National Training Aircraft Symposium (NTAS)   2020 - Perspectives: A Vision into the Future of Aviation

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Augmenting Aeronautical Decision Making (ADM) With Error and Threat Management Training in Young Pilots

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Augmenting Aeronautical Decision Making (ADM) With Threat and Error Management (TEM) Training in Young Pilots

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Goal

Improve aviation safety education outcomes by using the Threat and Error Management (TEM) framework in an effective format appropriate for young aviators

Mission and Context

- **ACE**: Engage, educate and accelerate the NextGen of aerospace professionals
  - World's leader in funding licensed teenage private pilots
  - Thought leader to growing number of high school aerospace academies

- **SEU**: Research to support initiatives by the AFRJOTC to restore luster of aviation in youth and build a pipeline of future leaders and aviators

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Opportunity:
Meeting Industry Labor Force Requirements

Increasing scholarships
to high school teenagers

Introduce pilot
opportunities at
younger ages

AFJROTC Flight
Academy program

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Proposals:
Exemptions for 16-year old PPC

FEDERAL REGISTER
The Daily Journal of the United States Government

(N) Notice

Petition for Exemption; Summary of Petition Received; Headquarters Air Force Junior Reserve Officer Training Corps

A Notice by the Federal Aviation Administration on 08/17/2018

*"We know 16-year olds can learn to fly, but we need data to show they are mature enough to make decisions."* (Kieran O'Farrell-Orlando FSDO, 2019)

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The Problem:
The Teenage Brain
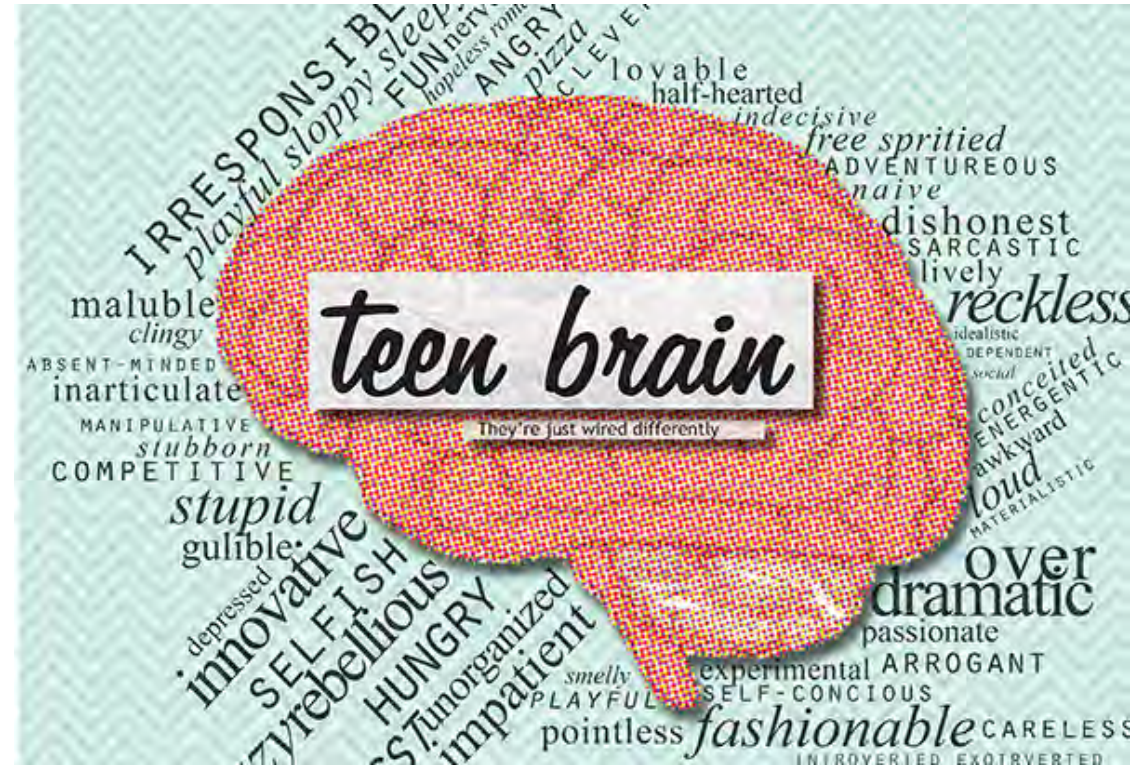
What We Know:
Executive Function/Judgment Development

Characteristics

- Seek short-term rewards

- Seek peer approval

Executive function increases

- Learning with peers/social

- Evaluated by peers vs. by authority figures

5-year-old brain · Preteen brain · Teen brain · 20-year-old brain

Dorsal lateral prefrontal cortex ("executive functions")

Front

Top view

Back

Red/yellow: Parts of brain less fully mature

Blue/purple: Parts of brain more fully matured

Sources: National Institute of Mental Health; Paul Thompson, Ph.D., UCLA Laboratory of Neuro Imaging

Thomas McKay | The Denver Post
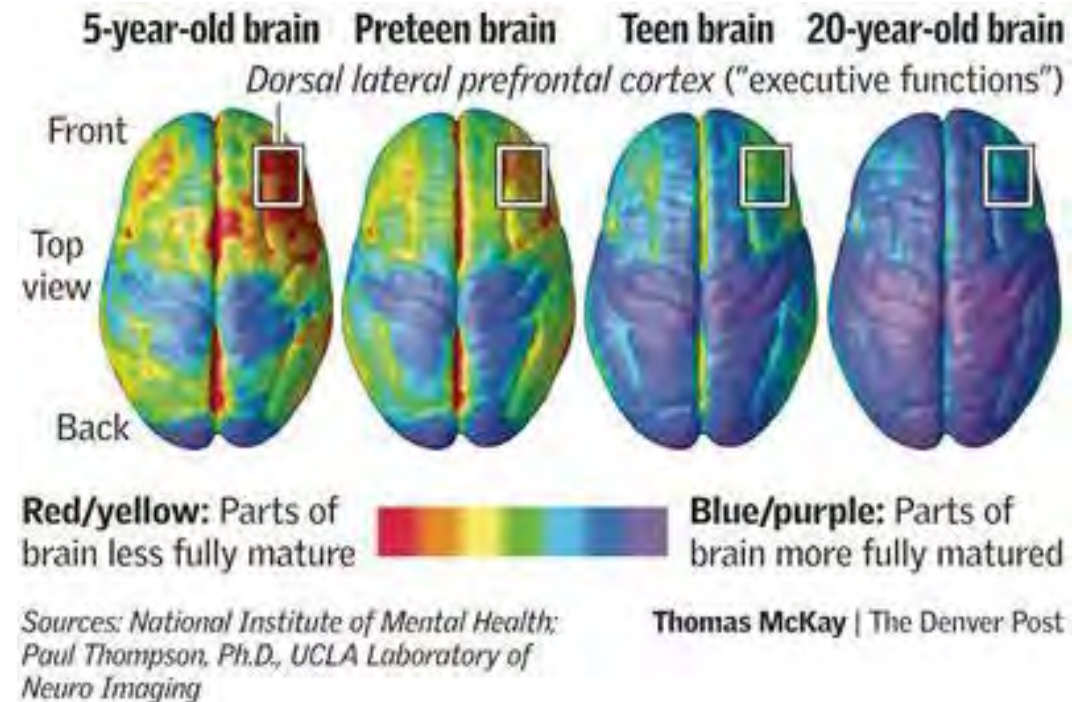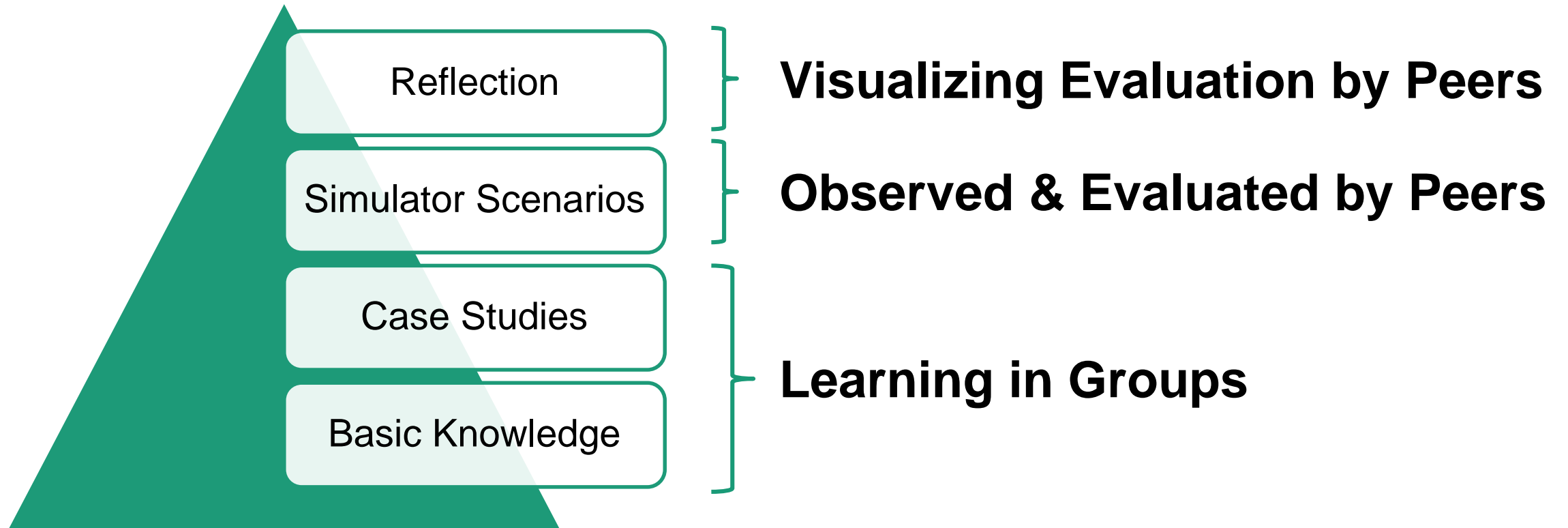
How:
Pedagogy in Aviation

Live Video Stream
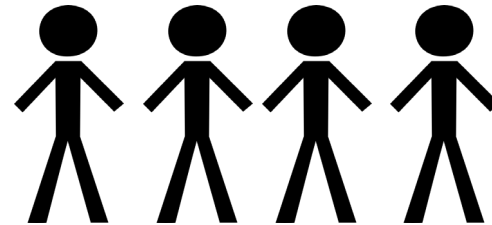
Scenarios in Redbird FMX Simulator

Peers Observe and Evaluate

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What:
Airman Certification Standards (ACS)

"CRM/SRM is the "**set of competencies**" that includes situational awareness, communication skills, teamwork, task allocation, and decision-making within a comprehensive framework of standard operating procedures" (Appendix 6: Safety of Flight, p. A-18)

FAA-S-ACS-6B
(with Change 1)

U.S. Department
of Transportation
Federal Aviation
Administration

Private Pilot – Airplane
Airman Certification Standards

June 2018

Flight Standards Service
Washington, DC 20591

TEM:
An Appropriate Framework

Learning Tool

Tool: Threat and Error Management (TEM)

ICAO Competency-Based Framework

1. *Application of procedures and compliance with regulations*
2. *Communication*
3. *Flight path management, automation*
4. *Flight path management, manual control*
5. *Leadership and teamwork*
6. ***Problem solving and decision making***
7. *Situation awareness and management of information*
8. *Workload management*

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TEM:
Event Matrix

Topic	Description	Observable Behaviors—ICAO	Desired Outcomes	Scenario/Key Events	Flight Profile
Adverse WX	TStorm, heavy rain, turbulence, inadvertent IMC, unusual flight attitude	1. Identifies, assesses and manages threats and errors in a timely manner	1. Recognizes deteriorating weather	Thunderstorm encounter during enroute	Cruise-Enroute
		2. Seeks accurate and adequate information from appropriate sources	2. Attempts to determine exact location and nature of the deteriorating weather		
		3. Identified and verifies what and why things have gone wrong, if appropriate	3. Determines why faced with deteriorating weather	Hazards & obstacles	
		4. Perseveres in working through problems while prioritizing safety	4. Seeks alternate flight paths to avoid deteriorating weather to maintain flight safety		
		5. Identifies and considers appropriate options	5. Considers multiple options to avoid deteriorating weather		
		6. Applies appropriate and timely decision-making techniques	6. Makes appropriate decisions to avoid deteriorating weather	Airspace considerations & restrictions	
		7. Monitor, reviews, and adapts decisions as required	7. Monitors, reviews and adapts prior decisions to avoid deteriorating weather		
		8. Adapts when faced with situations where no guidance or procedure exists	8. Identifies ways to exit Inadvertent IMC	IMC	
		9. Demonstrates resilience when encountering an unexpected event	9. Maintains aircraft control during IIMC	Vertigo	

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TEM:
Pilot Study Summer 2019

- Describe the participant demographics according to current private pilot training status and total flight time experience

- Assess TEM framework knowledge

- Determine if TEM framework knowledge transfers to problem solving and decision-making desired outcomes and competency observable behaviors (in young aviators)

TEM:
Pilot Study Summer 2019

One Group Posttest-Only

| Threat & Error Management Classroom Instruction | → | Problem-Solving & Decision-Making Scenario Event |

Threat & Error Management
Quiz

Adverse Weather &
Inadvertent IMC Scenario
Event w/Observable Behaviors
(Redbird FMX)

Positive correlation between TEM knowledge and problem-solving and decision making performance ($p > .05$)

Small sample size ($n = 6$)

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Summary

- Developing TEM Curriculum for Adolescents
  - Peer group, peer review, reflection
- Evaluate effectiveness
  - AFJROTC Flight Academy
  - Lakeland AeroClub Youth members
- Share results w/ industry and FAA

Q&A