

## I.B. The Learning Process

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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	<ol style="list-style-type: none"><li>1. Learning Theory</li><li>2. Perceptions and Insight</li><li>3. Acquiring Knowledge</li><li>4. The Laws of Learning</li><li>5. Domains of Learning</li><li>6. Characteristics of Learning</li><li>7. Acquiring Skill Knowledge</li><li>8. Types of Practice</li><li>9. Scenario Based Training</li><li>10. Errors</li><li>11. Memory and Forgetting</li><li>12. Retention of Learning</li><li>13. Transfer of Learning</li><li>14. Levels of Learning</li></ol>
Schedule	<ol style="list-style-type: none"><li>1. Discuss Objectives</li><li>2. Review material</li><li>3. Development</li><li>4. Conclusion</li></ol>
Equipment	<ol style="list-style-type: none"><li>1. White board and markers</li><li>2. References</li></ol>
IP's Actions	<ol style="list-style-type: none"><li>1. Discuss lesson objectives</li><li>2. Present Lecture</li><li>3. Ask and Answer Questions</li><li>4. Assign homework</li></ol>
SP's Actions	<ol style="list-style-type: none"><li>1. Participate in discussion</li><li>2. Take notes</li><li>3. Ask and respond to questions</li></ol>
Completion Standards	The student understands the learning process and can integrate the knowledge when instructing students.

**Instructors Notes:**

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**Introduction:**

**Attention**

Interesting fact or attention grabbing story  
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 particular behavior reinforced, 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 ways to encourage the student’s progress and learning with 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 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
      - Behavior, personal factors, and environmental events all work together to produce learning
- E. Both models have common principles
  - i. They both acknowledge the importance of reinforcing behavior and measuring changes
  - ii. Some means of measuring student knowledge, performance, and behavior is necessary
- F. 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

## 2. Perceptions and Insight

- A. Initially all learning comes from perceptions which come from the senses; the student then gives meaning to the senses
  - i. New students are overwhelmed and often focus on meaningless things, thus missing key info
    - a. It is important to direct perceptions so that the student obtains relevant information
- B. Factors affecting perceptions
  - i. Physical Organism
  - ii. Goals and Values
    - a. Every experience is affected by the individuals values and beliefs
      - Understand the students values and tailor teaching to those values
    - b. Goals are more highly valued and therefore sought after than other less important ideas
  - iii. Self Concept
    - a. Self image (confident or insecure) has a great influence on perception
      - A positive self-image allows the student to remain open to new experiences
      - A negative self-image has a negative effect on learning
  - iv. Time and Opportunity
    - a. Proper sequence and time are necessary for learning
  - v. Element of Threat
    - a. Threat does not promote effective learning
      - Attention is limited to threatening object/idea
    - b. Frightening or threatening students is not effective
- C. Insight
  - i. An insight is the 'aha!' moment (when the information (perceptions) 'clicks' and the student gains a more complete understanding of the concept or subject)
    - a. As a result, learning becomes more meaningful and more permanent
    - b. Insight is one of the instructor's primary responsibilities
  - ii. Help the student understand how each piece of information relates to the others

## 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 (insight)
- 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 (REEPIR)

- A. Laws of learning provide additional insight into what makes people learn most effectively
- B. Readiness
  - i. Individuals learn best when they are ready to learn
    - a. Provide useful, applicable, information tailored to a specific student's experience level
  - ii. Students make more progress if they have a strong purpose, clear objective, and a definite reason for learning
  - 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

I.B. The Learning Process

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 and performed properly
  - a. Don't let the student practice bad habits, fix them early

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 (encourage!)

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
  - a. Un-teaching is much more difficult than teaching
- iii. 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 (don't use threats of fear)
- 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

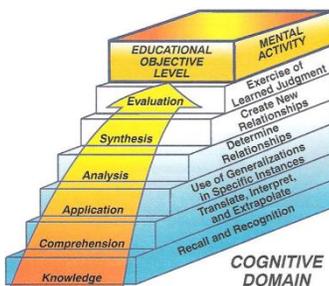
- i. Things most recently learned are best remembered
  - a. The further removed time-wise from a new fact/understanding, the more difficult to remember
- ii. Repeat, restate, or reemphasize, important points at the end of a lesson to help in remembering

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

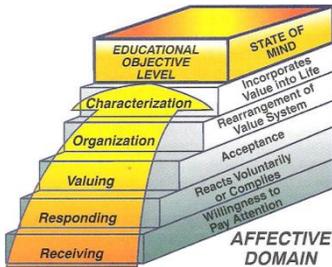
- i. Educational objectives refer to knowledge which might be gained as the result of attending a ground school, reading about aircraft systems, listening to a preflight briefing, etc
- ii. The highest objective level may be shown by learning to properly evaluate a maneuver



Objective Level	Action Verbs
Evaluation	Assess, evaluate, interpret, judge, rate, score, write
Synthesis	Compile, compose, design, reconstruct, formulate
Analysis	Compare, discriminate, distinguish, separate
Application	Compute, demonstrate, employ, operate, solve
Comprehension	Convert, explain, locate, report, restate, select
Knowledge	Describe, identify, name, point to, recognize, recall

C. **Affective Domain (Attitudes, Beliefs, and Values)**

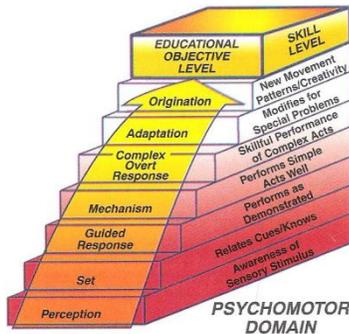
- i. This hierarchy attempts to arrange attitudinal objectives in order of difficulty
  - a. Measuring educational objectives in this domain is not easy
- ii. Most techniques for evaluation of achievement rely on indirect inferences
  - a. For example, evaluating a positive attitude toward safety



Objective Level	Action Verbs
Characterization	Assess, delegate, practice, influence, revise, maintain
Organization	Accept responsibility, adhere, defend, formulate
Valuing	Appreciate, follow, join, justify, show, concern, share
Responding	Conform, greet, help, perform, recite, write
Receiving	Ask, choose, give, locate, select, rely, use

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



Objective Level	Action Verbs
Origination	Combine, compose, construct, design, originate
Adaptation	Adapt, alter, change, rearrange, reorganize, revise
Complex Overt Response	Same as below except more highly coordinated
Mechanism	Same as below except with greater proficiency
Guided Response	Assemble, build, calibrate, fix, grind, mend
Set	Begin, move, react, respond, start, select
Perception	Choose, detect, identify, isolate, compare

## 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 the most important factor
    - 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 just 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 condition 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 to individual students
  - 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 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, etc.
- E. **Active Process (Constantly Engage the Student)**
  - i. If learning is a process of changing behavior, that process must be an active one
    - a. To learn, students need to react/respond outwardly, and inwardly (emotionally/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 increased 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; a student may know something is wrong but may not know how to correct it
- C. How to Develop Skills
  - i. Consistent practice
- D. Learning Plateaus
  - i. They're normal and temporary, ensure the student understands this and is prepared for them
  - ii. Over-practice can bring on a learning plateau
    - a. If necessary, move away from a certain task and return to it at a later time

## 8. Types of Practice

## I.B. The Learning Process

- 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 used are 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
      - Usually caused by 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
    - a. Chair flying when away from the aircraft can be a huge help (as long as it is practiced properly)
  - 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, information is processed, 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 one sense 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 temporarily remain or rapidly fade, depending on individual priorities
  - ii. Rehearsal or repetition of the info and sorting or categorization into chunks help with retention
    - a. The sorting process is called Coding (Usually takes 5 - 10 sec; if interrupted, the information is lost after about 20 sec.)
  - iii. Time limited and Capacity limited (time limitation can be overcome by repetition)
  - iv. The coding process may involve recoding to adjust information to individual experiences
    - a. This is when actual learning begins to take place
    - b. Recoding: relating incoming information to concepts or knowledge already in memory
  - v. Developing a logical strategy for coding information is a significant step in the learning process
- D. Long-Term Memory (Process, Store, Recall)
  - i. Where information is stored for future use
    - a. For it to be useful, 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
    - a. Use speech, visual, auditory, etc. The more sense involved, the greater the effectiveness
- E. Theories of Forgetting (RID)
  - 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
    - 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

## I.B. The Learning Process

- B. Praise Stimulates Remembering
- C. Recall is Promoted by Association
  - i. Each bit of information or action associated with something to be learned tends to be recalled
- D. Favorable Attitudes aid Retention
  - i. Without 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)

### 13. Transfer of Learning

- A. Primary Objective is to promote Positive Transfer
  - i. Positive Transfer - Learning skill A helps to learn skill B (slow flight and short field landings)
  - ii. Negative Transfer - Learning skill A hinders learning of skill B (landing an airplane vs a 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
  - i. Start with the basics and build from there

### 14. Levels of Learning (Not in PTS)

- 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 – Insight into 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 – Correlation of what has been learned with things previously learned and 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:

## I.B. The Learning Process

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.
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