or skills	When did the story take place? What is the formula for finding the area of a right triangle?	List, identify, define
2	Skills and Concepts	Make use of information in a context different from the one in which it was learned	When would you use an outline other than for taking notes?	Summarize, estimate, organize, classify, infer
3	Short-term Strategic Thinking	Coordinate knowledge and skill from multiple subject-matter areas to carry out processes to solve real-world problems with predictable outcomes	What facts would you select to support your position? Why?	Analyze, explain and support with evidence, generalize, create
4	Extended Thinking	Employ and sustain strategic thinking processes over a longer period of time to solve real-world problems with unpredictable outcomes	Design and conduct an experiment applying what you know about climate change to predict the impact on next year's wheat crop.	Synthesize, reflect, conduct, manage

Webb's Depth of Knowledge Guide, (2009)

Strategies for Effective Questioning

Teacher Strategies

According to *Teaching in the Interrogative* (n.d.), "There are numerous strategies that teachers can use to make their classrooms less 'imperative' and more 'interrogative.' Strategies include:

1. Using the think-pair-share strategy to allow students to respond to questions cooperatively.
2. Avoiding predictable question patterns by calling on students randomly and allowing for student calling.
3. Asking students to 'unpack their thinking' by describing how they arrived at an answer.
4. Promoting active listening by asking for summaries of individual and class responses to key questions.
5. Asking students why they hold a particular position or point of view on a subject.
6. Surveying the class (e.g., How many of you agree?—Thumbs up, thumbs down...)
7. Encouraging student-constructed questions.
8. Emphasizing 'why?' and 'how?' questions.
9. Using hypothetical thinking: What would happen if...? What if this had happened?
10. Employing reversals: What happens if we reverse the steps?
11. Applying different symbol systems: How can we present these ideas in graphic form?
12. Using analogies: How is this like _____ ?
13. Analyzing points of view: What else might account for this? How would Hamlet view these events?
14. Employing completion activities: Before we read the conclusion, what ending would you recommend?"

Additional strategies to adopt or implement include the following (*Learning and Teaching Should be Inclusive and Enjoyable: Questioning*, 2010):

1. Prior to instruction, ask students to generate questions about a topic.
2. Create a question wall, question box, or "parking lot" where students can submit questions while engaged in a topic of study.
3. Rather than responding to each answer, call on another student to encourage depth in the discussion.
4. Establish pairs or groups of students to explore more difficult questions.
5. Discourage hand-raising; instead, call on students to answer.
6. Assign students to return the next day with a question related to the day's topic.
7. Have students submit questions for their peers to consider.
8. Assess the quality of questions as well as answers.
9. When a question proves difficult, ask a student to rephrase the question for the class.
10. For a difficult question, provide reflection time for students to write their answers prior to class discussion.
11. When you ask a particular student a question, move away from the student so that the rest of the class feels involved.
12. When summarizing or reviewing, use various question types.
13. Invite a student to teach part of a lesson, including developing and asking appropriate questions.

Planning key questions to provide lesson structure and direction
Dr. Mike O'Neill (n.d.) offers key points for planning effective questioning:

- Write down your key questions in advance of the lesson, making sure that you have a range to suit all abilities.
- Ask fewer, better questions.
- Model a "questioning mind" by thinking aloud and asking good questions.
- Seek better answers. With fewer, better questions, you will have time to invite more responses, extend thinking time and probe more deeply.
- Encourage students to ask more questions. The ability to question is one of the keys to effective learning and it comes with practice. Value children's questions as much as their answers.
- Use a variety of questioning techniques to ensure that questions are well distributed; try to ask each student a

question during the course of the lesson (avoid using the "hands-up" technique).
- Use Bloom's Taxonomy and consider when to use low-, medium- and higher-order questions.
- Allow students time to think before answering, and give yourself time to think about their answers.
- Make your classroom a "questioning environment."

Posing clear and specific questions
Suggestions for posing clear and specific questions include the following (*Asking Questions to Improve Learning*, 2009):

- When planning questions, keep in mind your course goals.
- Avoid asking "leading" questions.
- Follow a "yes-no" question with an additional question.
- Aim for direct, clear, specific questions.
- In class discussions, do not ask more than one question at once.
- When you plan each class session, include notes of when you will pause to ask and answer questions.
- Ask a mix of different types of questions.

Asking questions at a variety of levels
The questions that teachers pose to students have cue words embedded which signal the level of thinking that is expected of them. The philosophy associated with Bloom and Webb asserts that lower levels of thinking are prerequisite to demanding higher levels of cognition. Their models encourage teachers to structure and sequence questions to lead students to higher and higher levels of thinking.

Throughout the questioning process, teachers should utilize the types of questions that are best suited to achieve their goal. Research indicates that teachers ask a preponderance of lower level questions; therefore, they are encouraged to intentionally plan questions which steer students toward more critical thinking skills. Questions for Life, Bloom's Taxonomy, and Webb's Depth of Knowledge each provide models for assuring that questions are developed so that students are enabled to reach higher levels of thinking (*Types of Questions,* n.d.).

Wait time
According to Hastings (2003), "In a US study, conducted in 1978 by Mary Budd Rowe, increasing the wait time improved the number and quality of the responses. For a lower-order recall questions, three seconds was found to be the optimum wait time, while wait times of more than 10 seconds produced even better results with higher-order questions. The same research also found that extending the wait time between the pupil giving the answer and the teachers commenting on it (typically fractions of a second) allows pupils to revise or expand their response, and encourages other pupils to contribute".

Thomas Good and Jere Brophy have reported on two types of wait time (*Classroom Questions – Types of Questions, Feedback, Effective Questioning Practices*, n.d.). Wait-time I is the silent period that follows a teacher question but precedes the next utterance. It can be thought of as "think time." Wait-time II follows a student answer but precedes a teacher reaction. It is recommended that wait-time I be increased to three to five seconds in order to generate a higher rate of student participation; longer, more correct and complete answers; and more on-task student talk and attract low-participating students into the conversation. By extending wait-time II, students have more time to formulate complete answers and build on each other's ideas and teachers have more time to carefully consider student responses and craft helpful responses to answers.

The benefits of wait time include:

- "The length of student responses increased.
- More frequent, unsolicited contributions (relevant to the discussion) were made.
- An increase in the logical consistency of students' explanations occurred.
- Students voluntarily increased the use of evidence to support inferences.
- The incidence of speculative response increased.
- The number of questions asked by students increased.
- Greater participation by all learners occurred" (*What is the Value of Wait Time?*, n.d.).

Consciously stopping and counting to five before calling on and responding to students is one way to develop the habit of implementing wait time.

Student-led Questioning Approaches

When students generate their own questions, their comprehension of a topic is enhanced (*Classroom Questions – Types of Questions, Feedback, Effective Questioning Practices*, n.d.). Additional positive outcomes include increased student retention and fewer student interruptions (Bilash, 2009).

Inquiry-based Questioning
Joe Exline (2004) asserts that "effective inquiry is more than just asking questions. A complex process is involved when individuals attempt to convert information and data into useful knowledge. Useful application of inquiry learning involves several factors: a context for questions, a

framework for questions, a focus for questions, and different levels of questions…. Inquiry is not so much seeking the right answer—because often there is none—but rather seeking appropriate resolutions to questions and issues. For educators, inquiry implies emphasis on the development of inquiry skills and the nurturing of inquiring attitudes or habits of mind that will enable individuals to continue the quest for knowledge throughout life."

The Centre for Research in Mathematics Education at the University of Nottingham created handouts for teachers (*Asking Questions That Encourage Inquiry-Based Learning*, 2010) which include principles for effective questioning in Inquiry-Based Learning. They include:

- Planning sequences of questions that foster thinking, reasoning, and a range of responses.
- Including everyone by arranging students' seats so students face each other and encourage them to respond to one another.
- Teaching students about wait time and employ it.
- Avoiding judging students' responses by acknowledging a student response and asking follow-up questions that solicit additional responses and deeper thinking.

Critical Thinking Skills

Multiple definitions of critical thinking abound. Critical thinking is a metacognitive process of applying rational higher-order thinking skills such as analysis, synthesis, evaluation, problem solving, and inference to information gathered from observation, experience, reflection, reasoning, and/or communication in order to make reasoned judgments. Students need to learn to think critically in order to have the skills to make sound decisions about complex problems in all aspects of their lives (Adsit, 1997).

Ron Ritchhart of Harvard's Project Zero addressed a question posted on Larry Ferlazzo's blog regarding how to teach critical thinking skills: "If we take seriously the notion that learning is a consequence of thinking, then thinking—in all its forms: critical, creative, and reflective—needs to be a part of every lesson we teach" (*Response: Several Ways To Teach Critical Thinking Skills*, 2011).

It is important to be clear about the type of thinking that you want to stimulate. Think back to the overview of the Questions for Life model: do we want students to gather information? work with information? take action? Lessons, assignments, questions, assessments are all driven by the type of thinking teachers want to induce.

Nobori (2011) offers tips for teaching critical thinking:

1. Questions, questions, questions – foster and encourage intellectual curiosity
2. Start with a prompt and help them unpack it – help clarify and define terms
3. Provide tools for entering the conversation – provide sentence starters and connectors
4. Model your expectations – both good and bad examples
5. Encourage constructive controversy – demonstrate respectful ways to disagree
6. Choose content students will invest in – relevant and significant topics
7. Set up Socratic discussions – inquiry method of questions and counter-questions
8. Assess their reasoning through different methods – essays, Socratic discussions, speeches
9. Let students evaluate each other – via the" fishbowl" strategy using a rubric
10. Step back – let students drive the content

Overview of Inquiry-based Learning

Inquiry-based learning (IBL) projects result from authentic questions generated by students. The author of *Intro to Youth Inquiry* (n.d.) suggests that "asking questions is at the heart of inquiry-based learning" and consequently, the purpose of IBL is to involve students "in the process of making learning decisions." The teacher's role is that of facilitator, guiding students "in finding the answers themselves and encourage them to ask new questions along the way."

Because questioning is crucial to the IBL process, teachers must master the art of asking good questions. That art includes the information and strategies included in this and subsequent modules. Good questions which serve as the foundation an IBL project include:

- "The questions must be answerable.
- The answer cannot be a simple fact.
- The answer can't be readily known.
- The questions must have some objective basis for an answer.
- The questions cannot be *too* personal" (*Intro to Youth Inquiry*, n.d.).

Teachers find that even more planning, preparation, and responsiveness is required from them to support and facilitate students' IBL projects since they help students identify and refine their questions into an IBL project and guide them through "the research, inquiry, and reporting processes." If implementing IBL is so hard, why do it? The author of *Intro to Youth Inquiry* (n.d.) states that research has identified a number of advantages for engaging students in IBL projects:

- Historically-challenged students often thrive in a learning environment based on inquiry;
- Due to the interdisciplinary nature of IBL projects, multiple skills and knowledge areas are accessed and reinforced;
- The physical, emotional, and cognitive domains are activated throughout the process of working on the project;
- IBL projects can be implemented in any grade level; and
- The experience and knowledge of each student is acknowledged and validated in the collaborative inquiry-based learning environment.

Barron and Darling-Hammond (2008) add that:

- "Student gains in factual learning are equivalent or superior" to those in traditional classrooms
- Students demonstrate an "increase in the ability to define problems, reason with clear arguments, and plan projects"
- Research has shown "improvements in motivation, attitude toward learning, and work habits."

Inquiry-based approaches include project-based learning, problem-based learning, and design-based instruction (Barron, B., & Darling-Hammond, L., 2008). Project-based learning is most commonly implemented in the K-12 classroom. Based on a review of the literature, five key components of effective project learning have been identified:

- Centrality to the curriculum
- Driving questions that lead students to encounter central concepts
- Investigations that involve inquiry and knowledge building
- Processes that are student driven, rather than teacher driven
- Authentic problems that people care about in the real world

5 W's (Who, What, When, Where, Why, and How?)

The art of effective questioning requires teachers and students to be able to craft questions that lead them through the learning process and to model a "spirit of inquiry" (*Intro to Youth Inquiry*, n.d.). They need to know how to formulate and when to ask lower-order, higher-order, convergent, and divergent questions as they facilitate learning. In *Ways to Classify Questions,* Robert Sweetland (n.d.) cites Lehnert as suggesting that selecting the appropriate "5 W" question word is one tool for creating the type of questions which should be asked at pertinent times during the learning process.

- *What* questions ask for a determination of cause, judgment, and properties: "What is a triathlon?"
- *Why* questions ask for goals, expectations, and requests: "Why did you do that?"

- *Where* questions ask for location or process: “Where would you begin research this topic?”
- *Which* questions ask for identification of a person, place, event, or object: “Which war began in 1865?”
- *When* questions ask for time of an event or process: “When do you capitalize nouns?”
- *Who* questions ask to identify a person or group of people: “Who was the first person on the moon?”
- *How* questions ask for procedure and quantity: “How would you solve this problem?”

Questions that begins with *what, when, where, why, who,* and *which* are often divergent (open-ended).

Best Practice Tips

According to Hastings (2003), “It’s worth making room with designated question time lessons, or asking children to come back next lesson with a question to ask.”

To avoid confusion, clearly state the question in a way that the whole class finds easy to understand and involve as many children as possible. The quality of responses is increased when the teachers pre-plans and sequences questions so that they are logically connected. Furthermore, “It’s not just a matter of what you ask, or how—but also when you ask it. Kathleen Cotton’s American research notes that lower ability and younger children respond more effectively to questions presented after they have been given the opportunity to look at material. With higher ability children it’s the other way round—asking questions before they have seen the material allows them to examine it with particular inquiries in mind, and elicits better responses” (Hastings, 2003).

Classroom Questions – Types of Questions, Feedback, Effective Questioning Practices (n.d.) offers suggestions based on a synthesis of research of effective questioning:

- Phrase questions clearly to reduce confusion and frustration
- Wait three to five seconds after asking a question that requires higher-order thinking (wait-time I) and three to five seconds after a student responds to provide specific feedback (wait-time II)
- Encourage all students to respond
- Ensure an appropriate balance of the use of higher-order questions which encourage higher-levels student thinking
- Teacher feedback should be specific and discriminating
- Encourage student-initiated questions which is an indication of student involvement and increased student comprehension

Practicing Effective Questioning (n.d.) offers the following suggestions for effective questioning:

Maximize...	Minimize...
...asking questions that begin with words like "What if," "Explain," "Analyze," "Create," and "Compare and contrast," etc.	...asking questions that have a "yes" or "no" response and questions that require merely direct recall of definitions etc.
...the amount of time you wait after you pose a question, i.e. wait-time, in order to allow students to process the question in their minds.	...calling on students directly after you pose a question and calling on a student before you even ask the question.
...asking students to elaborate on their answers and asking students "why."	...telling a student their answer is wrong and not asking them to think of why it is wrong.
...opportunities for students to pose questions amongst themselves.	...straight lecture without student interaction.
...providing opportunities that challenge students' original conceptual understandings.	...providing opportunities that do not encourage creative and critical thinking.
...encouraging students to work through their decision making process, even if it bring frustration and makes them leave their comfort zone of learning.	...giving students direct answers to their questions without allowing them to think through the decision making process.

Ben Johnson (2012) offers three steps for improving teacher questions:

1. Stop leading discussions. Teach students how to discuss and break them up into small groups to discuss the issues.
2. Plan questions in advance, especially higher-order questions which are hard to create spontaneously: “Savvy teachers will design learning activities in preparation for student-led discussions that will give students background knowledge, evidence, and ammunition to argue a point.”
3. Design a progression of questions which build from easy to hard (scaffold questions). Models for creating a progression of questions include Bloom’s Taxonomy and Questions for Life.

Conclusion

A critical component in the teaching and learning process is the use of effective questioning. Deliberately and intentionally planning sequences of questions designed to engage specific thinking processes and elicit particular types of responses is key to maximizing student learning opportunities. Practicing the strategies explained in this module and eBook will enable teachers to judiciously balance teacher-led and student-led questions and implement wait-time in order to create enhanced opportunities for student learning. Students will become aware of the types of questions and be able to formulate appropriate questions to deepen their own learning and that of their peers when teachers take the time to debrief the questioning process. This important metacognitive step dramatically increases the power of questioning in the learning process.

Conclusion

References

Adsit, K. (1997, January 1). Teaching critical thinking skills. Retrieved April 16, 2013, from http://academic.udayton.edu/legaled/ctskills/ctskills01.htm

Anderson, L. W., Krathwohl, D. R., & Bloom, B. S. (2001). A taxonomy for learning, teaching, and assessing: A revision of Bloom's taxonomy of educational objectives (Complete ed.). New York: Longman.

Asking questions that encourage inquiry-based learning. (2010). Retrieved April 14, 2013, from Centre for Research in Mathematics Education, University of Nottingham Web site: http://www.primas-project.eu/servlet/supportBinaryFiles?referenceId=4&supportId=1362

Asking questions to improve learning. (2009). Retrieved April 15, 2013, from Washington University in St. Louis, The Teaching Center Web site: http://teachingcenter.wustl.edu/asking-questions-improve-learning

Barkley, S. (2009). Questions for life: Powerful strategies to guide critical thinking. Cadiz, KY: Performance Learning Systems.

Barron, B., & Darling-Hammond, L. (2008, October 8). Powerful learning: Studies show deep understanding derives from collaborative methods. Edutopia. Retrieved April 15, 2013, from http://www.edutopia.org/inquiry-project-learning-research

Bilash, O. (2009). Asking and answering questions. Retrieved April 15, 2013, from http://www2.education.ualberta.ca/staff/olenka.Bilash/best%20of%20bilash/askinganswering questions.html

Classroom questions - types of questions, feedback, effective questioning practices. (n.d.). Education Encyclopedia. Retrieved April 15, 2013, from http://education.stateuniversity.com/pages/1836/Classroom-Questions.html

Danielson, C. (2011). The framework for teaching evaluation instrument. Princeton, NJ: The Danielson Group.

Exline, J. (2004). What is inquiry-based learning? Thirteen Ed Online. Retrieved April 16, 2013, from http://www.thirteen.org/edonline/concept2class/inquiry/

Ferlazzo, L. (2011, November 8). Response: Several ways to teach critical thinking skills [Web log comment]. Retrieved April 14, 2013, from http://blogs.edweek.org/teachers/classroom_qa_with_larry_ferlazzo/2011/11/response_several_ways_to_teach_critical_thinking_skills.html

Hastings, S. (2003, July 4). Questioning. TES Connect. Retrieved April 15, 2013, from http://www.tes.co.uk/article.aspx?storycode=381755

Intro to inquiry learning. (n.d.). YouthLearn. Retrieved April 15, 2013, from http://www.youthlearn.org/learning/general-info/our-approach/intro-inquiry-learning/intro-inquiry-learning

Johnson, B. (2012, June 26). Three steps for improving teacher questions. Edutopia. Retrieved April 15, 2013, from http://www.edutopia.org/blog/improving-teacher-questions-ben-johnson

Learning and teaching should be inclusive and enjoyable: Questioning. (2010, August 20). Highland Learning & Teaching Toolkit. Retrieved April 16, 2013, from http://www.highlandschools-virtualib.org.uk/ltt/inclusive_enjoyable/questioning.htm

McKenzie, J. (1996). Framing essential questions. Retrieved April 15, 2013, from http://fno.org/sept96/questions.html

Nobori, M. (2011, July 11). Ten takeaway tips for teaching critical thinking. Edutopia. Retrieved April 16, 2013, from http://www.edutopia.org/stw-kipp-critical-thinking-10-tips-for-teaching

O'Neill, M. (n.d.). Lesson planning aids effective G&T provision. Teaching Expertise. Retrieved April 15, 2013, from http://www.teachingexpertise.com/articles/lesson-planning-aids-effective-gt-provision-3682

Open and closed questions. (n.d.). Changing Minds. Retrieved April 15, 2013, from http://changingminds.org/techniques/questioning/open_closed_questions.htm

References

Practicing effective questioning. (n.d.). NDT Resource Center. Retrieved April 15, 2013, from http://www.ndt-ed.org/TeachingResources/ClassroomTips/Effective_Questioning.htm

Questioning to promote higher order thinking skills. (n.d.). Retrieved April 14, 2013, from https://www.google.com/url?sa=t&rct=j&q=&esrc=s&source=web&cd=9&sqi=2&ved=0CG0QFjAI&url=http%3A%2F%2Fdaretodifferentiate.wikispaces.com%2Ffile%2Fview%2FHigh%2BOrder%2BThinking%2BChart.doc&ei=SitbUa_mOK_h4AOH6IGYBg&usg=AFQjCNGchd15xGXqRk40XVUjKA0C33Xq3g&sig2=4-QtLctpl38RHTGAgR4QqA

Revised Bloom's taxonomy (n.d.). Retrieved April 14, 2013, from https://www.google.com/url?sa=t&rct=j&q=&esrc=s&source=web&cd=12&ved=0CH4QFjAL&url=http%3A%2F%2Fwww.ps399.org%2Fdownload.axd%3Ffile%3D62eb9a58-67c5-4171-b0f3-eb72f075a667%26dnldType%3DResource&ei=xgRrUcraJ9fi4AOJ6oDgAw&usg=AFQjCNHqSJ0pcDufcuGRNjV36omyaOyPOQ&sig2=WWyLzsSMWV72Nuc0fN3CAw&bvm=bv.45175338,d.dmg

Rothstein, D., & Santana, L. (2011). Teaching students to ask their own questions. Harvard Education Letter, 27(5). Retrieved April 16, 2013, from http://hepg.org/hel/article/507#home

St. Andrew's Episcopal Upper School Library. (n.d. a). Asking good questions: Convergent thinking. Retrieved April 15, 2013, from http://library.sasaustin.org/convergentQuestions.php

St. Andrew's Episcopal Upper School Library. (n.d. b). Asking good questions: Divergent thinking. Retrieved April 15, 2013, from http://library.sasaustin.org/divergentQuestions.php

Sweetland, R. (n.d.). Ways to classify questions. Retrieved April 15, 2013, from http://www.homeofbob.com/pedagogy/teach/question/classify.html

Teaching in the interrogative. (n.d.). Prince George's County Public Schools. Retrieved April 16, 2013, from http://www.pgcps.pg.k12.md.us/~elc/isquestion5.html

Types of questions. (n.d.). Retrieved April 14, 2013, from https://www.google.com/url?sa=t&rct=j&q=&esrc=s&source=web&cd=22&ved=0CDcQFjABOBQ&url=http%3A%2F%2Facademics.tulsaschools.org%2FUserFiles%2FServers%2FServer_1335250%2FFile%2Felderad%2FTypes%2520of%2520Questions.doc&ei=dENbUeHND7TI4AOjy4G4BQ&usg=AFQjCNHydei-Otj4o73hFVL_d6muu8p6VQ&sig2=1pTuTH80FhDHaaeNfWJpag

Webb's depth of knowledge guide. (2009). Retrieved April 14, 2013, from http://www.aps.edu/rda/documents/resources/Webbs_DOK_Guide.pdf

What is the value of wait time? (n.d.). Prince George's County Public Schools. Retrieved April 16, 2013, from http://www.pgcps.pg.k12.md.us/~elc/isquestion3.html

Wiggins, G. (2013, February 9). A four-phase process for implementing essential questions. TeachThought. Retrieved April 15, 2013, from http://www.teachthought.com/learning/a-four-phase-process-for-implementing-essential-questions/

Wiggins, G., & McTighe, J. (2005). Essential questions: Doorways to understanding. In Understanding by design, expanded 2nd edition (chap. 5). Alexandria, VA: Association for Supervision and Curriculum Development.

Wilhelm, J. D. (n.d.). Essential questions. Scholastic. Retrieved April 15, 2013, from http://www.scholastic.com/teachers/article/essential-questions

Zmuda, A. (2012, August 31). Grant Wiggins on essential questions. Just Start for Kids & Schools. Retrieved April 15, 2013, from http://just-startkidsandschools.com/2012/08/31/grant-wiggins-on-essential-questions/