

REVIEWS

Best Practice Strategies for Effective Use of Questions as a Teaching Tool

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Questions have long been used as a teaching tool by teachers and preceptors to assess students' knowledge, promote comprehension, and stimulate critical thinking. Well-crafted questions lead to new insights, generate discussion, and promote the comprehensive exploration of subject matter. Poorly constructed questions can stifle learning by creating confusion, intimidating students, and limiting creative thinking. Teachers most often ask lower-order, convergent questions that rely on students' factual recall of prior knowledge rather than asking higher-order, divergent questions that promote deep thinking, requiring students to analyze and evaluate concepts. This review summarizes the taxonomy of questions, provides strategies for formulating effective questions, and explores practical considerations to enhance student engagement and promote critical thinking. These concepts can be applied in the classroom and in experiential learning environments.

Keywords: questioning, critical thinking, pedagogy, effective teaching, teaching tool

INTRODUCTION

Using questions to teach is an age-old practice and has been a cornerstone of education for centuries.^{1,2} Questions are often used to stimulate the recall of prior knowledge, promote comprehension, and build critical-thinking skills. Teachers ask questions to help students uncover what has been learned, to comprehensively explore the subject matter, and to generate discussion and peer-to-peer interaction. Student-initiated questions increase higher-order learning by requiring them to analyze information, connect seemingly disparate concepts, and articulate their thoughts.³ Indeed, questions are ubiquitous, but are the right kinds of questions – ones that promote learning, not recall – asked at the appropriate time?⁴ Poor questions can stifle learning by creating confusion, intimidating students, and limiting creative thinking.⁵ Effective questions asked in a psychologically safe learning environment support student learning by probing for understanding, encouraging creativity, stimulating critical thinking, and enhancing confidence.⁶

The art of asking the right questions at the appropriate time is not innate.⁷ Bloom's taxonomy of learning categorizes cognitive levels into several domains.⁸ Questions that elicit responses in the knowledge, comprehension, and application domains are frequently considered lower-order questions, while questions in the analysis,

synthesis, and evaluation domains are considered higher-order questions.⁹ Higher-order questions elicit deeper and critical thinking; therefore, teachers are encouraged to ask questions in these domains (Table 1).^{2,10-12} This does not mean that lower-order questions should not be asked. It is appropriate to ask questions to address all cognitive domains as long as the desired learning outcome is kept in mind and a good mix of questions is used during each teaching session.² Given that the learning objectives in most courses in graduate and professional degree programs are often intended to stimulate high order cognitive processes, one would expect that higher-order questions would prevail during encounters between students and teachers. Unfortunately, observations of classroom-based instructors have repeatedly shown that lower-order questions are far more frequently used.^{11,13} Perhaps teachers do not value higher-order questions and feel they are not effective, or perhaps a lack of formal training on how to formulate questions to stimulate learning is the root cause.⁴

There is a paucity of empirical data regarding how to most effectively use questions to teach.^{1,10,11,13,14} The purpose of this review is to examine the taxonomy of questions and suggest some best practice strategies for formulating questions that can help achieve desired teaching objectives and learning outcomes.¹² To effectively illustrate these concepts, the examples provided throughout this manuscript relate to a specific content area: analgesics and pain management.

TAXONOMY OF QUESTIONS

Questions have been classified into several taxonomies intended to describe their fundamental essence.

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Table 1. Types of Nonhierarchical Questions Used as Teaching Tools^{1,2,12}

Question Type	Description	Sample Question (Content Area: Analgesics and Pain Management)
Convergent	Closed, not offering many options; converges on a single or narrow list of “best” answers; encourages focused, succinct response	What percentage of the population is a poor metabolizers, and therefore, unlikely to have an adequate analgesic response to codeine?
Divergent	Open, having many responses; permits the exploration of diverse perspectives; encourages dialog	Codeine isn’t used as much today for analgesia as it once was. Why?
Focal	Student must choose or justify a position.	Would you recommend the use of a fentanyl patch in a patient with a history of substance abuse? If so, why? If not, why not?
Brainstorm	Questions that generate a list of ideas or viewpoints.	If you could create the ideal analgesic product, one that could be widely used in any population for various causes of pain, what features would it have?
Shotgun	Questions containing several content areas with no particular link.	What are the potential risks of using NSAIDs? When was aspirin first synthesized? Methadone is available in what dosage forms? What patient-specific data should be obtained prior to initiating tramadol therapy? What the best way to manage opioid-induced constipation?
Funnel	Multiple questions starting broadly and gradually leading to more focused inquiry.	What federal laws and regulations apply to the sale of narcotic analgesics? What are the record keeping requirements for a pharmacy that stocks and dispenses narcotic analgesics? What are the potential benefits and risks of the narcotic prescription monitoring program requirement in our state? Can a pharmacist legally dispense an orally transmitted prescription order for methadone?

Abbreviations: NSAIDs = nonsteroidal antiinflammatory drugs.

For the purposes of teaching, these taxonomies can be used by educators to formulate questions intended to elicit specific cognitive processes. The basic way to characterize questions is to classify them as either convergent or divergent.¹ A convergent question, often called a closed question, is intended to elicit a specific response or a narrow list of possible responses. Educators use convergent questions to draw a single “best” response from learners. In contrast, divergent questions, also known as open questions, elicit a wide range of responses that often require substantive elaboration. Divergent questions do not have a single “best” response. Educators use divergent questions to stimulate dialog and explore a range of issues related to the topic (Table 1).

Another way to classify questions is to examine their cognitive level or complexity. A hierarchal approach to cognition was originally described by Bloom and subsequently modified by Anderson and Krathwohl (Table 2).^{2,8,15} Questions may address various levels of cognition ranging from mere recall of memorized facts to processes that require deep critical thinking.¹⁰ Questions can, therefore, address various cognitive domains with the intent of achieving specific learning outcomes.

Each domain is further categorized as lower or higher order in terms of cognitive difficulty.

Remembering, which is the act of recalling information, is considered the lowest order of cognitive processing and yet recall-type questions are the most frequently posed by educators. Questions aimed at eliciting a student’s understanding of the material are those that ask the learner to provide examples, classify items, summarize information, and/or draw inferences. Application questions require the learner to execute a procedure or process, mental or physical, to an unfamiliar situation or circumstance. Analysis requires the learner to break down the material into constituent parts and determine the inter-relationships among them. Analysis questions may ask the learner to organize elements within a structure, distinguish relevant from irrelevant information, or deconstruct underlying values and biases. Evaluation requires formulating judgments based on standards or existing criteria. Evaluating questions require the learner to critique a work or product, determine the appropriateness of a process or product for a given problem, or examine the inconsistencies in a theory. Finally, creating is considered the most difficult task in terms of cognitive

Table 2. Classification of Questions Based on Cognition Dimension and Student Actions Required for Achieving Specific Learning Outcomes^{8,16}

Cognitive Dimension	Cognitive Level	Actions Required	Sample Question (Content Area: Analgesics and Pain Management)
Remembering (Knowledge)	Low	List, name, identify, show, define, recognize, recall, state	What is the mechanism of action of acetaminophen?
Understanding (Comprehension)	Low	Summarize, explain, interpret, describe, compare, paraphrase, differentiate, visualize, restate, put in your own words	Describe the goals of therapy in patients with malignant pain?
Applying (Application)	Low	Solve, illustrate, calculate, use, interpret, relate, manipulate, apply, classify, modify, put into practice	According to the World Health Organization guidelines on persisting pain in children, what would be the most appropriate treatment choice in this case scenario?
Analyzing (Analysis)	High	Analyze, organize, deduce, choose, contrast, compare, distinguish	Given the patient's symptoms, what are the most likely etiologies of her pain?
Evaluating (Evaluation)	High	Evaluate, estimate, judge, defend, criticize, justify	Based on the findings of this study, what do you believe is the role of pregabalin in the treatment of post-herpetic neuralgia?
Creating (Synthesis)	High	Design, hypothesize, support, schematize, write, report, discuss, plan, devise, create, construct	This patient has had four emergency room visits in the past month due to uncontrolled pain. How would you manage this patient to prevent yet another urgent care visit?

processing. Questions that address this cognitive domain may require learners to generate alternative hypotheses based on observed phenomena, devise a new procedure to accomplish a task, or conceptualize a new product.

Questions can also be classified into knowledge dimensions. Anderson and Krathwohl describe 4 types of knowledge: factual, conceptual, procedural, and meta-cognitive.¹⁵ These knowledge dimensions range from the concrete to abstract (Table 3). Factual knowledge includes the technical vocabulary used in a discipline and the details extracted from reliable sources of information. While factual questions often ask students to recall specific elements from a reference source, they address higher-order thinking. Questions on the factual dimension of knowledge can be constructed to demonstrate understanding, prompt analysis, or evaluate the work of others. Conceptual knowledge includes an awareness of the inter-relationships between the elements of a larger structure. Conceptual questions might ask learners to justify an answer based on underlying principles or theories, or to classify elements into categories. Procedural knowledge is the ability to use algorithms, techniques, or criteria as

well as the ability to determine when it is appropriate to use them. Procedural questions might ask the learner about well-established methods for gathering information or selecting the most appropriate equation in a particular situation. Finally, metacognitive knowledge is an awareness of one's own cognition. Metacognition questions might ask a learner to articulate a cognitive strategy required to complete a task or examine personal motivations and values.¹⁵

Teachers predominantly ask lower-level cognitive questions that do not effectively stimulate critical thinking.^{11,13} During classroom-based instruction, researchers observed 91 faculty members asking 3,407 questions, and categorized the type and level of each question posed.¹¹ The majority of the questions asked were lower-level questions (68.9%). In a similarly designed study, Sellappah and colleagues found that during practice-based experiences, clinical instructors asked lower-level questions 91.2% of the time.¹³ Further, the clinical instructors' years of experience as a practitioner or teacher were not correlated with their propensity to ask lower- or higher-order questions. A study by Phillips and Duke

Table 3. Classification of Questions Based on Knowledge Dimensions¹⁵

Knowledge Dimension	Sample Questions, Cognitive Level (Content Area: Analgesics and Pain Management)
Factual	According to the textbook, what dose of morphine would be equianalgesic to 10mg of hydromorphone? (Low) Based on the results of this study, what would the equianalgesic dose of hydromorphone for a patient who is currently taking morphine 30mg daily and how confident can we be in that estimate? (High)
Conceptual	Describe the steps in the WHO pain management pyramid? (Low) In what ways is the WHO pain management pyramid similar to the National Comprehensive Cancer Network cancer pain guidelines? In what ways are they different? (High)
Procedural	What interviewing techniques can be used to determine the severity of a patient's pain? (Low) Several techniques are available to evaluate pain. What do you perceive are the strengths and weaknesses of each? (High)
Metacognitive	Thinking back on your encounter with this patient, how well do you think you addressed his pain? (Low) Given that you feel you handled the patient interaction in a less than optimal manner, what do you think would help you do a better job addressing patients' pain in the future? (High)

Abbreviations: WHO = World Health Organization.

compared the cognitive level of questions asked by full-time clinical faculty members and volunteer preceptors in nursing programs.¹⁴ Both faculty members and preceptors asked lower-order questions far more frequently than higher-order ones. However, full-time faculty members asked higher-order cognitive questions more frequently than preceptors.

Several nonhierarchical types of question prompts, including focal, brainstorm, shotgun, and funnel questions, are widely used in teaching (Table 1).¹² Shotgun questions and funnel questions often elicit confusion and generally should be avoided. A study that used a variety of question prompts directed at students enrolled in an online course found that brainstorming questions elicited the highest number of responses per prompt while shotgun questions elicited the least. Questions in the comprehension and application domains of Bloom's taxonomy elicited the highest average number of responses per prompt, whereas questions in the synthesis and comprehension level elicited the highest number of student-to-student exchanges.

STRATEGIES FOR FORMULATING QUESTIONS

Socratic Method Questioning

The Socratic method of questioning is a popular teaching approach.^{16,17} This method uses a form of inquiry that promotes open discussion in which one viewpoint is compared to another. Instead of providing information to students directly, the lesson is taught through probing and thought-provoking questions in an effort to stimulate original thought from the students. In order to master the Socratic method, instructors must become skillful at

developing 3 categories of questions: exploratory, spontaneous, and focused (Table 4).¹⁷

Exploratory questioning is used to find out how much students know about the issue under discussion. This type of question may be implemented to introduce a new topic to the audience, review past discussions of a topic, or determine how much students have retained from the previous learning sessions. A broad range of related issues and topics can be evaluated through this method of questioning. To ensure that the conversation is guided in an intellectual manner, it is best to plan exploratory questions and topics in advance.

Spontaneous questioning is best used when students are naturally curious about the topic or when an ongoing discussion slows. Spontaneous questions are used to probe students' thoughts in an effort to get them to explore their beliefs and assumptions. This type of question prompts students to self-correct, rather than be corrected by the instructor, through reflection on the question being asked. Spontaneous questioning can also be used when an important issue is raised, when students are on the edge of a breakthrough in learning, or when discussion requires clarification.

Focused questioning narrows the content down to specific issues on which the teacher would like the audience to reflect. Focused discussion helps to stimulate students intellectually by forcing them to evaluate their thoughts and perspectives. Students are able to experience an ordered dialogue in which they discover and share ideas and insights with regard to the topic.

A noted benefit of the Socratic method is that students often uncover personal knowledge deficits about the subject matter. This can be a difficult realization for students

Table 4. Sequencing of Questions Using the Socratic Method of Questioning as an Effective Teaching Tool

Content Area: Opioids and Pain Management	
●	Why does the group Physicians for Responsible Opioid Prescribing want to limit the dosing, supply, and duration of opioid analgesics for chronic, non-malignant pain? (Exploratory)
●	What assumptions do you think underlie their rationale? (Spontaneous)
●	Who is most likely to become addicted to opioid analgesics? (Focused)
●	How would you define legitimate opioid use? (Exploratory)
●	Based on your definition of legitimate use, what patient-specific data would you need in order to discriminate between the legitimate use of opioids for pain and illegitimate uses? (Spontaneous)
●	What does the data from other countries tell us about the positive and negative consequences of restricting the use of opioids? (Focused)
●	If opioid analgesic use were restricted by the FDA to a maximum of 3 months for the treatment of non-malignant pain in the United States, do you think the consequences would be similar or dissimilar to what has been observed in other countries? (Spontaneous)
●	Given what you know now and your values, what do you consider to be the most compelling reasons to either restrict or liberalize the use of opioid analgesics for the treatment of pain? (Spontaneous)

Abbreviations: FDA = Food and Drug Administration.

striving for success in the classroom. This is not necessarily a negative consequence and is often an important step in the learning process.¹⁸ When students recognize their knowledge gaps, it can spur them to clarify ideas and seek to better understand the concepts.

Question Circles

Question circles is a strategy that leads students from superficial responses to deeper discussions of the subject matter.² Originally conceptualized as a process to explore students' understanding of written texts, question circles can be easily adapted to discuss a wide range of learning materials (eg, case studies, videos) or experiences (eg, laboratory exercises, advanced practice experiences).

Using this model, questions are posed in 3 different domains: subject matter, personal response, and external reality (Table 5 and Figure 1). The subject matter includes the factual, conceptual, and procedural knowledge derived directly from the reading, learning materials, or experience. The personal response is the learner's reaction to, perceptions of, and direct experiences related to the subject matter. The external reality relates to the broad context in which the subject matter exists and its relationship with society at large as well as other disciplines. After the more superficial issues related to the subject matter, personal response, and external realities have been explored, the teacher then formulates questions related to multiple circles. Enriched questions are those that are de-

Table 5. Example of Using the Question Circles Method of Questioning²

Circle(s)	Sample Question (Content Area: NSAIDs and Pain Management)
Subject Matter	How do NSAIDs work in terms of reducing pain?
Personal Response	Under what circumstances have you used an NSAID for pain?
External Environment	According to the American Academy of Family Physicians, what are some circumstances when we should recommend against the use of NSAIDs for pain?
Subject Matter & Personal Response (Enriched)	If you had safety concerns about chronic NSAIDs use by one of your patients with persistent pain, what strategies would you use to discourage continued use?
Subject Matter & External Environment (Enriched)	What public policy changes related to the prescribing of NSAIDs would have a positive impact on patient outcomes?
Personal Response & External Environment (Enriched)	If NSAIDs were no longer available over the counter, what would you do to manage your pain?
Subject Matter, Personal Response, & External Environment (Dense)	After verifying the physician's intent and the patient's desire for treatment, under what circumstances would you refuse to fill a prescription for an NSAID?

Abbreviations: NSAIDs = nonsteroidal antiinflammatory drugs.

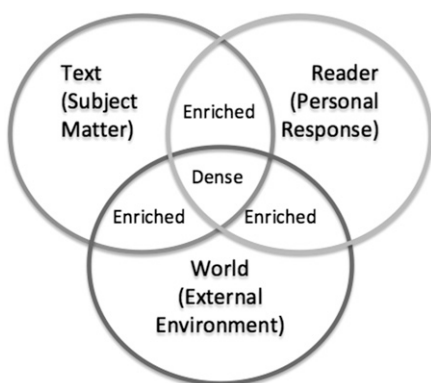


Figure 1. The Question Circles Method.

rived from the juxtaposition of 2 domains and dense questions are intended to explore the inter-relationships among all 3 domains.

Student-generated Questions

Most questioning approaches focus on the teacher asking the questions. However, student-generated questions also can lead to deep learning.^{19,20} Requiring students to create their own questions can elicit a greater understanding of the course material.¹⁹ Rather than continually questioning students regarding the material, Bowker achieved content understanding by making declarative statements intended to elicit questions from students. When there were no definitive answers to the questions asked, students were expected to reflect on all possible answers, known and hypothetical, to gain a deeper knowledge of the material. Using this questioning strategy, students demonstrated greater thought complexity and engagement.

Another strategy is the questioning as thinking (QAT) framework where students are encouraged to generate questions to aid in their exploration or understanding of a subject matter.²⁰ QAT incorporates both questioning and *think-aloud* learning strategies to support metacognition. Students are expected to independently monitor their learning by asking themselves questions such as, “What are my goals for learning?” and “Does this material make sense to me?” The think-aloud technique encourages students to verbalize their inner thoughts, thinking processes, and decision-making strategies. As students become more proficient in this exercise, they internalize the dialogue. Educators can facilitate QAT by modeling the relationship between questioning and thinking aloud. Using content material, a teacher can prepare an example think-aloud to demonstrate how multiple answers can stem from a question. The teacher should model the types of metacognitive questions that students must ask themselves. Once the QAT strategy has been modeled by the teacher, students

are asked to formulate their own questions, answers, and thought processes during classroom discussions.²⁰

PRACTICAL CONSIDERATIONS

Phrasing and Clarity

The phrasing and clarity of words used in formulating a question greatly influences its effectiveness. An ambiguous question is one that is unclear to students and confounds their response.² Posing compound questions that require multiple responses frequently leads to confusion. Teachers should avoid this practice. Limiting the number of action verbs per question to 1 will simplify the question.^{8,15} A well-phrased question enables students to effectively understand the nature and scope of the question being posed. Even the most seasoned teacher is guilty of occasionally formulating vague or ambiguous questions. Careful attention to students’ facial expressions and body language can provide clues that signal potential confusion. When a desired response is not forthcoming after the first prompt, rephrasing the question or providing clarifying comments may help elucidate the intent of the question for students. In other instances, repeating the question after a sufficient wait time may also be helpful.²

An effective teacher is able to gauge the audience and formulate questions to fit the cognitive level of students as well as formulate followup questions in response to unexpected answers.^{1,12} It is best to ask a variety of questions that address different cognitive levels and knowledge domains. Repeatedly asking the same type of questions might intimidate students. There are times when higher-order questions are not appropriate without first establishing a strong knowledge foundation. For example, it would be appropriate to ask lower-level questions in an introductory course. In a capstone course, the instructor should quickly proceed to higher-order questions after posing some lower-order questions intended to elicit prior knowledge. The mix of questions should vary depending on the course content and objectives.

Psychological Safety

When students refrain from answering questions despite repetition, rephrasing, and reducing the cognitive level of the questions, the teacher should consider whether the atmosphere of the classroom or other learning setting is perceived as intimidating, hostile, or unwelcoming. A psychologically unsafe environment will prevent students from expressing their thoughts and opinions aloud.^{2,4} The behavior and demeanor of the teacher greatly influences the perceived psychological safety of the learning environment. Repeatedly interrupting students before they have finished responding; breaking eye contact with the responder; or using an aggressive or condescending tone

of voice, facial expressions such as grimacing, and/or alienating body language such as turning away from the responder will erode students' sense of safety and self-worth. Students who do not feel safe or self-confident will not initiate responses to questions, or will provide short or purposefully erroneous answers when called on.^{2,4} Students should always be reminded that there may be several correct answers to questions and just because the answer did not match the instructor's, does not mean it was an incorrect response unworthy of discussion. The teacher should strive to ensure that each student feels valued. Students should be permitted to provide a full answer to the question without fear of penalty for an incorrect response.^{2,4} Positive reinforcement from the teacher is important. Behaviors such as maintaining eye contact, nodding, making affirming verbal comments or sounds, or asking a student to continue with additional clarifying remarks are all ways to encourage more participation.²

Sequencing and Balance

Two additional components of effective questioning are *sequencing* and *balance*. Sequencing is asking questions in a patterned order with the purpose to elicit meaningful responses from the audience. Balance is asking both convergent and divergent questions from multiple knowledge domains and at varying cognitive levels. For example, some professors like to first ask students lower-order questions to create a psychologically safe environment. After a few simple questions to get students involved and interested, they move toward questions relating to material that is more analytical in nature. Achieving balance also requires paying attention to the frequency at which questions are used relative to the amount of time spent presenting new information, providing examples, and engaging students in other active-learning activities. The excessive use of questions can lead to negative outcomes and student passivity.⁴ Some teachers in the classroom have asked up to 400 questions in a day. An overuse of questioning may discourage students from participating in discussions as they begin to feel threatened or interrogated.²

Wait Time

Defined as the lapse of time that occurs between the teacher's question and a student's response, or the time between a teacher's first and second questions to students, *wait time* influences the quality and quantity of student responses as well as the initiation of subsequent dialog.² If students do not respond within a relatively brief period of time (often as little as 1 second) after being asked a question, teachers often will attempt to move the conversation forward by repeating the question, rephrasing the question, or calling on students.² When a teacher uses

higher-order questions, ones that require complex cognitive processes, it may be necessary to provide 1 to 2 minutes of wait time before soliciting responses from students.^{21,22} A series of wait time studies involving both small groups and large classes was conducted.^{21,23,24} Wait times were manipulated with student participants at various levels of cognitive development, ranging from elementary school through university classrooms, to determine the optimal wait time and potential benefits for both students and teachers. Increasing wait time by a few seconds had several positive effects on the attitudes and behaviors of both students and teachers.²¹ Longer wait times consistently resulted in longer student responses, an increase in the number of students volunteering to respond, and an increase in the number of followup questions posed by students. Students significantly reduced the frequency of "I don't know" responses and student achievement scores on tests significantly increased. Improvements in teacher behaviors were also observed after they increased wait times. Question quality, flexibility, and variety increased while the number of questions declined. Conversely, too much wait time can be detrimental to student participation. Depending on the nature and cognitive complexity of the question, a wait time of more than 20 seconds may be perceived as threatening and result in equally poor responses.²²

Many teachers make the mistake of answering their own questions, and this behavior will quickly become self-defeating. After a relatively short wait time, some teachers attempt to fill the silence by providing their own answer to the question posed. This behavior has several negative consequences. Students are deprived of the opportunity to grapple with the question and formulate their own responses, a process essential for learning. The teacher fails to learn what the students already know and, more importantly, what they do not understand and merits more instruction. Students will quickly adapt to this behavior by simply "waiting out" the teacher. By repeatedly answering his/her own questions, the teacher is indirectly communicating to students that it is acceptable for them to not answer questions because the teacher will eventually do so. The work of learning will have been shifted away from the students. If students are unable to answer a question after a suitable wait time, the teacher should rephrase the question or modify it in order to address a related or supporting concept that is less cognitively difficult.

Think time is a closely related concept to wait time and is another strategy to improve student participation. Think time is a period of uninterrupted silence imposed by the teacher so that all students can process the question and formulate an answer.¹ Because some students can process and respond to questions more rapidly than others,

imposing a think time during which no responses will be accepted allows all students an opportunity to process their thoughts and formulate an answer.

Pimping Questions

The term *pimping* refers to asking a series of difficult questions to a trainee or student in an effort to establish respect for the educator's superior knowledge and intellect.²⁵ Pimping questions are typically asked in rapid succession, are unlikely to be answered correctly, and leave most learners feeling demoralized. Many students develop defense mechanisms in response to this questioning strategy. Dodging (answering a question with a question), bluffing, using evasive techniques (food in mouth), and using avoidance techniques (no eye contact) are all ways students attempt to thwart a questioner. Some students may inform the teacher of their discomfort or respond with hostility. For example, some students have been reported to use personal digital assistants to look up information and pimp the instructor in return.^{25,26} Pimping harms learning because students feel little desire to engage with the material or ask additional questions.

SUMMARY

Teachers in classroom and experiential learning environments frequently use lower-order, recall-type questions, and the overuse of this type of question hampers efforts to promote deeper, higher-order, critical thinking in students.²⁷ Understanding the taxonomy of questions and best practice strategies may help pharmacy educators formulate a wider range of questions that not only stimulate the recall of important factual, conceptual, and procedural knowledge but also requires learners to analyze, evaluate, and create. Greater attention to metacognition and the learner's personal responses through effective questions can lead students to deep insights. The clarity, sequencing, and delivery of questions, and the psychological safety of the learning environment influence student perceptions, motivation, and achievement of desired educational outcomes. Questions are among the most powerful teaching tools and adopting best practices can significantly enhance the quality of instruction.

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REFERENCES

1. McComas W, Abraham L. Asking more effective questions. Rossier School of Education. <http://cet.usc.edu/resources/>

- teaching_learning/material_docs/Asking_Better_Questions.pdf. Accessed December 4, 2012.
- Christenbury L, Kelly PP. *Questioning: A Path to Critical Thinking*. Urbana, IL: National Council of Teachers of English; 1983.
 - Ciardiello AV. Did you ask a good question today? Alternative cognitive and metacognitive strategies. *J Adolesc Adult Lit*. 1998; 42(3):210-219.
 - Brualdi AC. Classroom questions. *Practical Assessment, Research & Evaluation*. 1998;6(6). <http://PAREonline.net/getvn.asp?v=6&n=6>. Accessed October 16, 2012.
 - Chin C. Teacher questioning in science classrooms: what approaches stimulate productive thinking? *J Res Sci Teach*. 2007; 44(6):815-843.
 - Gose M. When Socratic dialogue is flagging: questions and strategies for engaging students. *J Coll Teach Learn*. 2009;57(1): 45-49.
 - Lorsch N, Ronkowski S. *Teaching Tips for TA's. Effective Questioning Enhances Student Learning, Instructional Development*. Santa Barbara, CA: Office of Instructional Consultation, University of California, Santa Barbara; 1982.
 - Bloom BS. *Taxonomy of Educational Objectives: The Classification of Educational Goals: Handbook 1: Cognitive Domain*. New York: David McKay Co Inc; 1956.
 - Neal MA. Engaging students through effective questions. *Educ Can*. 2012;52(4). www.cea-ace.ca/education-canada/article/engaging-students-through-effective-questions. Accessed October 16, 2012.
 - Wilten WW. *Questioning Skills for Teachers*, 3rd ed. Washington DC: NEA Professional Library, National Education Association; 1991: 5-32.
 - Saeed T, Khan S, Ahmed A, Gul R, Cassum S, Parpio Y. Development of students' critical thinking: the educators' ability to use questioning skills in the baccalaureate programmes in nursing in Pakistan. *J Pak Med Assoc*. 2012;63(3):200-203.
 - Ertmer PA, Sadaf A, Ertmer DJ. Student-content interactions in online courses: the role of question prompts in facilitating higher level engagement with course content. *J Comput High Educ*. 2011; 23(2-3):157-186.
 - Sellappah S, Hussey T, Blackmore AM, McMurray A. The use of questioning strategies by clinical teachers. *J Adv Nurs*. 1998; 28(1):142-148.
 - Phillips N, Duke M. The questioning skills of clinical teachers and preceptors: a comparative study. *J Adv Nurs*. 2001;33(4): 523-529.
 - Anderson LW, Krathwohl DR, Airasian PW, et al. *Taxonomy of Learning, Teaching, and Assessing: A Revision of Bloom's Taxonomy of Educational Objectives*, 2nd ed, abridged. Boston, MA: Pearson Allyn & Bacon; 2001.
 - Yang YC, Newby TJ, Bill RL. Using Socratic questioning to promote critical thinking skills through asynchronous discussion forums in distance learning environments. *Am J Distance Educ*. 2005;19(3):163-181.
 - Paul R, Elder L. Critical thinking: the art of Socratic questioning, part III. *J Dev Educ*. 2008;31(3):34-35.
 - Boghossian P. Socratic pedagogy: perplexity, humiliation, shame and a broken egg. *Educ Philos Theory*. 2012;44(7):710-720.
 - Bowker MH. Teaching students to ask questions instead of answering them. *Thought & Action*. 2010;26(Fall):127-134.
 - Wilson NS, Smetana L. Questioning as thinking: a metacognitive framework to improve comprehension of expository text. *Literacy*. 2011;45(2):84-90.

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21. Rowe, MB. Wait time: slowing down may be a way of speeding up! *J Teach Educ.* 1986;37(1):43-50.
22. Nicholl HM, Tracey CA. Questioning: a tool in the nurse educator's kit. *Nurse Educ Pract.* 2007;7(5):285-292.
23. Rowe MB. Relation of wait time and rewards to the development of language, logic and fate control: part one- wait time. *J Res Sci Teach.* 1974;11(4):291-308.
24. Rowe MB. Pausing principles and their effects on reasoning in science. *New Dir Community Coll.* 1980;31:27-34.
25. Brancati FL. The art of pimping. *JAMA.* 1989;262(1):89-90.
26. Detsky A. The art of pimping. *JAMA.* 2009;301(13):1379-1381.
27. Zygmunt DM, Schaeffer KM. Assessing the critical thinking skills of faculty: what do the findings mean for nursing education? *Nurs Educ Perspect.* 2006;27(5):260-268.