Expert Skills Program Learning Awareness Inventory with Annotations

John Pelley, PhD, 2018

This 16 question Learning Awareness Inventory, with five optional essay questions, was developed to reveal whether you possess the awareness needed for achievement in medical school. In particular, it has relevance well beyond scores on examinations because it is equally applicable to learning that underlies performance of the EPAs.

- Relevance in medical school is no longer related primarily to facts and concepts, but the ability to use them to solve problems.
- There is only one best way to solve problems and this skill can be learned. Other approaches to clinical problem solving are both less effective and less efficient.
- The use of time is a function of decision making and is therefore is also a skill.

The Expert Skills Program (ESP) originated and evolved from the need to help numerous students acquire a new way of thinking. It now applies to all medical students, not just those who become at-risk.

- The ESP Learning Awareness Inventory has been developed to help illustrate to interested students how this new thinking affects them. A passing grade is 16 out of 16, i.e. ESP is a holistic concept and piecemeal knowledge of its components cannot lead to the development of expert thinking skills. Each question raises the awareness of essential ESP concepts.
- To help illustrate the principles, annotations to the answer choices will show you how the ESP teaches you to become a complete professional.
- The optional essay questions are also annotated to help teach the relevant principles.

Instructions: As with all exams you will take in your medical education, the instruction is to choose the <u>most</u> correct answer.

1. What observation most influenced the Growth Mindset?

A. Students who understand how their brain learns have higher academic performance.

This is the correct answer. Carol Dweck found that matched groups of students showed higher academic performance in the group that was taught how their brains process information. She reported that the

students' awareness that the brain can undergo neuroplasticity to become more intelligent was a strong motivator as well.

B. Students who use retrieval practice have increased intelligence.

Retrieval practice has been shown to increase memory and thus can contribute to an "apparent" increase in intelligence. Since intelligence can be defined as a mental skill, up to seven types of intelligence have been identified (Gardner). Retrieval practice, by its very nature, contributes little to how the student thinks about what they remember. Thinking is done by the front of the brain by retrieving information from the back of the brain (and immediate sensory input) to prioritize choices and make decisions.

C. Students must make the most of their intelligence through regular practice.

This belief has been discarded, but it formed the "fixed" mindset that intelligence was fixed at birth. The discovery of neuroplasticity invalidated intelligence as a fixed property of the brain.

D. Students who fear failure generally are motivated to work harder.

Dweck's work showed that just the opposite is the case. Those students with the fixed mindset not only feared failure, they underperformed. They are reproducibly the lowest achieving students.

E. Students gradually increase their intelligence as they grow interested in learning.

This answer is partially correct in that motivation is an important component of academic success. It is not sufficient to grow higher order intelligence because the tendency of the brain is to conserve energy by performing tasks that are the easiest. This is why talent doesn't produce experts. Experts only develop through deliberate practice of task that are the hardest. Research shows that experts rarely engage in deliberate practice because they enjoy it.

2. Which one of the following <u>best</u> describes what happens during learning?

A. The brain stores new facts for use later.

This answer is partially correct because the brain stores connections (synapses) for (i) thinking about facts as well as (ii) improved motor function for acting on decisions and improved sensory function for improved ability to detect visual and other sensory input. Learning involves more than just the ability to use facts.

B. The brain uses existing facts to create new facts.

This answer is partially correct because the brain uses hypotheses, or guesses, to create new facts. It combines existing facts (in memory) with a variety of possible facts, i.e. possibilities, to forecast outcomes for each. The elimination of all but the most desired possibility then leads to a decision. If action follows a decision, learning occurs. If this

process is short-circuited by reciting, only rote memorization can occur.

C. The brain physically grows as it creates new facts.

The physical change in the brain balances growth of new synapses by pruning of other less used synapses. Also, the brain learns more than facts. It also learns how to think in order to use the facts to make decisions that lead to actions.

D. The brain makes better use of existing synapses.

This is partially correct in that learning is reinforced by using existing synapses. However, this can only happen after learning has created the long-term synapse.

E. The brain acts on experience to change itself.

This is the correct answer. When the brain replays the events of the day during slow wave sleep, the emotions associated with actions taken drive the formation of long-term potentiated (LTP) synapses, i.e. learning has occurred. The action that follows a decision produces new experience serving as input to make further decisions. This cycle is never ending and is only modified when action is avoided, thus cutting off an emotion from the decision. When emotion is removed, consolidation during sleep replay is prevented.

3. Which area of the brain most closely corresponds in its function to the hard drive in a computer?

A. The prefrontal cortex

The prefrontal cortex corresponds to the CPU in a computer. It uses data stored in the temporal cortex, the hard drive, and combines it with new information to formulate possibilities from which to make a decision.

B. The limbic system

The limbic system is the emotional part of the brain located just below the cerebral cortex. There is no emotional counterpart for the limbic system in a computer.

C. The temporal cortex

This is the correct answer. The temporal cortex stores both fact and pattern long-term memory just as a hard drive stores files. Likewise, according to artificial intelligence information processing models, facts and patterns are retrieved by use of a filing or indexing system similar to the indexed file structure of a computer. This indexing system is created by active learning in the fourth step of the experiential learning cycle. While long-term memory can be a list of facts that are unconnected, indexed memory that is cross-referenced is more likely to bring clarity in thinking when solving Step 1 case questions.

D. The motor cortex

The motor cortex corresponds to output devices attached to the computer such as speakers for generating sound or activation of switches for turning lights on and off.

E. The sensory cortex

The sensory cortex corresponds to input devices such as a keyboard or microphone.

4. What is the key determinant for consolidation of synapses that were formed when studying practice questions?

A. Retrieval practice

Retrieval practice forms synapses of the retrieval practice itself, but this is usually done without the activity that is needed to form emotion. Consolidation is not supported.

B. Repetition

Repetition is usually associated with reading - a passage is read over until it is felt to be mastered. In medical school, there is rarely time enough to combine repetition with the activity needed for consolidation.

C. Clarity of annotation comments

Clear annotations for a practice question are helpful because they are convenient but they don't produce consolidation without action. If the annotations are rephrased or concept mapped in "minimaps," then consolidation would be supported.

D. Difficulty of question stem

A question stem is only difficult if the student has not prepared for it through active learning.

E. Emotional relationship

This is the correct answer. Emotion is the one aspect of learning that is critical to enable the brain to decide what synapses to prune and what to consolidate.

5. Which of the following best describes how the preference for introversion is used during group learning?

A. Organized – Keeps group on task

The preference for judging would best correspond to being organized. The judging preference organizes both time and space as they set deadlines for their goals to be accomplished. Judging types try to have a place for everything and everything in its place.

B. Passive – allows contribution from members who know the material

There is no type preference that is described as passive. Instead, the term passive is better applied to motivation, indicating a lower level of motivation. The temptation to consider introverts as passive comes

from the outer appearance of inactivity, but they are very active as they process information, reach decisions, and organize their thoughts.

C. Processing – allows deep thinking to process rationales and facts

This is the correct answer. Introverts spend their time thinking about what they are hearing to determine what argument or rationale that they will eventually want to communicate. Their thinking is easily overwhelmed by their senses so they seek quiet environments to be able to focus on their thoughts.

D. Harmonizing – reduces tension and prevents arguments

The feeling preference corresponds to using subjective, quality of life values in making decisions which leads to seeking harmony among others.

E. Logical – certifies that discussion makes sense

The thinking preference corresponds to using logic to reach decisions. Compared to the feeling preference, thinking types are most comfortable with objective analysis.

6. Which of the following is <u>least</u> likely to be effective for constructing concept maps as part of self-directed learning?

A. Outlining

Outlining is the first step in the Expert Skills Program method adapted for concept mapping by medical students. However, the outline only includes the most general terms rather than all of the terms. The function of outlining is to bring attention to overall organization as a beginning point to provide room in the map for grouping terms most likely to have greater content (nodes).

B. Paraphrasing

Paraphrasing is critical to condensing concepts down to fit into the nodes. Otherwise, the map would quickly become crowded. The thinking required to paraphrase builds highly effective long-term memory because it requires decision making that is followed by action as the node is constructed.

C. Comparing

Comparing concepts in different sections of the map is needed to form crosslinks. This type of higher order learning develops the power of discrimination that is needed on more difficult exam problems. It also builds long term memory that is integrated and easier to use during problem solving.

D. Reciting

This is the correct answer. Reciting is a process that is rote and requires no decision except to repeat something memorized. This process bypasses the frontal cortex and thus eliminates the decision-

making that is needed for a clear rationale. The result is memory that is useless except for simple recognition.

E. Analytical reading

ESP concept mapping is heavily dependent on analytical reading for the proper choice of grouping terms and correct cross linkage of related terms. Even the outline formed in the first step requires analysis of the overview.

7. Which of the following is the most important contribution of concept mapping to learning?

A. It avoids an obsession with details.

ESP concept mapping includes any details that are considered important. Because the details associated with the material being learned are attached to the map in specific locations they are easier to remember through association. Obsession with details is a learning blind spot, usually characteristic of intuitives.

B. It reveals relationships through interconnected patterns.

This answer is correct. When more inclusive grouping terms are linked in a branch they allow for the construction of cross links that show relationships. Along with inclusion in a group, maps also depict differences and similarities and cause-and-effect.

C. It can be done on a computer.

Virtually any study method can now be done on a computer. Using a computer does have advantages in creating an electronic form of what is being studied so that it can be shared.

D. It can be done alone or in a group.

ESP concept mapping can be done alone or in a group, but this is not unique to this learning method.

E. It is more fun than other methods.

ESP concept mapping can be very satisfying, but constructing it can involve a lot of work. It is definitely not fun for sensing types even though it produces better grades from better learning.

8. Which of the following is the best way to help a student who is not performing well on their exams in medical school?

A. Recommend that they review practice questions on a daily basis.

This is partially correct. The term "review" is as imprecise as the word "study." If review involves reading the question, guessing an answer, and/or reading the annotations, then the time spent is virtually wasted just as is the time spent simply reading. A better term is "analyze." This involves the provision of a rationale, which at a bare minimum requires decision-making in order to express the rationale. If the

activity of speaking to another classmate (or texting a Firecracker study group member) is added, analyzing becomes a powerful memory builder as well as a thinking skill builder.

B. Get them to work with a tutor as soon as possible.

In order to be effective in transforming the student into a self-directed learner, they would need to begin with helping the student identify their learning weaknesses. In the medical curriculum, working with a tutor will take time away from the organizational effort needed for higher order learning. A skilled tutor could help, at first, by guiding the student in practice, but a long term, regular relationship will create a dependency that works against skill development.

C. Get them to describe how they can correct their learning weakness.

This is the correct answer. A student can only determine how to correct weakness if they 1) know themselves and 2) know how their learning occurs. Armed with this insight, any student can take any subject and become self-directed in their learning. This type of learning, usually accomplished best with concept mapping and question analysis, uses time optimally by producing effective long-term memory.

D. Don't help them. Medical school is sink or swim and the weak students will just become weak doctors.

This is unfortunately a belief held by many faculty and students. It is due to a lack of general knowledge about learning. Both students and faculty have the erroneous belief that test performance is the result of inborn intelligence when it can only result from the efforts of the student to actively organize and understand the important concepts.

E. Get them to set up regular visits with their professors to have their questions answered.

This practice would only work if the visits were purposely not regular. Automaticity of any kind leads to weakness by reducing awareness. The most effective learning involves awareness at all times. That is why group learning is so powerful. A well informed professor would never encourage regular visits.

9. Which of the following sequences best ranks the importance of the Myers-Briggs preferences (S,N,T,F) to success in medical school?(Key: **S**ensing, i**N**tuition, **T**hinking, **F**eeling)

A. N>S>T>F

One preference is not more important than another. It is tempting to think that the natural tendency for intuition would predispose a student to perform the best on exams, since the research data tend to show this result. However, it is important to remember that a preference does not measure the degree to which the student uses it

or the degree to which it has been balanced to make thinking more complete.

B. S>N>T>F

One preference is not more important than another. This answer would most likely be chosen by those who think that knowledge of details and facts are sufficient for success on examinations. Even if that were true, the question did not ask about examination performance only, but rather overall success.

C. N=S=T=F

This is the correct answer. All of the preferences that concern information processing have an equal value in the biological events that occur in learning. If one of the four is lacking, learning can be improved by making that preference stronger.

D. N=S>T>F

One preference is not more important than another. This answer might be guessed by a student who equates the value of detailed information with that of understanding relationships and patterns. This is flawed reasoning because it compares knowledge of facts and of patterns with the ability to use them to make logical conclusions that have emotional value to the student. No single process plays a more important role than the rest.

E. F>T>N>S

One preference is not more important than another. This answer places the type preferences in an order that prioritizes the role of feelings, or emotions, over the other steps involved in information processing. This reveals a misunderstanding of the need to develop each preference as a skill and using each deliberately.

10. Bias in identification of one's MBTI type occurs most often due to:

A. A desire to be different than you are

This is the correct answer. It is a common misunderstanding that our type "makes us" do things. An unconscious preference can always be over-ridden in adapting to any situation and this behavior can be improved as a skill when needed. Your type doesn't <u>make</u> you do anything, although it does reflect what comes most naturally.

B. Changes in preferences over time

While preferences haven't been shown to change over time, the certainty of the preference can change. Thus, an uncertainty of the preference for sensing over intuition can develop into a greater certainty for sensing. This can be interpreted as simply getting to know yourself through experience or enjoying the preference by using it better. A preference can be perceived as changing when a person returns home from work where they no longer have to adapt their

behavior and they can be themselves. Thus, work type (adaptive) can differ from "true" type (preferred).

C. Substantial proficiency in an area of preference

Proficiency produces confidence and a positive self-concept. This is a circumstance that will result in higher confidence scores for the true preference from the MBTI. Thus, bias would be avoided.

D. Mental illness

Bias from mental illness is undefined for MBTI type. The Jungian type preferences are based on normal behavior resulting from normal information processing. If mental illness influenced the outcome of the MBTI results, it would not represent any type because it would not be based on rational thought.

E. Knowing type descriptions in advance

The MBTI is likely one of the rare cases where bias is reduced by understanding the type descriptions in advance. Knowing that there is no good or bad type and that the type opposite can be developed as a skill helps to eliminate the inner desire to be different than you are.

11. Which of the following is the most likely target for applying deliberate practice?

A. An inborn talent

An inborn talent will naturally bring increased practice to maintain skill levels. Thus, to some extent the resulting practice will be an attempt to strengthen what is already strong. While it is important to maintain and develop an inborn talent or strength, it doesn't fulfill the definition of deliberate practice that has a focus on weakness not talent.

B. A specific type of intelligence

There are several models of intelligence that propose multiple areas of skill. An inborn talent can exist for individuals in any of these areas leading to the motivation to excel in that skill. Unless a deliberate attempt to balance the inborn skill with less developed skill, overall intelligence will not be increased.

C. A weakness

This is the correct answer. The focus of practice on an area of weakness is essential to compensate for the imbalance created by a talent for a skill.

D. A newly acquired interest

While new interests create a honeymoon period of practice simply to experience a skill, if there is not an inborn talent for that interest, the motivation to continue the hard work of deliberate practice will drop.

E. An area of expected success

Due to the fact the success is expected, any practice of the skill will not be deliberate and is most likely to be more automated. The

research shows that automaticity leads to a reduction in skill, even with the continued non-deliberate practice.

12. According to brain research findings, which of the following is the most effective method for learning?

A. Retrieval practice

Retrieval practice emphasizes the use of newly formed synapses on the same day before they have been consolidated during slow wave sleep. It also minimizes the generation of rationales and resembles recitation. The only positive feature of retrieval is that it does engage the frontal cortex in the recall process, but the timing is premature. This process is far more effective when a concept map is verbalized preferably after a night's sleep.

B. Reading for understanding

Reading is always attempted for understanding, even when memorization is the goal. However, surface reading will only produce understanding for the moment. At that moment, the synapses formed through achievement of understanding are real and the understanding is real – but if it is not followed by action such as discussion or writing, then it never happened. This is because without action and/or emotion there is no biological basis for consolidation and thus no basis for long term memory.

C. Reading for recognition

Recognition has its place in medicine. It is not part of decision making but rather it is part of sensory input. Some test questions are composed to assess recognition in order to determine an adequate vocabulary.

D. Reciting with or without flashcards

Reciting bypasses the frontal area because it requires no decision. It is a way of building the ability to recognize.

E. Concept mapping

This is the correct answer. Concept mapping takes advantage of the way the brain functions to sense input, to compare it to what is known, and then to propose alternative courses of action and to act on the best course of action.

13. Which of the following is the most important step in experiential learning?

A. Reflective observation

Reflective observation is critical to recognition of new information. It asks the question, "have I seen this before?" When combined with sensory input, reflective observation aids clear thinking by the frontal

cortex in making a decision. By itself, reflective observation does not lead to action.

B. Concrete experience

Concrete experience represents the input of new information from the senses such as vision or hearing. By itself, it is only information without meaning or context.

C. Abstract conceptualization

Abstract conceptualization is important to learning by creating different ways of understanding. This step requires skill in creating the alternatives and in choosing the one that produces the best understanding. By itself, it is wasted if not acted on through active testing.

D. Active testing

This is the correct answer. The essential emotional connection needed to produce consolidation only occurs when experiential learning is carried through to active testing. When active testing produces an outcome such as a concept map, it produces an emotion that is related to achieving, or not achieving, a goal.

E. Retrieval practice

Retrieval practice is not a part of experiential learning. This method involves an attempt to periodically recall as much material from a study period as possible, but it is not always accompanied by a decision leading to action. During experiential learning, the formation of abstract hypotheses (guesses or possible alternatives) generates choices that lead to action, such as an entry in a concept map. The map can continue to be refined through further action. This trial and error approach leads to understanding.

14. Which of the following is the most effective way to schedule Step 1 study?

A. Begin one month before the exam date

This actually used to work when the licensure exam was 85% memorization. A review of material that facilitated recognition of concepts and facts just one month prior to the exam helped many students get past this hurdle.

B. Regular practice question review beginning in year 2

It doesn't matter when you review questions if you are aiming at covering as many as possible. This will virtually ensure that only a minimum amount of analysis will enter into the process and it will be as useless as reading a review book. You can't develop thinking through analysis when you are rushing through questions. The ESP method prevents that.

C. Ongoing analysis of course relevant questions

This is the correct answer. The single most important feature of effective Step 1 preparation is the wise use of time. When memory is formed in association with other memory, it is stronger and faster to recall. This process should ideally occur at the beginning of year 1 and continue on a regular weekly basis in order to develop awareness of relationships between concepts. The benefit of question analysis is not just experienced during the analysis activity alone, but through carry-over into individual study. This makes the entire first two years an ESP Step 1 Prep.

D. Register for a prep course to find out areas of weakness

Prep courses cannot afford to supervise you consistently enough to bring out your thinking and develop your analytical skills. They are primarily aimed at providing the materials for you to use in your own learning program. It is a positive that prep courses generally offer high quality materials for learning.

E. Register for a prep course that provides a proven schedule

A schedule is more important when conducting a last minute review during the weeks before the exam. This helps to ensure coverage. You can develop your own schedule if you use a long-range strategy.

15. Which of the following is most likely represented by the crosslinks in the ESP Step 1 Prep side-to-side concept map that is used to analyze practice questions? (See sample map below)

A. Correlation between an answer choice and a trigger word in the stem

This is the correct answer. A correct link is a recognition that the correct answer will have the strongest relationship to the stem. The greater the number of links from the stem to the correct answer, the greater the certainty.

B. A rationale for elimination of an answer choice

The cross-link represents evidence for a correct answer. The absence of a cross-link shows a lack of correspondence or relevance to the significant trigger words in the stem. A student might tell an attending that a certain diagnosis is incorrect because it lacks cross-links with the patient's data.

C. Identification of a correct answer

One of the most significant functions of the cross-links is that, in addition to identifying a correct answer, they can also connect to a partially correct wrong answer. This highly visual demonstration of weak connections reveals not only the danger of looking for any connection at all (a type of false positive), but also the need to look for the weight of the evidence. This is visualized by the presence of multiple links to the correct answer (a true positive).

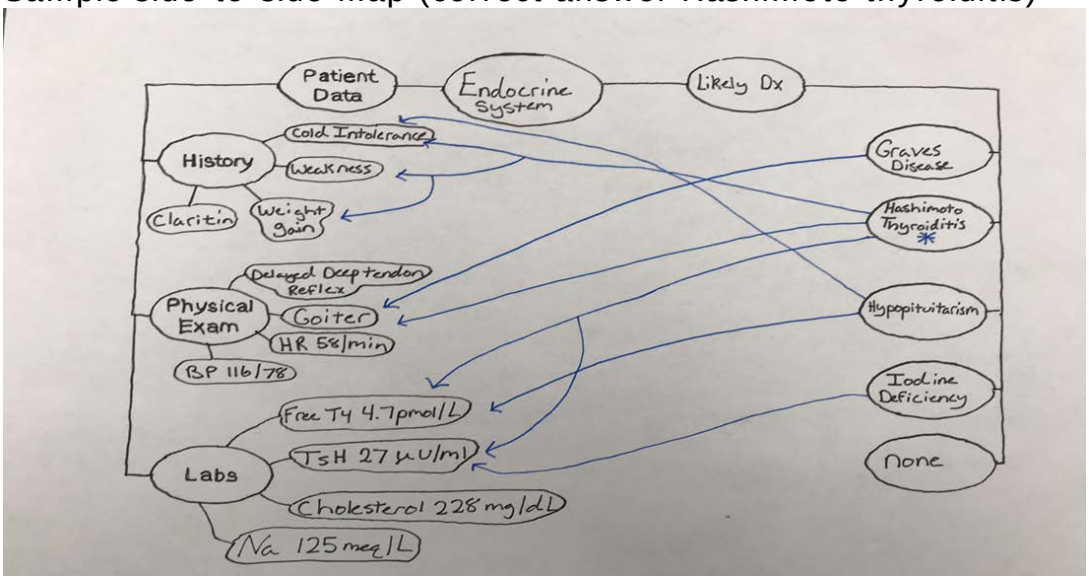
D. Identification of the most important finding

The typical case question will generate multiple cross-links. Step 1 does not ask for the most important finding.

E. The part of the question that should be memorized

No part of any question should be memorized. Anything less than a rationale for every part of the side-to-side map is a waste of time.

Sample side-to-side map (correct answer Hashimoto thyroiditis)



16. Which of the following best describes the way that sensing types answer case-based exam questions?

A. Seek the answer that matches notes or text

This is the correct answer. The preference for sensing provides the greatest comfort level when recognition is tested. Sensing types prefer to be tested in a "hands-on" setting such as a simlab and they both learn and perform better during the clinical years compared to classroom learning.

B. Rule out answer choices that don't fit learned patterns

Intuitive types prefer to rule out answers that don't fit the patterns that they learn instinctively. This can often amount to a guess, but the effort to organize their knowledge in the form of patterns and relationships makes the guess an "educated" one.

C. Read answer choices first to improve reading of question stem.

Sensing types prefer to take things in order and so they read the question first. Also, reading answer choices first uses up valuable time if you aren't aware of what you are supposed to decide about them.

D. Read end of case first to improve reading of question.

Sensing types will do this if they are told it is an effective strategy, but they will still seek to recognize the correct answer.

E. Cover up answer choices and determine answer before identifying the correct answer.

This is a strategy that sensing types can learn to use, but it does not come naturally to them. It still involves guessing from memory, and is not as natural as simple recognition.

Short essay questions (optional):

Instructions: Although most of your exams in medical education will be multiple choice, you will also be asked during your clinical experiences to explain your answer. Short essay questions are good practice for this. You will get more out of this exercise if you try to give a good answer first before reading the annotations. Better is to discuss your answer with a classmate first then check the annotation and discuss further.

1. Do you feel that development of your learning skills is nearly complete? Explain.

This answer should address whether the learning practices are following the evidence based principles that lead to consolidation of both memory and thinking skills. Reference should be to the use of time compared to the alternative choices and why, under the circumstances, that the methods used are the most effective use of time. Awareness of weakness should be mentioned and the nature of the deliberate practice should be described.

2. If you were/are a sensing type, how would you explain the value of learning specific facts and details to an intuitive type?

This answer should include first a description of yourself as a sensing type and what makes you comfortable and what makes you anxious. Then you should progress to how you have compensated through deliberate practice. Since the deliberate practice will involve the use of the intuitive function, you can continue with a description of the comfort levels and blind spots for that way of learning. In the end, you will have summarized how sensing activity balances intuitive activity.

3. Describe the biological event that corresponds to increasing intelligence.

This answer will involve a description of how and why consolidation of synapses occurs during slow wave sleep. It can involve methods that will bring about consolidation and why they are effective.

4. Do you think that your learning style is the best way for you to learn? Why?

This answer tests whether you have learned that your learning style has a blind spot that will hold you back until you bring it into balance. This could best be illustrated by some concrete examples.

5. Explain how learning style correlates with specialty choice.

This answer requires you to correlate the general features of both intuition and sensing that show the importance of perception in medical practice as well as in learning concepts. Your description should also include type differences in communication as well as the clinical reasoning process as related to the practice of each specialty. An extra good answer also would explain why learning style does not necessarily limit specialty choice.