

Criteria for Development of Core Competency Areas

National Resource Center for Materials Technology Education
February 2009

Core competencies consist of a set of performance indicators that provide a set of skills that technicians need to have to effectively carry out their tasks in a specific area. Within a competency area, these performance indicators need to be specifically focused on process-oriented behaviors. This means that performance indicators and competencies need to be written with action verbs to enable the reader to understand specifically what the technician must be able to DO.

Based on Bloom's taxonomy, these behaviors may be presented as follows, with example action verbs shown:

1. **Knowledge** behaviors related recalling facts and to identify needed information. Action verbs in this area include *recall, identify, describe, recognize, or distinguish*. An example performance indicator would be to
 - Identify major advantages and disadvantages of ceramic materials.
2. **Comprehension** behaviors relate to the ability to *restate, reorder or predict* based on prior knowledge, such as being able to *interpret, convert, translate or transform* an idea, process or behavior. An example could be to
 - Interpret technical drawings correctly.
3. **Application** of ideas or processes to new situations or environments would use behaviors described by *apply, prepare, perform, demonstrate, measure, explain, show, operate, plan, or repair*. An example would be to
 - Apply the scientific method to solution of a technical problem.
4. **Analysis** of concepts, data, ideas or processes tests the ability to *analyze, estimate, evaluate compare, observe, explore, distinguish, or determine* an appropriate procedure or solution. An example could be to
 - Explore differences between strength of steels as a function of alloy content
5. **Synthesis** behaviors focus on the ability to put information together in a way to solve a problem. This could include processes such as *write, plan, produce, specify, design, build, organize, or propose*. An example might be to
 - Organize a safety test of plant equipment
6. **Evaluation** of processes or ideas is needed to make judgments using standards of appraisal, including behaviors described *verify, measure, select, test, check, rank, or evaluate*. An example performance indicator might be to
 - Evaluate strength data in composites to determine the advantages and disadvantages of different layup processes.

Within these areas, many action verbs may be used. Those given above are only examples.

The task of developing core competency areas and specific performance indicators is thus one of identifying areas where technicians need to be competent, then focusing on the specific behavior needed. For a specific process, for example, does the technician need to be able to identify it, demonstrate it, design it or perhaps test it? The specifically desired behavior or behaviors need to be specified for each process of interest and included in the statement of the competency.

Generally, the core competency process is used to identify competencies that are to be included in technical education, such as in college, technical or industrial training courses. The goal of a competency study is to give direction to the instructor as to what the technician needs to be able to do. Competencies should therefore be a guide for the development of appropriate curriculum for technician training focused on these specifically needed behaviors.

A comprehensive set of competencies and performance indicators for basic materials technology may be found at www.materialseducation.org.

Reference: "Writing Learning Objectives," R. A Arreola, University of Tennessee.