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KEY POINTS

1. A teacher, serving as a manager, **develops educational objectives, motivates students, organizes the curriculum, evaluates performance, and provides feedback.**
2. **Educational objectives are an essential component** of any instructional activity, setting clear expectations for the learner and serving as a reference or evaluation by the teacher.
3. **Adults prefer active learning;** therefore, a curriculum that requires them to analyze, solve, defend, and evaluate increases their interest in learning.
4. **Developing a valid assessment tool is essential** to ensure that the learner has achieved the educational objectives.
5. **Formative feedback should be provided** during instructional activity to ensure the student's success.

Teaching success should be measured in terms of student performance, not the activities of the teacher. Delivering a carefully organized PowerPoint presentation, supervising problem-based workshops, or providing bedside clinical tutorials does not mean one has taught. Unless the learner has acquired new cognitive or psychomotor skills, teaching has not occurred.¹ An effective teacher takes responsibility for ensuring that students learn. If the teacher's perception is that providing a lecture or any instructional methodology fulfills this obligation, then the teacher is serving as "the" educational resource. The focus of this model is on what the teacher did and not on what the learner learned.

Stritter described a different model, one that is focused on the student.¹ In this model the teacher assumes responsibility for the learner's success and creates an environment conducive to learning by managing the educational resources. The teacher as a "manager" creates specific educational objectives, motivates students, utilizes various educational strategies, evaluates learning, and provides effective feedback to ensure the learner achieves all the educational objectives.¹

The goal of this chapter is to provide a detailed description of each of these steps, from creating educational objectives to providing feedback, so that the teacher can apply the concepts, whether organizing and presenting a 1-hour lecture, a 1-day workshop, a 1-month elective, or a 1-year curriculum.

CREATING EDUCATIONAL OBJECTIVES

Educational objectives outline the skills and behaviors that the student, resident, or fellow will be able to demonstrate after the teacher has completed a lecture, daily bedside instruction, 1-month elective, or fellowship training. Objectives should be developed for every instructional activity because they are a road map. They guide the teacher in developing an appropriate curriculum, they set unambiguous expectations for the learner, and they serve as a reference for evaluation and feedback.^{2,3}

Developing educational objectives involves three steps.^{2,3} First, using action verbs (e.g., defines, explains, demonstrates, identifies, summarizes, evaluates) the instructor describes a specific behavior that the learner must perform to show the achievement of the objective. An objective such as "teaches concepts of airway management" is not adequate because it defines what the teacher is doing and does not clearly describe what the learner should be demonstrating. Therefore, it neither serves as a road map for the teacher or the student nor does it identify a clear behavior that the teacher can evaluate.

Second, the teacher should describe the conditions under which the behaviors are to occur. For example "given a scenario using human simulation, the student will evaluate the airway and demonstrate effective bag-mask ventilation" or "given a patient with sleep apnea the fellow will outline a plan for management of the difficult airway." Finally, the criteria for acceptable performance should accompany the objective, that is, "bag-mask ventilation will be followed by successful laryngotracheal intubation within 30 seconds."

Bloom and Krathwohl developed a classification of educational objectives to assess three domains: cognitive, affective, and psychomotor.^{4,5} Objectives related to acquisition of knowledge are described in the cognitive domain, objectives related to the demonstration of attitudes and values are described in the affective domain, and objectives related to the acquisition of skills are described in the psychomotor domain.^{4,5}

When teaching students a specific clinical skill, for example, how to manage a patient with hypotension, the teacher must first establish that the learner has first mastered the lower cognitive domains, knowledge, and comprehension. Learners will not be able to initiate an appropriate treatment for hypotension or evaluate effectiveness of treatment unless they can first list the causes of hypotension and describe the effect of preload on stroke volume. The teacher must be able to identify where learners are in the cognitive domain and help them reach the higher domains such as synthesis and judgment. To accomplish this, the teacher needs to develop

TABLE 268-1. BLOOM'S TAXONOMY FOR COGNITIVE DOMAIN

Levels of Thinking–Thought Process	Verbs	Example
<i>Knowledge</i> – Remembering by recall or recognition: requires memory only	Define, list, recall. Who? What? Where? When?	What are the determinants of stroke volume?
<i>Comprehension</i> – Grasping the literal message; requires rephrasing or rewording	Describe, compare, paraphrase, contrast, in your own words.	Describe how a change in end-diastolic volume affects cardiac output.
<i>Application</i> – Requires use or application of knowledge to reach an answer or solve a problem	Write, demonstrate, show an example, apply, classify.	Show how a fluid bolus can change systolic blood pressure.
<i>Analysis</i> – Separate a complex whole into parts; identify motives or causes; determine the evidence	Why? Identify, outline, breakdown, separate.	Identify the factors that may contribute to abdominal surgery.
<i>Synthesis</i> – Produce original communication, solve a problem (more than one possible answer)	Write, design, predict, summarize, rewrite, develop, organize, rearrange.	Given a patient with chest pain, bibasilar rales, jugular venous distention, and mottled extremities, develop a hypothesis for a decrease in systolic blood pressure.
<i>Evaluation</i> – Make judgments, offer opinions; summarize physical finding to support the therapy is successful	Judge, describe, appraise, justify, evaluate finding to support.	Justify the decision to treat the patient in the previous example with fluids and inotropes.

educational objectives asking the student to predict the consequence of an intervention or evaluate the effectiveness of treatment. Table 268-1 lists the levels of Bloom's cognitive domain with the examples of action verbs and provides examples of questions that could be asked during lecture or teaching rounds to force the learner to higher levels.

Educational objectives specifically related to critical care medicine training programs should be developed in accordance with the expectations outlined in the Accreditation Council for Graduate Medical Education (ACGME) program.⁶ In addition to listing the specific cognitive and motor skills that must be taught, the ACGME has also developed general core competencies that focus on patient care and not just knowledge acquisition.⁶ The six competencies include Medical Knowledge, Patient Care, Interpersonal and Communication Skills, Professionalism, Practice-Based Learning, and Systems-Based Practice. Examples of educational objectives for each competency are shown in Table 268-2.

MOTIVATING STUDENTS TO LEARN

The next step in teaching as a manager is to motivate the students to want to learn. To accomplish this they must first value what is being taught. For them to value a specific goal they need to understand why it is necessary to incorporate the material into their clinical practice.^{8,9} The affective domain addresses educational objectives that relate to valuing and applying the material. The lowest level of the affective domain is receiving, in which the students attend lectures. Higher levels in the affective domain are concerned with getting the learner to incorporate material into daily patient care.⁵ These higher levels are accomplished by creating an environment that is conducive to learning. Table 268-3 lists specific activities the teacher can use to achieve higher levels in the affective domain. For example, the instructor should explain why certain educational goals have been chosen, why they are important, and what the consequences of failing to incorporate them are. Most importantly, the teacher needs to be aware of any inadvertent behaviors that may inhibit learning, for example, providing negative feedback in front of others or demonstrating negative body language. Because the teacher's goal is to facilitate rather than inhibit learning the teacher must recognize and change any behaviors that are barriers to learning.

A particularly effective tool to get students not only to learn but also to apply their cognitive skills to patient care is to put them in "simulated crisis situations" and allow them to make clinical mistakes and then attempt to manage the consequences. For example, as part of the airway management course for critical care medicine fellows, they are given an opportunity to manage a simulated patient with respiratory distress. If they sedate and paralyze the mannequin before obtaining all equipment for intubations, fail to verify intravenous access for fluid resuscitation, and do not evaluate the airway for potential difficulty, they will then have to manage a hypotensive patient with inability to intubate. Making this mistake in a simulated environment, and experiencing the potential complications in real time, has proven successful in getting fellows to learn and incorporate their cognitive and motor skills into their patient care. Simulation technology is described later under learning experiences.

LEARNING EXPERIENCES

There are numerous instructional methodologies a teacher can use to achieve educational objectives. Because adult learners prefer active learning, a curriculum that requires them to process information, participate in problem solving, and defend clinical judgment increases their enthusiasm for learning.⁹

Unfortunately traditional methods of instruction such as lectures provide little opportunity for interaction, but because they are an efficient means of conveying a significant amount of information they are frequently utilized. Despite being an efficient method for the teacher they are not as effective as other strategies in helping the learner to acquire clinical skills.¹⁰ In addition, much of what is taught is not retained, especially as the quantity of new material in the lecture increases.¹¹ Finally, because didactic sessions are not interactive the teacher does not have an opportunity to assess whether the learner understands the content and its applicability.

Small group sessions that incorporate problem-based learning and interactive workshops are more effective because they engage the students, force them to defend their decisions, and explain how they evaluate outcomes.¹⁰ Steps involved in developing a problem-based curriculum are to encourage the group to clarify any concept that is not

TABLE 268–2. EDUCATIONAL OBJECTIVES FOR THE ACGME GENERAL COMPETENCIES**Medical Knowledge: Fellow demonstrates knowledge of established and evolving biomedical, clinical and social sciences and the application of their knowledge to patient care and the education of others**

- Open-minded to acquiring new knowledge.
- Develops clinically applicable knowledge of the basic and clinical sciences that underlie the practice of critical care medicine.
- Accesses and critically evaluates current medical information and scientific evidence.
- Applies knowledge to clinical problem-solving, clinical decision-making, and critical thinking.
- Demonstrates appropriate ventilator management, including pressure and volume cycled ventilators, CPAP, and oxygen delivery systems.

Patient Care: Fellow provides patient care that is compassionate, appropriate, and effective for the promotion of health, prevention of illness, treatment of disease, and at the end of life

- Ability to identify and prioritize patient care plans.
- Gathers accurate, essential information from all sources, including medical interviews, physical examinations, medical records, and diagnostic/therapeutic procedures.
- Skill in performing procedures.
- Assumes leadership role in orchestrating patient care.

Interpersonal and Communication Skills: Fellow demonstrates interpersonal and communication skills that enable them to establish and maintain professional relationships with patients, families and other members of health care teams

- Provides effective and professional consultation to other physicians and health care professionals and sustains therapeutic and ethically sound professional relationships with patients, their families, colleagues, and students. Uses effective listening, nonverbal questioning, and narrative skills to communicate with patients and families.

Professionalism: Fellow demonstrates behaviors that reflect a commitment to continuous professional development, ethical practice, an understanding and sensitivity to diversity, and a responsible attitude toward patients, profession, and society

- Demonstrates respect, compassion, integrity, and altruism in relationships with patients, families, and colleagues.
- Adheres to principles of confidentiality, scientific/academic integrity, and informed consent.

Practice-Based Learning and Improvement: Fellow will be able to use scientific evidence and methods to investigate, evaluate, and improve patient care practices

- Develops and maintains a willingness to learn from errors and use errors to improve the system or processes of care; incorporates feedback into improvement activities.
- Uses information technology or other available methodologies to access and manage information, support patient care decisions, and enhance both patient and physician education.

Systems-Based Practice: Fellow demonstrates both an understanding of the contexts and systems in which health care is provided and the ability to apply this knowledge to improve and optimize health care

- Utilizes the resources, providers and systems necessary to provide optimal care (e.g., social services, PharmDs, nutrition service, case managers, resource intensivists, physical therapists).
- Collaborates with other members of the health care team at condition A or C and triages patients to appropriate level of care.

understood, define the problem, analyze the problem, and outline a management plan.¹²

Newer instructional methodologies involve technology. Since 1992, students have had the ability to access the Internet, hyperlink to additional resources, and search for reference material with potential cost savings both in terms of dollars and time compared with traditional instruction.^{13,14} Whereas surveys demonstrate that learners are satisfied with Internet-based instruction, there are no studies to

show Internet-based learning is more effective than other educational methods for increasing cognitive function or efficiency of learning.¹⁵

Lectures, small group discussions, problem-based learning, and Internet-based instruction are all effective in helping the learner acquire knowledge. However, none of these methods teaches students or residents how to apply these skills to real life situations. It is essential that a curriculum includes instruction that gives students an opportunity to learn how to manage unstable patients before they are expected to manage them in the clinical environment.

Each year 44,000 to 98,000 patients die because of medical errors.¹⁶ It is possible that giving students an opportunity to manage complex problems and anticipate consequences of their interventions in an environment where their mistakes do not result in untoward outcomes, where feedback is immediate, and where students can repeat their performance until they acquired these skills might improve patient safety.

Such instructional opportunities exist and have been available for years. Since the 1960s simulators have been used to teach crisis management to personnel in military, aviation, space flight, and nuclear power plant operations.¹⁷ Work in cognitive psychology and education theory suggest

TABLE 268–3. TEACHING FOR AFFECTIVE LEARNING

1. Explore the learner's goals, behaviors, perceptions, and assumptions.
2. Get the learner's agreement on objectives.
3. Use objectives that are likely to be met.
4. Elicit the learner's perceptions—What do you see? Think? Observe?
5. Point out and reinforce desired behaviors promptly.
6. Point out the steps to success.
7. Recognize and reinforce partial success.
8. Do not make negative comments of any kind.
9. Do not use negative body language.

that more effective learning occurs when the educational experience provides interactive clues similar to situations in which the learning is applied.¹⁸ In other words teaching management of unstable patients in a simulated environment, providing instruction, and evaluating learning is more effective than didactic sessions.

What initially began as computerized software with a separate torso apparatus has evolved into complex whole-body computerized mannequins with a functional mouth and airway, allowing bag-mask ventilation and intubation.^{19,20} The chest wall expands and relaxes; there are heart and breath sounds, and real-time display of physiologic variables including electrocardiogram, noninvasive blood pressure, temperature, and pulse oximetry. The human simulator has individual operator controls for upper airway obstruction, tongue edema, trismus, and reduced cervical range of motion. These computerized human simulators require trainees to integrate cognitive and psychomotor learning along with multisensory contextual cues to aid in recall and application in clinical settings.^{21,22} This type of simulation has been successfully incorporated into curricula to teach management of obstetrical emergencies, management of difficult airway in operating room, crisis management in the operating room,^{20,23} and management of unstable patients for critical care medicine trainees. Examples of learning objectives for third-year medical students, fourth-year medical students, and critical care medicine fellows using the simulator are listed in Tables 268-4 to 268-6. Note, all objectives are written in terms of behaviors the student must perform, thus giving the teacher clear guidelines for evaluation.

In addition to providing the learner with the opportunity to practice specific scenarios such as those outlined in Table 268-5, the simulator can be used to teach crisis

management skills.²⁴ Gaba and colleagues recognized the similarities that airline pilots and physicians face during crisis situations.²⁴ To bring order to the chaos that often accompanies a crisis, the team leader, whether they are an airline pilot or a physician, must demonstrate specific behaviors to effectively manage the situation. The leader must clearly identify himself or herself as the leader and be exempt from any responsibility other than providing orders. For example, when team leaders become involved with other activities, such as inserting intravenous catheters or performing laryngotracheal intubation, they lose oversight of the entire crisis. The leader must demonstrate effective communication skills by assigning specific responsibilities to specific team members. Identifying the nurse who will administer 1 L of normal saline wide open is more effective than asking someone to start some fluids. The leader should identify the essential members and ask nonessential personnel to step back. Finally, the team leader needs to “close the loop” by asking members to report when a specific task has been completed.

Studies of anesthesiology residents have demonstrated that training using simulation technology can improve performance in a simulated crisis,²⁵ although no study has unequivocally demonstrated improvement in actual patient outcomes.

EVALUATION

Evaluation is an essential component of any education curriculum and should address whether the goals and objectives of the course were met. When developing an assessment tool it is important to define what is being tested (the educational objective), define the behavior that indicates the task has been performed, select the testing method, and determine the acceptable standard for performance.²⁶ Some goals, including acquisition of knowledge, can be evaluated using written examinations or multiple-choice questionnaires. However, written examinations do not evaluate higher cognitive skills, such as evaluation, and cannot predict if the learner has become clinically competent and can exercise safe clinical judgment. Written examinations lack validity unless they are simply evaluating knowledge.²⁶ In addition, they tend to reinforce surface or superficial learning by rewarding students for memorizing facts for recall.

Chart-stimulated recalls are utilized to evaluate the student's higher cognitive capabilities. Whereas multiple-choice questions evaluate knowledge, the chart-stimulated recall requires the students to defend the workup, evaluation, diagnosis, and treatment of specific cases. As with other examinations, there must be predefined scoring rules and those conducting the oral review must be trained on how to administer and score the examinations.²⁷

Performance-based examinations can be utilized to assess clinical competency, psychomotor skills, and judgment.²⁸ An example of a performance-based examination is the Objective Structured Clinical Examinations (OSCE), which were developed by Harden and colleagues²⁹ in 1975. The examinations consist of several “clinical stations,” each with its own specific educational objectives. The OSCE requires the learner to recall knowledge, outline a treatment plan, interpret a study such as an electrocardiogram, or perform a specific motor skill.

These examinations are reliable and valid³⁰⁻³² and have been utilized to assess competency following medical school

TABLE 268-4. LEARNING OBJECTIVES FOR THIRD-YEAR CRITICAL CARE MEDICINE COURSE

Respiratory Distress

- Evaluate a simulated-patient in respiratory distress (tachypneic and hypoxemic).
- Initiate appropriate oxygen therapy.
- Evaluate effectiveness of therapeutic intervention.
- Demonstrate effective bag and mask ventilation.
- Insert intravenous line for resuscitation.
- Evaluate patient for potentially difficult airway.

Cardiovascular

- Evaluate a patient with hypotension.
- Initiate therapy for a patient with hypotension (initiate intravenous fluids).
- Order appropriate diagnostic tests for evaluation of a patient with hypotension.
- Evaluate effectiveness of therapeutic intervention.
- Evaluate a patient with sinus tachycardia, develop a differential diagnosis, and order appropriate diagnostic tests.

Arrhythmias

- Evaluate a patient with sinus tachycardia, develop a differential diagnosis, and order appropriate diagnostic tests.
- Demonstrate defibrillation of ventricular fibrillation and pulseless ventricular tachycardia.
- Demonstrate airway management and cardiovascular resuscitation for simulated patients with ventricular fibrillation, ventricular tachycardia, pulseless electrical activity, and asystole.

TABLE 268–5. LEARNING OBJECTIVES FOR FOURTH YEAR CRITICAL CARE MEDICINE COURSE

Scenario	Educational Objective	Correct Response	Typical Response before Training	Consequences
1. An 82-year-old man with coronary artery disease was receiving patient-controlled analgesia after a hip replacement. He is unresponsive and hypoventilating.	Administer correct dose of naloxone.	<ul style="list-style-type: none"> Mix 400 µg with 9 mL NS for a concentration of 40 µg/mL. Administer 1 mL at a time. 	<ul style="list-style-type: none"> Administer 1 ampule, 400 µg i.v. push. 	<ul style="list-style-type: none"> Patient awakens hypertensive with chest pain and shortness of breath ST segment changes are evident on rhythm strip.
2. Patient with shortness of breath; respiratory rate in 30s, refractory hypoxemia on 100% O ₂ via facemask. Able to improve saturation with synchronized bag-mask ventilation but is unable to open his mouth.	Prepare patient for intubation	<ul style="list-style-type: none"> Call for help. Crash cart at bedside. Provide bag and mask ventilation. Ensure all equipment is available. Ensure adequate intravenous line is present. Assess airway for difficulty before sedation/paralysis. 	<ul style="list-style-type: none"> Not calling for assistance Not having necessary equipment Not evaluating airway Not ensuring adequate IV access 	<ul style="list-style-type: none"> Unable to intubate after sedation Oxygen saturation falls. Patient develops bradycardia.
3. Patient is unresponsive and without a pulse.	Assume team leader position.	<ul style="list-style-type: none"> Assume leadership role. Assign responsibilities. Provide specific instructions. Assess response to interventions. Evaluate outcome. 	<ul style="list-style-type: none"> Becomes involved in obtaining arterial blood gas or inserting an intravenous line. Provides nonspecific instructions (i.e., "Someone start fluid"). 	<ul style="list-style-type: none"> The response is disorganized. Instructions are not carried out.
4. Patient develops stable atrial fibrillation in a nonmonitored area.	Rate control in monitored environment	<ul style="list-style-type: none"> Transfer to a monitored environment where staff can manage any complications. Students often prepare to electrically cardiovert with the patient awake. Often administer etomidate to cardiovert without preparing for airway management. 	<ul style="list-style-type: none"> Administer rate-controlling agent on the medical ward. 	<ul style="list-style-type: none"> Patient becomes hypotensive. If intravenous access has not been established, the patient remains hypotensive.
5. Postoperative day 1, nurse calls you to bedside to evaluate a patient whose tracheotomy tube falls out.	Successful reinsertion of tracheotomy tube	<ul style="list-style-type: none"> If the patient is stable, call ENT and insert with direct visualization using bronchoscopy. If patient is unstable, intubate orally. 	<ul style="list-style-type: none"> Reinsert tracheotomy tube into false passages. 	<ul style="list-style-type: none"> Tracheotomy tube placed in subcutaneous tissue. Patient develops hypoxemia and respiratory distress. Patient develops bradycardia.
6. Patient unresponsive with sinus bradycardia and hypoxemia	Perform bag-mask ventilation.	<ul style="list-style-type: none"> Increase oxygen saturation. Administer epinephrine at 10 µg. Secure airway. 	<ul style="list-style-type: none"> Administer 1 mg epinephrine 	<ul style="list-style-type: none"> Patient develops chest pain, tachycardia to 200 beats/min, and hypertension.

TABLE 268–6. LEARNING OBJECTIVES FOR CRITICAL CARE MEDICINE FELLOWS

1. Assess the patient's airway.
2. Immediately call for help and follow the difficult airway algorithm if difficulty anticipated.
3. Have primary and secondary airway strategies available (at least one supraglottic and one subglottic strategy).
4. Demonstrate good head position (sniffing position).
5. Check oxygen source and ensure connection of tubing to oxygen source.
6. Ensure two good peripheral intravenous lines are available and functional.
7. Demonstrate one- and two-hand bag-mask ventilation.
8. Use oropharyngeal or nasopharyngeal airway.
9. Establish working suction (check it yourself).
10. Check laryngoscope blades (have size 3 and 4 Mac and Miller blades available).
11. Have at least two sizes of endotracheal tubes available (recommended sizes: 7.0 and 8.0).
12. Check the balloon of the endotracheal tube.
13. Have stylet and CO₂ detector ready.
14. Have medications (etomidate [0.3 mg/kg] and succinylcholine [1 to 1.5mg/kg] ready in the room).
15. Have 2 ampules of Neo-Syneprine and 250 mL of D₅W in the room in the event of hypotension.

electives, for surgical and emergency medicine internships, and for licensure to practice by the Medical Council of Canada.³¹⁻³⁴

Some potential disadvantages of OSCEs are that they are labor intensive, they fail to simulate reality because they are broken down into separate stations, and students must rely on the person giving the examination for physical findings or response to treatment.

These limitations can be overcome using the human simulator, which allows the teacher to evaluate a student's cognitive and psychomotor skills in real time. Checklists should be developed, and all observers participating in the evaluation should prospectively agree on what constitutes a successful performance (interrater reliability).^{35,36} Because students receive immediate feedback their analytic and evaluative skills can be assessed and when necessary they can be instructed how to perform the task appropriately. Both computer-controlled simulators and OSCEs have been shown to be better than written examinations in predicting if students can solve clinical problems.³⁷ Gaba and colleagues have shown that technical skills can be assessed reliably from videotapes of the learner's performance on the simulator; however, behavioral skills, such as clinical decision making, were less reliably assessed.²⁴

Probably the most common method of assessing clinical competency is to evaluate the learner's performance in real-life clinical situations. Several evaluation tools can be utilized in this environment. Global rating scales are used to evaluate patient care, knowledge application, interpersonal, and communication skills. These evaluations are typically conducted in retrospect and are used to summarize a performance at the end of a clinical rotation. This type of rating has the potential to be highly subjective; and if those performing the evaluation have not been trained, the results may reflect evaluation bias and lose validity.²⁷

Psychomotor skills such as evaluation of airway management, bag-mask ventilation, intubation, central catheter insertion, and chest tube insertion are evaluated with procedure logs. Checklists should include the specific behaviors that need to be demonstrated to achieve a satisfactory evaluation.²⁷ An example of a procedure log for intubation is demonstrated in Table 268-7.

Communication and interpersonal skills can be evaluated by peers, staff, and families using 360-degree reviews and patient surveys. The 360-degree review is a tool that is completed by those individuals (nurses, respiratory therapists, families) working with the learner. The difficulty with this review is making sure staff understand the intent of each question, coordinating the distribution and collecting the completed examination reviews.²⁷

Finally, patient surveys are used to obtain feedback on communication, interpersonal skills, and professionalism. They are reliable if there are 20 to 40 patient responses per student, which limits the use of this tool.²⁷

PROVIDING EFFECTIVE FEEDBACK

The final step in being a manager of learning is to effectively utilize feedback to enhance learning. Too often feedback is used to fulfill an administrative function. It is provided as a summative report once the rotation is complete. When feedback is utilized effectively it enhances affective learning, and when utilized inappropriately or done poorly it can inhibit learning.³⁸

Students want feedback: they want to know how they are performing and how their performance can be improved. Most students, however, report inadequate feedback during their training.³⁵ Explanations for lack of feedback include a teacher's concerns that the feedback will result in unintended

TABLE 268-7. RESPIRATORY SUPPORT

	Yes	No	N/A	Comments
Equipment Preparation				
1. Assembles equipment correctly				
2. Ensures suction is available				
Drugs				
1. Provides adequate/appropriate use of muscle relaxants				
2. Provides adequate/appropriate use of sedative drugs				
3. Provides adequate/appropriate use of topical anesthetics				
Ventilation				
1. Ensures oxygen flow to bag				
2. Preoxygenates patient to 100%				
3. Provides adequate coordination of bag-mask support with spontaneous effort by patient				
4. Provides effective mask seal				
5. Provides effective ventilation by bag-mask				
6. Demonstrates appropriate use of naso or oropharyngeal airway				
Intubation				
1. Demonstrates appropriate head positioning				
2. Provides cricoid pressure used				
3. Verifies endotracheal tube placement				
Complications				
1. Prolonged laryngoscopy complications				
2. Number of intubation attempts _____				
3. Esophageal intubation (duration in minutes ____)				
4. Bleeding from lip, mouth, nose				
5. Dental injury				
6. Failed intubation				

consequences, will damage the student-teacher relationship, or will result in students evaluating the teacher as having performed poorly. None of these consequences will occur if the feedback is delivered correctly. Formative feedback is the only way to ensure the success of students, telling them what they have done well and, if necessary, what they need to do to achieve an educational objective. Without effective formative feedback, the behaviors go uncorrected and the student develops a system of self-validation: “I did well because no one told me otherwise.”

For feedback to effectively change behavior without causing unintended consequences, several rules should be followed. First, all feedback should be based on how the student performed regarding a specific goal and/or objective of the program.³⁸ This is another reason that teachers must develop clear educational goals. They serve not only as the framework for the curriculum but also as a reference for feedback. If feedback is provided in the context of specific performance, there should be no untoward consequence.³⁸ For example, if the goal is for the learner to demonstrate effective bag-mask ventilation with appropriate chest excursion and adequate oxygen saturation, then the goal was either achieved or it was not. This is a statement based on an objective and is not a personal affront unless the feedback contains judgmental language. Therefore, it is important not to tell the student he or she did a “terrible job.” Second, feedback must include a description of how to succeed. In the example presented, if the patient was not effectively ventilated, the teacher should suggest repositioning the head, inserting an oral airway, and performing two-person bag-mask ventilation so that there is a better seal with the mask. Third, the specific behavior that the learner demonstrated should be addressed and not just interpreted.³⁸ If students are late to rounds, do not assume they do not care or are lazy. Stating the expectation that rounds begin at 7 AM and the expectation is to be prepared by then assigns no judgment. Fourth, for feedback to be effective, it should be an expected component of the learning tools.³⁸ Students should be informed during orientation that they will receive daily feedback on their performance of the stated goals and objectives. Without successfully implementing feedback, the model of teaching described by Irby is incomplete.⁹

In conclusion, a teacher who begins every educational session with clear objectives, creates an environment where students want to learn, applies different educational strategies, evaluates learning, and provides formative feedback will help his or her students to successfully achieve the educational objectives. These guidelines are applicable for developing a bedside teaching session, a 1-month rotation, or a year-long curriculum for critical care medicine fellows.

ANNOTATED REFERENCES

Bloom BS: Taxonomy of educational objectives. In A Committee of College and University Examiners (eds): *The Classification of Educational Goals, Handbook 1/Cognitive Domain*. New York, Longman, 1956, pp 120-200.

Bloom's taxonomy is a description of cognitive objectives arranged from the lowest level of cognitive function, knowledge, to the highest, judgment. Faculty must ensure students have mastered the lower domain before they can expect the learner to comprehend, apply, analyze, synthesize, and judge.

Ende J: Feedback in clinical medical education. *JAMA* 1983;250:777-781.

This review discusses the formative functions of feedback, rather than the administrative function. Formative feedback is provided to the learner to help him or her successfully achieve the educational goals. It is based on student behaviors, not faculty interpretation of behaviors, and must be accompanied by a description of how to succeed.

Irby DM: What clinical teachers in medicine need to know. *Acad Med* 1994;69:333-342.

There are a variety of instructional activities. Whereas didactic sessions are the most common, they are the least effective, because adult learners prefer interactive learning that allows them to defend clinical decision-making.

Mager RF: *Preparing Instructional Objectives*. Palo Alto, CA, Fearson, 1962.

Educational objectives should be developed for every instructional activity. They guide the teacher in curriculum development, set unambiguous goals, and serve as a reference for feedback. Educational objectives should describe the exact behavior learners must demonstrate to successfully achieve the goal.

Rogers PL, Jacob H, Rashwan AS, et al: Quantifying learning in medical students during a critical care medicine elective: A comparison of three evaluation instruments. *Crit Care Med* 2001;29:1268-1273.

Evaluation is an essential component of any curriculum. The most common evaluative tool is written examination; however, this study showed that written examinations were not as good as performance examinations in predicting if students could manage complex clinical situations.