Designing Student Centered e-Learning Environments
# Handout #1: Grounded Instructional Strategies

Grounded instructional strategies are rooted in established theories and research in human learning, and form the basis for designing alternative e-learning environments. Table 1 outlines the primary instructional events prescribed by various instructional strategies. Each strategy is grouped according to general approaches. Proceeding pages further details the events associated with each strategy.

Table 1. Primary events associated with grounded instructional strategies

| Learner-Centered Approaches | | |
|---|---|---|
| **Adaptive Instructional Design** (Schwartz, Lin, Brophy & Bransford, 1992) <br><br> 1. Look Ahead & Reflect Back <br> 2. Present Initial Challenge <br> 3. Generate Ideas <br> 4. Present Multiple Perspectives <br> 5. Research and Revise <br> 6. Test Your Mettle <br> 7. Go Public <br> 8. Progressive Deepening <br> 9. General Reflection and Decisions <br> 10. Assessment | **Collaborative Problem-Solving** (Nelson, 1992) <br><br> 1. Build Readiness <br> 2. Form and Norm Groups <br> 3. Determine Preliminary Problem <br> 4. Define and Assign Roles <br> 5. Engage in Problem-Solving <br> 6. Finalize Solution <br> 7. Synthesize and Reflect <br> 8. Assess Products and Processes <br> 9. Provide Closure | **Eight Events of Student-Centered Learning** (Hirumi, 2002, 1998, 1996) <br><br> 1. Set Learning Challenge <br> 2. Negotiate Goals and Objectives <br> 3. Negotiate Learning Strategy <br> 4. Construct Knowledge <br> 5. Negotiate Performance Criteria <br> 6. Assess Learning <br> 7. Provide Feedback (Steps 1-6) <br> 8. Communicate Results |
| **Inquiry Training** (Joyce, Weil, & Showers, 1992) <br><br> 1. Confrontation with the Problem <br> 2. Data Verification <br> 3. Data Experimentation <br> 4. Organizing, Formulating and Explanation <br> 5. Analysis of inquiry process | **WebQuest** (Dodge, 1998) <br><br> 1. Introduction <br> 2. Task <br> 3. Process <br> 4. Resources <br> 5. Evaluation <br> 6. Conclusion | **Constructivist Learning** (Jonassen, 1992) <br><br> 1. Select Problem <br> 2. Provide Related Cases <br> 3. Provide Information <br> 4. Provide Cognitive Tools <br> 5. Provide Conversation Tools <br> 6. Provide Social Support |
| **BSCS 5E Model** (Bybee, 2002) <br><br> 1. Engage <br> 2. Explore <br> 3. Explain <br> 4. Elaborate <br> 5. Evaluate | **Problem-Based Learning** (Barrows, 1985) <br><br> 1. Start New Class <br> 2. Start a New Problem <br> 3. Problem Follow-Up <br> 4. Performance Presentation(s) <br> 5. After Conclusion of Problem | **Inductive Thinking** (Taba, 1967) <br><br> 1. Concept Formation <br> 2. Interpretation of Data <br> 3. Application of Principles |
| **Jurisprudential Inquiry** (Oliver & Shaver, 1971) <br><br> 1. Orientation to the Case <br> 2. Identifying the Issues <br> 3. Taking Positions <br> 4. Exploring the Stance(s) <br> 5. Refining and Qualifying the Positions <br> 6. Testing Factual Assumptions Behind Qualified Positions | **Case-Based Reasoning** (Aamodt & Plaza, 1994) <br><br> 1. Present New Case/Problem <br> 2. Retrieve Similar Cases <br> 3. Reuse Information <br> 4. Revise Proposed Solution <br> 5. Retain Useful Experiences | |

Table 1 (con't). Primary events associated with grounded instructional strategies

## Experiential Approaches

| **Experiential Learning**<br>(Pfeiffer & Jones, 1975) | **Simulation Model**<br>(Joyce, Weil, & Showers, 1992) | **Learning by Doing**<br>(Schank, Berman & Macpherson, 1999) |
|---|---|---|
| 1. Experience<br>2. Publish<br>3. Process<br>4. Internalize<br>5. Generalize<br>6. Apply | 1. Orientation<br>2. Participant Training<br>3. Simulation Operations<br>4. Participant Debriefing<br>5. Appraise and redesign the simulation | 1. Define Goals<br>2. Set Mission<br>3. Present Cover Story<br>4. Establish Roles<br>5. Operate Scenarios<br>6. Provide Resources<br>7. Provide Feedback |

## Teacher-Directed Approaches

| **Nine Events of Instruction**<br>(Gagne, 1974, 1977) | **Direct Instruction**<br>(Joyce, Weil, & Showers, 1992) | **Elements of Lesson Design**<br>(Hunter, 1990) |
|---|---|---|
| 1. Gain Attention<br>2. Inform Learner of Objective(s)<br>3. Recall Prior Knowledge<br>4. Present Stimulus Materials<br>5. Provide Learning Guidance<br>6. Elicit Performance<br>7. Provide Feedback<br>8. Assess Performance<br>9. Enhance Retention and Transfer | 1. Orientation<br>2. Presentation<br>3. Structured Practice<br>4. Guided Practice<br>5. Independent Practice | 1. Anticipatory Set<br>2. Objective and Purpose<br>3. Input<br>4. Modeling<br>5. Check for Understanding<br>6. Guided Practice<br>7. Independent Practice |

## Alternative Approaches

| **4Mat System**<br>(McCarthy, 1987) | **SQR**<br>(Maier, 1996) | **SQ3R**<br>(Robinson, 1961) |
|---|---|---|
| 1. Create an experience<br>2. Reflect/Analyze experience<br>3. Integrate reflective analysis<br>4. Develop concepts/skills<br>5. Practice defined "givens"<br>6. Practice adding something<br>7. Analyze application<br>8. Apply to new experience | 1. Summarize<br>2. Question<br>3. Response | 1. Survey<br>2. Question<br>3. Read<br>4. Recite<br>5. Review |

## Learner-Centered Approaches to Teaching and Learning

**Adaptive Instructional Design**
(Schwartz, Lin, Brophy & Bransford, 1992)

The primary goal of this theory is to teach a deep understanding of disciplines, while simultaneously fostering the skills of problem-solving, collaboration and communication, through the use of problem-based learning, followed by more open-ended project based learning.

1. **Look Ahead and Reflect Back**
   1.1 Provides an understanding of the goals, context and challenges
   1.2 Provides an opportunity to try it right now (pretest)
   1.3 Consists of motivational series of images, narrative, and questions
   1.4 Helps students represent a specific problem as an example of a larger set of issues
2. **Present Initial Challenge**
   2.1 Helps students develop a shared, initial mental model of what's to be learned
   2.2 Challenge selection: Motivating, interesting, invites student-generated ideas
3. **Generate Ideas**
   3.1 Helps students make their own thinking explicit
   3.2 Helps students see what other students are thinking
   3.3 Encourages sharing of ideas
   3.4 Helps teacher assess current state of student knowledge
   3.5 Provides students with a baseline to more easily see how much they learn
4. **Present Multiple Perspectives**
   4.1 Provide a way to introduce students to vocabulary and perspectives of experts
   4.2 Allow students to compare their ideas to experts' ideas
   4.3 Provide guidance on what students need to learn about
   4.4 Provide expertise, guidance, models of social practice in the domain
   4.5 Provide realistic standards of performance
   4.6 Indicate that multiple perspectives exist in the domain
5. **Research and Revise** (to help students explore a challenge)
   5.1 Consult resources
   5.2 Collaborate with other students
   5.3 Listen to "just-in-time" lectures
   5.4 Complete skill-building lessons
   5.5 Look at legacies left by other students
   5.6 Conduct simulations and hands-on experiments
6. **Test Your Mettle** (formative assessment)
   6.1 Multiple choice tests, checklists, essays, experiments, projects
   6.2 Feedback suggests which resources to consult to reach target
7. **Go Public**
   7.1 Present best solutions (oral, multimedia, print) and leave legacy of tips and ideas for future students
   7.2 Makes thinking visible
   7.3 Helps students learn to assess others and themselves
   7.4 Helps set standards for achievement
   7.5 Helps students learn from each other
   7.6 Motivates students to do well

**Collaborative Problem-Solving**
(Nelson, 1992)

The goals are to develop content knowledge in complex domains, problem-solving and critical thinking skills, and collaborative skills. It should only be used when those types of learning are paramount and when the students and instructor are receptive to this approach to learning, with its shift in roles and power relationships.

1. **Build Readiness**
   1.1 Overview of collaborative problem solving process
   1.2 Develop an authentic problem or project scenario to anchor instructional and learning activities
   1.3 Provide instruction and practice in group process skills
2. **Form and Norm Groups**
   2.1 Form small heterogeneous work groups
   2.2 Encourage groups to establish operational guidelines
3. **Determine Preliminary Problem**
   3.1 Negotiate a common understanding of the problem
   3.2 Identify learning issues and goals
   3.3 Brainstorm preliminary solutions or project plans
   3.4 Select and develop initial design plan
   3.5 Identify sources of needed resources
   3.6 Gather preliminary information to validate the design plan
4. **Define and Assign Roles**
   4.1 Identify the principal roles needed to complete the design plan
   4.2 Negotiate the assignment of roles
5. **Engage in Problem-Solving**
   5.1 Refine and evolve the design plan
   5.2 Identify and assign tasks
   5.3 Acquire needed information, resources, and expertise
   5.4 Collaborate with instructor to acquire additional resources and skills needed
   5.5 Disseminate acquired information, resources, and expertise to the other group members
   5.6 Engage in solution- or project-development work
   5.7 Report regularly on individual contributions and group activities
   5.8 Participate in intergroup collaborations and evaluations
   5.9 Conduct formative evaluations of the solution or project
6. **Finalize Solution**
   6.1 Draft the final version of solution or project
   6.2 Conduct final evaluation or usability test of the solution or project
   6.3 Revise and complete the final version of the solution or project
7. **Synthesize and Reflect**
   7.1 Identify learning gains
   7.2 Debrief experiences and feelings about the process
   7.3 Reflect on group and individual learning processes
8. **Assess Products and Processes**
   8.1 Evaluate the products and artifact created
   8.2 Evaluate the processes used
9. **Provide Closure**

**Eight Events for Student Centered Learning**
(Hirumi, 2002, 1998, 1996)

Based on constructivist theories of human learning, Hirumi presents seven instructional events that occur during a course to help students construct their own meaning based on their own interests and prior knowledge structures, and to promote independent, life-long learning:

1. **Set Learning Challenge** (Authentic Problem) for class
2. **Negotiate Learning Goals and Objectives** with learners
3. **Negotiate Learning Strategy** with learners
4. Learners **Construct Knowledge**
5. **Negotiate Performance Criteria** with learners
6. **Assess Learning** (Self, Peer & Expert Assessment)
7. **Provide Feedback** (Throughout Steps 1-6)
8. **Communicate Results**

**Inquiry Training Model**
(Joyce, Weil, & Showers, 1992)

This model is designed to promote strategies of inquiry and the values and attitudes that are essential to an inquiring mind including: process skills (e.g., observing, collecting and organizing data), active learning, verbal expression, tolerance of ambiguity, and logical thinking.

1. **Confrontation** with the Problem
    1.1    Explain inquiry procedures
    1.2    Present discrepant event
2. **Data Gathering** - Verification
    2.1    Verify nature of objects and conditions
    2.2    Verify the occurrence of the problem situation
3. **Data Gathering** - Experimentation
    3.1    Isolate relevant variables
    3.2    Hypothesize (and test) casual relationships
4. **Organizing, Formulating and Explanation** - Formulate rules or explanations
5. **Analysis of Inquiry Process** - Analyze inquiry strategy and develop more effective ones.

**WebQuest**
(Dodge, 1998)

WebQuest is an inquiry-oriented strategy in which most or all of the information used by learners is drawn from the Web.

1. **The Introduction** orients students and captures their interest
2. **The Task** describes the activity's end product
3. **The Process** explains strategies students should use to complete the task
4. **The Resources** are the Web sites students use to complete the task
5. **The Evaluation** measures the results of the activity
6. **The Conclusion** sums up the activity and encourages students to reflect on its process and results

**Constructivist Learning**
(Jonassen, 1992)

The primary goal of this theory is to foster problem-solving and conceptual development. It is intended for ill-defined or ill-structured domains.

1. **Select Problem**
   1.1 Problem should be interesting, relevant and engaging, to foster learner ownership
   1.2 Problem should be ill-defined or ill-structured
   1.3 Problem should be authentic (what practitioners do)
   1.4 Problem design should address its context, representation, and manipulation space
2. **Provide Related Cases** or worked examples to enable case-based reasoning and enhance cognitive flexibility.
3. **Provide Information**
   3.1 Provide learner-selectable information just-in-time
   3.2 Available information should be relevant and easily accessible
4. **Provide Cognitive Tools** that scaffold required skills, including problem-representation, knowledge-modeling, performance-support, and information-gathering tools
5. **Provide Conversation and Collaboration Tools** to support discourse communities, knowledge-building communities, and/or communities of learners.
6. **Provide Social/Contextual Support** for the learning environment

Additional Instructional Activities to Support Learning:
- Model the performance and the covert cognitive processes
- Coach learners by providing motivational prompts, monitoring and regulating the learner's performance, provoking reflection, and/or perturbing learners' models.
- Scaffold the learner by adjusting task difficulty, restructuring the task, and/or providing alternative assessments

**BSCS 5E Model**
(Bybee, 2002)

The natural inquiry of children and problem-solving of adults follow a pattern of initial engagement, exploration of alternatives, formation of explanations, use of the explanations, and evaluation of the explanations based on efficacy and responses from others. Activities encourage conceptual change and a progressive re-forming of ideas.

1. **Engage** activities provide the opportunity for teachers to identify students' current concepts and misconceptions. Although provided by a teacher or structured by curriculum materials, these activities introduce major ideas in problem situations. How do students' explain this situation?
2. **Explore** activities provide a common set of experiences for students and opportunities for them to "test" their ideas with their own experiences and those of peers and the teacher. How do students' exploration and explanation of experiences compare with others?
3. **Explain** activities provide opportunities for students to use their previous experiences to recognize misconceptions and to begin making conceptual sense of the activities through construction of new ideas and understandings. Allows introduction of formal language, terms and content information that makes students' previous experiences easier to describe and explain.
4. **Elaborate** activities apply or extend the student's developing concepts in new activities and relate their previous experiences to the current activities. How does the new explanation work in a different situation?
5. **Evaluate** activities serve as a summative assessment of what students know and can do. How do students understand and apply concepts and abilities?

**Problem-Based Learning**
(Barrows, 1985)

Disenchanted with medical students' ability to apply information learned from lectures, Barrow's developed this model to enhance transfer.

1. **Start New Class**
   1.1  Introductions
   1.2  Climate Setting (including teacher/tutor role)
2. **Start New Problem**
   2.1  Set problem
   2.2  Bring problem home
   2.3  Describe the product/performance required
   2.4  Assign tasks
   2.5  Reason through the problem (i.e., ideas/hypotheses, facts, learning issues and action plan).
   2.6  Commitment as to probable outcome
   2.7  Learning issues shaping/assignment
   2.8  Resource identification
   2.9  Schedule follow-up
3. **Problem Follow-Up**
   3.1  Resources used and their critique
   3.2  Reassess the problem (i.e., ideas/hypotheses, facts, learning issues and action plan).
4. **Performance Presentation(s)**
5. **After Conclusion of Problem**
   5.1  Knowledge abstraction and summary
   5.2  Self-evaluation

**Inductive-Thinking Model**
(Taba, 1967)

Based on information-processing theories of human learning, the inductive-thinking model was developed to enhance students' acquisition of concepts, information processing skills as well as their convergent use of information to solve problems.

1. **Concept Formation**
   1.1  Enumeration and listing
   1.2  Grouping
   1.3  Labeling, Categorizing
2. **Interpretation of Data**
   2.1  Identify critical relationships
   2.2  Explore relationships
   2.3  Make inferences
3. **Application of Principles**
   3.1  Predicting consequences, explaining unfamiliar phenomena, hypothesizing
   3.2  Explaining and/or supporting the predictions and hypotheses
   3.3  Verifying predictions

**Jurisprudential Inquiry Approach**
(Oliver & Shaver, 1971)

Based on Socratic modes of discussion, the purpose of this model is to help students resolve complex, controversial issues within the context of a productive social order:

1. **Orientation** to the Case
2. **Identifying** the Issues
3. **Taking** Positions
4. **Exploring** the Stance(s), patterns of argumentation
5. **Refining and Qualifying** the positions
6. **Testing** Factual Assumptions behind qualified positions

**Case-Based Reasoning**
(Aamodt & Plaza, 1994)

Case-based reasoning is a problem solving paradigm that utilizes the *specific* knowledge of previously experienced, concrete problem situations (cases). A new problem is solved by finding a similar past case, and reusing it in the new problem situation.

1. **Present:** new case or problem
2. **Retrieve**: Given a target problem, retrieve cases from memory that are relevant to solving it. A case consists of a problem, its solution, and, typically, annotations about how the solution was derived. For example, suppose Fred wants to prepare blueberry pancakes. Being a novice cook, the most relevant experience he can recall is one in which he successfully made plain pancakes. The procedure he followed for making the plain pancakes, together with justifications for decisions made along the way, constitutes Fred's retrieved case.
3. **Reuse**: Map the solution from the previous case to the target problem. This may involve adapting the solution as needed to fit the new situation. In the pancake example, Fred must adapt his retrieved solution to include the addition of blueberries.
4. **Revise**: Having mapped the previous solution to the target situation, test the new solution in the real world (or a simulation) and, if necessary, revise. Suppose Fred adapted his pancake solution by adding blueberries to the batter. After mixing, he discovers that the batter has turned blue -- an undesired effect. This suggests the following revision: delay the addition of blueberries until after the batter has been ladled into the pan.
5. **Retain**: After the solution has been successfully adapted to the target problem, store the resulting experience as a new case in memory. Fred, accordingly, records his newfound procedure for making blueberry pancakes, thereby enriching his set of stored experiences, and better preparing him for future pancake-making demands.

## Experiential Approaches to Teaching and Learning

**Experiential Learning Model**
(Pfeiffer & Jones, 1975)

Based on the belief that people learn best by doing, the experiential learning model can start with didactic (passive) forms of instruction but soon progresses to experiential (active) forms of learning.

1. **Experience** – Immerse learner in "authentic" experience (e.g., real or simulated job task).
2. **Publish** – Talking or writing about experience. Sharing observations, thoughts, and feelings.
3. **Process** – Debrief: Interpret published information, defining patterns, discrepancies and overall dynamics, making sense of the information generated by group.
4. **Internalize** – Private process, learner reflects on lessons learned, means of managing conflicting data and requirements for future learning.
5. **Generalize** – Develop hypotheses, form generalizations and reach conclusions from information and knowledge gained from lesson.
6. **Apply** – Use information and knowledge gained from lesson to make decisions and solve problems.

**Simulation Model**
(Joyce, Weil, & Showers, 1992)

Based on the application of cybernetic principles to education, the purpose of this model is to help students develop skills and knowledge by examining the consequences of their actions.

1. **Orientation**
   1.1 Present broad topic of simulation and major concepts
   1.2 Explain simulation and gaming
   1.3 Give overview of the simulation
2. **Participant Training**
   2.1 Set-up scenario (rules, roles, procedures, scoring, types of decisions, goals)
   2.2 Assign roles
   2.3 Hold abbreviated practice session
3. **Simulation Operations**
   3.1 Conduct game activity and game administration
   3.2 Feedback and evaluation (of performance and effects of decisions)
   3.3 Clarify misconceptions
   3.4 Continue simulation
4. **Participant Debriefing**
   4.1 Summarize events and perceptions
   4.2 Summarize difficulties and insights
   4.3 Analyze process
   4.4 Compare simulation activity to the real world
   4.5 Appraise and redesign the simulation

**Learning by Doing**
(Schank, Berman & Macpherson, 1999)

The primary goal is to foster skill development and the learning of factual information in the context of how it will be used. Assumes that learning occurs best in context of a goal that is relevant, meaningful, and interesting to students, and when content knowledge is learned in context of relevant tasks closely related to how students will use it outside of the learning environment.

1. **Define Goals**
   1.1    Process knowledge goals
   1.2    Content knowledge goals
2. **Set Mission**
   2.1    Must be motivational
   2.2    Must be somewhat realistic
3. **Present Cover Story**
   3.1    Must be motivating and create the need for the mission
   3.2    Must allow enough opportunities to practice the skills and seek the knowledge
4. **Establish Roles** (who the students will play)
   4.1    Must be one who uses the necessary skills and knowledge
   4.2    Must be motivating
5. **Operate Scenarios**
   5.1    Must be closely related to both the mission and the goals
   5.2    Must have decision points with consequences that become evident
   5.3    The consequences must indicate progress toward completing the mission
   5.4    A negative consequence must be understand as an expectation failure
   5.5    Must be plenty of operations for the student to do (to spent most of their time practicing skills)
   5.6    Should not require more than what the goals call for
6. **Provide Resources**
   6.1    Must provide the information the students need to succeed in their mission
   6.2    Information must be well organized and readily accessible
   6.3    Information is often best provided in the form of stories
7. **Provide Feedback**
   7.1    Must be situated, so it is indexed properly as an expectation failure
   7.2    Must be just-in-time, so the student will use it
   7.3    Can be given in three ways (a) consequences of actions, (b) coaches, (c) domain experts' stories about similar experiences.

## Teacher-Directed Approaches to Teaching and Learning

**Nine Events of Instruction**
(Gagne, 1974, 1977; Gagne & Medsker, 1996)

Based on information processing theories and models of human learning, Gagne posits that every unit of instruction should contain the following nine events to facilitate student learning:

1. **Gain** Attention
2. **Inform** Learners of Objective(s)
3. **Stimulate** Recall of Prior Knowledge
4. **Present** Stimulus Materials
5. **Provide** Learning Guidance
6. **Elicit** Performance
7. **Provide** Feedback about Performance
8. **Assess** Performance
9. **Enhance** Retention and Transfer

**Direct Instruction Model**
(Joyce, Weil, & Showers, 1992)

Based on behaviorist theories of human learning, this model is designed to facilitate learning through stimulus-response conditioning and is said to generate and sustain motivation through pacing and reinforcement.

1. **Orientation**
   1.1 Establish lesson content
   1.2 Review previous learning
   1.3 Establish lesson objectives
   1.4 Establish lesson procedures
2. **Presentation**
   2.1 Explain/demonstrate new concept or skill
   2.2 Provide visual representation of task
   2.3 Check for understanding
3. **Structured Practice**
   3.1 Lead group through practice example in lock step
   3.2 Students respond to questions
   3.3 Provide corrective feedback for errors and reinforce correct practice
4. **Guided Practice**
   4.1 Students practice semi-independently
   4.2 Circulate, monitor student practice
   4.3 Provide feedback through praise, prompt, and leave
5. **Independent Practice**
   5.1 Students practice independently at home or in class
   5.2 Provide delayed feedback

**Elements of Lesson Design**
(Hunter, 1990)

Widely known model for preparing lesson plans taught to pre-service teachers. Often used to evaluate lesson plans prepared by practicing educators.

1. **Anticipatory Set** – How will students' attention be focused**?**
2. **Objective and Purpose** – What will students learn and why?
3. **Input** – What new information will be discussed?
4. **Modeling** – How can teacher illustrate new skill or content?
5. **Check for Understanding** – How can teacher determine if students are learning?
6. **Guided Practice** – What opportunities are given to practice new materials?
7. **Independent Practice** – How can assignments be used for retention and transfer?

## Alternative Approaches to Teaching and Learning

**4Mat
System Model**
(McCarthy, 1987)

Based on research and literature on learning styles, this eight-step cycle of instruction is meant to capitalize on students' learning styles and brain dominance processing strengths. Rather than focus on one learning style, this method encourages students to examine and experience all learning styles.

1. **Create** an experience
2. **Reflect/Analyze** Experience
3. **Integrate** reflective analysis into concepts
4. **Develop** concepts/skills
5. **Practice** defined "givens"
6. **Practice** adding something of oneself
7. **Analyze** application for relevance, usefulness
8. **Apply** to new more complex experience

**SQR Model**
(Maier, 1996)

This strategy is designed to encourage students' to take responsibility for their learning and to give students a way to generate their own ideas. In general, this strategy is geared toward enhancing student learning from reading, but may be applied in other context.

1. **Summarize**
   1.1 Read materials
   1.2 Write a summary of the materials in journal
2. **Question**
   2.1 Write question on the materials in journal
   2.2 Discuss summaries and questions in small group
   2.3 Select "best" question to share with whole class based on ability to provoke engaging discussions
   2.4 Discuss "best" questions with whole class utilizing questioning techniques
3. **Response** - Write a response to the small group or whole group class discussion (summary of main points)

**SQ3R Study
Strategy**
(Robinson, 1961)

This strategy is designed to help students develop their study skills, particularly in relation to reading assignments.

1. **Survey** - Readers preview materials to develop general outline for organizing information.
2. **Question** - Reader raises questions with expectation of finding answers in materials
3. **Read** - Reader attempts to answer questions by reading
4. **Recite** - Reader answers questions out loud or in writing
5. **Review** - Reader rereads portions of materials to verify answers given during previous step

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**Online Examples**

Adaptive Instructional Design (Schwartz, Lin, Brophy & Bransford, 1992):
http://www.personal.psu.edu/users/h/x/hxk208/INSYS525/K_base4.htm

BSCS 5E Model (Bybee, 2002):
http://cte.jhu.edu/techacademy/fellows/ullrich/webquest/ScienceLesson.html

Case-based reasoning (Aamodt & Plaza, 1994):
http://en.wikipedia.org/wiki/Case-based_reasoning

Collaborative Problem-Solving (Nelson, 1992):
http://www.personal.psu.edu/users/m/x/mxm939/Prob3.html

Constructivist Learning (Jonassen, 1992):
http://tiger.coe.missouri.edu/~jonassen/courses/CLE/index.html

Elements of Lesson Design (Hunter, 1990):
http://www.huntington.edu/education/lessonplanning/Hunter.html

Inductive Thinking (Taba, 1967):
http://imet.csus.edu/fundamentals/inductive/

Inquiry training (Joyce, Weil, & Showers, 1992):
http://www.sasked.gov.sk.ca/docs/policy/incel/section_4.html

Jurisprudential Inquiry (Oliver & Shaver, 1971):
http://www.tki.org.nz/r/health/cia/olympic/learn_e/own_e.php

Learning by doing (Schank et al, 1999):
http://www.engines4ed.org/hyperbook/nodes/NODE-121-pg.html

Nine Events of Instruction (Gagne, 1974, 1977):
http://tip.psychology.org/gagne.html

Problem-Based Learning (Barrows, 1985):
http://www.usc.edu/hsc/dental/ccmb/usc-csp/titlproclanelle.htm

Simulation model (Joyce, Weil, & Showers, 1992):
http://imet.csus.edu/imet6/morte/classes/281/Simulations.htm

SQR (Maier, 1996):
http://www.readingonline.org/electronic/nasa/sqr.htm

SQ3R (Robinson, 1961):
http://www.ncrel.org/litweb/adolescent/strategies/sq3r.php

WebQuest (Dodge, 1998):
http://projects.edtech.sandi.net/staffdev/buildingblocks/p-index.htm

4Mat System (McCarthy, 1987):
http://www.geocities.com/jeniskanen/4mat2.htm