Fundamentals of Instruction
Study Supplement

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FOI Study Supplement

This supplement is meant to assist in learning the most used terms on the FOI portion of the CFI oral exam. Acronyms are used whenever possible. This supplement has been designed to follow the current PTS for Flight Instructors, Area of Operation I. Please reference the *Aviation Instructor's Handbook*, FAA publication *FAA-H-8083-9*, for expanded material on the subject matter contained herein.

Practical Test Standards (PTS)

AREA OF OPERATION: FUNDAMENTALS OF INSTRUCTING

NOTE: The examiner shall select TASK F and one other TASK.

    A. THE LEARNING PROCESS
    B. HUMAN BEHAVIOR AND EFFECTIVE COMMUNICATION
    C. THE TEACHING PROCESS
    D. TEACHING METHODS
    E. CRITIQUE AND EVALUATION
    F. FLIGHT INSTRUCTOR CHARACTERISTICS AND RESPONSIBILITIES
    G. PLANNING INSTRUCTIONAL ACTIVITY

Your input is appreciated! If you would like to see changes
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The Learning Process

Learning Theory

Learning is a change in behavior as a result of experience.

There are three different "types" of learning, as not everyone learns the same:
- **B**ehaviorism
  - "Behaviorism stresses the importance of having a particular form of behavior reinforced by someone, other than the student, to shape or control what is learned. In aviation training, the instructor provides the reinforcement. Frequent, positive reinforcement and rewards accelerate learning. This theory provides the instructor with ways to manipulate students with stimuli, induce the desired behavior or response, and reinforce the behavior with appropriate rewards. In general, the behaviorist theory emphasizes positive reinforcement rather than no reinforcement or punishment."
  - I.E. a student learns by an instructor REWARDING good behavior and "PUNISHING" bad behavior. Punishment is usually in the form of identifying an error and not giving false praise.
- **C**ognitive Theory
  - Unlike behaviorism, the cognitive theory focuses on what is going on inside the student's mind. Learning is not just a change in behavior; it is a change in the way a student thinks, understands, or feels.
  - i.e. Trying to understand what is going through the student's mind when you're teaching them. If you can figure out their point of view or thinking process, you can adapt your teaching style to them easier.
- **C**ombined
  - A combination of the above two, using the best of both. It is more difficult to do this.

Characteristics of Learning

Learning is:
- Purposeful
  - To learn, one must have a goal or set of goals and a *reason* they have sought instruction. A student may study harder for their written exam if their goal is to attain an aviation career than if they were only taking a written because they needed to satisfy a college credit requirement.
- Result of experience
  - Since learning is a change in behavior due to experience, learning must involve experience. **You cannot learn *for* your student.** A good example is that even if you explain how to land *perfectly* in the classroom, a student who has never landed before will not be able to land until they are able to experience it themselves.
- Multifaceted
  - Learning is not limited to one idea. The process of learning one thing will, at the same thing, learn other things.
- Active process
  - Like all students know, you cannot simply learn something by physically being in a classroom. A student must be ready to learn and willing to accept the ideas being communicated to them.

Principles of Learning

There are six principles of learning; a good acronym is REEPIR (say like "reaper"):
1. **Readiness**

A student must be **ready and willing** to learn before he/she can attempt to learn. There must be a purpose, an objective, and a motivation to learn.

2. **Exercise**
   Something most often repeated is best remembered.
3. **Emotion**
   Learning is strengthened when a positive emotional reaction occurs when exposed to something. Learning is weakened when a negative reaction occurs.
4. **Primacy**
   The first time something is learned leaves a strong impression. For instance, if you teach a student an improper recovery technique the first time you demonstrate a stall, it will be harder to teach them the right way than if you had taught them correctly the first time.
5. **Intensity**
   Students learn better if the situations they experience are genuine and not simulated. Can you remember how much more focus you had on your instruments the first time you went into actual IMC instead of simulated?
6. **Recency**
   Something learned recently is easier to remember than something learned a long time ago.

Levels of Learning

There are four levels of learning, in order least to most:

- **Rote** – Ability to repeat facts learned
- **Understanding** – to comprehend the nature of something
- **Application** – Putting learned information to use (*note: Most instructors stop here, unfortunately*)
- **Correlation** – Ability to take several previous learning experiences and transfer it to something never previously encountered (*i.e. Successfully troubleshooting engine roughness in an airplane without a checklist for such an occurrence*)

Domains of Learning

There are three domains of learning. They explain the levels of activity in learning a mental or physical skill. They are:

- **Cognitive**
  - Refers to the levels of learning in a classroom setting
  - i.e. Learning different lessons in ground school to pass the written test
- **Affective**
  - Least understood
  - Describes methods of feelings towards a learning objective, such as a "safe attitude"
- **Psychomotor**
  - Deals with learning physical skills
  - i.e. Learning the different skills using a GPS and flying the airplane to learn to shoot a GPS approach

Learning Physical Skills

Learning a new physical skill involves more than just "programming muscle memory." It includes the following nine principles:

1. **P**hysical Skills Involve More Than Muscles
2. **D**esire to Learn
3. **P**atterns to Follow
4. **P**erform the Skill
5. **K**nowledge of Results
6. **P**rogress Follows a Pattern
7. **D**uration and Organization of a Lesson

8. **E**valuation vs. Critique
9. **A**pplication of Skill

Memory

There are three types of memory:

- Sensory register
  - Basically, your brain's "filter" – it quickly organizes perceptions into things that are important, and things not needed to be remembered
  - 7 ± 2 Rule: Humans remember series in numbers of 7, plus or minus two depending on the person and information. We also can deal with 7 plus or minus two sensory inputs. This is important in aviation, because students sometimes find it hard to accept new information while flying an airplane.
- Short-term memory
  - Also called *working memory*
  - When something is being committed to short-term memory and is interrupted, it will only be remembered for 20 seconds
  - It takes about 5-10 seconds to "code" or remember something, such as a phone number or acronym
- Long-term memory
  - Where information is stored for future use
  - Information may become distorted with time or disuse

There are three Theories of Forgetting:

- **D**isuse
- **I**nterference
- **R**epression

There are five ways to aid *Retention of Learning*:

- **P**raise Stimulates Learning
- **R**ecall is Promoted by Association
- **F**avorable Attitudes Aid Retention
- **L**earning with All our Senses is most Effective
- **M**eaningful Repetition Aids Recall

Transfer of Learning

Learning is best accomplished following a pattern of **known to unknown**, **simple to complex, and past to present**. This is because all learning is based on things previously known. Good instruction plans for and seeks out **positive transfer of learning**. Students may benefit from **incidental learning** along the way. This is why most instruction follows the **building block concept**, combining smaller concepts to apply them to larger applications.

Review

3 Types of Learning Theory
- **B**ehaviorism
- **C**ognitive Theory
- **C**ombined

Principles of Learning (Remember **REEPIR**)
- **R**eadiness
- **E**xercise
- **E**motion
- **P**rimacy
- **I**ntensity
- **R**ecency

Domains of Learning
- **C**ognitive
- **A**ffective
- **P**sychomotor

Memory
- **S**ensory register
- **S**hort-term memory
- **L**ong-term memory

Retention of Learning:
- **P**raise Stimulates Learning
- **R**ecall is Promoted by Association
- **F**avorable Attitudes Aid Retention
- **L**earning with All our Senses is most Effective
- **M**eaningful Repetition Aids Recall

Characteristics of Learning
- **P**urposeful
- **R**esult of experience
- **M**ultifaceted
- **A**ctive process

Levels of Learning

There are four levels of learning, in order least to most:

- **R**ote
- **U**nderstanding
- **A**pplication
- **C**orrelation

Learning Physical Skills
- **P**hysical Skills Involve More Than Muscles
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Theories of Forgetting
- **D**isuse
- **I**nterference
- **R**epression

Human Behavior and Effective Communication

Control of Human Behavior

> "The relationship between the instructor and the students has a profound impact on how much the students learn. To students, the instructor usually is a symbol of authority. Students expect the instructor to exercise certain controls, and they tend to recognize and submit to authority as a valid means of control. The instructor's challenge is to know what controls are best for the existing circumstances. The instructor should create an atmosphere that enables and encourages students to help themselves.
>
> "Every student works toward a goal of some kind. It may be success itself; it may simply be a grade or other form of personal recognition. The successful instructor directs and controls the behavior of the students and guides them toward a goal. This is a part of the process of directing the students' actions to modify their behavior. Without the instructor's active intervention, the students may become passive and perhaps resistant to learning. The controls the instructor exercises-how much, how far, to what degree-should be based on more than trial and error."
>
> - Aviation Instructor's Handbook (*FAA-H-8083-9*), 2-1

Human Needs

There are five levels of human needs; each level must be satisfied to move onto the next:

- **P**hysical
- **S**afety
- **S**ocial
- **E**go
- **S**elf-Fulfillment

Defense Mechanisms

There are a total of eight defense mechanisms:

1. **C**ompensation
2. **P**rojection
3. **R**ationalization
4. **D**enial of Reality
5. **R**eaction formation
6. **F**light
7. **A**ggression
8. **R**esignation

The Flight Instructor as a Practical Psychologist

Anxiety:

A certain amount of anxiety can be a good thing. It may drive a student to perform better or enhance focus. *Too much* anxiety or abnormal reactions due to anxiety detriment student performance. As an example of dealing with anxiety, you might state that a student with a heightened fear of stalls can easily overcome that fear by introducing stalls in a series of "baby steps," i.e.

- Demonstrate a stall and recover at the very first burble, ask them "How was that?"
- Demonstrate again and recover a little after the first burble... and so on.

If you encounter a student whom you feel may not be psychologically fit to fly, immediately request an evaluation flight, an opinion from your FSDO, or consult their AME. Use your best judgment and try to determine if there are extenuating circumstances in your student's case. Try to figure out why they are behaving the way they are!

Effective Communication

There are three elements in human communication:

- Source
- Symbols
- Receiver

Barriers to Effective Communication

- Lack of Common Experience
- Confusion Between the Symbol and the Symbolized Object
- Overuse of Abstractions
- Interference

Review

Human Needs
- Physical
- Safety
- Social
- Ego
- Self-Fulfillment

Effective Communication
- Source
- Symbols
- Receiver

Defense Mechanisms
1. Compensation
2. Projection
3. Rationalization
4. Denial of Reality
5. Reaction formation
6. Flight
7. Aggression
8. Resignation

Barriers to Effective Communication
- Lack of Common Experience
- Confusion Between the Symbol and the Symbolized Object
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The Teaching Process

The teaching of new material can be broken down into four different stages. They are:

Preparation
A lesson plan must be prepared for each lesson an instructor wishes to teach. Objectives for a lesson must be clearly stated and are usually drawn from the Practical Test Standards. A lesson plan should also include material that should be studied beforehand by the student. Additionally, the elements of a performance-based objective are:
- **D**escription of the Skill or Behavior
- **C**onditions
- **C**riteria

Presentation
There are three primary methods of presenting a lesson plan available to an instructor. Material can be presented in **lecture** format, through the use of the **demonstration-performance method**, or with **guided discussion** (suited to larger groups).

Application
Application is where the student demonstrates what the instructor has presented.

Review and Evaluation
Every lesson should include a good review and evaluation of the student's performance. This is done to make the student aware of their progress, guides them to what problem areas they are having, and presents suggestions as to what the student should do to prepare for the next lesson.

Review

Elements of a performance-based objective:
- Description of the Skill or Behavior
- Conditions
- Criteria

Review and Evaluation
- Shows student progress
- Exposes problem areas of student
- Suggests study material for next lesson

Methods of Presentation
- Lecture
- Demonstration-Performance
- Guided Discussion

Teaching Methods

Organizing Material

The introduction of any lesson should have three elements:

- **A**ttention
- **M**otivation
- **O**verview

The lesson should then proceed to **Development**, and then **Conclusion**.

Development

Development refers to presenting the subject manner in a way the student understands. There are 4 components of development:

- Past to Present
- Simple to Complex
- Known to Unknown
- Most Frequently Used to Least Frequently Used

Cooperative/Group Learning Method

Group learning refers to grouping students in groups of 3 to 6 students to maximize the learning of a specific objective. It is important to remember that group learning must be highly organized and well planned, with a specific purpose statement. Students should be grouped in **heterogeneous groups**, meaning that students are put into diverse group based on academic ability and differing ethnic and cultural backgrounds. Students should not be allowed to form their own groups based on friendships; the instructor should choose groups to make a mix of students. Additionally, each student should contribute equally to the task, and a clear objective must be made to the group. Students can then interact and learn from each other most effectively. Groups should work towards a specific reward, made known to them by the instructor.

Guided Discussion Method

Usage of questions in the guided discussion method can achieve the maximum understanding of a lesson if used skillfully. There are several different types of useful questions:

- Overhead
- Rhetorical
- Direct (towards one student)
- Reverse

Characteristics of an Effective Question

- Has a specific purpose
- Is clear in meaning
- Contains a single idea
- Stimulates thought
- Requires definite answers
- Relates to previous material

Demonstration-Performance Method

Typically, all humans are effective "learn by doing" learners. The demonstration-performance method is used a great deal to this effect, especially when learning skills in the cockpit. There are 5 steps to the demonstration-performance method:

1. Explanation
2. Demonstration
3. Student Performance (simultaneous)
4. Instructor Supervision (simultaneous)

5. Evaluation

Computer-Based Training
Advantages of CBT:
- Less labor-intensive
- Progresses at pace of student
- Bases lesson on responses of student

Review

Organizing Material – Introduction Elements
- Attention
- Motivation
- Overview

Cooperative/Group Learning Method
Group learning refers to grouping students in groups of 3 to 6 students to maximize the learning of a specific objective (heterogeneous groups).

Characteristics of an Effective Question
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Computer-Based Training Advantages
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Organizing Material – Development Elements
- Past to Present
- Simple to Complex
- Known to Unknown
- Most Frequently Used to Least Frequently Used

Then **Conclusion.**

Guided Discussion Method – Question Types
- Overhead
- Rhetorical
- Direct (towards one student)
- Reverse

Demonstration-Performance Method
1. Explanation
2. Demonstration
3. Student Performance (simultaneous)
4. Instructor Supervision (simultaneous)
5. Evaluation

Critique and Evaluation

Characteristics of Effective Critiques

The instructor, acting as a critic, must make sure that each of his/her critiques contain the following characteristics:

- Objective
    - Critiques should not reflect on personal bias towards the student
    - Pre-formed opinions of the student can interfere with the critique, i.e. thinking the student is lazy
- Flexible
    - The critique should fit the lesson and the student
    - Usually, no two critiques are the same
- Acceptable
    - Students must be willing to accept what the instructor has to say before accepting criticism from them
- Comprehensive
    - Critiques need not cover everything in detail or be long-winded, but should cover all that needs to be covered
- Constructive
    - A critique is useless unless the student can learn from it
    - Critiques should identify strong and weak areas, and provide suggestions for improvement
- Organized
    - Critiques should follow a logical pattern so as to not bewilder the student
- Thoughtful
    - Instructors should respect their students while critiquing, and never belittle the student or their performance
- Specific
    - Students need to know specific points of detail to profit from a critique
    - Use of abstractions and generalizations should be avoided

Methods of Critique

- Instructor/Student Critique (Classroom setting)
- Student-led critique
- Small group critique
- Student critiquing another student
- Self-critique
- Written Critique

Methods of Evaluation

- Oral Quizzes
- Written Tests
- Performance Tests (Practical)

Types of Questions to Avoid

- Puzzle – Students must first decode the question's various parts before answering
- Oversize – Generalizing something very complicated
- Toss-up – Questions with no specific answer
- Bewilderment – The question leaves the student more confused than before they heard it!
- Trick question – Trick questions only HURT learning, and the student may lose trust in their instructor
- Irrelevant – Questions unrelated to the lesson lose focus

Characteristics of a Good Test

- Reliability – a test must be consistent in its results
- Validity – a test must measure what it is supposed to measure
- Usability – a test must be easy to administer
- Objectivity – a test must not allow the grader to have bias (e.g. some written tests)
- Comprehensiveness – a test must test the scope of what is intended to be tested (variety of questions)
- Discrimination – a test must distinguish between different levels of understanding between students (i.e. students with better understanding score higher; tests include questions of varying difficulty)

Review

Characteristics of Effective Critiques
- Objective
- Flexible
- Acceptable
- Comprehensive
- Constructive
- Organized
- Thoughtful
- Specific

Methods of Evaluation
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Types of Questions to Avoid
- Puzzle
- Oversize
- Toss-up
- Bewilderment
- Trick question
- Irrelevant

Flight Instructor Characteristics and Responsibilities

Responsibilities of All Aviation Instructors
There are four main responsibilities of an instructor. They are:
- Helping students learn
  - Learning should be enjoyable – not necessarily easy
  - Learning should be interesting – this can be achieved by letting objectives be known
  - Learning to fly should allow for experimentation and exploration
  - Learning should be tailored/suited to each individual student
  - Students should be led to performance meeting the PTS, and taught the responsibilities of safe flying accordingly and in a timely fashion
- Providing adequate instruction
  - An instructor should correctly analyze the student's personality, thought pattern, and ability (Get to know your students!)
  - An instructor is always acting as a practical psychologist
- Demanding adequate standards of Performance
  - **Instructors must analyze *their performance* as well as their students**
  - Allowing a student to get by with a substandard performance is not providing competent instruction; **it reflects poorly on you as well as your student**
- Emphasizing the Positive
  - Show your students the positive aspects of aviation before emphasizing negative aspects
  - This is greatly related to instilling fear into your students – a scared student does not learn well

Additional Flight Instructor Responsibilities
- Evaluation of Student Piloting Ability
  - Not only should you determine whether a student can perform a maneuver, you should evaluate how well a maneuver is done
  - Students should always be informed of progress in ability
  - Students should be allowed to make a mistake themselves (don't always take the controls from them)
- Pilot Supervision
  - Instructors have the responsibility for approving solo flight and supervising it
- Practical Test Recommendations
  - Flight instructors are responsible for signing off students prepared for a practical test and who have demonstrated the required knowledge and maneuvers to at least the standards of the PTS
  - An instructor must have flown 3 hours with a student within the past 60 days in preparation for the practical to sign a student off
- Flight Instructor Endorsements
  - Endorsements for solo flight should only be given when a student has shown the level of competence and responsibility to handle any emergencies that may arise on a solo flight
  - AC 61-65 lists most endorsements an instructor can give, such as: BFR's, IPC's, high performance, complex, and tailwheel signoffs
  - Records of each endorsement must be kept by an instructor for 3 years
- Additional Training and Endorsements
  - BFR's every 24 months
  - Wings Program
  - AC 61-98 outlines a sample transition program to a different airplane

- o An instructor holds great responsibility for the future passengers of any pilot he/she checks out in an aircraft
- Pilot Proficiency
  - o AC 61-91 outlines the Wings Program

Important Personal Characteristics (Professionalism)

No single definition can define professionalism. It must be remembered that the instructor is the primary representative of aviation, at all levels of training. Professionalism encompasses:
- Providing a service
- Extended periods of training and preparation
- Performance based on study/research
- Ability to logically reason
- Ability to make good decisions
- A code of ethics

Some of the traits common to good instructors are (use the acronym "SADSALI"):
- **S**incerity
  - o A good instructor is straightforward and honest
- **A**cceptance of the Student
  - o Personal bias has no place in the cockpit
  - o Instructors must accept students' faults and weaknesses
  - o Students deserve respect, just like you
  - o Students and instructors are working towards a common goal
- **D**emeanor
  - o An instructor's behavior should be disciplined and predictable
  - o Erratic behavior or changing attitudes should not be displayed
- **S**afety Practices and Accident Prevention
  - o Safety practices emphasized by an instructor have a lasting effect on students
  - o Observance of all rules and regulations is important to pass on to students
- Personal **A**ppearance and Habits
  - o Instructors must have a professional look
  - o Personal hygiene
- Proper **L**anguage
  - o Emphasize KNOWN to UNKNOWN, especially since students often pick up words, concepts, or acronyms that are new to them during flight training
  - o Jargon should be avoided
  - o Use of profanity/crude language can cause students to lose respect for an instructor
- Self-**I**mprovement
  - o A good instructor is never satisfied or complacent with their current qualifications

Ways to Minimize Student Frustration
- Motivate Students
- Keep Students Informed
- Approach Students As Individuals
- Give Credit When Due
- Criticize Constructively
- Be Consistent
- Admit Errors
- MIKECCC? / MIACCCE?

Review

Responsibilities of All Aviation Instructors
1. Helping students learn
2. Providing adequate instruction
3. Demanding adequate standards of Performance
4. Emphasizing the Positive

Professionalism is:
- A service
- Extended periods of training and preparation
- Performance based on study/research
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Ways to Minimize Student Frustration
- Motivate Students
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- Be Consistent
- Admit Errors

Additional Flight Instructor Responsibilities
- Evaluation of Student Piloting Ability
- Pilot Supervision
- Practical Test Recommendations
- Flight Instructor Endorsements
- Additional Training and Endorsements
- Pilot Proficiency

Traits Common to Good Flight Instructors:
- Sincere
- Accepting
- Demeanor
- Safety
- Appearance/Habits
- Language
- Improvement

Planning Instructional Activity

Developing Objectives and Standards for a Course of Training
An objective is a goal of what should be accomplished by a course of training. Standards are closely tied to the objective. Early in training, standards should be set lower than the applicable PTS as students' skills take time to progress. Before the completion of the course objective, performance of a student should at least *meet* the applicable PTS. The FAR's also outline what safe pilots everywhere should practice.

Building Blocks of Learning Theory
The building blocks theory of learning states that an overall objective should be broken down into smaller, more manageable chunks of learning. For instance, before a student can complete their first solo, they have to learn several different levels of tasks, each building on each other, before they can finally solo an airplane:
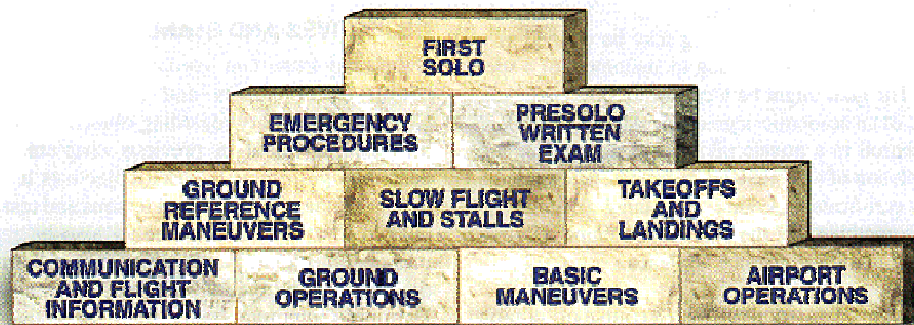

Figure 10-1. The presolo stage, or phase, of private pilot training is comprised of several basic building blocks. These blocks of learning, which should include coordinated ground and flight training, lead up to the first solo.

Requirements for Developing a Training Syllabus
Instructors need a practical guide to developing skills in their students in a **concise, logical** flow. Syllabi help to eliminate wasted training and student frustration while advancing student skills faster. Elements of a training syllabus usually include:
- Stage or Block of Training
- Objectives
- Content
- Completion Standards

Purpose and Characteristics of a Lesson Plan
Lesson plans outline the content, equipment, actions, and schedule pertinent to a period of instructional activity. It should be noted that lesson plans act as a guide, so they need to be easily adapted to a particular student or learning style. Lesson plans should be updated periodically to reflect changes that may make a lesson better. Lesson plans should have the following characteristics:
- Unity
- Content
- Scope
- Practicality
- Flexibility
- Relation to Course of Training

- Instructional Steps

The most common headings of a lesson plan include:
- Objective
- Content
- Schedule
- Equipment
- Instructor's Actions
- Student's Actions
- Completion Standards

Review

Requirements for Developing a Training Syllabus
- Stage or Block of Training
- Objectives
- Content
- Completion Standards

Lesson Plan Headings
- Objective
- Content
- Schedule
- Equipment
- Instructor's Actions
- Student's Actions
- Completion Standards

Characteristics of a Lesson Plan
- Unity
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