I.B. The Learning Process

References: FAA-H-8083-9

Objectives
The student should develop knowledge of the elements related to the learning process as required in the CFI PTS.

Elements
1. Learning Theory
2. Perceptions and Insight
3. Acquiring Knowledge
4. The Laws of Learning
5. Domains of Learning
6. Characteristics of Learning
7. Acquiring Skill Knowledge
8. Types of Practice
9. Scenario Based Training
10. Errors
11. Memory and Forgetting
12. Retention of Learning
13. Transfer of Learning
14. Levels of Learning

Schedule
1. Discuss Objectives
2. Review material
3. Development
4. Conclusion

Equipment
1. White board and markers
2. References

IP’s Actions
1. Discuss lesson objectives
2. Present Lecture
3. Ask and Answer Questions
4. Assign homework

SP’s Actions
1. Participate in discussion
2. Take notes
3. Ask and respond to questions

Completion Standards
The student understands the learning process and can integrate the knowledge when instructing students.
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Instructors Notes:

Introduction:

Attention
This will explain why you will or will not remember this lesson.

Overview
Review Objectives and Elements/Key ideas

What
Understanding how people learn, and applying that knowledge to the learning environment.

Why
As a flight instructor, the ability to effectively teach students is imperative. Understanding how people learn and how to apply that knowledge is the basis for effective teaching.

How:

1. The Learning Theory
   A. Definition – A body of principles used to explain how people acquire skills, knowledge, and attitudes
   B. Learning is explained by a combination of 2 basic approaches: Behaviorism and the Cognitive Theory
   C. Behaviorism (Positive Reinforcement, rather than no reinforcement or punishment)
      i. Stresses the importance of having a particular form of behavior reinforced by someone, other than the student, to shape or control what is learned
         a. The instructor provides the reinforcement
      ii. Frequent positive reinforcement and rewards accelerate learning
      iii. The theory provides the instructor ways to manipulate students with stimuli, induce the desired behavior or response, and reinforce the behavior with appropriate rewards
   D. Cognitive Theory (Focuses on what is going on inside the student’s mind)
      i. Learning isn’t just a change in behavior; it is a change in the way a student thinks/understands/feels
      ii. Two Major Branches of the Cognitive Theory
          a. The Information Processing Model
              • The student’s brain has internal structures which select and process incoming material, store/retrieve it, use it to produce behavior, and receive/process feedback on the results
          b. The Social Interaction Theory
              • Stress that learning and subsequent changes in behavior take place as a result of interaction between the student and the environment
              • The social environment to which the student is exposed demonstrates or models behaviors, and the student cognitively processes the observed behaviors and consequences
              • Techniques for learning include direct modeling and verbal instruction
              • Behavior, personal factors, and environmental events all work together to produce learning
      iii. Both models have common principles
          a. They both acknowledge the importance of reinforcing behavior and measuring changes
          b. Some means of measuring student knowledge, performance, and behavior is necessary
   E. Behavioral + Cognitive
      i. Plan, manage, and conduct aviation training with the best features of each theory
      ii. Provides a way to measure the behavioral outcomes and promote cognitive learning
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2. Perceptions and Insight
   A. Initially all learning comes from perceptions which come from the senses
      i. The student then gives meaning to the senses
      ii. New students are overwhelmed and often focus on meaningless things, thus missing key info
         a. It is important for the instructor to direct perceptions initially so that the student obtains relevant info
   B. Factors affecting perception
      i. Physical Organism
      ii. Goals and Values
         a. Every experience is colored by the individuals values and beliefs
         b. Goals are more highly valued and therefore sought after than less important ideas
      iii. Self Concept
         a. Self image (confident or insecure) has a great influence on perception
         b. If experiences support positive self image the student remains open to new experiences
         c. Negative has a negative effect on learning
      iv. Time and Opportunity
         a. Proper sequence and time are necessary for learning
      v. Element of Threat
         a. Does not promote effective learning
         b. Attention is limited to threatening object/idea
         c. Frightening or threatening students is not effective
   C. Insight
      i. Grouping perceptions into meaningful wholes
      a. One of instructor’s main responsibilities
      ii. Help the student understand how each piece relates to the others
      iii. As perceptions increase, students develop insight by assembling them into larger blocks of learning
         a. As a result, learning becomes more meaningful and more permanent

3. Acquiring Knowledge
   A. Memorization
      i. First attempt to acquire knowledge
         a. Not good for problem solving
   B. Understanding
      i. Stage 2 of acquiring knowledge
      ii. The learner begins to organize knowledge in useful ways and a collection of memorized facts gives way to understanding
   C. Concept Learning
      i. Based on the assumption that humans tend to group objects, events, ideas, people, etc., that share one or more major attributes that set them apart
         a. By grouping information into concepts, we create manageable categories

4. The Laws of Learning (REEPJR)
   A. Principles of learning provide additional insight into what makes people learn most effectively
   B. Readiness
      i. Individuals learn best when they are ready to learn and do not learn well if they see no reason it
      ii. If students have a strong purpose, clear objective, and a definite reason for learning, they make more progress than if they lack motivation
iii. Under certain circumstances, the instructor can do little, if anything, to inspire a readiness to learn
   a. If outside responsibilities, interests, worries, etc weigh heavily, they may have little interest

C. Exercise
   i. Things most often repeated are best remembered
   ii. Students learn by applying what they have been told and shown
      a. Every time practice occurs, learning continues
   iii. The instructor must provide opportunities for students to practice and, at the same time, make sure
      that this process is directed toward a goal

D. Effect
   i. Learning is strengthened when accompanied by a pleasant or satisfying feeling, and that learning is
      weakened when associated with an unpleasant feeling
   ii. Whatever the learning situation, it should contain elements that affect the student positively and
      give them a feeling of satisfaction

E. Primacy
   i. The state of being first, often creates a strong, almost unshakable impression
   ii. For the instructor, this means that what is taught must be right the first time
   iii. Every student should be started right; Unteaching is much more difficult than teaching
   iv. The first experience should be positive, functional, and lay the foundation for all that is to follow

F. Intensity
   i. A vivid, dramatic, or exciting learning experience teaches more than a routine or boring experience
      a. A student will learn more from the real thing than from a substitute
   ii. The instructor should use imagination in approaching reality as closely as possible
      a. Instruction can benefit from a wide variety of instructional aids to improve realism, motivate
         learning and challenge students

G. Recency
   i. Things most recently learned are best remembered
      a. The further removed time-wise from a new fact/understanding, the more difficult to remember
   ii. Repeat, restate, or reemphasize, important points at the end of a lesson to help in remembering

5. Domains of Learning (What is to be learned: Knowledge, Change in Attitude, Physical Skill, or combo)
   A. Besides the 4 basic levels of learning, several additional levels have been developed:
   B. Cognitive Domain (Knowledge); often referred to as Bloom’s Taxonomy of Educational Objectives
      i. Educational objectives refer to knowledge which might be gained as the result of attending a ground
         school, reading about aircraft systems, listening to a preflight briefing, etc
      ii. The highest objective level may be shown by learning to properly evaluate a maneuver

<table>
<thead>
<tr>
<th>Objective Level</th>
<th>Action Verbs</th>
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<tbody>
<tr>
<td>Evaluation</td>
<td>Assess, evaluate, interpret, judge, rate, score, write</td>
</tr>
<tr>
<td>Synthesis</td>
<td>Compile, compose, design, reconstruct, formulate</td>
</tr>
<tr>
<td>Analysis</td>
<td>Compare, discriminate, distinguish, separate</td>
</tr>
<tr>
<td>Application</td>
<td>Compute, demonstrate, employ, operate, solve</td>
</tr>
<tr>
<td>Comprehension</td>
<td>Convert, explain, locate, report, restate, select</td>
</tr>
<tr>
<td>Knowledge</td>
<td>Describe, identify, name, point to, recognize, recall</td>
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C. Affective Domain (Attitudes, Beliefs, and Values)
   i. This hierarchy attempts to arrange attitudinal objectives in an order of difficulty
      a. Measuring educational objectives in this domain is not easy (concerned with attitudes, etc)
   ii. Most techniques for evaluation of achievement rely on indirect inferences
      a. E.g., Evaluating a positive attitude toward safety

<table>
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<tr>
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<tbody>
<tr>
<td>Characterization</td>
<td>Assess, delegate, practice, influence, revise, maintain</td>
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<tr>
<td>Organization</td>
<td>Accept responsibility, adhere, defend, formulate</td>
</tr>
<tr>
<td>Valuing</td>
<td>Appreciate, follow, join, justify, show, concern, share</td>
</tr>
<tr>
<td>Responding</td>
<td>Conform, greet, help, perform, recite, write</td>
</tr>
<tr>
<td>Receiving</td>
<td>Ask, choose, give, locate, select, rely, use</td>
</tr>
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D. Psychomotor Domain (Physical Skills)
   i. Typical activities include learning to fly a precision approach, programming a GPS receiver
   ii. As physical tasks and equipment become more complex, the requirement for integration of cognitive and physical skills increases

<table>
<thead>
<tr>
<th>Objective Level</th>
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</thead>
<tbody>
<tr>
<td>Origination</td>
<td>Combine, compose, construct, design, originate</td>
</tr>
<tr>
<td>Adaptation</td>
<td>Adapt, alter, change, rearrange, reorganize, revise</td>
</tr>
<tr>
<td>Complex Overt Response</td>
<td>Same as below except more highly coordinated</td>
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<tr>
<td>Mechanism</td>
<td>Same as below except with greater proficiency</td>
</tr>
<tr>
<td>Guided Response</td>
<td>Assemble, build, calibrate, fix, grind, mend</td>
</tr>
<tr>
<td>Set</td>
<td>Begin, move, react, respond, start, select</td>
</tr>
<tr>
<td>Perception</td>
<td>Choose, detect, identify, isolate, compare</td>
</tr>
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</table>
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6. Characteristics of Learning (PRMA)
   A. To be effective, the learning situation should be purposeful, based on experience, multifaceted, and involve an active process
   B. Purposeful
      i. In the process of learning, the student’s goals are of paramount significance
         a. Each student has specific intentions and goals
         b. Students learn from any activity that tends to further their goals
         c. Individual needs and attitudes may determine what they learn as much as what the instructor is trying to get them to learn
      ii. To be effective, instructors need to find ways to relate new learning to the student’s goals
   C. Result of Experience (Learn by Doing)
      i. Learning is an individual process and the student can learn only from personal experiences
         a. Previous experiences conditions a person to respond to some things and to ignore others
         b. Instructors are faced with the problem of providing learning experiences that are meaningful, varied, and appropriate
      ii. If an experience challenges the student, requires involvement with feelings, thoughts, memory of past experiences, and physical activity, it is more effective
      iii. If students are to use sound judgment and develop decision making skills, they need learning experiences that involve knowledge of general principles and require the use of judgment in solving realistic problems
   D. Multifaceted
      i. The learning process may include verbal elements, conceptual elements, perceptual elements, emotional elements, and problem solving elements all taking place at once
      ii. While learning the subject at hand, students may be learning other things as well
         a. They may be developing attitudes about aviation, they may learn self reliance, and on and on
   E. Active Process (Constantly Engage the Student)
      i. If learning is a process of changing behavior, that process must be an active one
         a. For students to learn, they need to react and respond, perhaps outwardly, perhaps only inwardly, emotionally, or intellectually

7. Acquiring Skill Knowledge
   A. Stages of Acquiring a Skill
      i. Cognitive Stage
         a. Memorizing the steps to a skill
         b. Provide clear, step by step example
      ii. Associative Stage
         a. Practice begins to store the skill
         b. The student can assess progress and make adjustments instead of simply repeating steps
      iii. Automatic Response Stage
         a. Through practice the skill becomes automatic allowing the student to focus on other aspects as well
   B. Knowledge of Results
      i. The student must be informed of their progress
         a. Both good and bad
      ii. Flying is foreign, even though a student may know something is wrong they may not be able to correct it on their own
   C. How to Develop Skills
      i. Progress depends on practice
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D. Learning Plateaus
   i. They’re normal and temporary, be prepared for them
      a. If necessary, move away from a certain task and return to it at a later time
   ii. Overpractice can bring on a learning plateau

8. Types of Practice
   A. General
      i. 3 types of practice which yield results in acquiring skills
   B. Deliberate Practice
      i. Student practices specific areas for improvement and receives specific feedback after practice
         a. Feedback shows differences between performance and desired goal
            • Focus is on eliminating differences
   C. Blocked Practice
      i. Practicing the same drill until it becomes automatic
   D. Random Practice
      i. Mixes up the skills throughout the practice session
      ii. Performing a series of separate skills in a random order leads to better retention

9. Scenario Based Training
   A. Scenarios that resemble the environment in which knowledge and skills are later used are very helpful to learning
   B. Good Scenario:
      i. Good set of objectives
      ii. Tailored to the needs of the student
      iii. Capitalizes on the nuances of the local environment

10. Errors
    A. Kind of Errors
        i. Slip
           a. A person plans to do one thing but inadvertently does another
           b. Forms of Slips
              • Neglect to do something
              • Confuse two similar things
              • Asked to perform a routine in a slightly different way
              • Time pressure
        ii. Mistake
           a. A person plans to do the wrong thing and succeeds
              • A gap or misconception in student’s understanding
           b. Forms of Mistakes
              • Incorrect understanding
              • Incorrectly categorizing a specific situation
    B. Reducing Error
       i. Learning and practice
       ii. Taking time
          a. Work at comfortable pace
       iii. Checking for errors
       iv. Using reminders
          a. Checklists, bugs, notebook, etc
       v. Develop routines
vi. Raise awareness to common errors

C. Error Recovery
i. Error is inevitable, students must learn to recover from situations

D. Learning from Error
i. Great learning tool
ii. When an error is made ask the student why it happened/what could be done different

11. Memory and Forgetting
A. Memory General
i. Memory includes 3 parts: Sensory, Short Term, and Long Term
ii. The total system operates like a computer
   a. Accepts input, a processing apparatus is contained, storage capability, and an output function

B. Sensory Register (Quick Scan, Precoding)
i. Receives input and quickly processes it according to a preconceived concept of what is important
   a. Other factors can influence reception of info
      • If it is dramatic or impacts more than 1 of the senses it is more likely to make an impression
   b. It immediately recognizes certain stimuli and sends them to the working memory for action
      • This is called precoding (ex. Fire Alarm – working memory is immediately made aware of the alarm and preset responses begin to take place)

C. Working or Short-Term Memory (Coding, Rehearsal, Recoding)
i. Within seconds, relevant info is passed here where it may temp remain or rapidly fade, depending on individual priorities
   ii. Rehearsal or repetition of the info and sorting or categorization into chucks help retention
      a. Sorting process is called Coding (Usually takes 5 - 10 sec; if interrupted, the info is lost after 20)
   iii. Time limited and Capacity limited (time limitation can be overcome by repetition)
   iv. The coding process may involve recoding to adjust info to individual experiences
      a. This is when actual learning begins to take place
      b. Recoding: the process of relating incoming info to concepts or knowledge already in memory
   v. Developing a logical strategy for coding info is a significant step in the learning process

D. Long-Term Memory (Process, Store, Recall)
i. Where info is stored for future use
   a. For it to be useful, some special effort must have been expended during the coding process
      • The more effective the coding process, the easier the recall
   ii. One of the major responsibilities of the instructor is to help students use their memories effectively

E. Theories of Forgetting
i. Repression
   a. The submersion of ideas into the subconscious mind
   b. Material that is unpleasant or produces anxiety may be treated this way, but not intentionally
      • It is subconscious and protective

ii. Interference
   a. We forget things because an experience has overshadowed it, or the learning of similar things has intervened
   b. Two conclusions from interference:
      • Similar material seems to interfere with memory more than dissimilar material
      • Material not well learned suffers most from interference

iii. Disuse
   a. A person forgets those things which are not used
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b. But, the memory is actually there locked in the recesses of the mind
   • The difficulty is summoning it up to consciousness

12. Retention of Learning
   A. The instructor needs to make certain that the student’s learning is readily available for recall
      i. Teach thoroughly and with meaning
   B. Praise Stimulates Remembering
   C. Recall is Promoted by Association
      i. Each bit of info/action which is associated with something to be learned tends to be recalled
   D. Favorable Attitudes aid Retention
      i. W/o motivation there isn’t learning; the most effective motivation is rewarding objectives
   E. Learning with all our Senses is most Effective
   F. Meaningful Repetition aids Recall (mere repetition does not guarantee retention – Rote)

13. Transfer of Learning
   A. Primary Objective is to promote Positive Transfer
      i. Positive Transfer - If the learning of skill A helps to learn skill B (e.g. slow flight and short field LDGs)
      ii. Negative Transfer - If the learning of skill A hinders learning of skill B (LDG an airplane/helicopter)
      iii. A degree of transfer is involved in all learning since all learning is based on prior learned experience
         a. People interpret new things in terms of what they already know
      iv. Achieving Positive Transfer
         a. Plan for transfer as a primary objective
         b. Make certain the student understands that what is learned can be applied in other situations
         c. Maintain high-order learning standards
         d. Provide meaningful learning experiences that build confidence in the ability to transfer learning
         e. Use material that helps form valid concepts and generalizations (make relationships clear)
   B. Habit Formation
      i. It’s the instructor’s task to insist on correct techniques/procedures to provide proper habit patterns
   C. Training traditionally has followed a building block concept

14. Levels of Learning
   A. Four Basic Levels
      i. Rote Learning – The ability to repeat something which one has been taught, without understanding
         or being able to apply what has been learned
      ii. Understanding – what has been taught
         a. The student consolidates old and new perceptions into an insight on a subject/maneuver
      iii. Application – The skill for applying what has been learned
         a. Understands, has had demonstrations, and has practiced until consistent
         b. Don’t stop here!
      iv. Correlation – of what has been learned with things previously learned/subsequently encountered
         a. The objective in aviation instruction
         b. EX: Can correlate the elements of turn entries with performing lazy eights and chandelles

Conclusion
Brief review of the main points

PTS Requirements:
To determine that the applicant exhibits instructional knowledge of the learning process by describing:
1. Learning theory.
2. Perceptions and insight.
3. Acquiring knowledge.
4. The laws of learning.
5. Domains of learning.
7. Acquiring skill knowledge.
8. Types of practice.
10. Errors.
11. Memory and forgetting.
12. Retention of learning.