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| **[Perform a Task Analysis](http://cehdclass.gmu.edu/ndabbagh/Resources/IDKB/taskanalysis2.htm)** |
| Analyze the learning outcomes and performance objectives by identifying the domains and levels of learning and determining prerequisite skills and task/content structure. |

**What’s the Purpose of Task Analysis?**

"Task analysis for instructional design is a process of analyzing and articulating the kind of learning that you expect the learners to know how to perform" (Jonassen, Tessmer, & Hannum, 1999, p.3). Instructional designers perform a task analysis in order to:

1. determine the instructional goals and objectives;
2. define and describe in detail the tasks and sub-tasks that the student will perform;
3. specify the knowledge type (declarative, structural, and procedural knowledge) that characterize a job or task;
4. select learning outcomes that are appropriate for instructional development;
5. prioritize and sequence tasks;
6. determine instructional activities and strategies that foster learning;
7. select appropriate media and learning environments;
8. construct performance assessments and evaluation (Jonassen et al., 1999).

**What Methodology Does a Task Analysis Support?**

The process of task analysis emerged from the behaviorist era in an effort to describe the elemental behaviors involved in performing a task or job. Nevertheless, different methods of task analysis have indeed followed the paradigm shifts to cognitive psychology and onto constructivism. Ultimately, each methodology of instruction commands its own method of analysis, yet regardless of methodology, a task analysis is needed for an in-depth understanding of the learning that’s to take place (Jonassen, et al., 1999).

**I Know One Method of Task Analysis. Can I Use It All the Time?**

According to Jonassen, the answer is no. Too often instructional designers try to force-fit all learning situations into one or two methods with which they are most familiar. However, as different audiences require different instructional strategies, different contexts demand different task analysis methods. To determine the best method for your instruction, you must decide what kind of analysis to perform. In general, there are five kinds of task analyses:

1. job or performance analysis
2. learning analysis
3. cognitive task analysis
4. content or subject matter analysis
5. activity analysis.

Each of the five methods involves a different procedure for conducting a task analysis and also make different assumptions about the process of learning.

**How Do I Perform a Task Analysis?**

According to Jonassen, the task analysis process consists of five distinct functions:

* Classifying tasks according to learning outcomes –
* Inventorying tasks – identifying tasks or generating a list of tasks
* Selecting tasks – prioritizing tasks and choosing those that are more feasible and appropriate if there is an abundance of tasks to train.
* Decomposing tasks – identifying and describing the components of the tasks, goals, or objectives.
* Sequencing tasks and sub-tasks – defining the sequence in which instruction should occur that will best facilitate learning.

**What Formats Can I Use?**

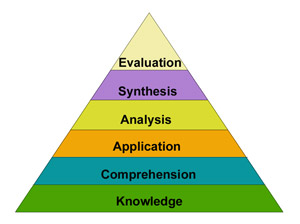
There are different formats to use based on the type of learning outcome. The following are the most prevalent:

1. [Procedural Task Analysis](http://cehdclass.gmu.edu/ndabbagh/Resources/IDKB/procedural_analysis.htm) (for procedural skills)
2. [Hierarchical or Prerequisite Analysis](http://cehdclass.gmu.edu/ndabbagh/Resources/IDKB/hierarchical_analysis.htm) (for intellectual skills)
3. [Information Processing Analysis](http://cehdclass.gmu.edu/ndabbagh/Resources/IDKB/info_processing.htm) (for procedural and cognitive tasks)
4. [Cluster Analysis](http://cehdclass.gmu.edu/ndabbagh/Resources/IDKB/cluster_analysis.htm) (for verbal information skills)
5. [Conceptual Graph analysis](http://cehdclass.gmu.edu/ndabbagh/Resources/IDKB/concept_graph.htm) (for concepts)

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| **Taxonomies for Identifying Learning Domains/Levels (psychomotor, intellectual, affective)** |
| |  |  | | --- | --- | | [Bloom's taxonomy of cognitive domain](http://cehdclass.gmu.edu/ndabbagh/Resources/IDKB/bloomstax.htm) | [Krathwohl's taxonomy of affective domain](http://cehdclass.gmu.edu/ndabbagh/Resources/IDKB/krathstax.htm) | | [Gagne's five learned capabilities](http://cehdclass.gmu.edu/ndabbagh/Resources/IDKB/gagnetax.htm) | [Harrow's taxonomy of psychomotor domain](http://cehdclass.gmu.edu/ndabbagh/Resources/IDKB/harrowstax.htm) | |

**Bloom's Taxonomy of Cognitive Development**

Bloom identified six levels within the cognitive domain, from the simple recall or recognition of facts, as the lowest level, through increasingly more complex and abstract mental levels, to the highest order which is classified as evaluation. A description of the six levels as well as verb examples that represent intellectual activity are listed here.

**Knowledge** is defined as remembering of previously learned material. This may involve the recall of a wide range of material, from specific facts to complete theories, but all that is required is the bringing to mind of the appropriate information. Knowledge represents the lowest level of learning outcomes in the cognitive domain.

**Verbs**: arrange, define, duplicate, label, list, memorize, name, order, recognize, relate, recall, repeat, reproduce state.

**Comprehension** is defined as the ability to grasp the meaning of material. This may be shown by translating material from one form to another (words to numbers), by interpreting material (explaining or summarizing), and by estimating furture trends (predicting consequences or effects). These learning outcomes go one step beyond the simple remembering of material, and represent the lowest level of understanding.

**Verbs**: classify, describe, discuss, explain, express, identify, indicate, locate, recognize, report, restate, review, select, translate.

**Application** refers to the ability to use learned material in new and concrete situations. This may include the application of such things as rules, methods, concepts, principles, laws, and theories. Learning outcomes in this area require a higher level of understanding than those under comprehension.

**Verbs**: apply, choose, demonstrate, dramatize, employ, illustrate, interpret, operate, practice, schedule, sketch, solve, use, write.

**Analysis**refers to the ability to break down material into its component parts so that its organizational structure may be understood. This may include the identification of the parts, analysis of the relationships between parts, and recognition of the organizational principles involved. Learning outcomes here represent a higher intellectual level than comprehension and application because they require an understanding of both the content and the structural form of the material.

**Verbs**: analyze, appraise, calculate, categorize, compare, contrast, criticize, differentiate, discriminate, distinguish, examine, experiment, question, test.

**Synthesis** refers to the ability to put parts together to form a new whole. This may involve the production of a unique communication (theme or speech), a plan of operations (research proposal), or a set of abstract relations (scheme for classifying information). Learning outcomes in this area stress creative behaviors, with major emphasis on the formulation of new patterns or structures.

**Verbs**: arrange, assemble, collect, compose, construct, create, design, develop, formulate, manage, organize, plan, prepare, propose, set up, write.

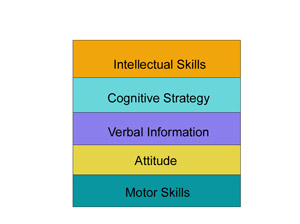
**Evaluation** is concerned with the ability to judge the value of material (statement, novel, poem, research report) for a given purpose. The judgements are to be based on definite criteria. These may be internal criteria (organization) or external criteria (relevance to the purpose) and the student may determine the criteria or be given them. Learning outcomes in this area are highest in the cognitive hierarchy because they contain elements of all the other categories, plus conscious value judgements based on clearly defined criteria.

**Verbs**: appraise, argue, assess, attach, choose compare, defend estimate, judge, predict, rate, core, select, support, value, evaluate.

**Reference***: Major categories in the cognitive domain of the taxonomy of educational objectives*(Bloom, 1956).

**Gagné's Five Learned Capabilities**

The classification of learning according to Robert Gagné includes five kinds of learned capabilities: intellectual skills, cognitive strategies, verbal information, attitudes, and motor skills. The Gagné taxonomy is perhaps the most popular of the many learning taxonomies in the field of instructional design (Reigeluth, 1983). Its popularity can be attributed best for its ability to clearly distinguish between abstract and concrete definitions of learning (Seels & Glasgow, 1990).

**Motor Skills** refers to bodily movements involving muscular activity. Examples might be: Starting a car, shooting a target, swinging a golf club.

**Attitude** is an internal state which affects an individual’s choice of action toward some object, person, or event. Examples might be: Choosing to visit an art museum, writing letters in pursuit of a cause.

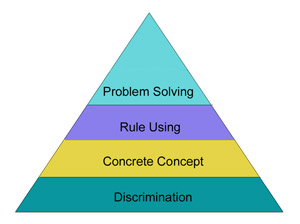
**Verbal Information** include: 1) Labels and Facts and 2) Bodies of Knowledge.

1) Labels and facts refer to naming or making a verbal response to a specific input. The response may be naming or citing a fact or set of facts. The response may be vocal or written. Examples: Naming objects, people, or events. Recalling a person's birthday or hobbies. Stating the capitals of the United States.

2) Bodies of Knowledge refers to recalling a large body of interconnected facts. Example: paraphrasing the meaning of textual materials or stating rules and regulations. Example: Paraphrasing the meaning of textual materials. Stating rules and regulations.

**Cognitive Strategy** is an internal process by which the learner controls his/her own ways of thinking and learning. Example: Engaging in self-testing to decide how much study is needed; knowing what sorts of questions to ask to best define a domain of knowledge; ability to form a mental model of the problem.

**Intellectual Skills** include 1) Discrimination 2) Concrete concept 3) Rule using and 4) Problem solving. These are the four levels within the intellectual skills domain that Gagné identified as his taxonomy.

**Discrimination** is making different responses to the different members of a particular class. Seeing the essential differences between inputs and responding differently to each. Example: Distinguishing yellow finches from house finches on the basis of markings; having to tell the differences between gauges on an instrument panel.

**Concrete concept** is responding in a single way to all members of a particular class of observable events. Seeing the essential similarity among a class of objects, people, or events, which calls for a single response. Example: Classifying music as jazz, country western, rock, etc.; saying "round upon seeing a manhole cover, a penny, and the moon.

**Rule using** is applying a rule to a given situation or condition by responding to a class of inputs with a class of actions. Relating two or more simpler concepts in the particular manner of a rule. A rule states the relationship among concepts. Examples: It is helpful to think of rules or principles as "if-then" statements. "If a task is a procedure, then use flowcharting to analyze the task." "If you can convert a statement into an 'if-then' statement, then it is a rule or principle."

**Problem solving** is combining lower level rules to solve problems in a situation never encountered by the person solving the problem. May involve generating new rules which receive trial and error use until the one that solves the problem is found.

Gagné, R.M. and Briggs, L.J. (1974). *Principles of instructional design (2nd ed.)*. Holt, Rinehart, and Winston.

Seels and Glasgow (1990). *Exercises in instructional design.*Columbus OH: Merrill Publishing Company.

**Krathwohl's Taxnomy of Affective Domain**

Krathwohl's affective domain taxonomy is perhaps the best known of any of the affective taxonomies. "The taxonomy is ordered according to the principle of internalization. Internalization refers to the process whereby a person's affect toward an object passes from a general awareness level to a point where the affect is 'internalized' and consistently guides or controls the person's behavior (Seels & Glasgow, 1990, p. 28)."

Receiving is being aware of or sensitive to the existence of certain ideas, material, or phenomena and being willing to tolerate them. Examples include: to differentiate, to accept, to listen (for), to respond to.

Responding is committed in some small measure to the ideas, materials, or phenomena involved by actively responding to them. Examples are: to comply with, to follow, to commend, to volunteer, to spend leisure time in, to acclaim.

Valuing is willing to be perceived by others as valuing certain ideas, materials, or phenomena. Examples include: to increase measured proficiency in, to relinquish, to subsidize, to support, to debate.

Organization is to relate the value to those already held and bring it into a harmonious and internally consistent philosophy. Examples are: to discuss, to theorize, to formulate, to balance, to examine.

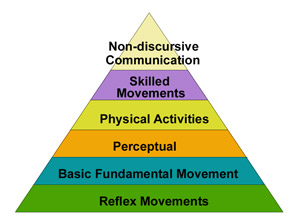
Characterization by value or value set is to act consistently in accordance with the values he or she has internalized. Examples include: to revise, to require, to be rated high in the value, to avoid, to resist, to manage, to resolve.

Krathwohl, D.R., Bloom, B.S., and Masia, B.B. (1964). *Taxonomy of educational objectives: Handbook II: Affective domain*. New York: David McKay Co.

Seels and Glasgow (1990). *Exercises in instructional design.*Columbus OH: Merrill Publishing Company.

**Harrow's Taxonomy of Psychomotor Domain**

Anita Harrow's taxonomy for the psychomotor domain is organized according to the degree of coordination including involuntary responses as well as learned capabilities. Simple reflexes begin at the lowest level of the taxonomy, while complex neuromuscular coordination make up the highest levels (Seels & Glasgow, 1990).

Reflex movements are actions elicited without learning in response to some stimuli. Examples include: flexion, extension, stretch, postural adjustments.

Basic fundamental movement are inherent movement patterns which are formed by combining of reflex movements and are the basis for complex skilled movements. Examples are: walking, running, pushing, twisting, gripping, grasping, manipulating.

Perceptual refers to interpretation of various stimuli that enable one to make adjustments to the environment. Visual, auditory, kinesthetic, or tactile discrimination. Suggests cognitive as well as psychomotor behavior. Examples include: coordinated movements such as jumping rope, punting, or catching.

Physical activities require endurance, strength, vigor, and agility which produces a sound, efficiently functioning body. Examples are: all activities which require a) strenuous effort for long periods of time; b) muscular exertion; c) a quick, wide range of motion at the hip joints; and d) quick, precise movements.

Skilled movements are the result of the acquisition of a degree of efficiency when performing a complex task. Examples are: all skilled activities obvious in sports, recreation, and dance.

Non-discursive communication is communication through bodily movements ranging from facial expressions through sophisticated choreographics. Examples include: body postures, gestures, and facial expressions efficiently executed in skilled dance movement and choreographics.

Harrow, A.J. (1972). *A taxonomy of the psychomotor domain*. New York: David McKay Co.

Seels and Glasgow (1990). *Exercises in instructional design.*Columbus OH: Merrill Publishing Company.

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| **Techniques and Methods for Analyzing Tasks and Structuring Content** |
| |  |  |  | | --- | --- | --- | | [Procedural analysis](http://cehdclass.gmu.edu/ndabbagh/Resources/IDKB/procedural_analysis.htm) | [Hierarchical/Prerequisite analysis](http://cehdclass.gmu.edu/ndabbagh/Resources/IDKB/hierarchical_analysis.htm) | [Differences between hierarchical and procedural](http://cehdclass.gmu.edu/ndabbagh/Resources/IDKB/hierarchy_vs_procedural.htm) | | [Information-processing analysis](http://cehdclass.gmu.edu/ndabbagh/Resources/IDKB/info_processing.htm) | [Cluster analysis](http://cehdclass.gmu.edu/ndabbagh/Resources/IDKB/cluster_analysis.htm) | [Conceptual Graph analysis](http://cehdclass.gmu.edu/ndabbagh/Resources/IDKB/concept_graph.htm) | |

**Procedural Task Analysis**

**What is a procedural analysis?**

Unlike learning a concept or a principle, procedures are strictly defined so that each step is clear and unambiguous to the learner. Procedures can be simple, whereby the learner follows one set of steps in a sequential fashion. However, procedures can also be complex, with many decision points that the learner must make. Regardless of the complexity of the procedure, a procedural analysis breaks down the mental and/or physical steps that the learner must go through so that the task can be successfully achieved. The steps that make up a task are arranged linearly and sequentially, illustrating where the learner begins and ends. Oftentimes, the steps throughout the task, from start to finish, as well as any decisions that the learner must make are arranged in a flowchart, but they can also be done in an outline form. See examples below.

Examples of learning outcomes that are procedural in nature are:

-balancing a checkbook,  
-changing a tire,  
-formatting a disk, and  
-bathing a dog.

**How do I conduct a procedural analysis?**

Learning goals that are procedures are the easiest goals upon which to conduct an instructional analysis. Generally, application of procedures involves these steps:

1. Determine whether a particular procedure is applicable.  
2. Recall the steps of the procedure.  
3. Apply the steps in order, with decision steps if required.  
4. Confirm that the end result is reasonable.

(From Smith & Ragan, 1999)

**Okay, I've broken down the steps, I'm ready to flowchart...**

Flowcharting has a language of its own. The following are the generally accepted conventions for flowcharting.

http://cehdclass.gmu.edu/ndabbagh/Resources/IDKB/images/oval.gif*Start/End* - This symbol is used as the beginning symbol pointing to the first task and as a symbol indicating that no more tasks are to be performed. A flowchart has only one starting point; therefore there is only one START symbol. However, there can be more than one END point.

http://cehdclass.gmu.edu/ndabbagh/Resources/IDKB/images/parallelogram.gif*Input/Output* - A parallelogram represents either an input task or an output task. An example of an input task is keying the account number of a savings account in a bank. An example of an output task is printing a reprt or displaying the results of a computation. An output at the end of a chain creates the input for the next step.

http://cehdclass.gmu.edu/ndabbagh/Resources/IDKB/images/rectangle.gif*Process* - A process is a simple procedure, an operation, or an instruction. Processes do not include tasks requiring a decision. A process is represented by a rectangle. Calculating simple interest, typing a report, or taking a test are examples of processes.

*Decision* - Decision symbols are used when two alternative sequences are possible depending upon the outcome of the decision. Usually decisions are posed as questions requiring a yes or no answer. However, any two-way alternative may be posed.

(Seels & Glasgow, 1990)

**Are there any flowcharting programs available?**

Absolutely! Programs like [Inspiration](http://www.inspiration.com/) and [Microsoft's Visio](http://www.microsoft.com/office/visio/) make it very easy to create quick, customized flowcharts. And if you just want to try them out, many of them offer 30-day trial demos for you to download.

**What criteria should I use to evaluate my procedural analysis?**

\_\_\_\_\_\_\_ Completeness (thoroughness); all steps present; complex procedures broken down; (0-5)

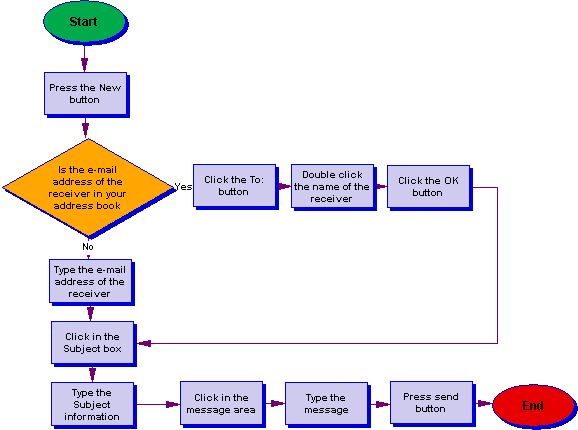
\_\_\_\_\_\_\_ All steps stated in performance terms (using verbs); (0-5)

\_\_\_\_\_\_\_ Appropriateness of procedural analysis for representing task; (0-5)

\_\_\_\_\_\_\_ Validity & accuracy: how well does analysis correspond to actual task; (0-5)

\_\_\_\_\_\_\_ Appropriate use of flowchart or representation used; directional flow obvious and consistent; (0-5)

**Can I see an example of a procedural task analysis using a flowchart?**



**Can I see an example of a procedural task analysis in an outline?**

Yes, indeed. Check out this [example](http://cehdclass.gmu.edu/ndabbagh/Resources/IDKB/procedural_outline.htm).

**Information-Processing Analysis**

**What is an information-processing analysis?**

"Conducting an information-processing analysis is the first step in 'decomposing' or breaking down a goal into its constituent parts, identifying what the students need to learn to attain the goal (Smith & Ragan, 1999, p. 69)." When conducting this type of analysis, the question to keep in mind is "what are the mental and/or physical steps that someone must go through in order to complete this learning task (Smith & Ragan, 1999, p. 69)?" One way to do this is to think through the steps one could go through to complete the task. It is helpful to use a defined procedure such as the steps listed below.

**How do I conduct an information-processing analysis?**

The following are ten steps to follow in conducting an information-processing analysis:

1. Collect as much information as possible about the task and the content implied by the goal. Use this to become familiar with the terminology involved. Then create a set of questions that could be asked of a subject matter expert.

2. Rewrite the goal in the form of a representative test question.

3. Ask several individuals who know how to complete the task and do one of the following: a) observe them completing the task and ask them to talk aloud about their thought processes as they complete the task; b) observe them completing the task and write down, videotape, or otherwise record the steps; c) have the individuals record the steps in writing as they complete them; or d) ask them to simply write down the steps they would use to complete the task. Techniques a) and b) give the most information because experts often forget some of the steps they go through when completing a task.

4. Review the steps recorded in step 3 and ask questions about the process of completing the task. This will help you to find out the unobservable cognitive knowledge that underlies the expert's behavior.

5. If more than one expert was used, review the findings and find the common steps and decision points collected from steps 3 and 4.

6. Identify the shortest, simplest way to complete the path, noting factors that require this simpler path.

7. Make notes of factors that may require more steps or more complex steps.

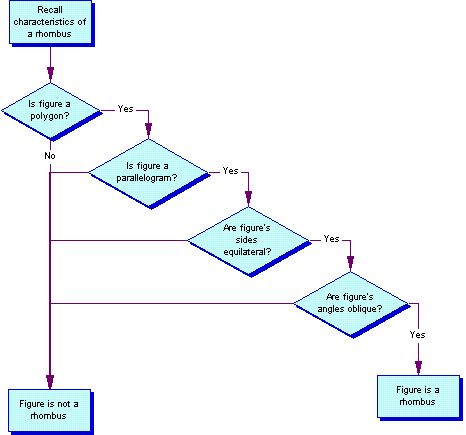
8. Choose the steps and circumstances that best match the intentions of the goal.

9. Make a list of the steps and decision points appropriate for the goal.

10. Confirm the analysis with other experts. (Smith & Ragan, 1999)

**Can I see an example of an information-processing analysis?**

Information-Processing Analysis for a Concept

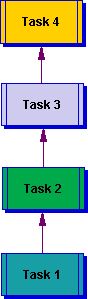


Smith, P.L. & Ragan, T. J. (1999). *Instructional Design.* 2nd edition. Upper Saddle River, New Jersey: Merrill.

**Hierarchical Task Analysis**

**What is a hierarchical analysis?**

"A hierarchy is an organization of elements that, according to prerequisite relationships, describes the path of experiences a learner must take to achieve any single behavior that appears higher in the hierarchy" (Seels & Glasgow, 1990, p. 94). Thus, in a hierarchical analysis, the instructional designer breaks down a task from top to bottom, thereby, showing a hierarchical relationship amongst the tasks, and then instruction is sequenced bottom up. For example, in the diagram below, task 4 has been decomposed into its enabling tasks implying that the learner cannot perform the third task until he/she has performed the first and second tasks respectively.



**How do I conduct a hierarchical analysis?**

The starting point for constructing a hierarchy is a comprehensive list of the tasks that make up a job or function. There are three major steps to constructing a hierarchy:

1. Cluster or group the tasks. For inclusion in a group, select tasks that bear close resemblance to each other. Each task must be included in at least one of the groups, but a task may also be common to several groups. Label the groups with terms that emerge from the job or function being analyzed. Initial clustering or grouping of tasks may be tentative. The composition of the groups may change as a result of decisions you make later on. Do not hesitate to regroup tasks when it seems appropriate.
2. Organize tasks within each group to show the hierarchical relationships for learning. Ask yourself "What would the learner have to learn in order to do this task?" Once the essential prerequisite relationships are shown, reevaluate the relationship between each pair of tasks with the question "Can this superordinate task be performed if the learner cannot perform this subordinate task?" The lower level skill must be integrally related to the higher-level skill. The learning types (domains) of the tasks should match horizontally.  
   [(See taxonomies for identifying learning domains/levels (psychomotor, intellectual, affective).](http://cehdclass.gmu.edu/ndabbagh/Resources/IDKB/task_analysis.htm#taxonomies)
3. Confer with a subject matter expert to determine the hierarchy’s accuracy. This step occurs concurrently with Steps 1 and 2.

(Seels & Glasgow, 1990)

**What criteria should I use to evaluate my analysis?**

The following is a checklist for you to evaluate your hierarchical analysis.

\_\_\_\_\_\_\_Adequate breadth (number) of tasks; (0-5)

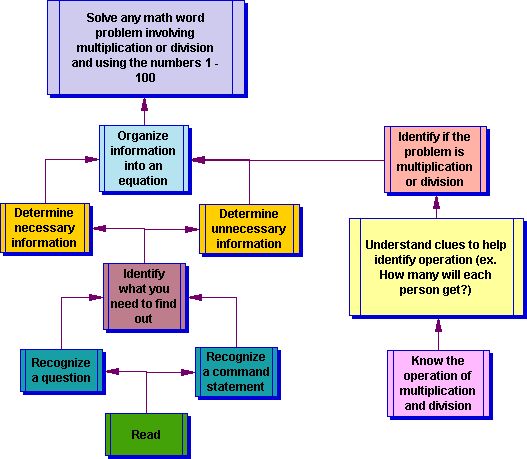
\_\_\_\_\_\_\_ Depth of levels: does hierarchy span all levels of learning (problem-solving to verbal information) leading to the final level of the task; (0-5)

\_\_\_\_\_\_\_ Validity & accuracy: how well does analysis correspond to learning processes; (0-5)

\_\_\_\_\_\_\_ Consistency in grouping similar tasks on same level in hierarchy; (0-5)

\_\_\_\_\_\_\_ All skills/sub-skills stated in performance terms (using verbs); (0-5)

**Can I see an example of a hierarchical task analysis?**



By Tina Stanley

Click [here](http://cehdclass.gmu.edu/ndabbagh/Resources/IDKB/more_hierarch.htm) for more examples of hierarchical task analyses.

[T](http://cehdclass.gmu.edu/ndabbagh/Resources/IDKB/task_analysis.htm)

**Cluster Analysis**

**What is a cluster analysis?**

"For goals within the verbal information domain, conduct an 'elaboration analysis,' or 'cluster analysis'" (Oliver, 2002, section 3, para. 3). A cluster analysis is used to analyze verbal information skills where no logical order is required to meet the stated goal(s) (Muffoletto, 2000).

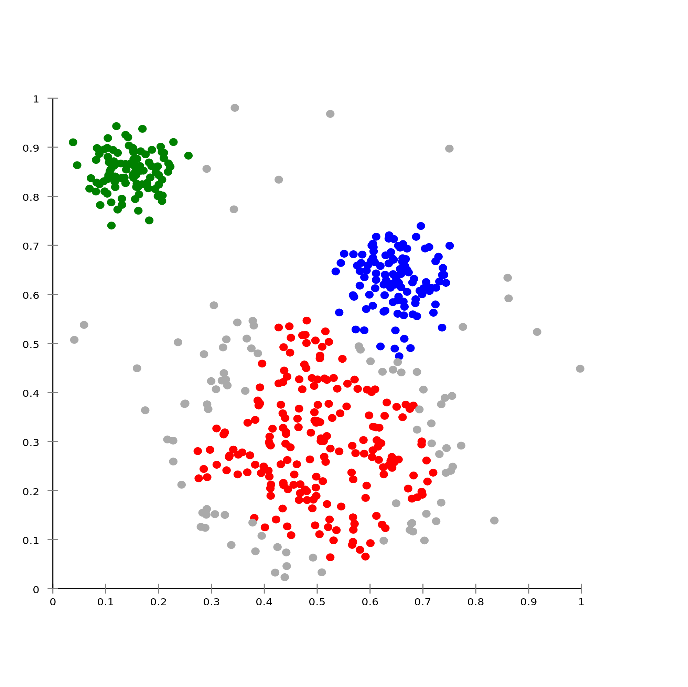
**How do I conduct a cluster analysis?**

Before conducting a cluster analysis, an instructional designer needs to first ask if there is a logical order to the steps needed to meet the goal. After determining there is no logical order needed to meet the goal, the next step for the designer is to identify the clusters or categories of information in each step. Oliver (2002) suggests the following procedure when analyzing goals within the verbal information domain.

1. Identify the main concept
2. Determine how the knowledge is structured (e.g., parts, kinds, classes)
3. Identify first-level headings, second-level headings, and so-forth
4. Try to identify what is related to the information being taught.

**Can I see an example of a cluster analysis?**

Please see the graph below:



**What examples are in the literature?**

Yousef, A. M. F., Chatti, M. A., Wosnitza, M., & Schroeder, U. (2015). A cluster analysis of MOOC stakeholder perspectives. *RUSC Universities and Knowledge Society Journal, 12*(1), 74-90. Retrieved from [http://journals.uoc.edu/index.php/rusc/article/view/v12n1-yousef-chatti-wosnitza-schroeder/v12n1-yousef-chatti-wosnitza-schroeder-en.](http://journals.uoc.edu/index.php/rusc/article/view/v12n1-yousef-chatti-wosnitza-schroeder/v12n1-yousef-chatti-wosnitza-schroeder-en)

Kerr, D. &, Chung, G. K.(2012). *Using cluster analysis to extend usability testing to instructional content*. Retrieved from [https://www.cse.ucla.edu/products/reports/R816.pdf.](https://www.cse.ucla.edu/products/reports/R816.pdf)

**Some Basic Differences Between a Procedural Task Analysis and a Hierarchical Analysis**

1. A hierarchical task analysis (also known as a prerequisite task analysis) answers the following question: "What must the learner know or be able to do to achieve this task?"

2. A procedural task analysis (also known as an information-processing analysis) answers the following question: "What are the mental and/or physical steps that the learner must go through in order to complete this task?"

3. A hierarchical task analysis is developed bottom up, from general to specific.

4. A procedural task analysis is developed linearly and sequentially, step-by-step. It has a directional flow. It has a start and a an end.

5. A hierarchical task analysis is based on learning taxonomies, starting from the most complex (e.g. problem-solving in Gagne’s cognitive taxonomy of learning) to the least complex (e.g. verbal information in Gagne’s taxonomy). The nature of the terminal task determines at which level in the taxonomy one should start breaking down the task from more complex to less complex, going through **each** of the learning levels.

6. A procedural task analysis is not concerned with the levels of the learning taxonomies, it is procedural in nature. If the task is a relational rule, then the steps of the task analysis would include "how to apply this rule". If the task is concept learning, then the task analysis would include "how to determine whether a particular instance (occurrence) is an example of this concept". Review examples on pages 75-84 in Smith & Ragan.

7. A hierarchical task analysis is represented in terms of levels of tasks. Each level should (more or less) represent one learning level (e.g. problem-solving, concept learning, etc.). The highest level is the most complex. Lower levels form prerequisite skills for higher levels. Lines connect tasks between levels. Each task can be broken down into one or more tasks from one level to the next.

8. A procedural task analysis is represented in the form of a flowchart or an outline. If a flowchart is used, then lines with arrows connect tasks. The direction of the arrows indicates the sequence of the steps (tasks). Diamond shaped decisions symbols indicate a change in direction depending on the outcome. If an outline is used, the steps in the outline are numbered to indicate the sequence. Subtasks are also numbered to indicate the flow within a larger task.

9. A hierarchical task analysis is read bottom-up. If we were to put arrows on the lines that connect the tasks they would be pointing upward, towards the terminal task.

10. A procedural task analysis is read from left to right or from top to bottom (following the direction of the arrows if in flowchart form, or the numbering of the steps if in outline form).

11. In a hierarchical analysis, each task is a **prerequisite** to the task directly above it. Tasks that can happen concurrently with other tasks should be on the same level in the hierarchy.

12. If using a flowchart format to do a procedural analyis, you can break down some of the tasks within the flowchart into an outline format if those tasks have subtasks.

13. In a hierarchical analysis, list all your givens or assumptions as prerequisites at the very bottom of the hierarchy.

14. In a procedural analysis, you must always have a START and an END, all tasks must be connected using arrows, and decision symbols can only have a YES/NO going out.

**Conceptual Graph Analysis**

**What is a conceptual graph analysis?**

Constructing a conceptual graph is similar to concept mapping, but it includes a formal and detailed collection of nodes, relations, and questions. The nodes can include more than just concepts. Nodes can be goals, actions, or events. There are specific relations for each type of node, and a set of formal, probing questions is developed for each node type. Basically, conceptual graph analysis has two stages. The first stage consists of the task analyst or expert creating a basic conceptual graph. The second stage consists of the analyst or expert using the probing questions to find a deeper layer of information for the graph. The analyst or expert may opt to include a third stage of validating the conceptual graph by having an expert perform the task to check for missing information (Jonassen, Tessmer, & Hannum, 1999).

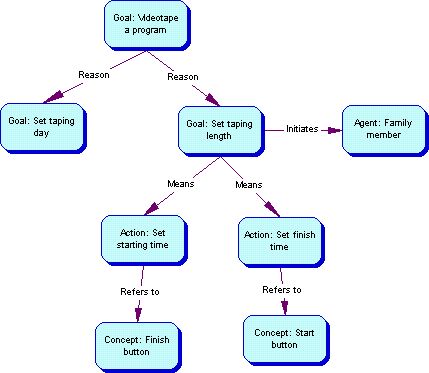
**How do I conduct a conceptual graph analysis?**

The following are six steps to follow in conducting a conceptual graph analysis:

1. Clarify the uses for the graph information.
2. Choose a set of situations for the expert to analyze.
3. Construct a rough graph.
4. Prepare a list of follow-up questions.
5. Expand the graph.
6. Review the final graph. (Jonassen, Tessmer, & Hannum, 1999, p.202-203)

**Can I see an example of a conceptual graph analysis?**

Excerpt of a conceptual graph on operating a video recorder:



Jonassen, D.H., Tessmer, M., Hannum, W.H. (1999). *Task Analysis Methods for Instructional Design.* Mahwah, New Jersey: Lawrence Erlbaum Associates, Publishers.

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| **Types of Analyses** |
| [Performance Analysis and Needs Assessment](http://cehdclass.gmu.edu/ndabbagh/Resources/IDKB/performance.htm)  Determine if it is a training/incentive/organizational problem. That is, identify who has the performance problem (management/workers; faculty/learners), the cause of the problem, and appropriate solutions. |
| [Environmental Analysis](http://cehdclass.gmu.edu/ndabbagh/Resources/IDKB/environmental.htm)  Accommodate organizational climate, physical factors, and socio-cultural climate to determine how these factors affect the problem. |
| [Learner Analysis](http://cehdclass.gmu.edu/ndabbagh/Resources/IDKB/learner.htm)  Identify learner/trainee/employee characteristics and individual differences that may impact on learning / performance, such as prior knowledge, personality variables, aptitude variables, and cognitive styles. |

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| **Techniques and Methods for Conducting a Front End Analysis** |
| |  |  |  | | --- | --- | --- | | [Extant data analysis](http://cehdclass.gmu.edu/ndabbagh/Resources/IDKB/techniques.htm#extantdata) | [Criterion-referenced tests](http://cehdclass.gmu.edu/ndabbagh/Resources/IDKB/techniques.htm#criterionreferenced) | [Focus groups](http://cehdclass.gmu.edu/ndabbagh/Resources/IDKB/techniques.htm#focusgroups) | | [Interviews](http://cehdclass.gmu.edu/ndabbagh/Resources/IDKB/techniques.htm#interviews) | [Questionnaires](http://cehdclass.gmu.edu/ndabbagh/Resources/IDKB/techniques.htm#questionnaires) | [Job descriptions](http://cehdclass.gmu.edu/ndabbagh/Resources/IDKB/techniques.htm#jobdescriptions) | | [Standardized tests](http://cehdclass.gmu.edu/ndabbagh/Resources/IDKB/techniques.htm#standardizedtests) | [Performance appraisals](http://cehdclass.gmu.edu/ndabbagh/Resources/IDKB/techniques.htm#performanceappraisals) | [Observations](http://cehdclass.gmu.edu/ndabbagh/Resources/IDKB/techniques.htm#observations) | | [Brainstorming](http://cehdclass.gmu.edu/ndabbagh/Resources/IDKB/techniques.htm#brainstorming) | [Customer studies](http://cehdclass.gmu.edu/ndabbagh/Resources/IDKB/techniques.htm#customerstudies) | [Work samples](http://cehdclass.gmu.edu/ndabbagh/Resources/IDKB/techniques.htm#worksamples) | | [Survey](http://cehdclass.gmu.edu/ndabbagh/Resources/IDKB/techniques.htm#survey) |  |  | |

**Performance Analysis and Needs Assessment**

To help you understand what a performance analysis is and to provide you with some examples of performance analyses, the following links are resources you can access.

[Instructional Systems Design the Analysis Phase](http://www.nwlink.com/~donclark/hrd/sat2.html)

This website explicitly defines what happens in the ISD analysis phase, as well as, details “how to” perform a Front End Analysis. This website was self-published by Don Clark in 1995, and was updated December 16, 2000.

[Instructional Systems Design Glossary](http://www.nwlink.com/~Donclark/hrd/sat.html#glossary)

Performance, Learning, Leadership, and Knowledge (Don Clark's website).

[Performance Analysis: Principles, Practices, and Resources](http://www.northwoodshrd.com/performance%20analysis%20and%20needs%20assessment%20tool.pdf)

November 2002, Society of Human Resources & Management, Panel Handout.

[First Things Fast: A Handbook for Performance Analysis](http://www.josseybass.com/legacy/rossett/rossett.html)

Allison Rossett's book.

[Needs Assessment](http://www.personal.psu.edu/wxh139/Needs.htm)

Described by Allison Rossett.

[YouTube Video on Needs Assessment](http://www.youtube.com/watch?v=QLx9afLhBh0)

Described by Lloyd Rieber.

[The A in ADDIE](http://www.grayharriman.com/ADDIE_Needs_Assessment.htm)

Described by Gray Harsiman.

**Environmental Analysis**

To help you understand environmental analysis and to provide you with a variety of examples within this area, the following links are resources you can access.

[Design and Environmental Analysis](http://ergo.human.cornell.edu/)

This department of graduate studies at Cornell University has two primary areas of interest:  interior design, concentrating on the creation of interior spaces and associated products; and human-environment relations, which focuses on ergonomics, facility planning and management, environmental psychology, and housing.

Human factors and ergonomics is the study of indoor air pollution; lighting; environmentally induced stress; the environment of poverty; the design of offices to improve individual usability; sustainability; and universal design issues.

[Eliminating Stress from Your Environment](http://www.mindtools.com/smimpenv.html#FE)

This site from Mindtools identifies factors that may create stress in the workplace environment.  When reduced, the environment is more organized and pleasant and can improve productivity.  These factors are air quality, lighting, decoration and tidiness, noise, furniture and ergonomics, and personal space.

[Environmental Analysis Inc.](http://www.enviroanalysis.com/iaq.htm)

This site explains one area to consider when conducting an environmental analysis:  indoor air quality.  Indoor air may not be as comfortable or safe as needed, which can affect the health and efficiency of employees.

[Specifying the Office](http://www.flexibility.co.uk/flexwork/offices/facilities4.htm)

This article from Flexibility, the Interactive Forum on New Ways of Working, explains how the office environment needs to change to encourage more dynamic ways of working.  Four types of work settings are mentioned:  hive, cell, den and club.

To help you understand the components of learner analyses, the following links are resources you can access.

[Mindtools](http://www.mindtools.com/swot.html)

This site explains the SWOT Analysis, an effective method of identifying Strengths and Weaknesses and the Opportunities and Threats employees may face. After carrying out an analysis using the SWOT framework, it may reveal useful changes.

[The Keirsey Temperment Sorter](http://www.keirsey.com/)

This site includes information on the four temperaments: rationals, idealists, artisans and guardians. It is complete with an online questionnaire.

[Index Of Learning Styles (ILS)](http://www.ncsu.edu/felder-public/ILSpage.html)

Dr. Richard Felder at North Carolina State University has a downloadable paper version of the Learning Styles inventory on his [Web site](http://www.ncsu.edu/felder-public/RMF.html).

[GSU Master Teacher Program: On Learning Styles](http://www.gsu.edu/~dschjb/wwwmbti.html)

This is a breakdown of the Myers-Briggs catagories with descriptions on how students learn and what they need to learn. Written by Harvey J. Brightman, Georgia State University.

[The Personality Type Test](http://www.humanmetrics.com/cgi-win/JTypes1.htm)

This is a modified version of the Jung- Myers-Briggs test. The inventory of 72 yes/no questions takes 10 minutes, if each question is considered carefully. After the inventory is scored you are given the results with links to explain your personality type.

**Techniques and Methods for Conducting a Front End Analysis**

**Criterion-Referenced Tests**

[NCREL, North Central Regional Educational Laboratory](http://www.ncrel.org/sdrs/areas/issues/methods/assment/as8lk3.htm)

**Focus Groups**

[Needs Focus Group Protocol](http://learningobjects.wesleyan.edu/downloads/focus_group_protocol.htm)

**Interviews**

[Needs Interview Protocol](http://edis.ifas.ufl.edu/fy393) from University of Florida

[Subject Matter Expert Interviews](http://techwhirl.com/technical-writing-foundations-mastering-the-art-of-the-sme-interview/) from University of Florida

**Questionnaires**

[Computer Knowledge Questionnaire](http://cehdclass.gmu.edu/ndabbagh/Resources/IDKB/techniques.htm)

**Standardized Tests**

[M.D. Angus and Associates Ltd.](http://www.psychtest.com/WhatAreS.html)

[Sample Test Questions from ACT](http://www.actstudent.org/sampletest/index.html)

**Performance Appraisals**

[Four Steps to Successful Performance Management Evaluations](http://hr.rpi.edu/update.do?artcenterkey=349)

**Observations**

[Observation Techniques for Performance Monitoring and Evaluation](http://www.ucsf.edu/aetcnec/evaluation/UseDirectObservationTechniques.pdf)

**Brainstorming**

[University of Colorado](http://www.colorado.edu/conflict/peace/treatment/brainstm.htm)

[Mindtools](http://www.mindtools.com/brainstm.html)

**Customer/User Studies**

[User Experience (UX) Design](http://uxdesign.com/)

[User Experience (UX) Community](http://www.uxmatters.com/topics/user-research/)

**Work Samples**

[Using work samples as tests to hire personnel](http://www.hr-guide.com/data/G316.htm)

**Survey**

[What is a survey?](http://www.amstat.org/sections/SRMS/whatsurvey.html)

[Seventh Grade Student Survey, Sidney Lanier Middle School](http://cehdclass.gmu.edu/ndabbagh/Resources/IDKB/survey_example.htm)

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| [**Develop Learner Outcomes / Performance Objectives**](http://cehdclass.gmu.edu/ndabbagh/Resources/IDKB/learning_domains.htm) |
| Identify behaviors, conditions, and criteria needed for performing and assessing |

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| **Techniques and Methods for Writing Objectives and Performance Outcomes** |
| |  |  |  |  | | --- | --- | --- | --- | | [Mager format](http://cehdclass.gmu.edu/ndabbagh/Resources/IDKB/objective_formats.htm#mager) | [Gagne/ Briggs format](http://cehdclass.gmu.edu/ndabbagh/Resources/IDKB/objective_formats.htm#g/b) | [ABCD (IDI) format](http://cehdclass.gmu.edu/ndabbagh/Resources/IDKB/objective_formats.htm#abcd) | [Comparison](http://cehdclass.gmu.edu/ndabbagh/Resources/IDKB/objective_formats.htm#table) | |

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| **Techniques and Methods for Assessing Learner Outcomes** |
| |  |  | | --- | --- | | [Pretests/ Posttests](javascript:openPopWin(%22assess_techniques.htm#preandposttests", 600, 325, "scrollbars,resizable", 20, 20)) | [Performance assessment](javascript:openPopWin(%22assess_techniques.htm#performance", 600, 350, "scrollbars,resizable", 20, 20)) | | [Peer / Self-evaluation assessment strategies](javascript:openPopWin(%22assess_techniques.htm#peerandself", 650, 250, "scrollbars,resizable", 20, 20)) | [Portfolio assessment](javascript:openPopWin(%22assess_techniques.htm#portfolio", 600, 225, "scrollbars,resizable", 20, 20)) | | [Norm-referenced tests (NRTs)](javascript:openPopWin(%22assess_techniques.htm#nrts", 600, 225, "scrollbars,resizable", 20, 20)) | [Criterion-referenced tests (CRTs)](javascript:openPopWin(%22assess_techniques.htm#crts", 600, 275, "scrollbars,resizable", 20, 20)) | | [Achievement tests](javascript:openPopWin(%22assess_techniques.htm#achievement", 600, 225, "scrollbars,resizable", 20, 20)) | [Observation](javascript:openPopWin(%22assess_techniques.htm#observation", 650, 375, "scrollbars,resizable", 20, 20)) | | [Interviews](javascript:openPopWin(%22assess_techniques.htm#interviews", 650, 250, "scrollbars,resizable", 20, 20)) | [Simulations](javascript:openPopWin(%22assess_techniques.htm#simulations", 700, 250, "scrollbars,resizable", 20, 20)) | | [Essays](javascript:openPopWin(%22assess_techniques.htm#essays", 650, 400, "scrollbars,resizable", 20, 20)) | [Recall items](javascript:openPopWin(%22assess_techniques.htm#recall", 650, 225, "scrollbars,resizable", 20, 20)) | | [Recognition items](javascript:openPopWin(%22assess_techniques.htm#recognition", 650, 225, "scrollbars,resizable", 20, 20)) | [Constructed answer items](javascript:openPopWin(%22assess_techniques.htm#constructedanswer", 600, 300, "scrollbars,resizable", 20, 20)) | | [Formative assessment](javascript:openPopWin(%22assess_techniques.htm#formative", 600, 225, "scrollbars,resizable", 20, 20)) | [Summative assessment](javascript:openPopWin(%22assess_techniques.htm#summative", 600, 225, "scrollbars,resizable", 20, 20)) | |

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| [**Matching Test Items to Learning Outcomes**](http://cehdclass.gmu.edu/ndabbagh/Resources/IDKB/tests.htm) |
| This matrix shows the type of test item (true/false, essay, checklists, etc.) most appropriate for each type of learning (domain, motor skill, verbal information...). |

**Techniques & Methods for Writing Objectives & Performance Outcomes**

[Gagne/ Briggs format](http://cehdclass.gmu.edu/ndabbagh/Resources/IDKB/objective_formats.htm#g/b) | [ABCD (IDI) format](http://cehdclass.gmu.edu/ndabbagh/Resources/IDKB/objective_formats.htm#abcd) | [Table of formats](http://cehdclass.gmu.edu/ndabbagh/Resources/IDKB/objective_formats.htm#table)

The purpose of instructional objectives and performance outcomes is to define the type of learning that will occur at the conclusion of instruction and how learning will be assessed. Both objectives and performance outcomes should be written as precisely as possible in order to best determine whether they have been achieved. In order to write accurate instructional objectives, a designer should be cognizant of the different learning domains as well as different formats for writing them. Here, we outline the three most prominent formats: the Mager format, the ABCD format, and the Gagné and Briggs format.

**The Mager Format**

In his book *Preparing Instructional Objectives: A Critical Tool in the Development of Effective Instruction*(1997), Mager outlines three important characteristics to include in all instructional objectives. They are:

1. **Performance** - An objective always states what a learner is expected to be able to do and/or produce to be considered competent.  
  
2. **Conditions** - An objective describes the important conditions (if any) under which the performance is to occur.  
  
3. **Criterion** - An objective describes the criteria of acceptable performance; that is, it says how well someone would have to perform to be considered competent.

Ultimately, the Mager format includes the learner's actions, the learning conditions, and the criteria for assessing the learner's performance The following are examples of the Mager format:

*Given a list of thirty five chemical elements (condition), the learner must be able to recall and write the valences (performance) of at least thirty (criterion).*

*Given a meter scale (condition), the learner is to be able to identify the value indicated by the position of the pointer (performance) as accurately as the construction of the meter will allow (criterion).*

**The Gagné and Briggs Format** ([TOP](http://cehdclass.gmu.edu/ndabbagh/Resources/IDKB/objective_formats.htm#top))

The Gagné and Briggs (1997) format for writing instructional objectives consists of five components. They are:

1. **Situation**
2. **Learned Capability**
3. **Object**
4. **Action**
5. **Tools and Other Constraints**

The components of the Gagné and Briggs format match Mager's condition, performance, and criterion, only to add the object, or content, of the learning activity as well as any tools used. Here are some examples of objectives according to Gagné & Briggs:

*Given a battery, light bulb, socket, and pieces of wire (situation), demonstrate (learned capability) the making of an electronic circuit (object) by connecting wires (action) to battery and socket (tools) and testing the lighting of the bulb (action).*

*In response to a question (situation), the learner will state (learned capability) orally (action) three technological trends that will affect the future capabilities of navies (object). The answer is to be completed in three minutes (constraints/tools).*

**The ABCD Format** ([TOP](http://cehdclass.gmu.edu/ndabbagh/Resources/IDKB/objective_formats.htm#top))

The name of the ABCD format for writing instructional objectives is simply a mneumonic for:

1. **Audience**
2. **Behavior**
3. **Condition**
4. **Degree**

These are the four components that comprise the instructional objective. Notice again that it is similar to Mager's format, yet includes an additional element for identifying the target audience. Below are examples of the ABCD format:

*Given all the basic shapes - cone, cylinder, cube, and sphere (condition), each second-semester geometry student (audience) will identify (behavior) orally each shape (degree).*

*Using tape recorded readings of the tryout sessions for the school play (condition), students in the drama class (audience) will select (behavior) the proper voice for each character as indicated in the drama text (degree).*

**Table: Comparison of Formats** ([TOP](http://cehdclass.gmu.edu/ndabbagh/Resources/IDKB/objective_formats.htm#top))

Seels & Glasgow (1990). *Exercises in Instructional Design.*Columbus, Ohio: Merrill Publishing Company.

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| **Component** | **Mager** | **Gagné & Briggs** | **ABCD** |
| **Performance** (What will be done) | Performance (Doing verb) | Learned capability, object, & action | Behavior |
| **Condition** (Under what) | Condition | Situation | Condition |
| **Criteria** (How well) | Criterion | Tools/Constraints | Degree |
| **Learner** (By whom) | (Implied) | (Implied) | Audience |

[Outcomes/ Objectives](http://cehdclass.gmu.edu/ndabbagh/Resources/IDKB/develop_objectives.htm)

[Embedded Theories](http://cehdclass.gmu.edu/ndabbagh/Resources/IDKB/models_theories.htm#theories) | [Principal Theorists](http://cehdclass.gmu.edu/ndabbagh/Resources/IDKB/models_theories.htm#theorists) | [Goals of Instruction](http://cehdclass.gmu.edu/ndabbagh/Resources/IDKB/models_theories.htm#goal) | [Instructional Models](http://cehdclass.gmu.edu/ndabbagh/Resources/IDKB/models_theories.htm#models) | [Implications for Instructional Design](http://cehdclass.gmu.edu/ndabbagh/Resources/IDKB/models_theories.htm#implications)

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| **Basic Principles** | | |
| **Objectivism/Behaviorism** | **Cognitivism/Pragmatism** | **Constructivism/Interpretivism** |
| Learning happens when a correct response is demonstrated following the presentation of a specific environmental stimulus  Learning can be detected by observing an organism over a period of time  Emphasis is on observable and measurable behaviors  Uses a "black box" metaphor - the learner is a black box, what happens inside is unknown  Emphasis is on relationships between environmental variables and behavior  Instruction utilizes consequences and reinforcement of learned behaviors  Believes behavior is guided by purpose  Cues are antecedents to behavior and set the conditions for its occurence | Learning is a change of knowledge state  Knowledge acquisition is described as a mental activity that entails internal coding and structuring by the learner  Learner is viewed as an active participant in the learning process  Emphasis is on the building blocks of knowledge (e.g. identifying prerequisite relationships of content)  Emphasis on structuring, organizing and sequencing information to facilitate optimal processing  Focus is on how learners remember, retrieve, and store information in memory  Examines the mental structure and processes related to learning  Learning is viewed as an active process that occurs within the learner and which can be influenced by the learner  The outcome of learning is not only dependent on what the teacher presents but also on what the learner does to process this information. | Learners build personal interpretation of the world based on experiences and interactions  Knowledge is embedded in the context in which it is used (authentic tasks in meaningful realistic settings)  Create novel and situation-specific understandings by "assembling" knowledge from diverse sources appropriate to the problem at hand (flexible use of knowledge)  Believes that there are many ways (multiple perspectives) of structuring the world and its entities  Believes that meaning is imposed by the individual rather than existing in the world independently |

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| **Embedded Theories** ([TOP](http://cehdclass.gmu.edu/ndabbagh/Resources/IDKB/models_theories.htm#top)) | | |
| **Objectivism/Behaviorism** | **Cognitivism/Pragmatism** | **Constructivism/Interpretivism** |
| [Pavlov's Classical Conditioning](javascript:openPopWin(%22theories.htm#classicalconditioning", 600, 310, "scrollbars,resizable", 20, 20))  [Skinner's Operant Conditioning](javascript:openPopWin(%22theories.htm#test", 600, 310, "scrollbars,resizable", 20, 20))  [Stimulus-Response Theory](javascript:openPopWin(%22theories.htm#stimulusresponse", 600, 300, "scrollbars,resizable", 20, 20))  [Thorndike's Laws and Connectionism](javascript:openPopWin(%22theories.htm#thorndike", 600, 225, "scrollbars,resizable", 20, 20))  [Information Processing](javascript:openPopWin(%22theories.htm#informationprocessing", 600, 325, "scrollbars,resizable", 20, 20)) | [Component Display Theory](javascript:openPopWin(%22theories.htm#componentdisplay", 600, 325, "scrollbars,resizable", 20, 20))  [Dual Coding Theory](javascript:openPopWin(%22theories.htm#dualcoding", 600, 325, "scrollbars,resizable", 20, 20))  [Elaboration Theory](javascript:openPopWin(%22theories.htm#elaboration", 600, 410, "scrollbars,resizable", 20, 20))  [Gestalt Theory](javascript:openPopWin(%22theories.htm#gestalttheory", 600, 375, "scrollbars,resizable", 20, 20))  [Mental Models](javascript:openPopWin(%22theories.htm#mentalmodels", 600, 425, "scrollbars,resizable", 20, 20))  [Schema Theory](javascript:openPopWin(%22theories.htm#schema", 600, 300, "scrollbars,resizable", 20, 20))  [Subsumption Theory](javascript:openPopWin(%22theories.htm#subsumption", 600, 275, "scrollbars,resizable", 20, 20)) | [Cognitive Flexibility Theory](javascript:openPopWin(%22theories.htm#cognitiveflexibility", 600, 420, "scrollbars,resizable", 20, 20))  [Generative Learning Theory](javascript:openPopWin(%22theories.htm#generativelearning", 600, 275, "scrollbars,resizable", 20, 20))  [Knowledge as Tools](javascript:openPopWin(%22theories.htm#knowledgeastools", 600, 520, "scrollbars,resizable", 20, 20))  [Situated Cognition](javascript:openPopWin(%22theories.htm#situatedcognition", 600, 450, "scrollbars,resizable", 20, 20))  [Social-Cultural Learning](javascript:openPopWin(%22theories.htm#socialculturallearning", 700, 600, "scrollbars,resizable", 20, 20)) |

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| **Principal Theorists** ([TOP](http://cehdclass.gmu.edu/ndabbagh/Resources/IDKB/models_theories.htm#top)) | | |
| **Objectivism/Behaviorism** | **Cognitivism/Pragmatism** | **Constructivism/Interpretivism** |
| [Bandura](javascript:openPopWin(%22theorists.htm#bandura", 600, 375, "scrollbars,resizable", 20, 20))  [Pavlov](javascript:openPopWin(%22theorists.htm#pavlov", 775, 600, "scrollbars,resizable", 20, 20))  [Skinner](javascript:openPopWin(%22theorists.htm#skinner", 600, 225, "scrollbars,resizable", 20, 20))  [Thorndike](javascript:openPopWin(%22theorists.htm#thorndike", 600, 250, "scrollbars,resizable", 20, 20)) | [Anderson](javascript:openPopWin(%22theorists.htm#anderson", 650, 550, "scrollbars,resizable", 20, 20))  [Ausubel](javascript:openPopWin(%22theorists.htm#ausubel", 600, 275, "scrollbars,resizable", 20, 20))  [Gardner](javascript:openPopWin(%22theorists.htm#gardner", 700, 550, "scrollbars,resizable", 20, 20))  [Gagné](javascript:openPopWin(%22theorists.htm#gagne", 600, 340, "scrollbars,resizable", 20, 20))  [Merrill](javascript:openPopWin(%22theorists.htm#merrill", 600, 350, "scrollbars,resizable", 20, 20))  [Norman](javascript:openPopWin(%22theorists.htm#rummelhartandnorman", 600, 450, "scrollbars,resizable", 20, 20))  [Novak](javascript:openPopWin(%22theorists.htm#novak", 600, 300, "scrollbars,resizable", 20, 20))  [Reigeluth](javascript:openPopWin(%22theorists.htm#reigeluth", 600, 550, "scrollbars,resizable", 20, 20))  [Rummelhart](javascript:openPopWin(%22theorists.htm#rummelhartandnorman", 600, 475, "scrollbars,resizable", 20, 20)) | [Bransford and the CTGV](javascript:openPopWin(%22theorists.htm#bransford", 600, 450, "scrollbars,resizable", 20, 20))  [Bruner](javascript:openPopWin(%22theorists.htm#bruner", 650, 575, "scrollbars,resizable", 20, 20))  [Dewey](javascript:openPopWin(%22theorists.htm#dewey", 600, 500, "scrollbars,resizable", 20, 20))  [Grabinger](javascript:openPopWin(%22theorists.htm#grabinger", 600, 225, "scrollbars,resizable", 20, 20))  [Lave & Wenger](javascript:openPopWin(%22theorists.htm#laveandwenger", 650, 575, "scrollbars,resizable", 20, 20))  [Papert](javascript:openPopWin(%22theorists.htm#papert", 650, 580, "scrollbars,resizable", 20, 20))  [Piaget](javascript:openPopWin(%22theorists.htm#piaget", 600, 375, "scrollbars,resizable", 20, 20))  [Spiro and colleagues](javascript:openPopWin(%22theorists.htm#spiro", 600, 425, "scrollbars,resizable", 20, 20))  [Vygotsky](javascript:openPopWin(%22theorists.htm#vygotsky", 600, 425, "scrollbars,resizable", 20, 20)) |

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| **Goals of Instruction** ([TOP](http://cehdclass.gmu.edu/ndabbagh/Resources/IDKB/models_theories.htm#top)) | | |
| **Objectivism** | **Cognitivism/Pragmatism** | **Constructivism/Interpretivism** |
| Communicate or transfer behaviors representing knowledge and skills to the learner (does not consider mental processing)  Instruction is to elicit the desired response from the learner who is presented with a target stimulus  Learner must know how to execute the proper response as well as the conditions under which the response is made  Learner acquires skills of discrimination (recalling facts), generalization (defining and illustrating concepts), association (applying explanations), and chaining (automatically performing a specified procedure). | Communicate or transfer knowledge in the most efficient, effective manner (mind-independent, can be mapped onto learners)  Focus of instruction is to create learning or change by encouraging the learner to use appropriate learning strategies  Learning results when information is stored in memory in an organized, meaningful way.  Teachers/designers are responsible for assisting learners in organizing information in an optimal way so that it can be readily assimilated | Build personal interpretations of the world based on individual experiences and interactions (constantly open to change, cannot achieve a predetermined, "correct" meaning, knowledge emerges in relevant contexts)  Learning is an active process of constructing rather than acquiring knowledge  Instruction is a process of supporting knowledge construction rather than communicating knowledge  Do not structure learning for the task, but engage learner in the actual use of the tools in real world situations  Learning activities should be authentic and should center around the ?problematic? or ?puzzlement? as perceived by the learner  The focus is on the process not the product  Role of teacher is a mentor not a ?teller?  Encourage reflective thinking, higher-order learning skills  Encourage testing viability of ideas and seeking alternative views |

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| **Instructional Models** ([TOP](http://cehdclass.gmu.edu/ndabbagh/Resources/IDKB/models_theories.htm#top)) | | |
| **Objectivism** | **Cognitivism/Pragmatism** | **Constructivism/Interpretivism** |
| [Computer-Based Instruction](javascript:openPopWin(%22models.htm#computerbasedinstruction", 600, 300, "scrollbars,resizable", 20, 20))  [Contract Learning](javascript:openPopWin(%22models.htm#contractlearning", 600, 375, "scrollbars,resizable", 20, 20))  [Individualized Instruction](javascript:openPopWin(%22models.htm#individualizedinstruction", 600, 225, "scrollbars,resizable", 20, 20))  [Programmed Instruction](javascript:openPopWin(%22models.htm#programmedinstruction", 600, 275, "scrollbars,resizable", 20, 20))  [Information Processing Model](javascript:openPopWin(%22models.htm#informationprocessing", 600, 320, "scrollbars,resizable", 20, 20))  [Systems Approach](javascript:openPopWin(%22models.htm#systemsapproach", 600, 225, "scrollbars,resizable", 20, 20)) | [Collins & Stevens Inquiry Teaching Model](javascript:openPopWin(%22models.htm#inquiryteaching", 600, 320, "scrollbars,resizable", 20, 20))  [Keller's ARCS Model of Motivation](javascript:openPopWin(%22models.htm#ARCS", 620, 500, "scrollbars,resizable", 20, 20))  [Merrill?s Component Display Model](javascript:openPopWin(%22models.htm#CDM", 600, 500, "scrollbars,resizable", 20, 20)) | [Action Learning](javascript:openPopWin(%22models.htm#actionlearning", 800, 600, "scrollbars,resizable", 20, 20))  [Anchored Instruction](javascript:openPopWin(%22models.htm#anchoredinstruction", 650, 520, "scrollbars,resizable", 20, 20))  [Authentic Learning](javascript:openPopWin(%22models.htm#authenticlearning", 600, 475, "scrollbars,resizable", 20, 20))  [Case-Based Learning](javascript:openPopWin(%22models.htm#casebasedlearning", 600, 500, "scrollbars,resizable", 20, 20))  [Cognitive Apprenticeship](javascript:openPopWin(%22models.htm#cognitiveapprenticeship", 600, 450, "scrollbars,resizable", 20, 20))  [Cognitive Flexibility Hypertext](javascript:openPopWin(%22models.htm#cognitiveflexibility", 600, 225, "scrollbars,resizable", 20, 20))  [Collaborative Learning](javascript:openPopWin(%22models.htm#collaborativelearning", 600, 500, "scrollbars,resizable", 20, 20))  [Communities of Practice](javascript:openPopWin(%22models.htm#communitiesofpractice", 600, 225, "scrollbars,resizable", 20, 20))  [Computer-Supported Intentional Learning Environments (CSILEs)](javascript:openPopWin(%22models.htm#CSILES", 600, 225, "scrollbars,resizable", 20, 20))  [Discovery Learning](javascript:openPopWin(%22models.htm#discoverylearning", 600, 275, "scrollbars,resizable", 20, 20))  [Distributed Learning](javascript:openPopWin(%22models.htm#distributedlearning", 600, 300, "scrollbars,resizable", 20, 20))  [Epistemic Games](javascript:openPopWin(%22models.htm#epistemicgames", 600, 225, "scrollbars,resizable", 20, 20))  [Generative learning](javascript:openPopWin(%22models.htm#generativelearning", 600, 225, "scrollbars,resizable", 20, 20))  [Goal-Based Scenarios (GBSs)](javascript:openPopWin(%22models.htm#goalbasedscenarios", 600, 275, "scrollbars,resizable", 20, 20))  [Inquiry-Based Learning](javascript:openPopWin(%22models.htm#inquirybasedlearning", 600, 225, "scrollbars,resizable", 20, 20))  [Microworlds/Simulations](javascript:openPopWin(%22models.htm#microworlds_simulations", 600, 375, "scrollbars,resizable", 20, 20))  [MOOs and MUDs](javascript:openPopWin(%22models.htm#moosandmuds", 600, 320, "scrollbars,resizable", 20, 20))  [Problem-Based Learning (PBL)](javascript:openPopWin(%22models.htm#problembasedlearning", 600, 475, "scrollbars,resizable", 20, 20))  [REALs](javascript:openPopWin(%22models.htm#reals", 600, 510, "scrollbars,resizable", 20, 20))  [Reciprocal Teaching](javascript:openPopWin(%22models.htm#reciprocalteaching", 600, 275, "scrollbars,resizable", 20, 20))  [Situated Learning](javascript:openPopWin(%22models.htm#situatedlearning", 650, 650, "scrollbars,resizable", 20, 20))  [WebQuest(s)](javascript:openPopWin(%22models.htm#webquests", 600, 300, "scrollbars,resizable", 20, 20)) |

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| **Implications for Instructional Design**([TOP](http://cehdclass.gmu.edu/ndabbagh/Resources/IDKB/models_theories.htm#top)) | | |
| **Objectivism/Behaviorism** | **Cognitivism/Pragmatism** | **Constructivism/Interpretivism** |
| [Behavioral objectives](javascript:openPopWin(%22implications.htm#behavioralobjectives", 600, 325, "scrollbars,resizable", 20, 20))  [Dick & Carey instructional design model](javascript:openPopWin(%22implications.htm#dickandcareymodel", 650, 575, "scrollbars,resizable", 20, 20))  [Performance-based assessment](javascript:openPopWin(%22implications.htm#performancebasedassessment", 600, 400, "scrollbars,resizable", 20, 20))  [Systems models](javascript:openPopWin(%22implications.htm#systemsmodels", 600, 390, "scrollbars,resizable", 20, 20))  [Events of Instruction](javascript:openPopWin(%22models.htm#eventsofinstruction", 600, 420, "scrollbars,resizable", 20, 20)) | [Cognitive objectives](javascript:openPopWin(%22implications.htm#cognitiveobjectives", 600, 225, "scrollbars,resizable", 20, 20))  [Learning strategies](javascript:openPopWin(%22implications.htm#learningstrategies", 600, 350, "scrollbars,resizable", 20, 20))  [Learning taxonomies (Gagné's intellectual skills)](javascript:openPopWin(%22implications.htm#learningtaxonomies", 600, 225, "scrollbars,resizable", 20, 20))  [Prerequisite skills](javascript:openPopWin(%22implications.htm#prerequisiteskills", 600, 250, "scrollbars,resizable", 20, 20))  [Task analysis](javascript:openPopWin(%22implications.htm#taskanalysis", 600, 500, "scrollbars,resizable", 20, 20)) | [Authentic assessment methods](javascript:openPopWin(%22implications.htm#authenticassessment", 600, 520, "scrollbars,resizable", 20, 20))  [Learning through exploration](javascript:openPopWin(%22implications.htm#learningthroughexploration", 600, 330, "scrollbars,resizable", 20, 20))  [Problem-oriented activities](javascript:openPopWin(%22implications.htm#problemorientedactivities", 600, 330, "scrollbars,resizable", 20, 20))  ["Rich" environments](javascript:openPopWin(%22implications.htm#richenvironments", 600, 400, "scrollbars,resizable", 20, 20))  [Visual formats and mental models](javascript:openPopWin(%22implications.htm#visualformats", 600, 320, "scrollbars,resizable", 20, 20)) |

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| **Behaviorism** | **Cognitivism** | **Constructivism** |
| [Building fluency](javascript:openPopWin(%22strategies.htm#fluency", 600, 225, "scrollbars,resizable", 20, 20))  [Chaining](javascript:openPopWin(%22strategies.htm#chaining", 600, 225, "scrollbars,resizable", 20, 20))  [Drill and practice](javascript:openPopWin(%22strategies.htm#drillandpractice", 600, 245, "scrollbars,resizable", 20, 20))  [Fading](javascript:openPopWin(%22strategies.htm#fading", 600, 225, "scrollbars,resizable", 20, 20))  [Instructional cues](javascript:openPopWin(%22strategies.htm#cues", 600, 250, "scrollbars,resizable", 20, 20))  [Negative reinforcement](javascript:openPopWin(%22strategies.htm#negativereinforcement", 600, 225, "scrollbars,resizable", 20, 20))  [Positive reinforcement](javascript:openPopWin(%22strategies.htm#positivereinforcement", 600, 225, "scrollbars,resizable", 20, 20))  [Punishment](javascript:openPopWin(%22strategies.htm#punishment", 600, 250, "scrollbars,resizable", 20, 20))  [Reinforcement removal](javascript:openPopWin(%22strategies.htm#reinforcementremoval", 600, 285, "scrollbars,resizable", 20, 20))  [Shaping](javascript:openPopWin(%22strategies.htm#shaping", 600, 225, "scrollbars,resizable", 20, 20)) | [Accretion](javascript:openPopWin(%22strategies.htm#accretion", 600, 225, "scrollbars,resizable", 20, 20))  [Advance organizers](javascript:openPopWin(%22strategies.htm#advanceorganizers", 600, 530, "scrollbars,resizable", 20, 20))  [Anchoring ideas](javascript:openPopWin(%22strategies.htm#anchoringideas", 600, 225, "scrollbars,resizable", 20, 20))  [Chunking information](javascript:openPopWin(%22strategies.htm#chunkinginformation", 600, 350, "scrollbars,resizable", 20, 20))  [Clarify subsumption](javascript:openPopWin(%22strategies.htm#clarifysubsumption", 600, 270, "scrollbars,resizable", 20, 20))  [Comparative organizers](javascript:openPopWin(%22strategies.htm#comparativeorganizers", 600, 225, "scrollbars,resizable", 20, 20))  [Comprehension monitoring strategies](javascript:openPopWin(%22strategies.htm#comprehensionmonitoring", 600, 225, "scrollbars,resizable", 20, 20))  [Concept mapping](javascript:openPopWin(%22strategies.htm#conceptmapping", 600, 225, "scrollbars,resizable", 20, 20))  [Examples and matched nonexamples](javascript:openPopWin(%22strategies.htm#discriminate", 600, 460, "scrollbars,resizable", 20, 20))  [Gagné's events of instruction](javascript:openPopWin(%22strategies.htm#nineevents", 760, 600, "scrollbars,resizable", 20, 20))  [Imagery](javascript:openPopWin(%22strategies.htm#imagery", 600, 225, "scrollbars,resizable", 20, 20))  [Logical sequencing of content](javascript:openPopWin(%22strategies.htm#sequencingcontent", 600, 225, "scrollbars,resizable", 20, 20))  [Metaphoric devices](javascript:openPopWin(%22strategies.htm#metaphoricdevices", 600, 225, "scrollbars,resizable", 20, 20))  [Mnemonics](javascript:openPopWin(%22strategies.htm#mnemonics", 600, 225, "scrollbars,resizable", 20, 20))  [Organizational techniques](javascript:openPopWin(%22strategies.htm#organizationaltechniques", 600, 225, "scrollbars,resizable", 20, 20))  [Outlining](javascript:openPopWin(%22strategies.htm#outlining", 600, 225, "scrollbars,resizable", 20, 20))  [Pattern recognition](javascript:openPopWin(%22strategies.htm#patternrecognition", 600, 225, "scrollbars,resizable", 20, 20))  [Repetition](javascript:openPopWin(%22strategies.htm#repetition", 600, 225, "scrollbars,resizable", 20, 20))  [Self-questioning](javascript:openPopWin(%22strategies.htm#selfquestioning", 600, 225, "scrollbars,resizable", 20, 20))  [Summarization](javascript:openPopWin(%22strategies.htm#summarization", 600, 360, "scrollbars,resizable", 20, 20))  [Synthesis vs. Singling out](javascript:openPopWin(%22strategies.htm#synthesis", 600, 340, "scrollbars,resizable", 20, 20))  [Tuning](javascript:openPopWin(%22strategies.htm#tuning", 600, 225, "scrollbars,resizable", 20, 20)) | [Articulation](javascript:openPopWin(%22strategies.htm#articulation", 600, 225, "scrollbars,resizable", 20, 20))  [Authentic learning activities](javascript:openPopWin(%22strategies.htm#authenticlearningactivities", 600, 225, "scrollbars,resizable", 20, 20))  [Coaching](javascript:openPopWin(%22strategies.htm#coaching", 600, 225, "scrollbars,resizable", 20, 20))  [Cognitive conflicts](javascript:openPopWin(%22strategies.htm#cognitiveconflicts", 600, 250, "scrollbars,resizable", 20, 20))  [Cognitive reflexivity](javascript:openPopWin(%22strategies.htm#cognitivereflexivity", 600, 225, "scrollbars,resizable", 20, 20))  [Collaboration and social negotiation](javascript:openPopWin(%22strategies.htm#collaboration", 600, 225, "scrollbars,resizable", 20, 20))  [Cultural diversity](javascript:openPopWin(%22strategies.htm#culturaldiversity", 600, 225, "scrollbars,resizable", 20, 20))  [Encourage curiosity](javascript:openPopWin(%22strategies.htm#encouragecuriousity", 600, 250, "scrollbars,resizable", 20, 20))  [Enhance relevance](javascript:openPopWin(%22strategies.htm#enhancerelevance", 600, 250, "scrollbars,resizable", 20, 20))  [Enrich the learning environment](javascript:openPopWin(%22strategies.htm#enrichlearningenvironment", 600, 350, "scrollbars,resizable", 20, 20))  [Exploration](javascript:openPopWin(%22strategies.htm#exploration", 600, 225, "scrollbars,resizable", 20, 20))  [Hypothesis generation](javascript:openPopWin(%22strategies.htm#hypothesisgeneration", 600, 225, "scrollbars,resizable", 20, 20))  [Learning by discovery](javascript:openPopWin(%22strategies.htm#learningbydiscovery", 600, 225, "scrollbars,resizable", 20, 20))  [Modeling and explaining](javascript:openPopWin(%22strategies.htm#modelingandexplaining", 600, 225, "scrollbars,resizable", 20, 20))  [Multiple perspectives and case-based reasoning](javascript:openPopWin(%22strategies.htm#multipleperspectives", 600, 225, "scrollbars,resizable", 20, 20))  [Problem-solving activities](javascript:openPopWin(%22strategies.htm#problemsolvingactivities", 600, 270, "scrollbars,resizable", 20, 20))  [Reflection (imitation, replay, etc.)](javascript:openPopWin(%22strategies.htm#reflection", 600, 225, "scrollbars,resizable", 20, 20))  [Role-playing](javascript:openPopWin(%22strategies.htm#roleplaying", 600, 225, "scrollbars,resizable", 20, 20))  [Scaffolding](javascript:openPopWin(%22strategies.htm#scaffolding", 600, 225, "scrollbars,resizable", 20, 20))  [Self-directed learning](javascript:openPopWin(%22strategies.htm#selfdirectedlearning", 600, 225, "scrollbars,resizable", 20, 20)) |

[Hypermedia/ Exploratory Media](http://cehdclass.gmu.edu/ndabbagh/Resources/IDKB/delivery_media.htm#hypermedia) | [Dialogical Media](http://cehdclass.gmu.edu/ndabbagh/Resources/IDKB/delivery_media.htm#dialogical) | [Integrational Media](http://cehdclass.gmu.edu/ndabbagh/Resources/IDKB/delivery_media.htm#integrational) | [Emerging Technologies](http://cehdclass.gmu.edu/ndabbagh/Resources/IDKB/delivery_media.htm#emergingtechnologies)

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| **Non-Instructional Interventions** |
| |  |  |  | | --- | --- | --- | | [Expert systems](javascript:openPopWin(%22media_defin.htm#expertsystems", 600, 225, "scrollbars,resizable", 20, 20)) | [Job aids](javascript:openPopWin(%22media_defin.htm#jobaids", 600, 250, "scrollbars,resizable", 20, 20)) | [Performance support systems](javascript:openPopWin(%22media_defin.htm#performancesupportsystems", 600, 225, "scrollbars,resizable", 20, 20)) | |

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| **Instructor-Based Media** |
| |  |  |  | | --- | --- | --- | | One-to-one | Small group | Large class | |

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| **Text-Based Media** |
| |  |  |  | | --- | --- | --- | | Manual/ workbook | Textbook | [Programmed instruction](javascript:openPopWin(%22media_defin.htm#programmedinstruction", 600, 225, "scrollbars,resizable", 20, 20)) | |

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| **Multimedia** | | |
| **Simple Presentation Media** | **Computer Mediated Instruction** | **Simulated Instruction** |
| Audio  Overhead  Slides | [Computer-based instruction](javascript:openPopWin(%22media_defin.htm#computerbasedinstruction", 600, 225, "scrollbars,resizable", 20, 20))  [Intelligent tutoring systems](javascript:openPopWin(%22media_defin.htm#intelligenttutoring", 600, 225, "scrollbars,resizable", 20, 20)) | Board games  [Manipulatives](javascript:openPopWin(%22media_defin.htm#manipulatives", 600, 225, "scrollbars,resizable", 20, 20))  Models (physical/ tactile)  Puzzles |

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| **Hypermedia and/or Exploratory Media**([TOP](http://cehdclass.gmu.edu/ndabbagh/Resources/IDKB/delivery_media.htm#top)) | | |
| Derived from the term hypertext, hypermedia uses computer-addressable files that embed hyperlinks to multimedia information and/or objects. Hypermedia links are usually contained in Web documents and in instructional products generated through the use of authoring tools, and include text, graphic images, video, audio, and animation displays.  Exploratory media is based on the theoretical construct of discovery learning. Learners are provided with a scientific inquiry in a given content area and asked to gather relevant information using a variety of resources provided within Web-based instruction through the use of external resources. | | |
| **Associated Technologies** | **Theoretical Constructs/ Models\*** | **Strategies\*\*** |
| [Animation](javascript:openPopWin(%22media_defin.htm#animation", 600, 225, "scrollbars,resizable", 20, 20))  [Digital audio & video](javascript:openPopWin(%22media_defin.htm#audiovideo", 600, 500, "scrollbars,resizable", 20, 20))  [Direct manipulation interface](javascript:openPopWin(%22media_defin.htm#directmanipulation", 600, 325, "scrollbars,resizable", 20, 20))  [Graphics](javascript:openPopWin(%22media_defin.htm#graphics", 600, 225, "scrollbars,resizable", 20, 20))  [Hyperlinks/ Hypertext](javascript:openPopWin(%22media_defin.htm#hyperlinks", 600, 300, "scrollbars,resizable", 20, 20))  [Plug-ins](javascript:openPopWin(%22media_defin.htm#plugins", 600, 300, "scrollbars,resizable", 20, 20))  [Programs created in authoring systems](javascript:openPopWin(%22media_defin.htm#authoredprograms", 600, 225, "scrollbars,resizable", 20, 20))  [Search engines](javascript:openPopWin(%22media_defin.htm#searchengines", 600, 250, "scrollbars,resizable", 20, 20))  [Self-contained instructional modules](javascript:openPopWin(%22media_defin.htm#selfcontainedmodules", 600, 225, "scrollbars,resizable", 20, 20)) | Authentic activity  Discovery learning  Case-based learning  Cognitive flexibility hypertext  Contextualized learning  Experiential learning  Exploration  Guided learning-by-doing  Individualized instruction  Interactivity  Learner Control  Microworlds/ Simulations  Multimodal  Self-directed learning  Thematic-based learning | Articulation and self-reflection  Browsing  Chunking  Determining cause & effect  Feedback  Hypothesis formulation  Focused browsing  Learner-generated searches  Linking abstract concepts to case examples  Problem-solving  Promote active learning  Provide multiple perspectives  Remediation  Self-paced  Sequencing  Trial and error |

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| **Dialogical/ Collaborative Media (**[**TOP**](http://cehdclass.gmu.edu/ndabbagh/Resources/IDKB/delivery_media.htm#top)**)** | | |
| Dialogical, or collaborative, media is based on the pedagogical models of learning communities, knowledge building communities, communities of practice, and distributed learning. This type of media assists learners in constructing new knowledge primarily through dialogue as a form of an interaction. It can be facilitated through various asynchronous and synchronous technologies. | | |
| **Associated Technologies** | **Theoretical Constructs/ Models\*** | **Strategies\*\*** |
| **Asynchronous (events that take place independently in time)**  [Asynchronous learning networks](javascript:openPopWin(%22media_defin.htm#asynchronouslearningnetworks", 600, 225, "scrollbars,resizable", 20, 20))  [Bulletin boards/ discussion forums](javascript:openPopWin(%22media_defin.htm#bulletinboards", 600, 300, "scrollbars,resizable", 20, 20))  [Computer conferencing](javascript:openPopWin(%22media_defin.htm#computerconferencing", 600, 225, "scrollbars,resizable", 20, 20))  [CSILE](javascript:openPopWin(%22media_defin.htm#csile", 600, 250, "scrollbars,resizable", 20, 20))  [CSCW](javascript:openPopWin(%22media_defin.htm#cscw", 600, 250, "scrollbars,resizable", 20, 20))  [Document sharing](javascript:openPopWin(%22media_defin.htm#documentationsharing", 600, 300, "scrollbars,resizable", 20, 20))  [Email](javascript:openPopWin(%22media_defin.htm#email", 600, 300, "scrollbars,resizable", 20, 20))  [Groupware](javascript:openPopWin(%22media_defin.htm#groupware", 600, 300, "scrollbars,resizable", 20, 20))  [Listservs](javascript:openPopWin(%22media_defin.htm#listservs", 600, 250, "scrollbars,resizable", 20, 20))  **Synchronous (events that take place in real-time)**  [Groupware](javascript:openPopWin(%22media_defin.htm#groupware", 600, 300, "scrollbars,resizable", 20, 20))  [IRC](javascript:openPopWin(%22media_defin.htm#irc", 600, 250, "scrollbars,resizable", 20, 20))  [MEOWs](javascript:openPopWin(%22media_defin.htm#meows", 600, 375, "scrollbars,resizable", 20, 20))  [MOOs](javascript:openPopWin(%22media_defin.htm#moos", 600, 225, "scrollbars,resizable", 20, 20))  [MUDs](javascript:openPopWin(%22media_defin.htm#muds", 600, 225, "scrollbars,resizable", 20, 20))  [MUVEEs](javascript:openPopWin(%22media_defin.htm#muvees", 600, 375, "scrollbars,resizable", 20, 20))  [Shared synthetic environments](javascript:openPopWin(%22media_defin.htm#sharedsyntheticenviron", 600, 275, "scrollbars,resizable", 20, 20))  [Videoconferencing](javascript:openPopWin(%22media_defin.htm#videoconferencing", 600, 500, "scrollbars,resizable", 20, 20))  [Virtual chat](javascript:openPopWin(%22media_defin.htm#virtualchat", 600, 225, "scrollbars,resizable", 20, 20))  [Virtual communities](javascript:openPopWin(%22media_defin.htm#virtualcommunities", 600, 320, "scrollbars,resizable", 20, 20)) | Anthropomorphesis/ avatars  Collaborative learning  Computer-mediated communication  Cyberspace cultures  Distributed learning | Articulation  Brainstorming  Collaborative activities  Dynamic group interaction  Group and peer evaluations  Group self-management  Mentoring  Modeling  Negotiation, consensus building  Reflection  Role-playing  Synthesis |

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| **Integrational Media (**[**TOP**](http://cehdclass.gmu.edu/ndabbagh/Resources/IDKB/delivery_media.htm#top)**)** | | |
| Integrational media is based on the recent emergence of Web-based course authoring tools, such as WebCT, LearningSpace, and Blackboard. It attempts to merge elements of the instructional attributes of exploratory and dialogical learning environments into a central course or knowledge portal. It presents an opportunity to incorporate various instructional strategies using available features of software into a holistic course design. | | |
| **Associated Technologies** | **Theoretical Constructs/ Models\*** | **Strategies\*\*** |
| [**Web-based authoring tools**](javascript:openPopWin(%22media_defin.htm#webbasedauthoring", 600, 250, "scrollbars,resizable", 20, 20)) **(e.g. Dreamweaver, Authorware, Toolbook)**  [**Course management systems**](javascript:openPopWin(%22media_defin.htm#coursemanagement", 600, 300, "scrollbars,resizable", 20, 20)) **(e.g. WebCT, Blackboard)**  [**Learning management systems**](javascript:openPopWin(%22media_defin.htm#learningmanagement", 600, 250, "scrollbars,resizable", 20, 20)) **(e.g. Saba, Docent, THINQ TrainingServer, LearningSpace, TopClass)** | Collaborative  Computer-mediated communication  Distributed learning  Embedded authentic activities  Guided learning  Interactivity  Knowledge representation  Learner control  Multimodal  Self-directed learning | Articulation  Brainstorming  Collaborative activities  Group interaction On-line testing  Negotiation, concuss building  Reflection  Self and peer assessment  Synthesis |

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| **Emerging Technologies** ([TOP](http://cehdclass.gmu.edu/ndabbagh/Resources/IDKB/delivery_media.htm#top)) |
| |  |  |  | | --- | --- | --- | | [Assistive technologies](javascript:openPopWin(%22media_defin.htm#assistivetechnologies", 600, 225, "scrollbars,resizable", 20, 20)) | [Data mining](javascript:openPopWin(%22media_defin.htm#datamining", 600, 450, "scrollbars,resizable", 20, 20)) | [Digital libraries](javascript:openPopWin(%22media_defin.htm#digitallibraries", 600, 360, "scrollbars,resizable", 20, 20)) | | [Learning objects/ Shareable courseware](javascript:openPopWin(%22media_defin.htm#learningobjects", 600, 425, "scrollbars,resizable", 20, 20)) | [Modeling and visualization tools](javascript:openPopWin(%22media_defin.htm#modelingandvisualization", 600, 300, "scrollbars,resizable", 20, 20)) | [Peer-to-peer computing](javascript:openPopWin(%22media_defin.htm#peertopeercomputing", 600, 450, "scrollbars,resizable", 20, 20)) | | [Virtual reality](javascript:openPopWin(%22media_defin.htm#virtualreality", 650, 550, "scrollbars,resizable", 20, 20)) | [Wearable computers](javascript:openPopWin(%22media_defin.htm#wearablecomputers", 650, 425, "scrollbars,resizable", 20, 20)) | [Wireless Web](javascript:openPopWin(%22media_defin.htm#wirelessweb", 600, 425, "scrollbars,resizable", 20, 20)) | |

\*For more inforrmation on [Theoretical Constructs](http://cehdclass.gmu.edu/ndabbagh/Resources/IDKB/models_theories.htm#theories) or [Models](http://cehdclass.gmu.edu/ndabbagh/Resources/IDKB/models_theories.htm#models), visit [Select Instructional Models/ Theories to Develop Instructional Prototypes](http://cehdclass.gmu.edu/ndabbagh/Resources/IDKB/models_theories.htm).

\*\*For more information on strategies, visit [Support Instructional Models with Instructional Strategies and Tactics](http://cehdclass.gmu.edu/ndabbagh/Resources/IDKB/strategies_tactics.htm).

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| **Formative Evaluation** | |
| Coined by Michael Scriven (1967), the term "formative evaluation" is used for the type of evaluation that occurs during the developmental stage of the instructional design process (Seels & Glasgow, 1990). The instructional designer evaluates materials **during** the process of instructional development to determine where there are weaknesses in the instruction so that revisions can be made (Smith & Ragan, 1999). There are several variations of formative evaluation.  **Explore the models below to learn more.** | |
| **Dick & Carey** | **Flagg** |
| [Clinical (one-to-one evaluation)](javascript:openPopWin(%22eval_techniques.htm#clinicaleval", 600, 400, "scrollbars,resizable", 20, 20))  [Small group evaluation](javascript:openPopWin(%22eval_techniques.htm#smallgroup", 650, 625, "scrollbars,resizable", 20, 20))  [Field trial](javascript:openPopWin(%22eval_techniques.htm#fieldtrial", 650, 550, "scrollbars,resizable", 20, 20)) | [Needs assessment](javascript:openPopWin(%22eval_techniques.htm#needsassessment", 600, 225, "scrollbars,resizable", 20, 20))  [Pre-production formative evaluation](javascript:openPopWin(%22eval_techniques.htm#preproduction", 600, 260, "scrollbars,resizable", 20, 20))  [Production formative evaluation](javascript:openPopWin(%22eval_techniques.htm#production", 600, 260, "scrollbars,resizable", 20, 20))  [Implementation formative evaluation](javascript:openPopWin(%22eval_techniques.htm#implementation", 600, 280, "scrollbars,resizable", 20, 20)) |
| **Seels & Glasgow** | **Smith & Ragan** |
| [Internal review](javascript:openPopWin(%22eval_techniques.htm#expertreviews", 650, 450, "scrollbars,resizable", 20, 20))  [Tutorial and small-group tryouts](javascript:openPopWin(%22eval_techniques.htm#smallgroup", 650, 625, "scrollbars,resizable", 20, 20))  [Operational tryout](javascript:openPopWin(%22eval_techniques.htm#fieldtrial", 650, 550, "scrollbars,resizable", 20, 20)) | [Design reviews](javascript:openPopWin(%22eval_techniques.htm#designreviews", 700, 500, "scrollbars,resizable", 20, 20))  [Expert reviews](javascript:openPopWin(%22eval_techniques.htm#expertreviews", 650, 450, "scrollbars,resizable", 20, 20))  [Learner validation](javascript:openPopWin(%22eval_techniques.htm#learnervalidation", 600, 225, "scrollbars,resizable", 20, 20))  [Ongoing evaluation](javascript:openPopWin(%22eval_techniques.htm#ongoingevaluation", 600, 225, "scrollbars,resizable", 20, 20)) |
| **Tessmer** | **Evaluation for Technology-based Instruction** |
| [Expert review](javascript:openPopWin(%22eval_techniques.htm#expertreviews", 650, 450, "scrollbars,resizable", 20, 20))  [One-on-one evaluation](javascript:openPopWin(%22eval_techniques.htm#clinicaleval", 600, 400, "scrollbars,resizable", 20, 20))  [Small group evaluation](javascript:openPopWin(%22eval_techniques.htm#smallgroup", 650, 625, "scrollbars,resizable", 20, 20))  [Field test](javascript:openPopWin(%22eval_techniques.htm#fieldtrial", 650, 550, "scrollbars,resizable", 20, 20)) | [Rapid prototype](javascript:openPopWin(%22eval_techniques.htm#rapidprototype", 600, 225, "scrollbars,resizable", 20, 20))  [Alpha testing](javascript:openPopWin(%22eval_techniques.htm#alphatesting", 600, 375, "scrollbars,resizable", 20, 20))  [Beta testing](javascript:openPopWin(%22eval_techniques.htm#betatesting", 600, 275, "scrollbars,resizable", 20, 20)) |

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| **Summative Evaluation** | | |
| Instructional designers may be involved in evaluating the effectiveness of instructional materials **after** the materials have been implemented into the instructional contexts for which they were designed (Smith & Ragan, 1999). However, Seels & Glasgow (1990) find that "summative evaluation is seldom carried out by the designers responsible for developing the original instruction and is not an integral part of our system model" (p. 199). Nevertheless, it is important to be familiar with the process. Like formative evaluation, there are several variations of summative evaluation.  **Explore the models below to learn more.** | | |
| **Dick & Carey** | **Smith & Ragan** | **Kirkpatrick** |
| [Expert judgement](javascript:openPopWin(%22eval_techniques_summ.htm#expertjudgement", 600, 400, "scrollbars,resizable", 20, 20))  [Field trial](javascript:openPopWin(%22eval_techniques_summ.htm#fieldtrial", 600, 225, "scrollbars,resizable", 20, 20)) | [Determine goals of evaluation](javascript:openPopWin(%22eval_techniques_summ.htm#determinegoals", 600, 350, "scrollbars,resizable", 20, 20))  [Select indicators of success](javascript:openPopWin(%22eval_techniques_summ.htm#selectindicators", 600, 250, "scrollbars,resizable", 20, 20))  [Select orientation of evaluation](javascript:openPopWin(%22eval_techniques_summ.htm#selectorientation", 600, 275, "scrollbars,resizable", 20, 20))  [Select design of evaluation](javascript:openPopWin(%22eval_techniques_summ.htm#selectdesign", 600, 275, "scrollbars,resizable", 20, 20))  [Design or select evaluation measures](javascript:openPopWin(%22eval_techniques_summ.htm#selectevalmeasures", 600, 225, "scrollbars,resizable", 20, 20))  [Collect data](javascript:openPopWin(%22eval_techniques_summ.htm#collectdata", 600, 225, "scrollbars,resizable", 20, 20))  [Analyze data](javascript:openPopWin(%22eval_techniques_summ.htm#analyzedata", 600, 225, "scrollbars,resizable", 20, 20))  [Report results](javascript:openPopWin(%22eval_techniques_summ.htm#reportresults", 600, 325, "scrollbars,resizable", 20, 20)) | [Level 1 - Reaction](javascript:openPopWin(%22eval_techniques_summ.htm#level1", 600, 350, "scrollbars,resizable", 20, 20))  [Level 2 - Learning](javascript:openPopWin(%22eval_techniques_summ.htm#level2", 600, 325, "scrollbars,resizable", 20, 20))  [Level 3 - Transfer](javascript:openPopWin(%22eval_techniques_summ.htm#level3", 600, 325, "scrollbars,resizable", 20, 20))  [Level 4 - Results](javascript:openPopWin(%22eval_techniques_summ.htm#level4", 600, 375, "scrollbars,resizable", 20, 20))  Note: In Kirkpatrick's four-level model, evaluation always begins with Level 1 and each successive level builds on information gathered from the previous level. |

Scrieven, M. (1967). *The methodology of evaluation*(AERA Monograph series on curriculum evaluation, No. 1). Chicago IL: Rand McNally.

Seels, B. and Glasgow, Z. (1990). *Exercises in instructional design*. Columbus, Ohio: Merrill Publishing Company.

Smith, P. and Ragan, T. (1999). *Instructional design* (2nd ed.). New York: John Wiley & Sons, Inc.