Educational Design

A CanMEDS guide for the health professions

Editors
Jonathan Sherbino | Jason R. Frank
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Acknowledgements

The editors wish to thank the following individuals, without whose considerable efforts the publication of this book would not have been possible.

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Jonathan Cormier

Copy editors
Jennifer Thomas
Anne Marie Todkill

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Chapter objectives
After reading this chapter, you should be able to:
• define and contrast the terms learning objective and goal
• describe the three broad domains of learning objectives
• describe how learning objectives are useful in planning a curriculum
• describe how to compose clear and effective learning objectives

Introduction
Learning objectives direct both the teacher and the learner. They give students a clear indication of what they need to learn and teachers a means of prioritizing and structuring content. For both, they provide an educational road map.

Learning objectives are distinct from goals in their degree of specificity. In general, goals are broad statements that articulate the general intentions or overall focus of a curriculum. They are abstract and are not easily validated or measured. Making the general purpose and overall goals explicit is essential, but not sufficient, in formulating the aims of a curriculum.

A learning objective, in contrast, is more specific. Importantly, it is concrete and can be measured and validated. A learning objective is a precise statement of specific performance, the achievement of which contributes to the attainment of the goal. A single goal may have many specific, subordinate learning objectives.

The degree of specificity in learning objectives is, however, variable. For example, Royal College Objectives of Training set out specific objectives that pertain to a given discipline of practice. Program-level objectives are those adapted to a particular, local, residency program. Rotation objectives adapt program objectives to a specific clinical context and environment. And, finally, objectives specific to instructional events are used for brief educational activities such as seminars or rounds.

What are learning objectives?
In the context of educational planning, a learning objective has been defined as what learners will be able to do after an education process that they could not do before, and that will enable them in the future to perform a task. In other words, learning objectives are clear statements of the intended outcomes of the specific learning encounter.
The practice of drafting explicit objective statements before formulating the content of an educational program may seem foreign to many medical teachers. However, learning objectives are not the bureaucratic red tape of accreditation bodies. Rather, they help to provide a clear focus for content as well as benchmarks for assessing learning outcomes. Until you develop your learning objectives, you cannot refine your content and match it to appropriate instructional methods and assessment tools. As Mager points out, “if we do not know where we are going, it is difficult to select a suitable means of getting there, or, for that matter, even to know if or when we have arrived.” Learning objectives form the cornerstone of a curriculum.

Learning objectives can be divided into the following three domains:

- cognitive: intellectual capability—“thinking”
- psychomotor: technical skills—“doing”
- affective: attitudes as manifested by behaviour—“feeling”

Typically, knowledge and skill acquisition receive the most attention in curriculum development. However, the affective domain, in which physician competence is addressed with reference to attitudinal objectives, should not be neglected.

Why should learning objectives be used?

Learning objectives have multiple benefits (Textbox 5.1). For the teacher, especially if he or she is considerably removed from the process of curriculum design, objectives help to guide what should be prioritized (i.e., what content should be included) and how it should be structured. Many educators assume that all of the pieces of a curriculum (i.e., clinical rotations, rounds, etc.) will be readily understood by the clinicians who provide this teaching as forming a cohesive whole. This is not necessarily the case, however, and so for front-line teachers tasked with delivering “a piece of the puzzle,” the sharing of objectives promotes an understanding of how the various components of a curriculum fit together. For faculty members who are not participating in a particular learning activity, the sharing of objectives facilitates communication about what colleagues are doing, preventing duplication of effort.

For the learner, reviewing the objectives is the first step in the active learning process. Objectives benefit learners by setting out expectations for the outcomes of a learning activity. Established principles of adult learning suggest that learning is optimized when it is:

- connected to previously accumulated knowledge and experience;
- clearly relevant to a learner’s work; and
- goal oriented—or, in other words, based in explicit objectives.

Lastly, learning objectives are foundational to the curriculum planning process. One of the key steps in the process of developing a curriculum is the creation of a curriculum blueprint, which maps the learning objectives from all of the learning activities, linking them to the instructional methods and assessment tools and providing a structure for appropriate program evaluation. Thus, a curriculum blueprint ensures coordination and sufficient sampling of content. Table 5.1 presents a truncated outline of how a curriculum blueprint can be designed.

Writing clear learning objectives

In general, educational programs benefit from having more, rather than fewer, learning objectives. Before you can formulate objectives, however, you will need to know the following:

- The characteristics of the target audience: level of training and responsibility, mix of specialties, etc.
- The learning needs of the target audience (see ch. 4).
- The setting. Learning objectives will vary from one learning environment to another. For example, the learning objectives for managing a cardiac arrest as taught in a seminar will be different from those appropriate to a simulation lab or the emergency department.

Textbox 5.1: Benefits of learning objectives

Learning objectives determine:
- content
- instructional methods or learning activities
- assessment tools
- benchmarks for program evaluation
It is important to emphasize that learning objectives should be written from the learner’s, not the teacher’s, perspective. They should be framed “beginning with the end in mind”; that is, their focus should be the learner’s performance at the conclusion of the learning activity. Lastly, each specific learning objective should include only one outcome.

Learning objectives consist of four elements:

1. A **time reference** (during which learning occurs). This may be reflected in the level of the learning objective. For example, residency-level objectives reflect competency acquisition over the course of a residency program, whereas workshop-specific objectives reflect an activity that takes place over a period of hours.

2. A **performance description** of what the student should be able to do, and the level of sophistication of that performance. Using action verbs that identify an observable behaviour is crucial here. Frequently, verbs such as *understand, appreciate, be aware of* and *know*, which fail to describe a readily observable action or outcome, are inappropriately selected.

3. The **conditions** under which the learner will perform the task. The educational tools and aids that will be provided or denied should be made clear.

4. The **criteria** for assessing student performance, including the minimum standard for acceptable performance, such as the degree of accuracy of performance.

In some cases, the objective statement will imply one or two of these elements; however, it may be necessary to specify each element in detail.

In formulating learning objectives, it can be helpful to start with the phrase, “At the end of this [rotation/workshop/lecture/seminar/etc.] the learner should be able to …”. This would then be followed by a verb signifying an action, along with a specification of the observable behaviours, conditions or criteria associated with the acceptable performance of that action (seeTextbox 5.2). Of note, the order of the components is not fixed, and the degree of precision of the objectives should be balanced with educational utility.

**Textbox 5.2: Formulating a learning objective**

**Formula**

At the end of the [time reference] the learner should be able to [action verb] + [observable behaviour] + [conditions] + [criteria]

**Example**

“At the end of the simulation session, the learner should be able to interpret a standardized ECG demonstrating ventricular tachycardia and describe the features that differentiate it from other wide-complex tachydysrhythmias.”

---

**Table 5.1: A truncated curriculum blueprint**

<table>
<thead>
<tr>
<th>Role</th>
<th>Objective</th>
<th>Domain (knowledge / skill / attitude)</th>
<th>Instructional method</th>
<th>Assessment</th>
</tr>
</thead>
<tbody>
<tr>
<td>Health Advocate</td>
<td>Identify opportunities for health promotion and disease prevention</td>
<td>Knowledge</td>
<td>Clinical rotation</td>
<td>Academic half-day</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Other</td>
</tr>
<tr>
<td>Health Advocate</td>
<td></td>
<td></td>
<td>Health Advocacy workshop; PGY 2 and 4</td>
<td>PGY 1 code blue simulation session</td>
</tr>
<tr>
<td>Health Advocate</td>
<td>Junior inpatient general medicine rotation; senior outpatient specialty clinics</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>PGY 2 and 4</td>
<td></td>
<td></td>
<td>Other</td>
<td></td>
</tr>
<tr>
<td>PGY 2 and 4</td>
<td></td>
<td>Oral exam</td>
<td>ITER</td>
<td></td>
</tr>
<tr>
<td>in-training exam</td>
<td></td>
<td></td>
<td>PGY 2 OSCE</td>
<td></td>
</tr>
<tr>
<td>Junior inpatient general medicine rotation; senior outpatient specialty clinics</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

ITER = in-training evaluation report; PGY = postgraduate year; OSCE = objective structured clinical examination
### Table 5.2: The domains of learning

<table>
<thead>
<tr>
<th>Level</th>
<th>Descriptor</th>
<th>Key verbs</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>COGNITIVE DOMAIN</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Knowledge</td>
<td>Recalls data or information</td>
<td>Defines, describes, identifies, knows, labels, lists, matches, names,</td>
</tr>
<tr>
<td></td>
<td></td>
<td>outlines, recalls, recognizes, reproduces, selects, states</td>
</tr>
<tr>
<td>Comprehension</td>
<td>Demonstrates understanding</td>
<td>Assesses, classifies, compares, describes, differentiates, explains,</td>
</tr>
<tr>
<td></td>
<td></td>
<td>predicts, interprets, restates, gives an example</td>
</tr>
<tr>
<td>Application</td>
<td>Applies what was learned to clinical practice</td>
<td>Constructs, chooses, demonstrates, develops, selects, employs,</td>
</tr>
<tr>
<td></td>
<td></td>
<td>prepares, predicts, matches, uses</td>
</tr>
<tr>
<td>Analysis</td>
<td>Separates material into component parts and</td>
<td>Analyzes, compares, contrasts, appraises, distinguishes,</td>
</tr>
<tr>
<td></td>
<td>shows relationship between parts</td>
<td>differentiates, discriminates, separates, outlines</td>
</tr>
<tr>
<td>Synthesis</td>
<td>Uses diverse elements to form a whole with</td>
<td>Combines, compiles, creates, formulates, integrates, organizes,</td>
</tr>
<tr>
<td></td>
<td>new meaning</td>
<td>plans, explains, summarizes, constructs</td>
</tr>
<tr>
<td>Evaluation</td>
<td>Makes judgments about the value of ideas or</td>
<td>Appraises, determines, evaluates, judges, ranks, recommends,</td>
</tr>
<tr>
<td></td>
<td>materials</td>
<td>concludes, critiques, assesses, tests</td>
</tr>
<tr>
<td><strong>AFFECTIVE DOMAIN</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Receiving</td>
<td>Willingly hears and considers</td>
<td>Perceives, acquires, identifies (demonstrates awareness of), attends,</td>
</tr>
<tr>
<td></td>
<td></td>
<td>appreciates, realizes, questions, listens, selects</td>
</tr>
<tr>
<td>Responding</td>
<td>Attends and reacts to a particular phenomenon</td>
<td>Answers, completes, reports, participates, discusses, describes,</td>
</tr>
<tr>
<td></td>
<td></td>
<td>establishes, writes, records, develops</td>
</tr>
<tr>
<td>Valuing</td>
<td>Attaches worth to a particular object,</td>
<td>Initiates, invites, shares, follows, selects, proposes, influences,</td>
</tr>
<tr>
<td></td>
<td>phenomenon or behaviour</td>
<td>appreciates, justifies</td>
</tr>
<tr>
<td>Organizing</td>
<td>Organizes values into priorities, with an</td>
<td>Arranges, combines, integrates, organizes, prepares, relates,</td>
</tr>
<tr>
<td></td>
<td>emphasis on comparing, relating and</td>
<td>conceptualizes, formulates, examines, balances</td>
</tr>
<tr>
<td></td>
<td>synthesizing</td>
<td></td>
</tr>
<tr>
<td>Internalizing</td>
<td>Acts consistently in accordance with</td>
<td>Acts, discriminates, displays, avoids, resists, influences, requires,</td>
</tr>
<tr>
<td></td>
<td>internalized values</td>
<td>modifies, practises, judges</td>
</tr>
<tr>
<td><strong>PSYCHOMOTOR DOMAIN</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Perception</td>
<td>Uses sensory cues to guide motor activity</td>
<td>Chooses, describes, detects, differentiates, distinguishes, identifies,</td>
</tr>
<tr>
<td></td>
<td></td>
<td>isolates, relates, selects</td>
</tr>
<tr>
<td>Set</td>
<td>Possesses a mental, physical or emotional state</td>
<td>Begins, displays, explains, visualizes, proceeds, reacts, shows, states,</td>
</tr>
<tr>
<td></td>
<td>underpinning a readiness to act</td>
<td>volunteers</td>
</tr>
<tr>
<td>Guided response</td>
<td>Imitates, follows instruction, trial and</td>
<td>Copies, traces, follows, reacts, reproduces, responds, mirrors</td>
</tr>
<tr>
<td></td>
<td>error</td>
<td></td>
</tr>
<tr>
<td>Mechanism</td>
<td>Applies learned responses habitually and</td>
<td>Assembles, calibrates, constructs, displays, measures, manipulates,</td>
</tr>
<tr>
<td></td>
<td>with increasing confidence</td>
<td>palpates, percusses</td>
</tr>
<tr>
<td>Complex overt response</td>
<td>Performs without hesitation or</td>
<td>Assembles, calibrates, constructs, displays, measures, manipulates,</td>
</tr>
<tr>
<td></td>
<td>automatically</td>
<td>palpates, percusses</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Note: The key verbs are the same as for Mechanism, but will have</td>
</tr>
<tr>
<td></td>
<td></td>
<td>modifiers that indicate that the performance is quicker, better, more</td>
</tr>
<tr>
<td></td>
<td></td>
<td>accurate, etc.</td>
</tr>
<tr>
<td>Adaptation</td>
<td>Modifies skills to fit special requirements</td>
<td>Innovates, modifies, adapts, alters, changes, rearranges, reorganizes,</td>
</tr>
<tr>
<td></td>
<td></td>
<td>revises, varies</td>
</tr>
<tr>
<td>Origination</td>
<td>Shows creativity based on highly developed</td>
<td>Rearranges, innovates, builds, combines, composes, constructs,</td>
</tr>
<tr>
<td></td>
<td>skills</td>
<td>creates, designs, initiates, makes, originates</td>
</tr>
</tbody>
</table>
Categories of learning objectives

The action verb chosen for the formulation of a learning objective is crucial in determining the degree of sophistication of learner behaviour that the activity seeks to promote. Learning taxonomies—that is, classifications of educational goals—articulate a progressive sophistication of learning. One of the most widely used of these is Bloom's taxonomy of the cognitive domain. An important premise of Bloom's model is that each level within the taxonomy must be attained before the learner can progress to the next. Thus, the action verb (and its corresponding taxonomy level) will determine the level of learning or performance that is required. Krathwohl, Bloom and Masia's taxonomy deals with aspects of the affective domain. The third, psychomotor, domain, was established to address skills development related to manual tasks and physical movement. However, it is also applicable to skills important in today's practice of medicine, such as communication and collaboration.

Table 5.2 maps action verbs to common learning taxonomies for the cognitive, affective and psychomotor domains: knowledge, attitudes and skills, respectively.

Prioritizing objectives

Before you attempt to transform identified educational needs into learning objectives, consider this word of caution. It is easy to create too many objectives for the time available. Prioritizing objectives is a difficult but crucial step. When triaging educational needs, consider whether the knowledge, skill or attitude you plan to address is common or essential to clinical practice. Include only those objectives that are feasible within the practical considerations of your clinical and educational environment.

Conclusion

Ultimately, the success of any curriculum is determined by what participants actually learn. To measure learning, we must be prepared with a definition of the intended outcomes. Learning objectives provide a road map for educational initiatives, guiding teachers and learners alike. Physician competence is contextual, dynamic, developmental and multi-dimensional. There are multiple stages of performance that lead a resident toward the ultimate goal of becoming a competent independent practitioner. The use of learning objectives in the design and delivery of educational programs is an essential component of this complex educational process.

Educational vignette revisited

A few days later, Dr. Albrecht sits down to transform the learning needs she has identified into learning objectives for the session. Having reviewed her program's Objectives of Training, the needs identified in the previous evaluations, and the priorities identified by her colleagues, she concludes that conflict resolution, an important aspect of the Collaborator Role, should be the focus of the two-hour session. She writes up the learning objectives for the session as follows:

At the end of this two-hour interactive session, participants should be able to:

1. List at least four of the five different styles of conflict resolution and describe two distinguishing features of each.
2. Describe their own preferred conflict resolution styles.
3. Identify the major source of conflict in a given dispute scenario, one that could arise in their own clinical setting.
4. In a role play, demonstrate an openness to the exploration of differing perspectives in a conflict situation.

In drafting this outline, Dr. Albrecht succeeds in including learning objectives that address knowledge, objectives 1 and 2), skills (objective 3) and attitudes (objective 4) that are relevant to the content area.

With the objectives formulated, she now has a road map for the session and is well prepared to choose learning methods, resources and assessment strategies appropriate to the task.

References


**Key resources**


This reference will provide the reader with an expanded appreciation of the cognitive, psychomotor and affective domains of educational objectives. It also provides sound direction for the creation of educational objectives.

Harden RM. *Learning outcomes and instructional objectives: is there a difference? Med Teach*. 2002;24(2);151–5.

This article contrasts the terms *learning outcomes* and *instructional objectives*. Both terms describe educational intentions, and they are often used interchangeably in the literature. Although Harden’s discussion concerns the use of learning outcomes at a program or curriculum level, it also provides context for the use of specific learning objectives.


This resource approaches medical education in an easy-to-follow, six-step approach, devoting one chapter to each step. The third chapter highlights the importance of establishing relevant goals and objectives.
Chapter 7
What drives learning: assessing clinical competence
Jonathan Sherbino, MD, MEd, FRCPC, and Glen Bandiera, BASc, MD, MEd, FRCPC

Chapter objectives
After reading this chapter, you should be able to:
• define the term assessment for a colleague
• describe the differences between formative and summative assessment
• describe five common pitfalls in assessment

Introduction
It may seem easy for clinician-teachers to determine whether a resident has met the criteria necessary to complete an educational experience. After all, physicians are exposed to “testing” from the time they start kindergarten, and they are implicitly expected to understand the basics of assessment by the time they take on teaching responsibilities. However, many front-line teachers realize that their understanding of assessment is insufficient, particularly when they are faced with the need to assess trainees’ performance in the multiple physician roles described in competency-based frameworks such as CanMEDS. If research activity is any marker of ambient challenges in a field, then the predominance of research on assessment over all other types of research in medical education suggests that assessment is one of the biggest challenges of medical educators.1

In this chapter, some fundamental “big picture” themes associated with assessment will be discussed. Specific, practical details about how to assess residents with respect to each CanMEDS Role are available in a sister publication produced by the Royal College of Physicians and Surgeons of Canada, The CanMEDS Assessment Tools Handbook. An Introductory Guide to

Educational vignette
As he leaves the hospital post-shift, Dr. Chen is still thinking about a case that his Emergency Medicine resident discussed with him. An elderly woman with non-operative pelvic rami fractures was referred to the Orthopedic Surgery service because she was unable to ambulate due to pain. When the junior surgical resident refused the consult, Dr. Chen had to step in. He is frustrated with his resident’s performance, given that his residents attended a half-day workshop on Health Advocacy one month ago. Did they not learn and incorporate the principles discussed at the workshop? Dr. Chen begins to muse about developing a simple yet efficient assessment tool to determine if his residents learned anything from the workshop.

Assessment Methods for the CanMEDS Competencies, which describes classic and evolving assessment tools for competency-based education.2 The first section of that handbook contains matrices that match assessment tools to CanMEDS Roles. The second section describes common assessment methods, details their strengths and limitations, and suggests an appropriate match between each method and a Role. The last section discusses each CanMEDS Role, recommending the best tools to assess performance of the Role and providing annotated references to the related literature.

Figure 4.1 (p. 22) illustrates a sequence wherein assessment follows instructional methods, which in turn flow from the goals and objectives of the curriculum. It is imperative that the goals and objectives of a curriculum guide how knowledge, skills and attitudes are both taught and assessed. However, it is also important to be aware that, even in a professional education environment, some learners will focus more on learning to maximize their success on a “test” than on learning to meet the goals and objectives of the curriculum. Therefore, as front-line teachers drafting assessment tools, we must consciously acknowledge that assessment can result in inappropriate emphasis being given to certain aspects of a curriculum. When
resident-physician assessment is not guided by the objectives, the curriculum becomes skewed and a different educational agenda emerges.

**Definition**

Assessment can be defined as “the process of collecting, synthesizing and interpreting information to aid decision-making.”\(^3\) Assessment defined in this way appears to be a simple process, until you are faced with the challenge of actually making it work. Three issues deserve mention.

First, Miller\(^4\) suggests that the achievement of competence involves a hierarchical progression, from “knows” to “knows how” to “shows how” to “does.” Achieving competence (i.e., independent professional practice) is a longitudinal process. Therefore, assessment of a learner’s progression toward competence requires sampling throughout residency. It also requires sampling across the CanMEDS Roles. These sampling requirements are important concepts if you are a program director tasked with developing a curriculum map for an entire residency. However, if you are organizing a curriculum on a smaller scale (e.g., a workshop or specific rotation) you may find these concepts less relevant. Even if the “big picture” is not your immediate perspective, it is important to appreciate that the assessment arising from each component of a resident’s overall program is part of a framework of multiple assessments of the learner’s progress from “knows” to “does” over the course of a residency.

Second, the choice of assessment tool should reflect the sophistication of learning being tested (Fig. 7.1). For example, a written test can measure only “knows” and “knows how,” whereas a simulation assessment instrument can assess “shows how” and a direct observation tool can assess “does.” Therefore, any assessment tool used as part of an educational program should match the type and stage of learning being assessed (and taught). In other words, the complexity of the assessment tool should match the complexity of the learning objective. For example, if the objective of a simulation laboratory is for a learner to place a central line, or the objective of a psychiatry rotation is for a learner to perform a complete psychiatric evaluation of a real patient, and both learning activities conclude with a written examination, there is a complete disconnect between the objective of the instructional activity and the level of learning being assessed by the tool. (Levels of learning are discussed further in ch. 6.)

Third, as front-line teachers educated to think scientifically, we have a tendency to favour assessment tools with measures that we perceive to be objective—hard, reproducible end points. There is merit in using assessment tools with robust psychometric (i.e., valid, reliable) properties when possible, yet the CanMEDS framework includes Roles that such classic tools may not be able to assess well. As educators we should be wary of a reliance on a narrow array of assessment tools presumed to be objective. The reliability of these tools may not be as rigorous as implied\(^5\) or their ability to assess non-technical (yet fundamental) domains may be limited.\(^6\)

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**Figure 7.1: Matching assessment tools to progression of competence**

![Diagram of assessment tools and progression of competence]

- Portfolio
- Mini clinical exam
- Multi-source feedback
- Partial-task trainer
- Simulated patient
- Objective structured clinical examination
- Short-answer question
- Oral exam
- (Modified) essay
- Multiple-choice exam
- Short-answer question
Five key messages

Key practical considerations in assessment are described below and summarised in Textbox 7.1.

1. **Direct observation is central to assessment.** If medical trainees learn by doing, the best way to verify that they have acquired the necessary learning is to observe their clinical practice. It is essential to use assessment tools that provide insight into actual learner performance by incorporating direct observation of residents in the course of real-life care delivery.²

2. **There is a tool for every CanMEDS Role.** Every domain of the CanMEDS framework can and must be assessed to ensure that resident-physicians achieve competence within all of the domains that constitute specialist practice. For example, there are tools that can appropriately assess learning in an academic half-day seminar of competencies perceived as difficult to assess. The *CanMEDS Assessment Tools Handbook* has information that can inform the choice of tool.

3. **Assessment is multi-modal and longitudinal.** All curricula—large and small—benefit from the assessment of learners’ knowledge, skills and attitudes by means of multiple tools so that the curriculum designers can gain a multi-dimensional understanding of the learning that has occurred. Although an assessment may occur within a discrete period of time (e.g., a written test after a workshop or a simulated patient experience at the end of a rotation), the assessment data the tool generates should complement and enrich the collective pool of data that eventually forms the global assessment of learner competence across the period of training.

4. **It is unnecessary to assess all the Roles all the time.** Despite myths to the contrary, it is appropriate to use specific tools to assess only the specific objectives of a particular curriculum. For example, it may be inappropriate to force the assessment of Professional competencies into a simulation curriculum in Critical Care Medicine that teaches Medical Expert and Communicator skills.

5. **Appropriate tools will be program specific.** One size does not fit all. Of course, the principles of assessment are the same across specialties, but as a content expert in your specialty, you should feel empowered to appropriately adapt an assessment tool to meet your needs. Do not be afraid to tailor a generic tool to both your specialty and your local circumstances. As educators we must stop perpetually reinventing the wheel. Build from scratch only what cannot be adopted or adapted from existing tools.

Textbox 7.1

**Five key messages on assessment**

1. Direct observation is central to assessment.
2. There is a tool for every CanMEDS Role.
3. Assessment is multi-modal and longitudinal.
4. It is unnecessary to assess all the Roles all the time.
5. Appropriate tools will be program specific.

**Characteristics of assessment tools**

Assessment is often categorized as either formative or summative, depending on its purpose. Formative assessment informs both the learner and the teacher about the learner’s progress toward attaining the objectives of the curriculum and provides insights to guide further teaching. Classically, formative assessment occurs during an educational experience (e.g., at the midpoint of a rotation). Summative assessment sums up the learner’s attainment of the objectives of the curriculum. Typically, this occurs at the conclusion of the experience.

Within a competency-based framework, an iterative process of formative assessment is the ideal: a learner progresses to the next step toward autonomous practice only after achieving the preceding milestone. Complementary assessments of competence must simultaneously occur to ensure that the trainee’s core competencies do not erode as he or she acquires more advanced knowledge and skills (i.e., to ensure maintenance of competence).

An alternative way to categorize assessment is by the consequences of the assessment results: assessments can be regarded as high stakes or low stakes. For example, certification examinations, which are gateways to licensure, are clearly high stakes, whereas a practice examination that learners take in the hope of receiving feedback to improve their performance on the real
examination is low stakes. In general, high-stakes assessments must be much more rigorous in design and implementation than low-stakes assessments.

Several questions should be asked during the process of selecting an assessment tool. What is the purpose of the assessment (e.g., formative versus summative, high stakes versus low stakes)? What are the practical considerations (e.g., environmental and resource constraints)? To what degree do the reliability (i.e., the degree to which an assessment tool generates reproducible results) and validity (i.e., the degree to which an assessment tool measures what it is purported to measure) of the tool need to be considered? For example, a high-stakes, one-time summative assessment upon which important decisions will be made will require a tool that has been rigorously demonstrated to be both reliable and valid. In contrast, formative assessments that are part of a larger overall assessment program may require less attention to these issues. The ideal is to have multiple assessors determine competence using multiple modes (including ones that emphasize qualitative measures) multiple times at regular intervals to determine the patterns in a learner's performance that emerge over time.

The answers to the previous questions will guide the selection or development of a tool or assessment program. Local education experts can provide helpful proposals, which can then be tailored by the physician-teacher (the content expert) to meet the assessment challenge at hand. Early collaboration can prevent later problems. Finally, competency-based education is predicated on the principle that learners are to meet defined and achievable objectives, which must be readily accessible to learners, teachers and assessors.

Pitfalls

Despite educators’ best intentions, problems can develop when they attempt to assess resident-physicians. Some of the common problems we have encountered are discussed below and are summarized in Textbox 7.2.

1. **There may be no plan or system for assessment.** The development of an assessment plan should be an integral part of the educational cycle of your curriculum. Problems arise when an assessment tool is tacked onto a curriculum at the end of the cycle. If the assessment process is not integrated into the curriculum, it may produce data that are not meaningful or that inappropriately skew the direction of the curriculum. In a large-scale curriculum (e.g., a residency program), a comprehensive blueprint that maps learning objectives to instructional methods and multiple assessment tools ensures that the assessment program will be robust and that there will be no gaps in the assessment process (i.e., all learning objectives will be fully assessed). When assessment flows from the learning objectives in a logical plan, educational efficiency is achieved.

2. **Data capture may not be adequate.** An assessment system (and each tool within it) should generate a meaningful pool of data (either quantitative or qualitative). To aid busy faculty members and busy learners, data acquisition processes should be simple and, where possible, automated. A combination of push and pull motivators can be used: learners should be encouraged to submit data (pull), and mandatory activities that require active generation of assessment data should be implemented (push).

3. **Data may have poor reliability and validity.** This is perhaps one of the most challenging pitfalls of assessment. The problem is complex and relates to the amount of time required to provide precise data; the inability of a supervisor to independently assess multiple competencies simultaneously; and the systemic reluctance of supervisors to provide necessary negative or “unsatisfactory” assessments because of the emotional, personal and professional consequences that such assessments may have. Arguably, the best way to accurately assess learners’ progression is for a wide range of faculty members to use multiple efficient, precise tools to assess learners’ performance in several different educational experiences. This approach, in combination with faculty development sessions, creative systemic safeguards to protect assessors and measures to create a culture of accountability, may provide the foundation for improving the reliability and validity of assessment data.

4. **Assessors may fail to fail learners.** In the current educational climate, the time required to implement a decision to fail a learner and, in some cases, the legal considerations associated with such a decision, have led to maladaptive strategies whereby learners are allowed to progress through curricula without
attaining competence. There are many strategies by which learners in need of remediation can be appropriately identified and the desire of educators to “pass” them through the curriculum can be mitigated. Data collected early in the curriculum and at the midpoint can provide feedback about learners in trouble to both educators and the learners in question. A formal system for addressing failures can prevent the creation of ad hoc solutions, along with their potential challenges. If a process of appeals, a process of remediation and other mechanisms for dealing with failures are established, the time required to respond when a learner does not achieve competence within a curriculum can be minimized. Faculty members should be encouraged to seek advice early when they suspect a learner is in difficulty. A competency-based curriculum does not view “failure of achievement” as definitive or final; rather, this assessment simply (and effectively) suggests that further learning and iterative, formative assessment is required before progress toward the next milestone.

5. Faculty members may not buy into the assessment strategy. Assessment of learners relies heavily on the investment of time and energy by faculty members. Front-line teachers who do not appreciate the big picture of the assessment strategy of an educational program may not be motivated to contribute to the assessment process in the desired manner. If early buy-in is sought from faculty members by having them contribute to the initial design of the assessment process and instructional methods, the likelihood that they will take ownership of the program being designed will increase considerably.

Textbox 7.2

<table>
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<th>Pitfalls of assessment</th>
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<tr>
<td>• There may be no plan or system for assessment.</td>
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<td>• Data capture may not be adequate.</td>
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Conclusion

Assessment of learners is an important step in the medical educational cycle. It measures the progress that our future colleagues are making toward achieving competence as medical professionals. This step in the educational cycle influences, and is influenced by, the other steps. The development of a systematic approach to assessment improves the robustness of a curriculum.

Educational vignette revisited

After work the next day, Dr. Chen opens The CanMEDS Assessment Tools Handbook, which he had asked his administrative assistant to order for him. After only 15 minutes of reading he has conceived a workable plan. Reviewing the objectives of his workshop, he chooses two simple tools to assess changes in the knowledge and attitudes of the Emergency Medicine residents as a result of the workshop. First, Dr. Chen asks the program director if he can submit several short-answer questions on the Health Advocate Role for inclusion in the musculoskeletal section of the annual written examination. He plans to ask questions about risk factors for falls in the elderly and discharge interventions to reduce the risk of recurrence of falls. Dr. Chen’s workshop framed the themes of advocacy within this clinical scenario. Second, he learns about portfolios from his reading of the handbook and discovers how he can easily modify them to suit the needs of his curriculum. He will require each resident to submit, after he or she completes the workshop, a brief essay documenting a recent encounter with a patient that involved advocacy. The essay will be included in the portfolio that the residency program is developing. Dr. Chen will require only that the essay be graded as complete or incomplete.

References


**Key resources**


This publication describes a broad (although not exhaustive) range of assessment tools. Particular attention is paid to the psychometric properties of the tools.


This “how-to” manual is a good first resource for clinician-teachers who are selecting or developing an assessment tool. Common assessment tools are described, including their strengths and limitations. Each of the CanMEDS Roles is discussed and appropriate tools to assess each Role are suggested.


This systematic review provides an excellent overview of the themes of assessment in competency-based education. The authors argue for more direct observation as a means of assessment.