

Lecture

Meeting Student Differences in Learning as a Strategy for Improving the Quality of Perfusion Education

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ABSTRACT

The quality of perfusion graduates has always been a core concern of perfusion educators. Teaching the student as an individual is a key concept.

This article reviews a learning taxonomy and reminds us about the individual needs of all learners, specific motivators of adult learners, the differences among individual learners, and the effects of stress on learning.

Assessment of each student must be done in all three domains—cognitive, affective, and psychomotor. Subsequently, teaching strategies can be devised which take the learner's individuality into account, and which aim for the creation of a competent and professional entry-level practitioner.

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INTRODUCTION

Perfusion educators have always been concerned with the quality of perfusion graduates. However, in light of the fact that the supply of perfusionists seems to have caught up with demand, the quality (rather than quantity) of perfusion graduates has emerged as perhaps an even greater focus of perfusion education (1,2). What can we do, as perfusion educators, to enhance the learning experience for students and produce even more technically proficient and ethical graduates who exhibit the kind of attitudes we wish to instill? Given some basic knowledge of educational theory, there are many things the perfusion educator can do.

Teaching the student as an individual is a key concept. This article will review a learning taxonomy and will remind us about the individual needs of all learners, specific motivators of adult learners, the differences among individual learners, and the effects of stress on learning. Ignoring these principles can lead to the teaching situation becoming derailed due to incorrect assumptions and miscommunications on the part of either the teacher or the student. It is helpful to recall that in every encounter between teacher and learner, something is learned, whether or not it is what the instructor intends to teach. The student may learn that the teacher has no tolerance for mistakes, or that the rest room is down the hallway, or even that a particular instructor should be avoided at all costs, when the teacher had intended to teach the student how to assemble the pump components for use (3). Part of the reason for this miscommunication may be that the teacher is approaching the student from a preconceived idea of what the student's knowledge and skill levels ought to be rather than taking the time to assess the student's progress and meet the student where he or she is, at that moment, in the teaching/learning process.

The more we apply adult learning theory to perfusion education, the better we meet students' needs and tailor our instruction to individuals, the better perfusionists we may be able to graduate.

Learning Taxonomy

Learning can be divided into three domains, or areas. Figuratively speaking, they are: cognitive (the head), psychomotor (the hands), and affective (the heart) (4).

The cognitive domain emphasizes remembering, understanding, and combining ideas and concepts (4). The largest proportion of what we learn in postsecondary education is cognitive, ranging from simple rote recall to the evaluation and judging of ideas. Cognitive levels are progressive; that is, one level must be mastered before the next can be achieved. Like the construction of a brick wall, each builds on its preceding level. Cognitive levels are (4):

- Knowledge (rote recall)
- Comprehension (understanding, knowing meaning)

- Application (use of information, applying it in proper context)
- Analysis (breaking information into its components)
- Synthesis (combining ideas and concepts into new ideas)
- Evaluation (judging the value of information)

Didactic perfusion education often emphasizes the lower cognitive levels but not the higher levels. For example, we might expect our students to memorize normal laboratory values or the coagulation cascade. Higher level cognitive functioning is often achieved only in the later portion of clinical perfusion practicums, when opportunity has been given the student to apply knowledge to specific situations and develop higher-level problem-solving skills. At these levels, a student might be asked, "What should we do about our pH of 7.2?" or "Why do you think our patient's potassium level is 6.9? How can we treat it?"

Students often come to their clinical education experience with a great deal of knowledge and even comprehension, but fall down on application—understandably—because they have not had the opportunity to use their knowledge in real life situations. Instructors need to remember that the students may not always be able to make use of their knowledge because at first they do not always know where and when it applies. Students should not be expected to have application skills in hand when they arrive at clinicals; in fact, clinical education is the primary area in which students develop those higher level cognitive skills. Each successive learning experience builds on those which preceded it. As a result, the tenth time a student takes a patient off bypass should be significantly more effective than the first.

The psychomotor domain emphasizes motor skills and the manipulation of materials or objects (4). It plays a major role in perfusion education. The best way to learn a psychomotor skill is in a stepwise fashion. Consider, if you will, an ideal sequence for someone learning how to set up and prime a perfusion circuit (4):

- Hearing basic information about the procedure (lecture)
- Seeing an expert do it (case observation)
- Being able to practice on a model or simulation, if possible (wet lab)
- Performing the skill under supervision (clinical experience with instructor present)
- Performing the skill independently

Unfortunately this neat sequence may not always be possible, although the ideal sequence should be kept in mind. Difficulties also arise when standards for skills are not evident, or when different instructors have different methods or different standards. This situation, known as interrater unreliability, can be terribly confusing for students. In addition, sometimes instructors are so expert at particular procedures that it is difficult for them to break down the skill into steps that the learner can follow and imitate, yet unless the skill can be divided into procedural steps, the learner will be hard-pressed to imitate the de-

sired behavior (3). Clear objectives, clearly-broken steps, organized practice conditions, and consistent instruction can help alleviate these problems and enhance the clinical performance of the learner on psychomotor behaviors.

The affective domain emphasizes feelings, emotions and attitudes (4). It is much more difficult to influence a change in attitudes or values than a change in knowledge and skills, but it is essential to producing just the kind of quality entry-level perfusionist we desire. In fact, a major part of clinical instructing involves instilling appropriate attitudes and values in students and fostering professional affective growth (5). Current attitudes must be assessed and analyzed before good attitudes can be reinforced or bad attitudes modified (3). Many times this attitudinal growth takes place through role-modeling. It is usually futile to *tell* someone how to be and expect them to be what we tell them. Rather, it must most often be lived (6). Moralizing, preaching, and other pedantic approaches will probably not work, and using failure to induce guilt may only encourage covert behavior, passive resistance, or cause the student to lose confidence and leave the academic program entirely (3).

Many times a change in attitude is a prerequisite to knowledge and skills; as Erikson says, "most instruction involves a two-part process: presenting information while at the same time indicating its worth" (3).

Affective changes are dynamic, but, like cognitive learning, can be thought of as existing in a hierarchy. They include behaviors such as (4):

- Receiving (willingness to give something attention)
- Responding (willingness to respond, increased emotional satisfaction with the experience)
- Valuing (interest, appreciation, enthusiasm, acceptance of a value)
- Organization (organizing relevant values into a system, recognizing the place of relevant values in one's life)
- Characterization of a value (development of a consistent value system)

The affective domain is the province of ethics as well. Ethical situations in patient care must be resolved by the integration of the practitioners' (and students') value systems with their ability to synthesize and evaluate the cognitive information available (4).

MOTIVATION OF ADULT LEARNERS

Adult motivators fall into two categories: external and internal. Adults will respond to some external motivators such as a better job, a salary increase, etc., but the most potent adult motivators are internal: self-esteem, recognition, better quality of life, greater self-confidence, self-actualization, and the like (7). Self-esteem and self-confidence will increase as students perceive their skills improving. Keller (3) highlighted the impor-

tance of attention, relevance, confidence, and satisfaction: "How can I make this material valuable and stimulating to my students? What prior knowledge and experience can I build upon? How can I help them succeed? What activities will produce student involvement and participation?" We can use Keller's questions to "tune in" to our students and help motivate them to their best potential.

MASLOW'S HIERARCHY OF NEEDS

Abraham Maslow was a psychologist who developed a theory of motivation known as the hierarchy of needs. Maslow's theory might at first seem irrelevant to perfusion education, but a closer look reveals that there is a great deal which is applicable (4).

Maslow held that individuals are motivated by needs, beginning with basic survival requirements and moving through six levels encompassing an individual's thirst for knowledge and other higher functions (4).

The lowest level needs are known as deficiency needs because if they are not met, the individual cannot move to the higher levels. They are, in ascending order (4):

- Physiological
- Safety
- Social
- Esteem

If we overlook these basic needs of students, we may keep them from reaching the highest level, a state Maslow calls self-actualization—a focus on becoming what one is capable of becoming, and realizing life goals. Maslow's growth needs focus on self-actualization and include both cognitive needs (the desires to know and understand) and aesthetic needs (need for beauty and appealing surroundings) (4).

For the medical learner, these growth needs motivate the learner to become self-directed and to develop professional and personal fulfillment. It must be noted, however, that if deficiency needs aren't met, the learner will have difficulty reaching these higher levels (4). Clinical instructors can do a great deal to meet deficiency needs and to enhance and expedite the teaching/learning process.

Of the deficiency needs, the most basic are physiological: food, water, shelter, sleep. Basic needs can be strong barriers to learning when they are unmet (4). Long hours are sometimes necessary in perfusion, but the student's basic human needs cannot be ignored without affecting the efficiency of the learning process. As a minimum, students should have the chance to sleep, eat, and use the restroom at reasonable intervals.

The next level of needs is that of safety: protection from physical and emotional harm, which is met by a comprehensible, predictable environment. Learners like to have consistent rules, or skills for avoiding trouble. This is difficult if the rules change

from day to day or instructor to instructor. Much of the stress involved in meeting the needs of this level involves lack of skills or the acquisition thereof (4). The issue of "psychological safety" falls into this category. Whitman points out that teachers need to let students know clearly their expectations; they need to treat students with respect and not ridicule and to develop an atmosphere where open dialogue becomes possible (3). Trust is important. Good communication helps build trust, and appropriate verbal responses with consistent nonverbal messages are essential. Trust is also enhanced by the instructor's emphasis on developing the learner's sense of competence, self-esteem, and appropriate responsibility for the student's current skill level (4). The establishment of an environment of trust and psychological safety also helps meet the learner's higher level deficiency needs, the social and esteem needs.

The next higher level is social needs, both passive (feeling wanted, accepted, belonging to a group), and active (being kind, taking responsibility, being helpful) (4). Students who are ridiculed or threatened do not feel accepted. Insults or ridicule, however seemingly well-meant, do not improve learning. Usually the feelings are remembered longer than the facts at issue. These tactics create antagonism, and very little learning takes place in a negative environment, except, perhaps that the student learns to avoid that instructor if possible (4). To quote Robert Mager, "People avoid things they get hit with" (8).

The highest level deficiency needs are esteem needs: the need for recognition and self-respect and a feeling of competence and mastery. Self-respect can make the burden of job responsibilities less onerous (4). Self-respect is built when the student experiences success while building skills for the future, in a positive environment. In this way, the student feels satisfaction and a sense of reward and develops a positive attitude toward the profession and the patients served (5). Carefully focusing negative feedback only on students' behavior and performance ("I am *not* pleased with the way you came off bypass today, and this is why...") rather than on their inherent self-worth ("You're worthless! You can't even come off bypass!") can help preserve esteem when essential feedback is given to change an incorrect behavior (9).

EFFECTS OF STRESS ON LEARNING

Closely related to motivation is the issue of stress in the learning environment. Simply stated, people learn less when there is either too much or too little stress (3). Either extreme can decrease learning. In order to optimize learning, instructors need to create a challenging, but not threatening (in other words, challenging, but psychologically safe) learning environment (3). There is enough inherent stress in the operating room environment without the instructor adding to the stress level by using inappropriate teaching techniques. As in weight-lifting, if the weights are too light, no strength increase takes place. If the weights are too heavy, one risks injury.

Whitman believes that the key to helping medical students and residents cope with stress is the concept of "professional intimacy," where the instructor and student are emotionally close without necessarily being social friends (3). Hechinger asked people to recall teachers who had influenced them and the characteristics that were repeated over and over were high expectations, respect, understanding, and opening "windows" of new ideas and possibilities, all characteristics exemplary of Whitman's concepts of the mentor and of professional intimacy (3,6). These techniques and concepts are undoubtedly important in perfusion education, too.

It is also important to recall that not everyone is stressed to the same degree by the same events. Furthermore, when stressed, not everyone generates the same physiological or psychological response (3). This is another example of an area where learners differ and where it is critical to take those differences into account.

DIFFERENCES IN INDIVIDUAL LEARNERS

There are numerous ways to categorize learners. Learners differ greatly in their learning potential, their readiness to learn, and how they learn most effectively. Some students remember best what they read; others remember best what they hear. Still others learn best by doing. Generally, though, it has been estimated that people remember 20% of what they hear, 30% of what they see, and 50% of what they both hear and see (4). A multi-sensory approach would seem to be desirable, whereby students can not only hear about a procedure, but see it done, and then practice themselves what they have seen and heard while at the same time receiving constructive feedback from the clinical instructor.

Grasha and Reichmann have described six categories of learners (4):

- The competitive learner learns in order to be one-up on the others, to perform better than the others or display superior knowledge.
- The collaborative learner shares ideas and works with others, perhaps starting journal clubs or organizing group study.
- The avoidant learner is uninterested in or overwhelmed by the activities at hand, and seeks to remain physically and intellectually inconspicuous.
- The participant enjoys learning, takes the responsibility for getting the most out of each course, but does not take on independent experiences.
- The dependent learner is looking for authority and guidelines, looking to faculty and peers for structure. The dependent learner learns what is required and will seek specific answers rather than engaging in independent thinking. The dependent learner is a low risk taker.
- The independent learner prefers to work on his or her own. This type of learner thinks independently, may or may not

attend class regularly, and learns what he or she thinks is important. During clinical experiences, independent learners tend to learn for themselves rather than utilize mentors for answers. They are high risk takers.

Individual learners never fit into one category all the time. For example, in some areas they may be independent learners, in others competitive (4).

In addition, the learner's previous medical and non-medical experiences—or lack thereof—may either help or hinder learning. Assessing the learner's present level of understanding and experience is, therefore, essential.

It is valuable to assess the student's position within the context of the various theories and strategies we have discussed. Establishing the student's knowledge base, for example, gives the teacher somewhere to begin. Underestimating may result in unnecessary repetition, frustration, or boredom. Overestimation results in knowledge gaps and delayed progress. Incorrect knowledge must be identified before correct information can be taught. Either extreme derails the teaching/learning process. These concepts also hold true for skills within the psychomotor domain. It is simple and effective to ask the learner, "Have you done this before? How many times?" to identify starting points (4).

Assessing the attitudes and beliefs within a student's affective realm is more difficult. Most often these attitudes are demonstrated through overt behavior that indicates a student's true feelings; at other times, in a desire to make a good impression, students may say or do things they think the instructor supports. What a student says is often less reliable than how that student behaves. Whitman lists five approaches to discerning learner attitudes (3):

- Develop a rapport with students by sharing your own personal feelings.
- Show genuine interest in learners by treating them as colleagues.
- Be accessible to them by being patient with them and recognizing the extra time it takes to teach on a one-to-one basis.
- Be empathetic by remembering what it was like to be a student.
- Be non-judgmental by acknowledging differences among people.

CONCLUSION

In summary, an assessment of the cognitive, affective, and psychomotor status of the learner can be accomplished by informal questioning, by observation, or by more formal evaluation, but it is critical to the quality of perfusion education that assessment be done in all three domains. Subsequently, teaching strategies can be devised which take the learner's individu-

ality into account while assuring that all the elements of the teaching/learning process result in a competent and professional entry-level practitioner.

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