

1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
18
19
20
21
22
23
24
25
26
27
28
29

Article type : Educational Download

The emergency department (ED) is an environment rife with uncertainty and interruptions, quick patient turnover, and often brief yet critical patient encounters. While residency education in emergency medicine (EM) shares some similarities to other specialties, such as formal sign-out and structured teaching sessions, the constant presence of attending physicians in the ED makes this training environment unique among other medical specialties. This combination of fast paced learning environment coupled with the constant presence of supervising physicians creates incredible potential for learning.

One approach to help realize this potential is strategic, question-prompted learning. This approach adapts the Socratic method, with guidance from Bloom’s Taxonomy, to create a learner-centered, progressively complex questioning strategy by which the instructor can identify knowledge gaps and stimulate critical thought in an environment of mutual respect with a graduated design. Interpretations of Socratic questioning have taken many forms, but the modern approach is rooted in three consistent components: working collaboratively with the learner; probing, open-ended questions; and reflection with focused discussion.^{1,2}

Similarly, Bloom’s taxonomy is a hierarchical model used to classify learning. Therefore, strategic questioning that uses Bloom’s taxonomy as a scaffold can guide learners from basic recall to critical thinking and reflection. Dialogue can begin with convergent questions (close-ended, seeking a specific response) to identify the learner’s knowledge base while probing for gaps and evolve into divergent questions (open-ended, requiring application of thought to develop an answer) with an escalating level of complexity as the learner progresses.^{3,4} By traversing this model, the learner can build on each step and climb the ladder through understanding, applying, analyzing, and evaluating (Table 1).

Bloom’s Taxonomy has also been molded into a variety of different uses since inception over 60 years ago. In 2007, Marzano and Kendall proposed “The New Taxonomy of Educational Objectives”

This is the author manuscript accepted for publication and has undergone full peer review but has not been through the copyediting, typesetting, pagination and proofreading process, which may lead to differences between this version and the [Version of Record](#). Please cite this article as [doi: 10.1002/aet2.10126-18-072](https://doi.org/10.1002/aet2.10126-18-072)

30 which served as an update to Bloom's that "incorporated modern advances in the understanding of human
31 thought and the structure of knowledge."⁵ This model more accurately reflects the breadth of skills
32 demonstrated in the ED. For example, if an instructor asked a learner to recall a fact, this would come
33 from the recall level of the information domain. Similarly, debriefing after a failed intubation would
34 come from the awareness and reflection level of both the mental processing and psychomotor domain
35 (Figure 1).

36 In order to effectively perform the question-prompted learning approach in the ED, attendings must
37 foster a safe learning environment through mutual respect between the instructor and learner, in contrast
38 to traditionally unidirectional "pimping." Once this groundwork has been laid, the teacher should first
39 focus on the lower order questions, especially if the learner is unfamiliar, in order to characterize their
40 knowledge base. This step can be done repeatedly across the spectrum of core knowledge competencies.
41 It would be unreasonable to ask a learner to describe comprehensive sepsis management before you have
42 confirmed that they can first recognize the condition. If significant deficiencies are identified with lower
43 order questioning, the instructor should not move on to higher levels, but rather spend time remediating.
44 Once a learner has demonstrated solid foundational knowledge, the instructor should escalate question
45 complexity, striving to push the learner towards critical thinking. If working in a group setting with
46 multiple levels of learners present, the attending should attempt to direct questions with increasing
47 difficulty towards senior learners in the presence of junior learners, thereby making critical thinking
48 transparent.

49 An approach to strategic, question prompted learning involving a patient presenting with a
50 myocardial infarction is illustrated in Table 2. Questions at the recall level probe the learner to simply
51 remember medical knowledge. After identifying these data points, they can be strung together by
52 understanding the presentation of disease. Applying questions will allow learners to demonstrate
53 knowledge by implementing a plan. Analyzing questions allow learners to begin deeper exploration.
54 Evaluating questions allow the learner to weigh the pros and cons of differing strategies. And lastly,
55 creating questions challenge the learner to assimilate ideas into new original work, though this higher
56 level is not routinely achieved during typical encounters.

57 Strategic questioning is a technique that can enhance the unique learning environment of EM training.
58 By incorporating this into the routine expert-learner encounters of daily practice, it can be used to engage
59 learners, explore their knowledge base, probe for gaps, encourage development, and grow critical
60 thinking skills.⁶ We propose that this become routinely used in EM training as a tool to strengthen
61 residency education.

References

1. Kost A, Chen FM. Socrates was not a pimp: changing the paradigm of questioning in medical education. *Acad Med.* 2015;90:20–24.
2. Beckman TJ, Lee MC. Proposal for a collaborative approach to clinical teaching. *Mayo Clin Proc.* 2009;84:339–344.
3. Tofade T, Elsner J, Haines ST. Best practice strategies for effective use of questions as a teaching tool. *Am J Pharm Educ.* 2013;77(7)
4. Bloom BS. *Taxonomy of educational objectives; the classification of educational goals.* New York: D. McKay Co., Inc.; 1974.
5. Marzano RJ, Kendall, JS. *The New Taxonomy of Educational Objectives.* Thousand Oaks, CA: Corwin Press; 2007.
6. Magas, C., Dedhia, P., Barrett, M., Gauger, P., Gruppen, L., & Sandhu, G. Strategic questioning in surgical education. *Clinical Teacher.* 2017; 14(2), 134-136.

Table 1. Blooms Taxonomy for the EM trainee

Categories	Key Words	EM specific sample questions
Remember/Understand <ul style="list-style-type: none"> Recall of facts and basic concepts Explain results, discuss concepts 	Define List State Describe Recognize Explain	<ul style="list-style-type: none"> What is the most common cause of...? How many differentials can you list for...? Explain what happens when...? What is an example of...? What are common risk factors for venous thromboembolic disease? How would you assess for pulmonary embolism (PE)?
Apply/Analyze <ul style="list-style-type: none"> Interpret results and carry out basic plans Critical examination assimilate facts into meaningful framework 	Interpret Demonstrate Execute Organize Question Relate Compare & Contrast	<ul style="list-style-type: none"> What approach can you use to...? What would result if...? Demonstrate how to... What is the problem with...? How is this similar to...? Can you distinguish between...? A patient is found to have subsegmental PE after surgery. What are your initial treatment options? What if the patient was found to have submassive PE needing oxygen, how would your approach change?
Evaluate/ Create <ul style="list-style-type: none"> Making judgements about the merits of ideas and plans Putting ideas together to create new original work 	Appraise Critique Justify Develop Construct Investigate	<ul style="list-style-type: none"> How would you prioritize...? Do you agree with...? Why? Why did you decide to...? What alternative would you propose...? What can be done to maximize...? How would you design...? Justify your decision to give systemic lytics instead of catheter directed thrombolysis. How could you improve hospital-wide approach to acute pulmonary embolism care?

Table 2. Strategic Questioning Example – Myocardial Infarction

Questioning Level	Learner Action	EM-specific sample questions
Recall	Remember medical knowledge	<ul style="list-style-type: none"> • What are the common risk factors for myocardial infarction? • What is the patient's HEART score? • When does the serum troponin level peak?
Understanding	Organize and assimilate data	<ul style="list-style-type: none"> • Can you describe the difference between stable and unstable angina? • What is the difference between STEMI and NSTEMI? • Patients with which HEART scores should be considered for admission?
Applying	Demonstrate knowledge by implementing a plan	<ul style="list-style-type: none"> • What is the initial ED treatment for acute anterior myocardial infarction?
Analyzing	Begin deeper problem exploration	<ul style="list-style-type: none"> • What if your patient had a posterior MI? • What if your patient became unstable? • How would initial management change if you were practicing at a smaller rural hospital?
Evaluating	Weigh the pros and cons of different strategies	<ul style="list-style-type: none"> • Justify your decision to give systemic lytics. • Justify your decision to mobilize the cardiac cath lab at midnight?
Creating	Assimilate ideas into new original work	<ul style="list-style-type: none"> • How would you investigate the effectiveness of a new anti-platelet agent given during suspected acute myocardial infarction?

Figure 1. Bloom's New Taxonomy

