Articulating Learning Goals: A path to improved student performance and increased efficiency

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The Kaneb Center supports the pursuit of teaching excellence by stimulating scholarly reflection and conversation about teaching and encouraging the adoption of practices that enhance learning.

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Workshop Goals

■ Upon successful completion you will be able to:
  ■ Identify reasons for articulating learning goals
  ■ Describe taxonomies for learning
  ■ Apply the ideas presented in the workshop to write learning goals for your course(s)
  ■ Calculate the Bloom’s Index for your goals
Why Articulate Student Learning Goals?

- Identify the most important outcomes
- Form the basis for designing assessments/assignments.
- Add transparency for the students
- Decrease time spent responding to student work
- Connect to broader goals and outcomes
  - Department/Program
  - College – https://goo.gl/68g8f3
  - University – http://goo.gl/23oepr
In order to lay the foundations for life-long learning, by the time they graduate, Notre Dame undergraduates will be able to:

A. Acquire, synthesize, and communicate knowledge by incorporating relevant disciplinary approaches, cultural perspectives, and Catholic intellectual tradition.

B. Recognize moral and ethical questions in lived experiences, evaluate alternatives, and act with integrity.

C. Contribute to the common good by displaying a disciplined sensibility and committed engagement in response to complex challenges facing local, national, or global communities.

D. Demonstrate the vision and self-direction necessary to articulate, set, and advance toward their goals.

E. Think critically in formulating opinions or accepting conclusions.

F. Exhibit creativity or innovation in the pursuit of their intellectual interests.

G. Display a level of mastery in their major field(s) of study that enables them to successfully pursue professional careers or advanced study.
Think for a moment about the kinds of questions you ask yourself when you prepare to teach. When I was a twenty-three-year-old rookie getting ready to conduct my first college course (a survey of United States history through the Civil War), I scribbled four questions on the back of an envelope. Years later I found that scrap of my youthful self tucked in an old notebook and discovered that my needs were apparently simple: Where's the classroom? What textbook will I use? What will I include in my lectures? How many tests will I give?

As we began our study, we played a game with the teachers: If college courses didn’t exist and you wanted to invent them, what questions would you ask yourself? Their lists of inquiries were much richer than mine and remarkably similar to each other, regardless of discipline. As we probed this result we realized, however, that they were not simply reciting some litany of good practice they had memorized. Instead, the similarities stemmed from a deeper base, from primary conceptions of what it means to teach and learn that then shaped the way they prepared any learning experience. Like a flower that reflects the genetic code of its seed, their questions sprang from those fundamental ideas. If we want to benefit from their insights, we must understand both the flowers and that code.

At the core of most professors’ ideas about teaching is a focus on what the teacher does rather than on what the students are supposed to learn. In that standard conception, teaching is something that instructors do to students, usually by delivering truths about the discipline. It is what some writers call a “transmission model.” I must have held that view in 1965 because the limit of my questions made sense only from that perspective.

In contrast, the best educators thought of teaching as anything they might do to help and encourage students to learn. Teaching is engaging students, engineering an environment in which they learn. Equally important, they thought of the creation of that successful learning environment as an important and serious intellectual (or artistic) act, perhaps even as a kind of scholarship, that required the attention of the best minds in academia. For our subjects, that scholarship centered around four fundamental inquiries:

1. What should my students be able to do intellectually, physically, or emotionally as a result of their learning?
2. How can I best help and encourage them to develop those abilities and the habits of the heart and mind to use them?
3. How can my students and I best understand the nature, quality, and progress of their learning?
4. How can I evaluate my efforts to foster that learning?

Already we can begin to see a rich set of concerns. The first question draws on important thinking about the nature of a discipline or art form. It is a kind of epistemological investigation into what it means to know something, pushing far beyond the vague little phrases that often litter discussions of learning objectives (“learning the material,” “thinking critically,” “engaging the subject matter,” “feeling comfortable with the topic,” “taking it to a higher level”). In an attempt to define what such traditional language might mean, highly effective teachers often talk about what they want students to “do” intellectually rather than about what they should “learn.” The other questions, however, survey matters that most disciplines do not study, and so depend on the vast and growing body of learning research and theory.

These two powerful notions—that teaching is fostering learning and that it requires serious intellectual work—appear quite clearly in a baker’s dozen of specific planning questions we heard most often.
A Baker’s Dozen of Specific Planning Questions
(from *what the best college teachers do*, Ken Bain)

1. What big questions will my course help students answer, or what skills, abilities, or qualities will it help them develop and how will I encourage my students’ interest in these questions and abilities?
2. What reasoning abilities must students have or develop to answer the questions that the course raises?
3. What mental models are students likely to bring with them that I will want them to challenge? How can I help them construct that intellectual challenge?
4. What information will my students need to understand in order to answer the important questions of the course and challenge their assumptions? How will they best obtain that information?
5. How will I help students who have difficulty understanding the questions and using evidence and reason to answer them?
6. How will I confront my students with conflicting problems (maybe even conflicting claims about the truth) and encourage them to grapple (perhaps collaboratively) with the issues?
7. How will I find out what they know already and what they expect from the course, and how will I reconcile any differences between my expectations and theirs.
8. How will I help students learn to learn, to examine and assess their own learning and thinking, and to read more effectively, analytically, and actively?
9. How will I find out how students are learning before assessing them, and how will I provide feedback before – and separate from – any assessment of them?
10. How will I communicate with students in a way that will keep them thinking?
11. How will I spell out the intellectual and professional standards I will be using in assessing students’ work, and why do I use those standards? How will I help students learn to assess their own work using those standards?
12. How will the students and I best understand the nature, progress, and quality of their learning?
13. How will I create a natural critical learning environment in which I embed the skills and information I wish to teach in assignments (questions and tasks) that students will find fascinating – authentic tasks that arouse curiosity, challenge students to rethink their assumptions and examine their mental models of reality? How will I create a safe environment in which students can try, fail, receive feedback, and try again?
FIGURE 2.1 Course Preparation Components

TIME: THREE MONTHS BEFORE THE FIRST CLASS*

Write Objectives, Goals, or Outcomes

The first step in preparing for a course is working out course objectives, because the choice of textbook, the selection of the type and order of assignments, the choice of teaching techniques, and all the decisions involved in course planning should derive from your objectives. What are your students like? What do they expect? What outcomes do you expect them to achieve? At this point your list of goals or objectives should be taken only as a

* I borrowed the idea of three months, two months, and so on from P. G. Zimbardo and J. W. Newton, Instructor's Resource Book to Accompany Psychology and Life (Glenview, IL: Scott, Foresman, 1975). Don’t take the “three months” too seriously. You may not have three months, but get started as soon as you can.

Time: Three Months Before the First Class

Writing out your goals helps clarify your thinking.

Your objectives have the great advantage of pointing clearly to what you can look for as evidence that the objective has been achieved. Your students see your methods of assessing or testing achievement of the objectives as the most important operational definition of your goals; hence goals and testing are inseparable teaching tasks. This does not mean that all of your goals should be assessed and count toward a grade. Some of your goals will involve motivational, attitudinal, and value outcomes, as discussed in the chapters “Motivation in the College Classroom,” “Teaching Students How to Become More Strategic and Self-Regulated Learners,” and “The Ethics of Teaching and the Teaching of Ethics.” Course grades are typically based only on cognitive and skill outcomes.

What Goals?

The answer obviously depends on the course and discipline, but it is important to note that the overall course objectives involve educating students; the objective of a course is not just to cover a certain set of topics, but rather to facilitate student learning and thinking. Ordinarily we are concerned not simply with the learning of a set of facts, but rather with learning that can be applied and used in situations outside course examinations. In fact, in most courses we are concerned about helping our students in a lifelong learning process; that is, we want to develop interest in further learning and provide a base of concepts and skills that will facilitate further learning, thinking, and appreciation. Thus in framing your goals, think about what will be meaningful to your students. Will these goals really be relevant to them now and in the future?

Your personal values inevitably enter into your choice of goals. Although many of us were taught to be strictly objective, I have come to believe that this is impossible. Our teaching is always influenced by our values, and students have a fairer chance to evaluate our biases or to accept our model if we are explicit about
them. Hiding behind the cloak of objectivity simply prevents honest discussion of vital issues.

In thinking about your goals, remember that each course contributes to other general goals of a university education that transcend specific subject matter, such as critical thinking, being willing to explore ideas contrary to one's own beliefs, knowing when information or data are relevant to an issue and how to find that information, and developing skills for learning and self-regulation (see the chapters “Teaching Students How to Become More Strategic and Self-Regulated Learners” and “Teaching Thinking”).

In addition to this general perspective, you need to keep in mind characteristics of the setting in which you teach. What is the role of this course in the curriculum? Are other instructors depending on this course to provide specific kinds of background knowledge or skill? What are your students like? How do they differ? (See the part on “Understanding Students.”) What are their current concerns? Self-discovery? Social action? Getting a job? How can their goals be integrated with other goals of the course? Talk to some of your colleagues.

A committee of college and university examiners developed two books, which are now classics, to assist faculty members in thinking about their objectives: *Taxonomy of Educational Objectives, Handbook I: Cognitive Domain* (Bloom, 1956) and *Handbook II: Affective Domain* (Krathwohl et al., 1964). Krathwohl and others have completed a revision (Anderson et al., 2001). Another good framework is the SOLO (Structure of the Observed Learning Outcome) taxonomy (see Biggs, 1999).
When Writing Student Learning Goals

- Use specific language
  - ... Describe, Analyze, Argue, Solve, Create, Compare, etc.

- Avoid vague or passive language
  - “Know” and “understand” are valuable but not precise
  - “Students will be exposed to …” is passive

- Indicate student responsibility
  - “Upon successful completion of this course, you will be able to . . .”

A Taxonomy for Learning, Teaching & Assessing:
The Cognitive Process Dimension

From A Taxonomy for Learning, Teaching & Assessing: A Revision of Bloom’s Taxonomy of Education Objectives. Anderson & Krathwohl (Eds.)
### 5.1 The Cognitive Process Dimension

<table>
<thead>
<tr>
<th>Categories &amp; Cognitive Processes</th>
<th>Alternative Names</th>
<th>Definitions and Examples</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>1. REMEMBER</strong>—Retrieve relevant knowledge from long-term memory</td>
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<tr>
<td>1.1 Recognizing</td>
<td>Identifying</td>
<td>Locating knowledge in long-term memory that is consistent with presented material (e.g., Recognize the dates of important events in U.S. history)</td>
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<tr>
<td>1.2 Recalling</td>
<td>Retrieving</td>
<td>Retrieving relevant knowledge from long-term memory (e.g., Recall the dates of important events in U.S. history)</td>
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<tr>
<td><strong>2. UNDERSTAND</strong>—Construct meaning from instructional messages, including oral, written, and graphic communication</td>
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<td>2.1 Interpreting</td>
<td>Clarifying,</td>
<td>Changing from one form of representation (e.g., numerical) to another (e.g., verbal) (e.g., Paraphrase important speeches and documents)</td>
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<tr>
<td></td>
<td>paraphrasing,</td>
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<td></td>
<td>representing,</td>
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<tr>
<td></td>
<td>translating</td>
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<tr>
<td>2.2 Exemplifying</td>
<td>Illustrating,</td>
<td>Finding a specific example or illustration of a concept or principle (e.g., Give examples of various artistic painting styles)</td>
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<tr>
<td></td>
<td>instantiating</td>
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<tr>
<td>2.3 Classifying</td>
<td>Categorizing,</td>
<td>Determining that something belongs to a category (e.g., concept or principle) (e.g., Classify observed or described cases of mental disorders)</td>
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<tr>
<td></td>
<td>subsuming</td>
<td></td>
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<tr>
<td>2.4 Summarizing</td>
<td>Abstracting,</td>
<td>Abstracting a general theme or major point(s) (e.g., Write a short summary of the events portrayed on a videotape)</td>
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<tr>
<td></td>
<td>generalizing</td>
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<tr>
<td>2.5 Inferring</td>
<td>Concluding,</td>
<td>Drawing a logical conclusion from presented information (e.g., In learning a foreign language, infer grammatical principles from examples)</td>
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<tr>
<td></td>
<td>extrapolating,</td>
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<td></td>
<td>interpolating,</td>
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<tr>
<td></td>
<td>predicting</td>
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<tr>
<td>2.6 Comparing</td>
<td>Contrasting,</td>
<td>Detecting correspondences between two ideas, objects, and the like (e.g., Compare historical events to contemporary situations)</td>
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<td></td>
<td>mapping,</td>
<td></td>
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<td></td>
<td>matching</td>
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<tr>
<td>2.7 Explaining</td>
<td>Constructing</td>
<td>Constructing a cause-and-effect model of a system (e.g., Explain the causes of important 18th-century events in France)</td>
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<td></td>
<td>models</td>
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<td><strong>3. APPLY</strong>—Carry out or use a procedure in a given situation</td>
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<tr>
<td>3.1 Executing</td>
<td>Carrying out</td>
<td>Applying a procedure to a familiar task (e.g., Divide one whole number by another whole number, both with multiple digits)</td>
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<tr>
<td>3.2 Implementing</td>
<td>Using</td>
<td>Applying a procedure to an unfamiliar task (e.g., Use Newton’s Second Law in situations in which it is appropriate)</td>
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### 5.1 The Cognitive Process Dimension (continued)

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<tr>
<td>4. <strong>ANALYZE</strong>—Break material into its constituent parts and determine how the parts relate to one another and to an overall structure or purpose</td>
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<tr>
<td>4.1 <strong>DIFFERENTIATING</strong></td>
<td>Discriminating, distinguishing, focusing, selecting</td>
<td>Distinguishing relevant from irrelevant parts or important from unimportant parts of presented material (e.g., Distinguish between relevant and irrelevant numbers in a mathematical word problem)</td>
</tr>
<tr>
<td>4.2 <strong>ORGANIZING</strong></td>
<td>Finding coherence, intergrating, outlining, parsing, structuring</td>
<td>Determining how elements fit or function within a structure (e.g., Structure evidence in a historical description into evidence for and against a particular historical explanation)</td>
</tr>
<tr>
<td>4.3 <strong>ATTRIBUTING</strong></td>
<td>Deconstructing</td>
<td>Determine a point of view, bias, values, or intent underlying presented material (e.g., Determine the point of view of the author of an essay in terms of his or her political perspective)</td>
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<tr>
<td>5. <strong>EVALUATE</strong>—Make judgments based on criteria and standards</td>
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<tr>
<td>5.1 <strong>CHECKING</strong></td>
<td>Coordinating, detecting, monitoring, testing</td>
<td>Detecting inconsistencies or fallacies within a process or product; determining whether a process or product has internal consistency; detecting the effectiveness of a procedure as it is being implemented (e.g., Determine if a scientist’s conclusions follow from observed data)</td>
</tr>
<tr>
<td>5.2 <strong>CRITIQUING</strong></td>
<td>Judging</td>
<td>Detecting inconsistencies between a product and external criteria, determining whether a product has external consistency; detecting the appropriateness of a procedure for a given problem (e.g., Judge which of two methods is the best way to solve a given problem)</td>
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<tr>
<td>6. <strong>CREATE</strong>—Put elements together to form a coherent or functional whole; reorganize elements into a new pattern or structure</td>
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<tr>
<td>6.1 <strong>GENERATING</strong></td>
<td>Hypothesizing</td>
<td>Coming up with alternative hypotheses based on criteria (e.g., Generate hypotheses to account for an observed phenomenon)</td>
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<tr>
<td>6.2 <strong>PLANNING</strong></td>
<td>Designing</td>
<td>Devising a procedure for accomplishing some task (e.g., Plan a research paper on a given historical topic)</td>
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<tr>
<td>6.3 <strong>PRODUCING</strong></td>
<td>Constructing</td>
<td>Inventing a product (e.g., Build habitats for a specific purpose)</td>
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<tr>
<td>Level of Taxonomy</td>
<td>Definition</td>
<td>Process Verbs</td>
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</tbody>
</table>
| **Creating**     | Generating new ideas, products, or ways of viewing things<br>Designing, constructing, planning, producing, inventing | Act<br>Arrange<br>Combine<br>Compose<br>Construct<br>Create<br>Develop<br>Devise<br>Formulate | Generate<br>Improve<br>Infer<br>Invent<br>Imagine<br>Plan<br>Predict<br>Prepare<br>Revise<br>Show<br>Write | Advertisement<br>Poem<br>Blueprint<br>Cartoon<br>Collage<br>Film<br>Formula<br>Invention<br>New game | Newspaper<br>Painting<br>Plan<br>Play Song<br>Story<br>Video | -Can you design a…to…?  
-Can you see a possible solution to…?  
-How would you devise your own way to…?  
-What would happen if…?  
-How many ways can you…?  
-Can you create new and unusual uses for…? |
| **Evaluating**   | Justifying a decision or course of action<br>Checking, hypothesizing, critiquing, experimenting, judging | Argue<br>Assess<br>Choose<br>Compare<br>Conclude<br>Criticize<br> Debate<br>Decide<br>Defend | Determine<br>Evaluate<br>Justify<br>Prioritize<br>Rate<br>Recommend<br>Tell why<br>Value | Conclusion<br>Debate<br>Editorial<br>Investigation<br>Judgment<br>Opinion | Recommendation<br>Report<br>Survey<br>Verdict | -Is there a better solution to…?  
-What do you think about…?  
-Do you think…is a good or bad thing?  
-How would you feel if…?  
-How effective are…?  
-What are the pros and cons of …? |
| **Analyzing**    | Breaking information into parts to explore understandings and relationships<br>Comparing, organizing, deconstructing, interrogating, finding | Calculate<br>Categorize<br>Classify<br>Compare<br>Contrast<br>Diagram<br>Differentiate<br>Discover<br>Distinguish<br>Examine<br>Experiment | Group<br>Interpret<br>Investigate<br>Order<br>Organize<br>Question<br>Relate<br>Research<br>Sequence<br>Solve<br>Survey | Chart<br>Checklist<br>Database<br>Diagram<br>Graph<br>Illustration<br>Investigation | List<br>Outline<br>Plan<br>Questionnaire<br>Report<br>Spreadsheet<br>Summary | -Which events could not have happened?  
-How is …similar to …?  
-What are some other outcomes?  
-Why did …occur?  
-What was the problem with…? |
<table>
<thead>
<tr>
<th>Level of Taxonomy</th>
<th>Definition</th>
<th>Process Verbs</th>
<th>Assessments</th>
<th>Question Stems</th>
</tr>
</thead>
</table>
| Applying         | Using information in another familiar situation | Adapt  
Apply  
Calculate  
Change  
Compute  
Demonstrate  
Dramatize  
Draw  
Experiment  
Illustrate | List  
Make  
Manipulate  
Practice  
Produce  
Sequence  
Show  
Solve  
Teach  
Use | Demonstration  
Diagram  
Experiment  
Illustration  
Journal  
Lesson  
Map  
Model | -Do you know of another instance where…?  
-Can you group…?  
-Which factors would you change…?  
-What questions would you ask of…?  
-From the information given, can you develop a set of instructions about…? |
| Understanding    | Explaining ideas or concepts  
Interpreting, summarizing, paraphrasing, classifying, explaining | Ask  
Calculate  
Convert  
Describe  
Discuss  
Explain  
Give examples  
Identify  
Locate | Observe  
Recognize  
Report  
Research  
Retell  
Review  
Summarize  
Tell | Debate  
Definition  
Dramatization  
Example  
Explanation  
Label  
List | Outline  
Quiz  
Recitation  
Reproduction  
Story Problems  
Summary  
Test | -Can you write in your own words?  
-How would you explain…?  
-What could happen next?  
-Who do you think…?  
-What was the main idea…? |
| Remembering      | Recalling information  
Recognizing, listing, describing, retrieving, naming, finding | Choose  
Cite  
Define  
Describe  
Give example  
Group  
Know  
Label  
List  
Listen  
Locate | Match  
Memorize  
Name  
Quote  
Recall  
Recite  
Record  
Repeat  
Select  
Underline | Definition  
Fact  
Label  
List  
Quiz | Reproduction  
Test  
Workbook  
Worksheet | -What happened after…?  
-How many…?  
-What is…?  
-Who …?  
-Can you name…?  
-Which is true or false?
Taxonomy of Significant Learning

From Creating Significant Learning Experiences: An Integrated Approach to Designing College Courses. L. Dee Fink

The Interactive Nature of Significant Learning

From Creating Significant Learning Experiences: An Integrated Approach to Designing College Courses. L. Dee Fink
**AFFECTIVE** learning is demonstrated by behaviors indicating attitudes of awareness, interest, attention, concern, and responsibility, ability to listen and respond in interactions with others, and ability to demonstrate those attitudinal characteristics or values which are appropriate to the test situation and the field of study.

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<tr>
<th>Level</th>
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<th>Definition</th>
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<tbody>
<tr>
<td>Receiving</td>
<td>Asks, chooses, describes, follows, gives, holds, identifies, locates, names, points to, selects, sits erect, replies, uses</td>
<td>Willingness to receive or attend</td>
<td>Listening to discussions on controversial issues with an open mind, respecting the rights of others</td>
</tr>
<tr>
<td>Responding</td>
<td>Answers, assists, complies, conforms, discusses, greets, helps, labels, performs, practices, presents, reads, recites, reports, selects, tells, writes</td>
<td>Actively participating indicating positive response or acceptance of an idea or policy</td>
<td>Completing homework assignments, participating in team problem-solving activities</td>
</tr>
<tr>
<td>Valuing</td>
<td>Completes, describes, differentiates, explains, follows, forms, initiates, invites, joins, justifies, proposes, reads, reports, selects, shares, studies, works</td>
<td>Expressing a belief or attitudes about the value or worth of something</td>
<td>Accepting ideas or participating in activities</td>
</tr>
<tr>
<td>Organization</td>
<td>Adheres, alters, arranges, combines, compares, completes, defends, explains, generalizes, identifies, integrates, modifies, orders, organizes, prepares, relates, synthesizes</td>
<td>Organizing various values into an integrated system</td>
<td>Recognizing own abilities, limitations, and values and developing realistic aspirations</td>
</tr>
<tr>
<td>Characterization by value or value complex</td>
<td>Acts, discriminates, displays, influences, listens, modifies, performs, practices, proposes, qualifies, questions, revises, serves, solves, solves, uses, verifies</td>
<td>The value system becomes a way of life</td>
<td>A person’s lifestyle influences reactions to many different kinds of situations</td>
</tr>
</tbody>
</table>

**PSYCHOMOTOR** learning is demonstrated by physical skills: coordination, dexterity, manipulation, grace, strength, speed, actions which demonstrate the fine motors skills such as use of precision instruments or tools, or actions which evidence gross motor skills such as the use of the body in performance.

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<th>Examples</th>
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<tr>
<td>Perception</td>
<td>Chooses, describes, detects, differentiates, distinguishes, identifies, isolates, relates, selects, separates</td>
<td>Using sense organs to obtain cues needed to guide motor activities</td>
<td>Listening to the sounds made by instruments before tuning them, recognizing sounds that indicate malfunctioning equipment</td>
</tr>
<tr>
<td>Set</td>
<td>Begins, displays, explains, moves, proceeds, reacts, responds, shows, starts, volunteers</td>
<td>Being ready to perform a particular action: mental, physical, or emotional</td>
<td>Knowing how to use a computer mouse, having instrument ready to play and watching conductor to being performance, showing eagerness to assemble components to complete a task</td>
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<tr>
<td>Guided responses</td>
<td>Assembles, builds, calibrates, constructs, dismantles, displays, dissects, fastens, fixes, grinds, heats, manipulates, measures, mends, mixes, organizes, sketches</td>
<td>Performing under guidance of a model: imitation or trial and error</td>
<td>Using a tool after observing an expert demonstrate its use, experimenting in various ways to measure a substance</td>
</tr>
<tr>
<td>Mechanism</td>
<td>Same as list for guided response</td>
<td>Being able to perform a task habitually with some degree of confidence or proficiency</td>
<td>Demonstrating the ability to correctly execute a maneuver consistently</td>
</tr>
<tr>
<td>Complex or overt response</td>
<td>Same as list for guided response</td>
<td>Performing a task with a high degree of proficiency and skill</td>
<td>Dismantling and re-assembling various components quickly and with no errors</td>
</tr>
<tr>
<td>Adaptation</td>
<td>Adapts, alters, changes, rearranges, reorganizes, revises, varies</td>
<td>Using previously learning skills to perform new but related tasks</td>
<td>Using skills developed using one type of equipment to operate advanced equipment</td>
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<tr>
<td>Origination</td>
<td>Arranges, combines, composes, constructs, creates, designs, originates</td>
<td>Creating new performances after having developed skills</td>
<td>Designing a more efficient way to perform a task</td>
</tr>
</tbody>
</table>

### 4.1 The Knowledge Dimension

<table>
<thead>
<tr>
<th>Major Types and Subtypes</th>
<th>Examples</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>A. Factual Knowledge</strong>—The basic elements students must know to be acquainted with a discipline or solve problems in it</td>
<td></td>
</tr>
<tr>
<td><strong>AA. Knowledge of terminology</strong></td>
<td>Technical vocabulary, musical symbols</td>
</tr>
<tr>
<td><strong>Ab. Knowledge of specific details and elements</strong></td>
<td>Major natural resources, reliable sources of information</td>
</tr>
<tr>
<td><strong>B. Conceptual Knowledge</strong>—The interrelationships among the basic elements within a larger structure that enable them to function together</td>
<td></td>
</tr>
<tr>
<td><strong>Ba. Knowledge of classifications and categories</strong></td>
<td>Periods of geological time, forms of business ownership</td>
</tr>
<tr>
<td><strong>Bb. Knowledge of principles and generalizations</strong></td>
<td>Pythagorean theorem, law of supply and demand</td>
</tr>
<tr>
<td><strong>Bc. Knowledge of theories, models, and structures</strong></td>
<td>Theory of evolution, structure of Congress</td>
</tr>
<tr>
<td><strong>C. Procedural Knowledge</strong>—How to do something, methods of inquiry, and criteria for using skills, algorithms, techniques, and methods</td>
<td></td>
</tr>
<tr>
<td><strong>Ca. Knowledge of subject-specific skills and algorithms</strong></td>
<td>Skills used in painting with watercolors, whole-number division algorithm</td>
</tr>
<tr>
<td><strong>Cb. Knowledge of subject-specific techniques and methods</strong></td>
<td>Interviewing techniques, scientific method</td>
</tr>
<tr>
<td><strong>Cc. Knowledge of criteria for determining when to use appropriate procedures</strong></td>
<td>Criteria used to determine when to apply a procedure involving Newton’s second law, criteria used to judge the feasibility of using a particular method to estimate business costs</td>
</tr>
<tr>
<td><strong>D. Metacognitive Knowledge</strong>—Knowledge of cognition in general as well as awareness and knowledge of one’s own cognition</td>
<td></td>
</tr>
<tr>
<td><strong>Da. Strategic knowledge</strong></td>
<td>Knowledge of outlining as a means of capturing the structure of a unit of subject matter in a textbook, knowledge of the use of heuristics</td>
</tr>
<tr>
<td><strong>Db. Knowledge about cognitive tasks, including appropriate contextual and conditional knowledge</strong></td>
<td>Knowledge of the types of tests particular teachers administer, knowledge of the cognitive demands of different tasks</td>
</tr>
<tr>
<td><strong>Dc. Self-knowledge</strong></td>
<td>Knowledge that critiquing essays is a personal strength, whereas writing essays is a personal weakness; awareness of one’s own knowledge level</td>
</tr>
</tbody>
</table>
Annotated Bibliography


