The Introduction to Engineering Course
An Articulation Between Universities and Community Colleges of Arizona

Developed by University and Community College Representatives

Approved by Engineering Articulation Taskforce, October 1, 1999

Context

The Introduction to Engineering course is the cornerstone in any BS engineering curriculum. Unfortunately, introductory engineering courses do not generally have the type of defined learning objectives found in a statics or dynamics course. Consequently these introductory courses have been unique at each of the State’s three universities. The three unique courses have made it very difficult for community colleges to offer courses that transfer to all three universities for credit. Each community college has been forced to select the university most of its students are likely to attend and develop a course consistent with that university. The transfer of credit for the introductory course is not limited to the community colleges; students also have a difficult time transferring credit for the course between the universities.

This is not a desirable situation. Therefore, the three state universities, with input from several of the community colleges, have developed a unified set of learning objectives for an introductory course, as well as a process to document that a proposed course meets the learning objectives. The material that follows is the result of this collaboration.

The material is organized to provide: 1) an overview of the articulation matrix, which is the foundation of the process; 2) instructions for completing the articulation matrix; and 3) an appendix containing operational definitions of the terms found in the articulation matrix.

The Articulation Matrix

Defining a course requires three things:

1. a set of learning objectives,
2. the degree to which each of the learning objectives is to be accomplished, and
3. a set of course activities that are intended to help students master the learning objectives at the defined level of accomplishment.

An articulation matrix is a compact way of showing all three of these required ingredients. The matrix consists of a number of rows, one for each course learning objective, and a series of columns, one for each course activity. The degree to which an objective is impacted by an activity is shown as a symbol or letter in the box located at the intersection of the objective and the activity. A skeleton matrix for the Introduction to Engineering course is shown in Figure 1.

There are six major learning objectives shown in Figure 1 (engineering design process, working in teams, engineering as a profession, planning for success, written / oral communication skills, and mathematical models). Since this is a skeleton matrix, there are no specific course activities shown; however, the matrix does show the required level of learning for each major learning objective (e.g., the engineering design process is to be learned to the application level of learning, as shown by the cell with the A, just to the right of the learning objective).

The matrix in Figure 1 and the following four requirements represent the minimum content required for articulation of the freshman engineering course:
<table>
<thead>
<tr>
<th>Learning Objectives</th>
<th>Level of Learning</th>
<th>Course Activities</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>1. Engineering Design Process</strong></td>
<td>A</td>
<td></td>
</tr>
<tr>
<td>1.1 formulating a problem</td>
<td></td>
<td></td>
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<tr>
<td>1.2 solving the problem</td>
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<tr>
<td>1.3 implementing the solution</td>
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<tr>
<td>1.4 documenting the process</td>
<td></td>
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<tr>
<td>1.5 using engineering/physical principles</td>
<td></td>
<td></td>
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<tr>
<td>1.6 using quality principles</td>
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<td></td>
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<tr>
<td><strong>2 Working in Teams</strong></td>
<td>C</td>
<td></td>
</tr>
<tr>
<td>2.1 team dynamics</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2.2 team communication</td>
<td></td>
<td></td>
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<tr>
<td>2.3 social norms</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2.4 conflict management</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>3 Engineering as a Profession</strong></td>
<td>K</td>
<td></td>
</tr>
<tr>
<td>3.1 the profession</td>
<td></td>
<td></td>
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<tr>
<td>3.2 selection of a major</td>
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<tr>
<td>3.3 professional ethics</td>
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<tr>
<td><strong>4 Planning for Success</strong></td>
<td>C</td>
<td></td>
</tr>
<tr>
<td>4.1 personal career planning</td>
<td></td>
<td></td>
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<tr>
<td>4.2 learning to learn</td>
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<tr>
<td>4.3 assessment of progress</td>
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<tr>
<td>4.4 time management</td>
<td></td>
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</tr>
<tr>
<td><strong>5 Written / Oral Communication Skills</strong></td>
<td>A</td>
<td></td>
</tr>
<tr>
<td>5.1 organize / present oral / written reports</td>
<td></td>
<td></td>
</tr>
<tr>
<td>5.2 graphical representations</td>
<td></td>
<td></td>
</tr>
<tr>
<td>5.3 information media / access</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>6 Mathematical Models</strong></td>
<td>C</td>
<td></td>
</tr>
<tr>
<td>6.1 problem solving techniques</td>
<td></td>
<td></td>
</tr>
<tr>
<td>6.2 implementation with spreadsheet algorithms</td>
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<td></td>
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</tbody>
</table>

**Legend**

<table>
<thead>
<tr>
<th>Level of Learning</th>
<th>Impact of learning</th>
</tr>
</thead>
<tbody>
<tr>
<td>K Knowledge</td>
<td>Low impact</td>
</tr>
<tr>
<td>C Comprehension</td>
<td>Medium impact</td>
</tr>
<tr>
<td>A Application</td>
<td>High impact</td>
</tr>
</tbody>
</table>

Figure 1. Skeleton Articulation Matrix for the Introduction to Engineering Course.
1. There must be at least two extensive (3 to 6 weeks) team-based projects.
2. At least one of the projects must include the design, construction, and evaluation of an artifact.
3. There must be at least three different types of mathematical models (e.g., time varying problem, a statistical problem, a mixing problem, an optimization problem, a simulation problem, a risk problem, etc.)
4. At least one activity must substantially impact each of the secondary learning objectives in Figure 1.

Typically, student work products will be associated with the 6 learning objectives in Figure 1. The universities may request that individual community colleges provide examples of these work products for use in their accreditation efforts. Community colleges will be afforded one semester to collect materials.

Note: the operational definitions of terms in the articulation matrix can be found in the appendix.

**How to Complete the Articulation Matrix**

In general, each school will develop the set of activities that will accomplish the desired learning objectives for the class. Complete the matrix as outlined below:

1. Enter a course activity in the first empty column.

2a. For the course activity just entered, go down the column to the intersection of this column and the first row that has a learning objective that is impacted by the activity and enter the level of learning that will result from this activity; i.e., K, C, A, etc. For example, will the work products produced by the students at the end of the activity demonstrate that the specified level of learning has been achieved? Use the templates in the Appendix to help assign levels of learning.

or

2b. For the course activity just entered, go down the column to the intersection of this column and the first row that has a learning objective that is impacted by the activity and enter one of the following codes:

- ● if the activity has a high impact on the learning objective,
- ○ if the activity has a moderate impact on the learning objective, or
- △ if the activity has a low, but not zero impact on the learning objective.

If a proposed course meets the four requirements outlined above, it meets the expectations of the universities and such a course can be transferred, for credit, to any of the State’s universities.
The Introduction to Engineering Course

Appendix
Checklist for Evaluating the Articulation Matrix

After all the class activities have been added and the impact of these activities noted in the matrix, the matrix must be evaluated to confirm that the proposed course is acceptable. The following checklist can be used to perform this evaluation.

There is explicit evidence of at least two team projects.
There is explicit evidence that one of the projects includes the design, construction and evaluation of an artifact.
There is explicit evidence that at least three different types of mathematical models are included.
There is at least one course activity that impacts each of the secondary learning objectives (i.e., no empty rows).

If all items in the above list are checked the proposed course meets the expectations of the universities and such a course can be transferred, for credit, to any of the State’s universities.

Operational Definitions of Terms in the Articulation Matrix
It is important to understand what each term in the matrix means before completing the matrix. The following material defines each of the terms in the Introduction to Engineering articulation matrix shown in Figure 1. Official representatives from Arizona State University, Northern Arizona University, and the University of Arizona have established these definitions.

1. Learning Objectives
   The learning objectives refer to the set of skills and attitudes to be learned in the course. The degree to which each of these skills and attitudes is learned varies and is measured by the level of learning (see Level of Learning).

2. Engineering Design Process
   The engineering design process is a strategy for using available resources to cause the best change in a poorly understood or uncertain situation.

3. Formulating a Problem
   Formulating a problem includes the set of tasks associated with defining the problem. These tasks include accepting responsibility for a need, exploring the problem, and defining constraints and criteria.

4. Solving a Problem
   Solving a problem involves the generation of solution alternatives, and the use of criteria based decision techniques to select the best alternative.

5. Implementing a Solution
   Implementing a solution involves planning for success (e.g., using a Gantt Chart), building and using prototypes (physical / analytical), doing the work, and periodically evaluating the process and the products of the process (i.e., the design).

6. Documenting the Process
   Documenting the process involves the creation of a report or a design notebook that is an organized presentation of the work.

7. Using Engineering/Physical Principles
   Using engineering and physical principles involves using these principles in the solution of the problems associated with a design project.
8. Using Quality Principles
   Using quality principles involves understanding the role of the customer in defining quality and what it means
to exceed customer expectations; as well as working to customer defined specifications, and striving to
continuously improve.

9. Working in Teams
   Working in teams involves learning how teams operate and how to covert a group into a potentially high
performance team.

10. Team Dynamics
    Team dynamics include the stages of team development, issues germane to team building, team composition
and roles, and guidelines for productive meetings.

11. Team Communication
    Team communication involves learning the principles of communicating used by team members in team
meetings and to report to its sponsor. This includes how to listen to team members, how to express a view or
opinion, and how to give progress and final reports.

12. Social Norms
    Social norms refer to the rules by which a team chooses to operate.

13. Conflict Resolution
    Conflict resolution refers to standard processes for bringing a team through a stress filled period.

14. Engineering as a Profession
    Engineering as a profession involves understanding enough about the profession of engineering that a student
can commit to the major and create an education / career plan.

15. The Profession
    The profession involves an understanding and valuing of the attributes of an engineer (i.e., an understanding
of and valuing: engineering and science fundamentals, design and manufacturing processes, having a systems
perspective, knowing the context within which engineering is practiced, being able to communicate
effectively, having high ethical standards, being able to think critically and creatively, being flexible, being a
life long learner, and working on teams). The profession also involves understanding the role of and valuing
professional societies and an engineering license.

16. Selection of a Major
    Selection of a major includes awareness of the types of engineering work, as well as the types of work
associated with various engineering disciplines.

17. Professional Ethics
    Professional ethics includes codes of ethics, checklists for ethics evaluation, professional societies, and
engineering license.

18. Planning for Success
    Planning for success requires acquiring the personal learning and management skills necessary to complete an
engineering education and become a self-regulated learner (i.e., a life long learner).

19. Personal Career Planning
    Personal career planning involves designing an educational and career plan.

20. Learning to Learn
    Learning to learn involves knowing how to apply appropriate strategies to facilitate learning in various
environments, reflecting on the learning that is taking place within and outside of the classroom, and taking
responsibility for learning.

21. Assessment of Progress
Assessment of progress involves monitoring progress made in the implementation of the course plan. This includes recognizing, documenting, and reflecting on what has been learned, and evaluating how this relates to the achievement of educational and or career goals.

22. Time Management
Time management involves setting priorities and working on the most important objectives first (e.g., meeting customer expectations before trying to exceed customer expectations) and working to meet deadlines.

23. Written / Oral Communication Skills
Written / oral communication skills include those skills needed to effectively transmit technical information, team progress and ideas, etc. to other individuals.

24. Organize/Present Oral/Written Reports
Organize and present oral and written reports involves learning the basic structure for the presentation of technical work (i.e., a context, the work, and a discussion or reflection).

25. Graphical Representations
Graphical representations involve learning and practicing the basic requirements for presenting work in graphical form.

26. Information Media/Access
Information media access involves using the world wide web, e-mail, library materials, and electronic forums.

27. Mathematical Models
Mathematical models are purposeful representations of a problem, device, process, situation, etc. that can be used to help make decisions about the problem, device, process, situation, etc.

28. Problem Solving Techniques
Problem solving techniques include using problem definition skills, applying appropriate heuristics (e.g., eliminate all unnecessary information, divide a problem into small pieces, identify variables and look for formulae, search for upper and lower bounds, etc.), checking the validity or reasonableness of the model, and reflecting on the process used in solving the problem.

29. Implement with Spreadsheet Algorithms
Implement with spreadsheet algorithms involves the creation of models using spreadsheets or other sophisticated software.

30. Levels of Learning
Levels of learning define how much is known about a learning objective. The level of learning method uses a taxonomy of learning that was defined by Bloom (B. Bloom et al., “Taxonomy of Educational Objectives Book 1 Cognitive Domain”, Longman, 1956). The levels of learning, from simplest to most involved, are: knowledge, comprehension, application, analysis, synthesis, and evaluation.

Learning is progressive, going from knowledge to comprehension to application to analysis, etc. There must be several learning opportunities for each of the levels (e.g., two at knowledge, two at comprehension and two at application to take a student who has no knowledge of a learning objective up to an application level of learning for that objective).

31. Pre-Knowledge Level of Learning
A student who may have heard about the concept but cannot define or use the concept demonstrates pre-knowledge level of learning.

32. Knowledge Level of Learning
Knowledge level of learning is attained when a student recognizes a concept, can define the concept, but cannot easily explain it to others.

33. Knowledge Level of Learning for Engineering as a Profession
The student understands the engineering profession enough to commit to a major and create an education / career plan.

34. Comprehension Level of Learning
Comprehension level of learning is attained when a student can work assigned problems using the concept and can explain the work to others.

35. Comprehension Level of Learning for Working in Teams
A student can use team building and maintenance concepts, when told to do so, to become a member of an effective team.

36. Comprehension Level of Learning for Planning for Success
The student can use the various time management tools and problem solving techniques, when told to do so, to develop the personal learning and management skills needed to complete the course, complete an engineering education, and to become a life long learner.

37. Comprehension Level of Learning for Mathematical Models
The student can successfully use problem solving and modeling heuristics, when told to do so, in conjunction with computer models to answer pre-posed questions.

38. Application Level of Learning
Application level of learning is attained when a student recognizes, without being told, that a concept should be used and then applies the concept correctly.

39. Application Level of Learning for the Engineering Design Process
A student recognizes, without being told, when to apply each part of the engineering design process to successful solve posed problems.

40. Application Level of Learning for Written / Oral Communication Skills
A student recognizes, without being told, when to apply the presentation techniques to successfully transmit information to another person.

41. Analysis Level of Learning
Analysis level of learning is attained when a student can break a concept down into its parts and explain how the parts work together.

42. Course Activities
Course activities are the set of in class and out of class activities that students undertake or participate in as they attempt to master the learning objectives at the desired levels of learning.
Activities at Various Levels of Learning


KNOWLEDGE (INFORMATION)

How do I know I have reached this level?
I can recall information about the subject, topic, competency, or competency area. I can recall the appropriate material at the appropriate time. I have been exposed to and have received the information about the subject; thus, I can respond to questions, perform relevant tasks, etc.

What do I do at this level?
I read material, listen to lectures, watch videos, take notes. I pass ‘true/false’, ‘yes/no’, ‘multiple choice’, or ‘fill in the blank’ tests which demonstrate my general knowledge of the subject. I learn the vocabulary or terminology as well as the conventions or rules associated with the subject.

How will the teacher know I am at this level?
The teacher will provide verbal or written tests on the subject that can be answered by simply recalling the material I have learned about this subject.

What does the teacher do at this level?
The teacher directs, tells, shows, identifies, examines the subject or competency area at this level.

What are typical ways I can demonstrate my knowledge?
1. Answer ‘true/false’, ‘yes/no’, ‘fill in the blank’, or ‘multiple choice’ questions correctly.
2. Define technical terms associated with the subject by stating their attributes, properties, or relations.
3. Recall the major facts about the subject.
4. Name the classes, sets, divisions, or arrangements that are fundamental to the subject.
5. List the criteria used to evaluate facts, data, principles, or ideas associated with the subject.
6. List the relevant principles and generalizations associated with the subject.
7. List the characteristic methods of approaching and presenting ideas associated with the subject (e.g., list the conventions or rules associated with the subject).
8. Describe the general problem solving method (i.e., the techniques and procedures) or the method(s) of inquiry commonly used in the subject area.

What are typical work products?
1. Answers to knowledge level quizzes (‘true/false’, ‘yes/no’, ‘fill in the blank’, or ‘multiple choice’).
2. Lists of definitions or relevant principles and generalizations associated with the subject.
3. Modifications of example problems presented in the textbook; for example, modest changes in numerical values or units; i.e., solutions to problems that were solved using ‘pattern recognition’.

What are descriptive ‘process’ verbs?
Define, label, listen, list, memorize, name, read, recall, record, relate, repeat, view

COMPREHENSION (UNDERSTANDING)

How do I know I have reached this level?
I comprehend or understand the subject, topic, competency, or competency area. I use ideas associated with the subject without relating them to other ideas or subjects. I may not yet completely understand the subject. When others are discussing this subject, I can follow and understand the discussion. This level requires knowledge.

What do I do at this level?
I successfully solve textbook problems using appropriate techniques and procedures based on (1) where the problem is located in the book or (2) the problem statement. I translate ideas into my own words (translation from one level of abstraction to another). I translate graphical or symbolic information (e.g., tables, diagrams, graphs,
mathematical formulas, etc.) into verbal forms, and vice versa. I interpret or summarize communications
(oral/written/graphical). I can use the problem solution to determine effects, trends, implications, corollaries, etc.

*How will the teacher know I am at this level?*

The teacher will ask questions that can be answered by restating or reorganizing material in a literal manner; i.e.,
by clearly stating facts or the principle meaning of the material in your own words. The teacher will also give tests
based on the textbook problems that were (1) assigned as homework or (2) used as examples in the textbook or in
class.

*What does the teacher do at this level?*

The teacher demonstrates, solves problems, listens, questions, compares, contrasts, and examines the information
and your knowledge of the subject.

*What are typical ways I can demonstrate, on my own, my comprehension and understanding?*

1. Read textbook problems, understand what is required, and successfully solve the problems.
2. Clearly document the process used to solve the problem.
3. Clearly describe the solution to the problem.
4. Draw conclusions based on the solution to the problem.
5. Compare/contrast two different textbook problems (i.e., what elements are the same? what elements are
different?).
6. Restate an idea, theory, or principle in your own words.

*What are typical work products?*

1. Answers to Comprehension level quizzes and exams (‘multiple choice’ or textbook problems).
2. Solutions to textbook problems that include (a) a summary of the learning objectives associated with the
   problem, (b) the problem statement in the form of a clearly labeled sketch, specifications, and what is
   required, (c) a description of the general solution method (techniques and procedures) used to solve the
   problem, and (d) a discussion of the solution.

*What are descriptive ‘process’ verbs?*

Describe, discuss, explain, express, identify, locate, recognize, report, restate, review, solve, tell

**APPLICATION (INDEPENDENT PROBLEM SOLVING)**

*How do I know I have reached this level?*

I can recognize the need to use an idea, concept, principle, theory, or general solution methods (techniques and
procedures) without being told and without any specific or immediate context or cues. For example, I do not need
to locate a similar example in a textbook, nor do I need to know that an assignment is for a particular course in
order to recognize the need to use a particular idea, etc. I know and comprehend these ideas, concepts, principles,
thories, or general solution methods (techniques and procedures and I can apply them to new situations. I also
have the ability to recognize when a certain task or project is beyond my current competency. This level requires
knowledge and comprehension.

*What do I do at this level?*

I apply ideas, concepts, principles, theories, or general solution methods (techniques and procedures) that I
learned at the knowledge and comprehension level to new situations. I solve problems in which the solution
method is not immediately evident or obvious. I solve these problems independently and make use of other
techniques and procedures as well. This requires not only knowing and comprehending these ideas, concepts,
principles, theories, and general solution methods (techniques and procedures but deep thinking about their
usefulness and how they can be used to solve new problems that I identify or define.

*How will the teacher know I am at this level?*

The teacher will review my work products and confirm that I am solving problems independently, in new
situations, and without prompting by the teacher. The teacher will be able to pose general questions such as “How
much protection from the sun is enough?” and I will know how to answer the question by defining and solving a
problem.
What are the typical ways I can demonstrate, on my own, my application of knowledge and comprehension?
1. Solve problems that require that I recognize and apply the appropriate ideas, concepts, principles, theories, general solution methods (techniques and procedures), etc. without being told and without any specific or immediate context or cues.
2. Apply the laws of mathematics, chemistry, and physics, as well as engineering, business or design concepts, etc. to practical problems or situations.
3. Solve problems associated with design/build projects.

What are typical work products?
1. Application level work products are very similar to comprehension level work products; however, documentation will be included which demonstrates that you recognized the need to use ideas, concepts, principles, theories, general solution methods (techniques and procedures), etc. in a new situation.

What are descriptive process verbs?
Apply, demonstrate, employ, illustrate, interpret, operate, practice, recognize, solve, use

ANALYSIS (LOGICAL ORDER, COMPONENTS)

How do I know I have reached this level?
I can explain why. I can methodically examine ideas, concepts, principles, theories, general solution methods (techniques and procedures), reports, etc. and separate these into their component parts or basic elements. I can use the results of this examination to clarify the organization of the whole or to gain a global view. This level requires knowledge and comprehension levels of learning; application is not required.

What do I do at this level?
I demonstrate that I can analyze results by breaking ideas, concepts, principles, theories, general solution methods (techniques and procedures), reports, etc. into their component parts. I explain the logical interconnections of the parts. I can also develop detailed cause and effect sequences.

What does the teacher do at this level?
The teacher probes, guides, observes, and acts as a resource or facilitator.

What are typical questions I can ask myself that will demonstrate my analysis level of learning?
1. What are the causal relationships between the parts and how the whole functions?
2. Can I explain, from the parts, why the whole does or does not work?
3. Does sound reasoning support conclusions?
4. Does the evidence provided support the hypothesis or the conclusion?
5. Do facts, opinions, or an analysis of the results support the conclusions?
6. What are the unstated assumptions?

What are typical work products?
1. Answers to analysis level exams (problems, multiple choice, and essays).
2. Analysis level work products are similar to comprehension level work products; however, documentation will include a more extensive discussion of the work. The content, amount, and depth of the presentation are what distinguish analysis level work products from comprehension level work products; e.g., see items 1 through 6 above.

What are descriptive process verbs?
Analyze, appraise, break apart, break down, calculate, compare, contrast, debate, diagram, differentiate, examine, experiment, explain, inspect, inventory, question, relate, solve

SYNTHESIS (CREATE)

How do I know I have reached this level?
I have the ability to assemble parts and elements into a unified organization or whole that requires original or creative thinking. I recognize new problems and develop new tools to solve them. I create my own plans, models,
hypotheses, etc. for constructing solutions to problems. This level of learning requires knowledge, comprehension, application and analysis levels of learning.

**What do I do at this level?**
I generate ideas and use them to create a physical object, a process, a design method, a written or oral communication, or even a set of abstract relations (e.g., mathematical models). I produce written or oral reports that have the desired effect (e.g., information acquisition, acceptance of a point of view, continued support, etc.) on the reader or listener. I generate project plans. I propose designs. I formulate hypotheses based on the analysis of relevant or pertinent factors. I am able to generalize from a set of axioms or principles.

**How will the teacher know I am at this level?**
I demonstrate that I can combine ideas into a statement, a plan, a product, etc. that was previously unknown to me; e.g., I develop a program that includes the best parts of each of these ideas.

**What does the teacher do as this level?**
The teacher reflects, extends, analyzes, and evaluates.

**What are the typical questions I can ask myself that will demonstrate my synthesis level of learning?**
1. Can I create a project plan?
2. Can I develop a model?
3. Can I propose a design?

**What are typical work products?**
1. Answers to synthesis level exams (problems, multiple choice, and essays).
2. Synthesis level work products are very similar to comprehension level work products; however, documentation will include a more extensive discussion of the work. The content, amount, and depth of the presentation are what distinguishes synthesis level work products from comprehension level work products; e.g., see items 1 through 3 above.

**What are descriptive process verbs?**
Arrange, assemble, collect, compose, construct, create, design, formulate, manage, organize, plan, prepare, propose, set up, write

**EVALUATION (APPRECIATION)**

**How do I know I have reached this level?**
I have the ability to judge and appreciate the value of ideas, concepts, principles, theories, or general solution methods (techniques and procedures) using appropriate criteria. This level requires knowledge, comprehension, application, analysis, and synthesis levels of learning.

**What do I do at this level?**
I make value judgments based on certain criteria such as usefulness and effectiveness. Based on information gained through application, analysis, and synthesis, I can rationally select a process, a method, a model, a design, etc. from among a set of possible processes, methods, models, designs, etc. I evaluate competing plans of action before actually starting the work. I evaluate work products based on internal standards of consistency, logical accuracy, and the absence of internal flaws; e.g., I can certify that the feasibility of a design has been demonstrated in a report. I evaluate work products based on external standards of efficiency, cost, or utility to meet particular goals or objectives; e.g., I can certify that the quality of the design has been demonstrated in a report.

**How will the teacher know I am at this level?**
I demonstrate that I can select, judge, or appreciate a process, a method, a model, a design, etc. using appropriate criteria or standards.

**What does the teacher do at this level?**
The teacher clarifies, accepts, harmonizes, aligns, and guides.
What are typical statements and questions I can answer to that will demonstrate or show my appreciation/evaluation?
1. I can evaluate an idea in terms of ...
2. For what reasons do I favor...?
3. Which policy do I think would result in the greatest good for the greatest number?
4. Which of these models or modeling approaches is best for my current needs?
5. How does this report demonstrate that the design is feasible?
6. How does this report demonstrate the quality of the design?

What are typical work products?
1. Answers to evaluation level exams (problems, multiple choice, and essays).
2. Evaluation level work products are very similar to comprehension level work products; however, documentation will include a more extensive discussion of the work. The content, amount, and depth of the presentation are what distinguish evaluation level work products from comprehension level work products; e.g., see items 1 through 6 above.

What are descriptive process verbs?
Appraise, assess, choose, compare, estimate (quality), evaluate, judge, predict (quality), rate, value, select