

Type of Learning	Problem Solving	Declarative Knowledge	Concept Learning	Principle Learning	Learning Procedures	Cognitive Strategies	Attitude change, Motivation, and Interest	Psychomotor Skill Learning
<p>Highlights and Key Points</p>	<p>The ability to combine previously learned principles, procedures, declarative knowledge, and cognitive strategies in a unique way within a domain of content to solve previously un-encountered problems.</p> <p>Must involve the almost simultaneous consideration of principles and procedures within a domain, the careful selection of the principles and the sequencing of the application of the principles so a problem is solved.</p> <p>AKA heuristic problem solving – problem for which no clear procedural rule exists.</p> <p>Well-defined vs. ill-defined problems</p> <p>Clarify the problem space – goal state, given state, intermediate states.</p>	<p>Involves “knowing that” something is the case.</p> <p>Explain, Describe, Summarize, List</p> <p>It is the substance of much of our thinking.</p> <p>The learning of procedures requires a form of Declarative Knowledge.</p> <p>Labels and Names Facts and Lists Organized Discourse</p> <p>Procedural Knowledge must pass through a declarative knowledge stage.</p> <p>Is essential to learning intellectual skills.</p>	<p>One of the intellectual skills that involves the ability to apply knowledge across a variety of instances or circumstances.</p> <p>DK involves memorization of an association between two or more entities...</p> <p>Intellectual skills involve the ability to apply knowledge across a variety of previously un-encountered instances</p> <p>Two types of concepts: Abstract – non physical Concrete – physical Distinction can by “muddy”</p> <p>Two misunderstandings: 1. Confusing the learning of a concept with the learning of the definition of that concept. 2. Labeling of things versus identification of membership in a class of things.</p> <p>Concept learning allows a person to identify something when given a picture not previously seen.</p> <p>Concept learning is not the application of a principle that contains that concept</p> <p>Concepts have a DK aspect and a procedural knowledge aspect.</p> <p>Concept characteristics – attributes (p. 180): Intrinsic Functional Relational</p>	<p>Other terms used for principles are propositions, laws, axioms, theorems, and postulates.</p> <p>A principle describes the relationship between the concepts in the principle.</p> <p>The ability to state a principle is DK. The acquisition of a principle involves the ability to apply that principle to a variety of previously un-encountered situations.</p> <p>The mental operations involved in applying principles are called productions.</p> <p>Productions are implicit in all the intellectual skills</p> <p>Remember, problem solving is the selection of the appropriate principles to combine to solve a problem that requires application of several principles often concurrently, to solve it.</p>	<p>Procedures are often strictly defined – all steps are included and each step is unambiguous.</p> <p>An algorithm</p> <p>Decision points are points in a procedure at which the learner must determine which of two situations exist. Making decisions at these points requires a kind of concept recognition.</p> <p>Many tasks in mathematics that are called problem solving are really applications of procedures.</p> <p>Learners discover or are taught a procedure for solving some problems quickly: first determine what values are know, and then determine which form of the equation will solve for the unknown. With this approach learners can acquire an efficient means to deal with solving for an unknown, but at the same time they will truly understand what occurs when the procedure is employed through learning the principle that relates the relevant concepts.</p> <p>The ability to list or describe the steps in a procedure is DK learning.</p> <p>Learning the procedure involves the ability to apply that procedure to a variety of previously un-encountered situations.</p> <p>Demonstration of knowledge of a procedure requires actual application of it.</p> <p>Productions are implicit in</p>	<p>Cognitive strategies are those techniques that learners use to control and monitor their own cognitive processes. Two primary kinds: 1. For learning: Learning strategies are mental tactics for attending to organizing, elaborating, manipulating, and retrieving knowledge. 2. For thinking: Thinking strategies are mental tactics that lead to discovery, invention, or creativity.</p> <p>General problem-solving skills are a form of thinking strategy that is different from domain-specific problem solving.</p> <p>Learning Strategies When LS employed learners guide their own processing rather than having the processing guided or supplied by instruction.</p> <p>Processing strategies can be built into the instruction or built into the learners.</p> <p>Often discovered by good students.</p> <p>Cognitive domain strategies include selecting information to promote the encoding and storage of information and enhancing retrieval: (see p.231) 1. Organizing strategies 2. Elaborating “ 3. Rehearsing “ 4. Metacognitive “</p> <p>Affective domain strategies are those self-motivating skills that influence active engagement in learning tasks and maintain attitude conducive to learning: Eg. Time management,</p>		

					all the intellectual skills concepts, procedures, and problem solving.	Stress reduction, positive self talk. Divergent Thinking Strategies for general problem solving and a variety of thinking strategies. (review p.232 for details) 1. Individual techniques 2. Group techniques 3. Information processing 4. Understanding/search 5. Inspiration, intuition Certain uses of technology can enhance creativity. Six phase Synectics approach (see p.232)		
Cognitive Processes and/or Requirements	<p>Learners must possess and apply three kinds of knowledge: principles, declarative knowledge, and cognitive strategies.</p> <p>Ability to apply principles is most critical component</p> <p>Four components of cognitive processing in problem solving: Knowledge representation, solution planning, solution implementation, solution evaluation.</p> <p>9 step Problem Solving Task Analysis (see p. 135)</p>	<p>Primary form of representation of declarative knowledge is propositional networks.</p> <p>Propositions are the ideas, sentences contain more than one proposition.</p> <p>A network of propositions is the collection of many propositions linked together in some fashion.</p> <p>Schema Theory: Accretion, Tuning, Restructuring (see p.160)</p> <p>Process of learning declarative knowledge in four steps: 1. new knowledge is presented via some medium 2. material is translated by the learner into propositions 3. related propositions in learners memory are activated 4. elaborations are generated by the learner as new connections stimulate the making of inferences</p> <p>Critical cognitive activities in learning DK Linking Organizing Elaborating</p>	<p>Acquire a concept when learned to recognize a “pattern” in surroundings and consistently respond to that pattern, no matter what non-essential features may appear along with that pattern.</p> <p>Requires two processes Generalization Discrimination</p> <p>Generalize beyond the single instance to others that fall into the same category.</p> <p>Discriminate between examples and non-examples of the concept that may share some features with the concept but not the critical attributes.</p> <p>Ability to transfer the concept to settings other than the settings in which they first encountered it.</p> <p>Two caveats: Under-generalization Over-generalization</p> <p>Concepts are described in terms of increasing depth of processing: concrete,</p>	<p>The cognitive processes underlying knowing a principle can be identified in the productions associated with them.</p> <p>One of the main cognitive tasks in learning to apply a principle is learning to recognize the situation in which these two or more concepts are related so that the principle applies.</p> <p>The importance of understanding the relationship underlying the relationship is one reason why principles should be learned as principles rather than as procedures.</p>	<p>As with principles, procedures require that productions be learned.</p> <p>See page 214 for more details.</p> <p>Steps in a procedure may be decisional or operational.</p> <p>Procedures may be classified as simple or complex.</p> <p>Age, sophistication, and prior knowledge of the audience as well as difficulty of each step help designers determine whether to use a simple procedure (5-7 steps).</p>	<p>6 overarching processes involved in applying a cognitive strategy (see p. 233). Strongly resembles the information-processing analysis of traditional problem-solving.</p> <p>Cognitive strategies tend to be applicable across a variety of domains of content.</p> <p>Metacognitive skills must be learned along with the ability to apply a particular cognitive strategy.</p>		

			<p>identify, classificatory, and formal. These refer to the process of concept development.</p> <p>When concept learning has attained a formal level, an individual can identify examples and non-examples as well as name the concept and its defining attributes, provide a definition of the concept, and specify critical attributes of the concept, even those that differentiate it from closely related concepts.</p>					
Conditions Supporting Learning			<p>The essential condition in a concept lesson are the features that promote generalization and discrimination and reduce over-a and under-generalization.</p> <p>The most critical features of a concept lesson lie in the events in within the body of the lesson.</p>		<p>Clarify the procedure and list its steps and decisions in an unambiguous form.</p> <p>Guidelines:</p> <ul style="list-style-type: none"> - Clear sentences - Careful cognitive task analysis - each step a single action - Each decision should be dichotomous - Decision steps in the form of questions - Operational steps stated as imperative sentences 			
Instructional Strategies	<p>The design of problem-solving instructions will vary depending on how well defined the problem is.</p>	<p>8 Major categories p. 161:</p> <ul style="list-style-type: none"> Organization strategies Classification Frames Concept Mapping Advance Organizers Metaphoric Techniques Rehearsal Strategies Mnemonics Imagery <p>A vast majority of strategies can be implemented as either supplantive or generative instruction. (see p. 161-162)</p>	<p>Two general strategies (see pp.181-182):</p> <ul style="list-style-type: none"> Inquiry Expository 	<p>The design for principle lessons is quite similar to the design of concept lessons.</p> <p>An inquiry approach may be extremely useful.</p> <p>However, an inquiry strategy can be more time-consuming and potentially confusing to unskilled learners than an expository approach.</p>	<p>Differences for Simple vs Complex procedures (see pp. 215-216)</p> <p>A didactic, expository approach, rather than a discovery approach seems to be best for teaching procedures</p>	<p>6 alternative approaches to strategy instructions (see p. 233):</p> <ol style="list-style-type: none"> 1. Discovery and guided discovery. 2. Observation 3. Guided participation 4. Strategy instruction in books and courses 5. Direct explanation, teacher directed 6. Dyadic instruction 7. Self-instructional training <p>Direct Explanation may be the most successful and the most applicable in classroom situations.</p> <p>Certain strategies may be characterized as “embedded” – technique instruction is part of</p>		

						content/objective instruction. Others as “ detached ” – technique instruction stands alone.		
Introduction								
Gain Attention	Present an interesting and challenging problem that the learners will learn to solve. Use novel stimuli if possible.	Plan a strategy to increase curiosity and interest such as novel, conflicting, and paradoxical events. Create conflicting/paradoxical events by use of juxtaposition. (p.162) Use of anecdotes with personal and emotional elements	Inquiry strategies are often highly attention provoking, interest arousing, and motivating. Unusual picture or humorous story. Origin or history of the concept to be learned Information about how knowledge of this concept will relate to future tasks or problems.	Learner’s attention should be directed toward investigating the relationships between key concepts in the principle.	Demonstrate the actual application of the procedure itself	Give learners a task that requires use of the particular strategy and then ask them to complete it.		
Establish Purpose	Explain how this problem is representative of the class of problems to be learned Other see p.136	Due to the potential for DK learning goals to appear more dull than higher-order learning tasks, an effort to present the goal in an interesting, dynamic format is worthwhile. Specific requirements for successful attainment of the learning goal should be pointed out.	If using an inquiry approach it is critical that within the summary and closure events, it is confirmed that learners clearly understood the purpose of the lesson.	Inquiry – purpose may be originally defined as a puzzle to solve. Expository – purpose is stated explicitly by verbally stating the rule that relates two or more particular concepts together.	Inform terms in which procedure is to be learned and its range of applicability.	Discussion of the utility and efficiency of the strategies learners can use can lead into a statement of the purpose of the current lesson – to learn a particular strategy.		
Arouse Interest and Motivation	Suggest how problem solving in this domain may assist learners in everyday problems.	Let learners know in what form they must remember the material (recognize or recall, recite or paraphrase). Use wording from objectives but “You will learn to...” as opposed to “The learner will be able to...”		An inquiry approach may be sufficient in its own. Puzzling situations may also be posed in an expository lesson.	Learning procedures can be intrinsically motivating because they allow learners to complete tasks more efficiently and more reliably than they did using trial-and-error approaches.	The specific strategy being learned should be discussed within the context of metacognition and executive processes. Include the importance, effectiveness, and efficiency of active, purposeful learning. Learners should know: 1. personal effort often increases the likelihood of success. 2. effort per se is important, effort channeled into strategic activity is better than working hard. “Work smarter not harder”. 3. strategies are not tied to one task but can be matched to new situations 4. if strategy actions and plans are to be successful, they should be shielded from behaviors, distractions, and emotions.		
Preview Lesson	Instruction should inform the learners that they will	Overview with advanced organizers.	Provide an overview of the content to be learned	Inquiry – giving directions to solving the puzzle.	Important to tell learners that the demonstration is an	Steps in the cognitive strategy can be overviewed		

	be going through a succession of problems with increasing complexity	Expository Organizers and Comparative Organizers. P.163	(expository) and also provide an indication of how the lesson will proceed. Set up the “problem” of the inquiry task (inquiry).	Expository – outline how the lesson will allow learners to solve a puzzle or resolve a scenario to be presented.	overview and that they are not expected to learn the entire procedure at this point. Learners can become anxious if this is not made clear, and that they will be taught the procedure’s individual steps.	and a model can demonstrate the use of the strategy for a straightforward situation appropriate for the strategy.		
Body								
Recall prior Knowledge	<p>Review declarative knowledge related to the area</p> <p>Review general problem-solving strategies</p> <p>Review the type and source of principles related to the problem.</p> <p>Discuss similarities and differences between this problem and similar problems.</p>	<p>Advance organizers bridge old and new knowledge.</p> <p>Metaphoric devices provide a link between known and unknown, intellectual stimulation and interest through the figural use of concrete images.</p> <p>Use analogies</p> <p>Stimulate recall of prior learning by straight forward review of prerequisite concepts.</p> <p>The meaningfulness of DK is buttressed by links to previously learned concepts and other declarative knowledge.</p>	<p>The most critical prior knowledge in learning a concept is the knowledge of concepts that comprise the critical attributes or characteristics of the concept.</p> <p>If pre-requisite concepts have been learned previously, a brief overview of these concepts is very useful.</p> <p>The comparative organizer seems most appropriate for teaching concepts. A comparative organizer reviews a co-ordinate concept that the learners have acquired previously to allow learners to make clear comparisons between the two concepts.</p>	<p>The most critical prior knowledge to acquisition of a principle is acquisition of the concepts underlying the principle.</p>	<p>Sequencing and clustering of the steps of the procedure are important decision at this stage in the strategy plan.</p> <p>Concept knowledge may also be involved in completing a step in the procedure.</p> <p>Often learners have learned less complex procedures that will be combined with other procedures to form a new and complex procedure.</p>	<p>Previous strategies can be contrasted with a new strategy. A comparison of utility can be made.</p>		
Process Information	<p>Choose between Generative – low scaffolding approach, or Supplantive – high scaffolding approach.</p> <p>Regardless of approach the following main aspects of presentation of information and processing must occur: Presentation of problem Problem Space Selection of Appropriate Principles</p>	<p>Processing can be provided by instruction, and some should be required of the learner.</p> <p>Techniques depend on subtypes (see pp. 164-168) Association Techniques Mnemonics Images Analogies Organizational Techniques Clustering and chunking Graphic organizers Generating expository and narrative structures Advance organizers Elaborative Techniques - elaboration into sentences and devising rules</p>	<p>The examples should clearly embody all of the necessary attributes of the concept</p> <p>Rational Set Generator (p. 183-184)</p>	<p>See page 200</p> <p>Helpful to display a statement of the principle on a poster, bulletin board, transparency, or chalkboard for learners to refer to during the initial portion of the lesson.</p> <p>Often useful to explain the whys of a principle to make it meaningful and therefore, more memorable.</p> <p>Once the learners have begun to learn to apply the principle, the designer can point out to them common errors and misconception regarding the relationship of the concepts in the principle.</p>	<p>Remember that to learn a procedure, learners must learn to recognize situations that require a particular procedure, complete its steps, recall the steps in the procedure, and determine if the procedure has been properly applied</p> <p>See p 218 for details on processing information for each of: 1. Learning to determine if the procedure is required. 2. Learning to complete the steps in the procedure 3. Learning to list the steps in the procedure 4. Learning to check the appropriateness of a completed procedure</p>	<p>(see pp.235-236) STAGE 1 Process Information and examples & Focus Attention Present when and where the strategy can be appropriately applied.</p> <p>Learners can be asked to supply example situations in which the strategy is appropriate and situations in which it is not inappropriate. Employ learning strategies Other strategies that may have similar application may be compared as to their efficiency or effectiveness in the purpose of an instructional task Practice & Evaluate</p>		

				As learners experience the application of a principle, it is important they identify which features of the situation suggest that a particular principle should be employed. So that learners can be aware of the breadth of the domain to which the principle is applicable, identify non-critical aspects of the principle application.		Feedback Provide example situations in which they specify whether or not the new strategy is appropriate. As with other pattern recognition practice, some of the instances should be very easy and obvious, while others should involve find discriminations in order to determine that the learners are neither under-generalizing or over-generalizing the utility of the strategy.		
Focus Attention	Use guiding questions or direct statements to focus attention on key aspects.	Focus on distinctive features Questions are a powerful tool for establishing and maintaining attention Embedded questions within the body of the instruction	Point out the critical attributes. Provide visual clues to the attributes as they are isolated is helpful to those who possess few learning strategies.	Learners may require assistance in determining which concepts are being related by the principle and how the concepts are related.	see p. 219 for details on focusing attention for each of: 1. Learning to determine if the procedure is required. 2. Learning to complete the steps in the procedure 3. Learning to list the steps in the procedure 4. Learning to check the appropriateness of a completed procedure	STAGE 2 Process Information & Focus Attention Sequence of instruction that follows next depends upon complexity of strategy. If strategy is complex, a part-whole technique for presentation and practice would be appropriate. Employ learning strategies Instructor may find a self-questioning pattern appropriate to represent this metacognitive processing, particularly monitoring success of the strategy. Practice & Evaluate Feedback Practice applying the strategy, supported with a checklist or flowchart that reminds learner of the steps to follow.		
Employ Learning Strategy	Learning strategies may be taught through direct instruction, modeling, or guiding questions. 9 suggestions on p.138	Appropriate strategies include mnemonics, elaboration strategies, imagery, analogy, organization, chunking, linking, graphic organizers, and rehearsal. (pp.168-169)	Elaborating by inventing own examples. Isolating attributes and highlighting in some way. Concept trees or maps, analogies, mnemonics, use of imagery. p. 185-186	Mnemonic may be suggested to aid in recalling a principle. Learners may be encouraged to illustrate or diagram the relationships of concepts as presented in the principle.	Mnemonic device to aid in recalling the critical steps of the procedure Encourage students to develop their own aids Important that learners acquire the habit of estimating results of their actions. Then they can compare the actual results with their estimate			
Practice	Opportunities to solve problems of similar difficulty Initial practice may involve performance of only one stage of problem solving.	Determine if learning task requires recall or recognition Practice is associated with reaching automaticity the performance of a skill Automaticity is involved in DK. Practice for labels should involve presenting one of the two elements in the association Practice for facts and lists is generally verbatim recall Practice for connected discourse is most often in the form of paraphrased	From simple to discriminate to most difficult instances to discriminate. Settings from which examples and non-examples are drawn are as random as possible.	Learners should practice principles at 4 levels: 1. Stating the principle 2. Recognizing situation in which the principle is applicable 3. Applying the principle to predict, explain, or control the effect of one concept on another 4. Determining whether a principle has been correctly applied Incorrect solutions could represent common misconceptions or errors that learners make when applying a particular	Although the ultimate goal of learning a procedure is the ability to perform all four of the components of completing a procedure, it is helpful to practice each of these components before moving on to the next component. see p. 220 for details on practice for each of: 1. Learning to determine if the procedure is required. 2. Learning to complete the steps in the procedure 3. Learning to list the steps in the procedure 4. Learning to check the	Involve reciprocal teaching... learners paired. Feedback may involve reviewing any artifacts of the strategy as good and poor models of the outcomes of the strategy application. Stage 3 Process Information, Focus Attention & Employ learning		

		recall.		principle.	appropriateness of a completed procedure	strategies There should be a presentation with tasks and materials that do not require the strategy at all, the entire metacognitive sequence, from assessing the task to evaluating the success of the strategy use and “fix-up” techniques, should be shown in these demonstrations. Practice & Evaluate Feedback Learners should be provided the opportunity to practice the strategy on more naturalistic complex materials across a variety of contents and tasks. Include some tasks to which the newly acquired strategy is not applicable. After each application there should be opportunity for feedback and discussion of the strategy.		
Provide Feedback	In the form of hints or guiding questions. Feedback on efficiency or speed.	Various depending on type (see p. 170)	Should include an explanation of why an instance is classified as an example or non-example. Indicate what criterial attributes they are overlooking.	Feedback various for each type of practice question. (see p.202)	see p. 220 for details on providing feedback for each of: 1. Learning to determine if the procedure is required. 2. Learning to complete the steps in the procedure 3. Learning to list the steps in the procedure 4. Learning to check the appropriateness of a completed procedure			
Conclusion								
Summarize and Review	Include the following: p.139 Review of problem characteristics Summary of effective strategies Methods for organizing the problem schema	Summary and review is critical to DK learning. Summaries are needed as practice and to assist consolidation. Use a different strategy from that used in information process-practice-feedback phase. Student processed summaries are a powerful learning too, particularly for organized discourse. Students better retain the studied material if they generate the summaries themselves. Summarizing is not a single event.	Restate definition or criterial attributes of the concept as well as concept name. Paraphrase the definition. Guide learners to develop or complete a concept map of the concept just learned.	Paraphrase restatement of the principle from the original statement in the lesson. Could use graphic format, such as an illustration or diagram that shows the relationship of the concepts that are associated in the principle.	Summary of a procedure lesson often begins with a review of the types of problem, goals, or situations to which the procedure belongs	This event is the most critical to the development of the executive control and metacognition processes. As learners acquire other learning strategies and the contexts in which they should be used, the learners should be encouraged to consider whether previously learned strategies are viable alternatives to the newly learned strategy, or whether the new strategy is useful in learning situation that are unique. All instructors should be skilled in the strategies being taught and aware of the schedule upon which the strategies are taught so they can explicitly and consciously prompt the learners to employ the strategies correctly.		

						When there is evidence that the learners are not using the appropriate strategies, the strategy should again be “detached” and reviewed.		
Enhance Transfer	The more and varied the problems encountered in practice, the better the transfer to related problem tasks	To apply a fact or make use of a list, it must come to mind easily so that it can be used. Understanding and ability to perform can be stymied by mere lack of ability to remember a simple fact The more relationships between elements that are established the easier the retrieval is. The key to connected discourse recall is organization. The organization or structure of a lecture or text provides retrieval cues. Certainly the structure provided by the course can assist recall of the idea in the course.	See page 186	Application in concert with other rules in problem-solving situations.				
Re-motivate and Close	Remind learners of the amount and utility of the knowledge that they have acquired.	Re-emphasize the utility of the knowledge that has been learned. Encourage learners to mentally manipulate the information on their own.		Identify the relevance of the principle’s application in their later instruction or in their daily lives.	Remind them of its limitations, situations that would nullify the utility of the procedure			
Assessment								
Assess Learning	Requires learners to solve problems of the class that the instruction has targeted.	DK items should not assess learners’ ability to apply this knowledge, rather they should assess learners’ ability to remember the information. Recall items Recognition items Constructed answer items	Assessment of concepts may involve learners in: Explaining Categorizing Producing their own examples	Assessment may include: 1. Stating the principle 2. Recognizing situations in which the principle is applicable 3. Applying the principle 4. Determining whether a principle has been correctly applied Items should be examples that were not presented during the instruction, including practice items. If using old instances you would be assessing recall of DK, not of the ability to apply the principle.	Ultimate assessment for a procedure is the learner’s ability to correctly apply the procedure across as diverse a range of difficulty and situations as the designer has prescribed.	The ideal assessment of the learner’s ability to apply the strategy would be individual assessments of the learners’ think-aloud protocols by the instructor or other skilled strategy users. In practice, cognitive strategies are not often assessed, because they are rarely explicitly taught. A designer might assess whether the learners can perform each of the individual steps by giving them a task and then		

						prompting them to perform each step.		
Provide Feedback and Remediation				Feedback should be in the form of cumulative information.		Whether the strategy was applied correctly, whether appropriate monitoring of strategy use and adaptation to problems was used.		
Assess Instruction								
Other Important Notes	<p>Differences between Expert and Novice problem solvers (see p.136)</p> <p>Domain specific problem solving involves identifying the knowns and unknowns in a problem, selecting principles to solve the problem, applying a procedure defining the order in which these principles should be applied, confirming the correct application of principles, and “fixing up” if the principles have not been correctly applied.</p> <p>Macro Strategies for Problem Solving Instruction (see pp.140-145)</p> <p>Socratic Dialogue</p> <p>Expert Systems</p> <p>Elaboration Model</p> <p>Simulations</p> <p>Microworlds</p> <p>Anchored Instruction</p> <p>Case Studies and Case Problems</p> <p>Problem-Based Learning</p> <p>Cognitive Apprenticeships</p> <p>Other</p>					<p>Impediments to Strategy Use: (see p. 239-240)</p> <ol style="list-style-type: none"> 1. Low skills in strategy use 2. Low motivation 3. Learner’s feelings of self-efficacy are low, and attributions of success are external 4. Learners’ lack of awareness of their own memory and processing characteristics 5. Lack of knowledge of task characteristics 6. Devoting/allocating sufficient time 7. Insufficient content knowledge 		