



NATIONAL ASSOCIATION OF FLIGHT INSTRUCTORS

MENTOR

LIVE

Leveling Up!

**A Game-Based Approach to
Pilot Development**

Presented by:

Brandon Seltz & Mark Thompson of



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Introduction – Brandon Seltz



Microsoft
Flight Simulator



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Introduction – Brandon Seltz



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Introduction – Mark Thompson

- Top pilot on winning team at NIFA SAFECOM
- Designer of RNP/AR Approaches for Airlines
- Gold-Seal CFI
- Strong interest in how pilots learn

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Goals of this Presentation

- Learn how leveraging game design can:
 - Maximize engagement and skill development
 - Get more students to certification
 - Create safer pilots
- Discover new technology that can:
 - Improve quality and consistency of instruction
 - Enable more effective use of the airplane
 - Improve the business of training



Game Design 101

The true power of game design in training is its ability to create the motivation to improve.

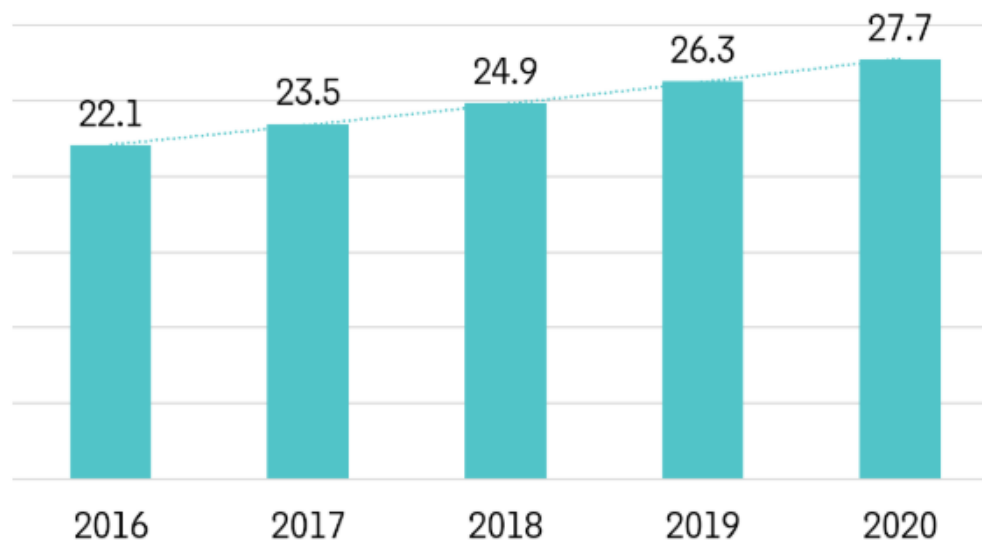
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Game Design in Everyday Life

- Engagement is critical in knowledge transfer and retention.
- Fundamentals of game design are valuable in everyday life.
- The power of games in a nutshell:
 - “Last one in is a rotten egg!”

The Rise of Gamification

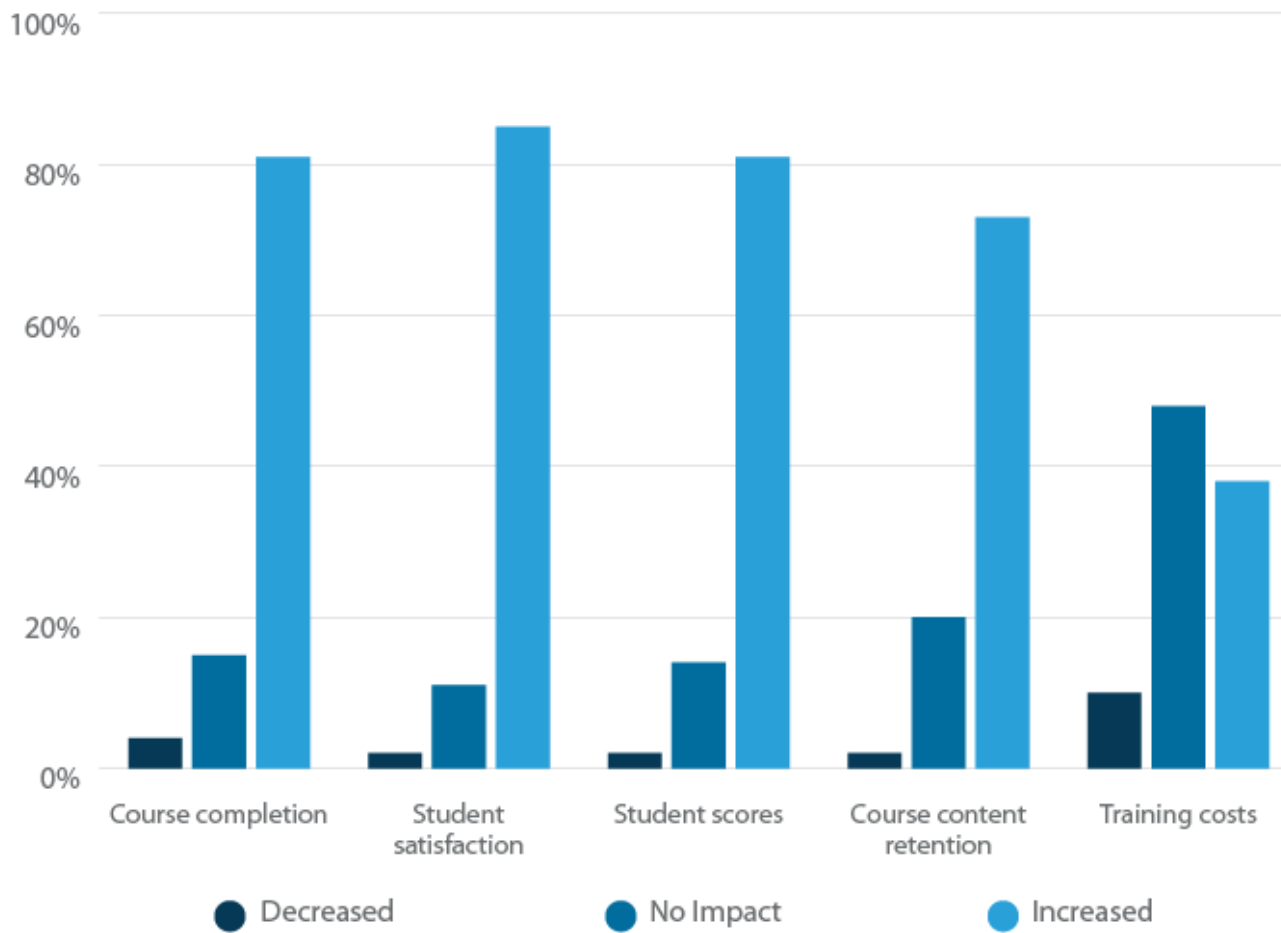
Total Retail Sales, In Trillion USD, Global, 2016 - 2020



Source : US Department of Commerce



The rise of Game-Based Learning



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<https://www.capterra.com/learning-management-system-software/lms-gamification-research>

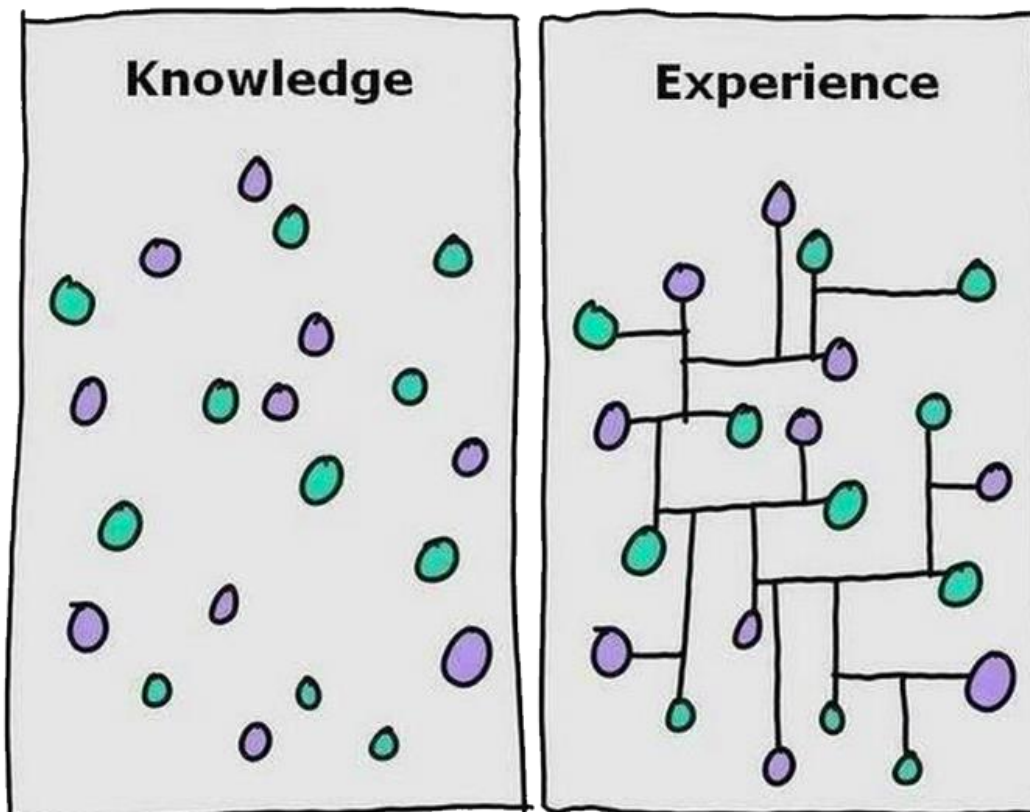
Why Game-Based Learning Works

- Learning from failure
- Active vs Passive Learning
- Context before knowledge
- Ah-ha moments
- We are built to play!



<http://pixdaus.com/learning-by-doing/items/view/75833/>

Why Game-Based Learning Works



<http://flowpro.io/solutions>

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Game Design 101

A game is a **system** in which players overcome **challenge**, bound by a set of **rules** and has **quantifiable outcome**.

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Game Design 101

- How these elements apply to Flight Training:
 - **Systems**
 - Aircraft & Airspace
 - **Challenge**
 - Maneuvers
 - Stage checks
 - Check ride.
 - **Rules**
 - FAR/AIM
 - **Quantifiable Outcomes**
 - ACS



<http://www.gonuldergisi.com/wp-content/uploads/2017/03/67-oyun.jpg>

Game Design 102 – Game Loop



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Game Design 102 – Game Loop





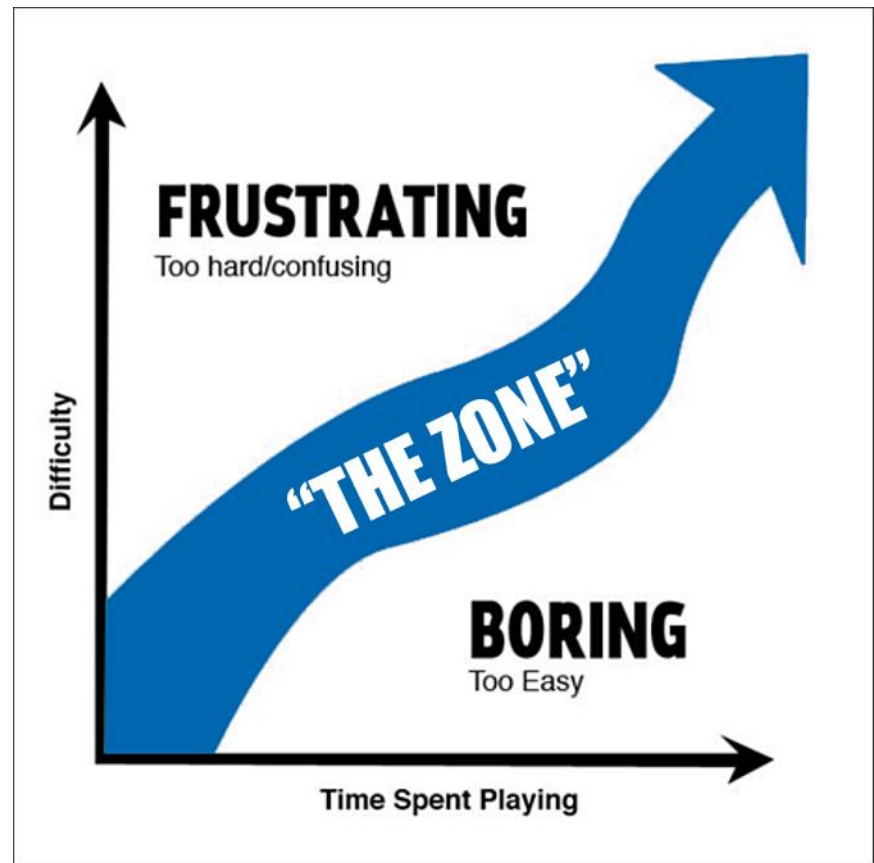
Game Design 101

Game Mechanics are the building blocks of games.

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Game Design 102 - Difficulty

- Too hard = Frustrating
- Too easy = Boring
- Just right = In the Zone



<http://www.razeyourgame.com>

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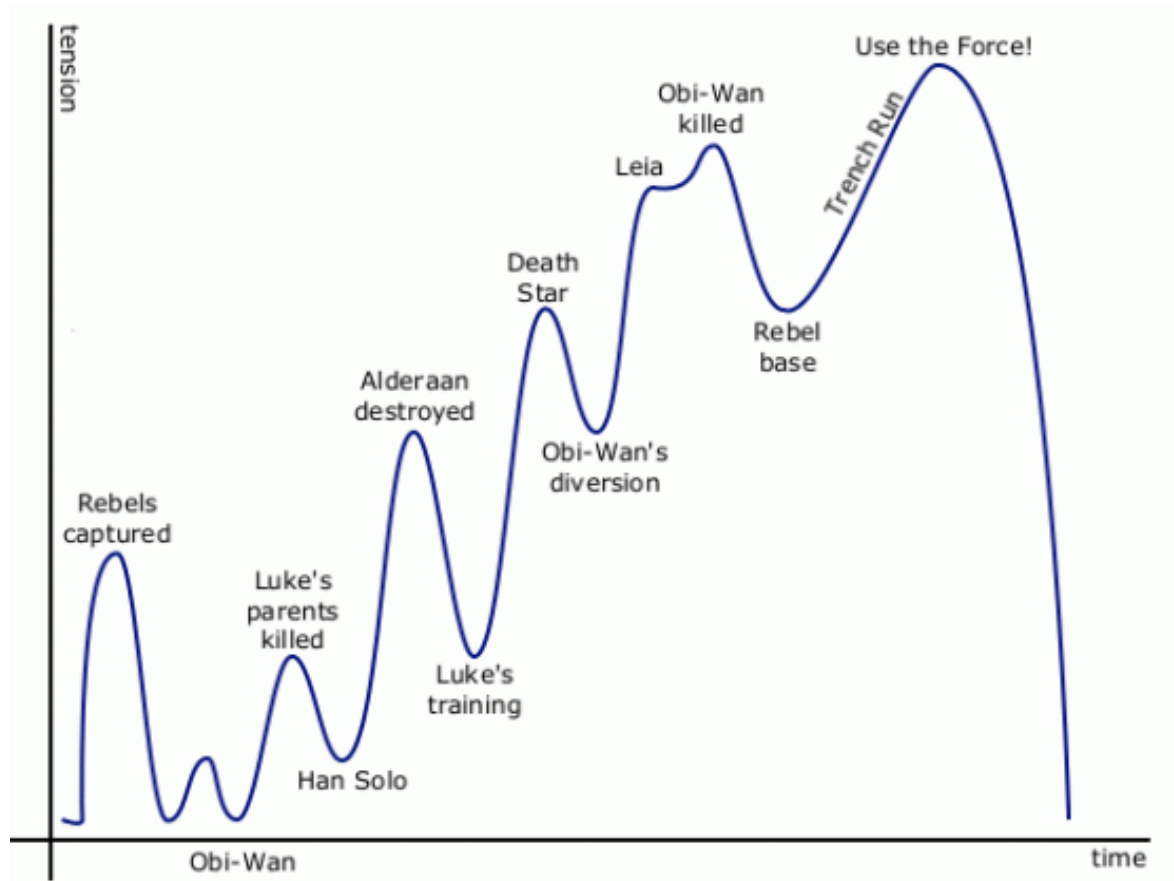
Game Design 202 - Mechanics

- These mechanics can be part of your toolbox to drive student engagement:
 - Interest Curves
 - Surprise
 - Clear Goals & Measures
 - Problem Solving
 - Curiosity
 - Chance
 - Meaningful Choices
 - Story
 - Visible Progress
 - Reward

Game Design 202 - Mechanics

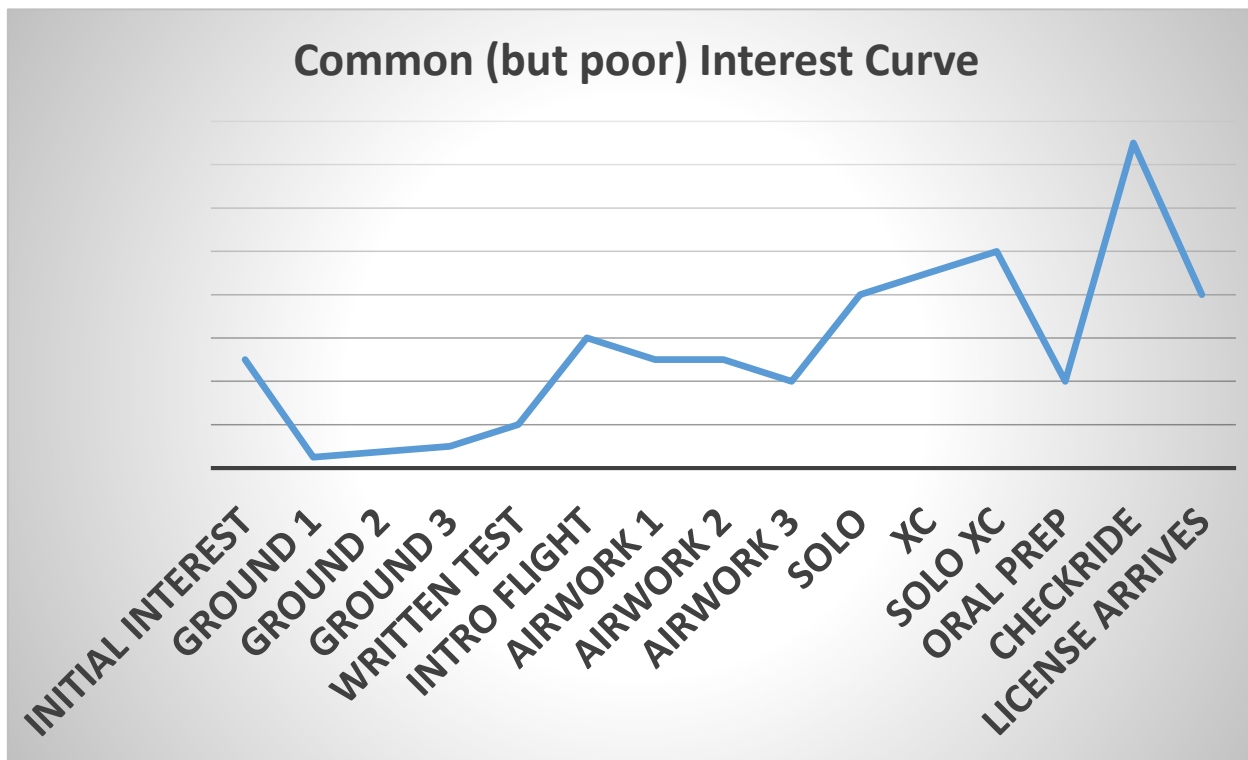
- Interest Curves

A structure of variable tension to maintain & build interest.



Game Design 202 - Mechanics

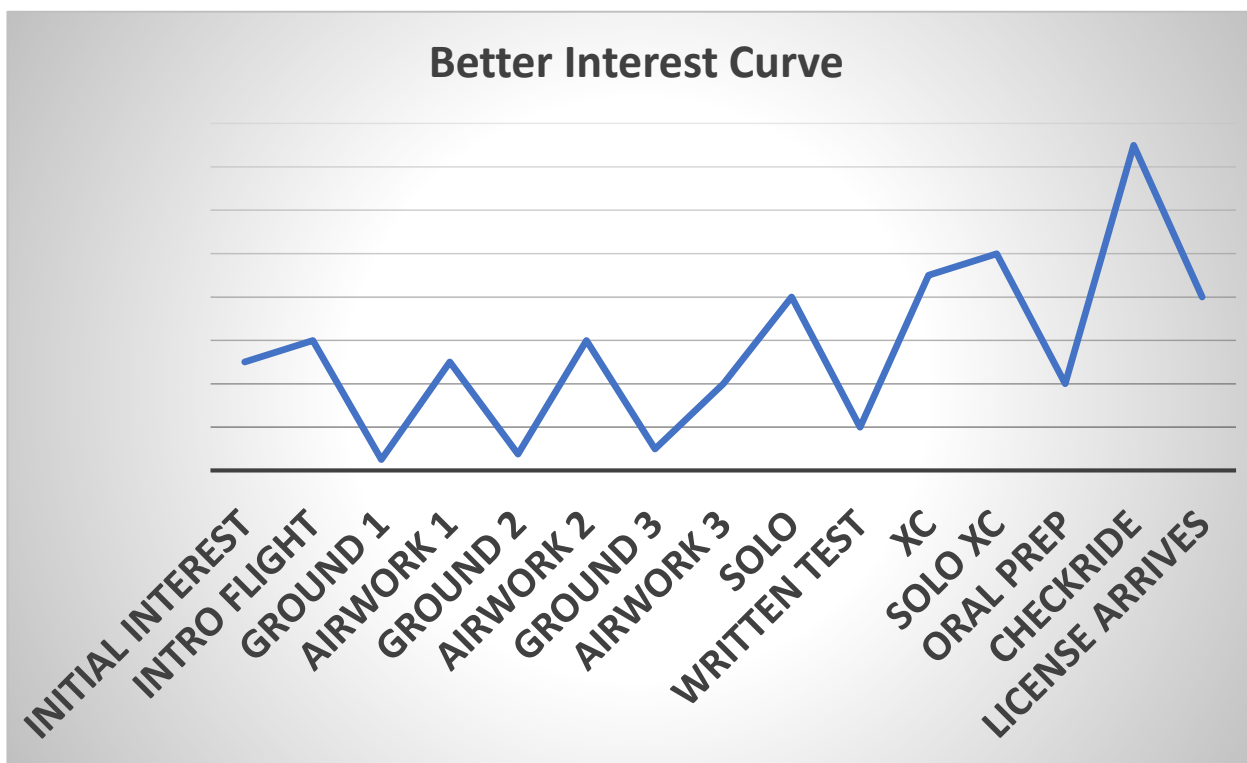
- Interest Curve – Current Training Process (not ideal)



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Game Design 202 - Mechanics

- Interest Curve – Better Training Process?



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Game Design 202 - Mechanics

- **Surprise** – Something unexpected
 - Engine out in the Pattern
 - Diversions
 - Go-Around



<https://commons.wikimedia.org>

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Game Design 202 - Mechanics

- **Curiosity** – The desire to know, often unusual
 - Visit unique local airport
 - Try out techniques seen online
 - Give them some control over training



<https://commons.wikimedia.org>

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Game Design 202 - Mechanics

- **Problem Solving** – Finding solutions
 - Let them figure it out on their own.
 - “Hey Mark, what altitude should I fly at?”
 - What do you think?



Game Design 202 - Mechanics

• Clear Goals & Measures

- Everyone wants to know they're doing!
- ACS provides this, but often not top of mind.
- Stay objective!



<https://pixabay.com/illustrations/goal-setting-goal-dart-target-1955806/>

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Game Design 202 - Mechanics

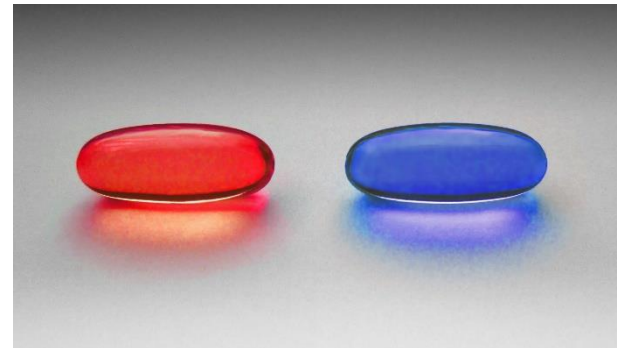
- **Chance** – The possibility unknown events
 - Inherent in training:
 - Weather
 - NOTAMS
 - Maintenance
 - Letting chance happen
 - Weather safe but iffy?
 - Opportunity to fly a new type



<https://www.flickr.com/photos/14616064@N06/>

Game Design 202 - Mechanics

- **Meaningful Choices** – Have Possible Outcomes
 - The go-no-go
 - Turn back due to weather
 - Routes when flight planning



<https://en.wikipedia.org/wiki/Choice>

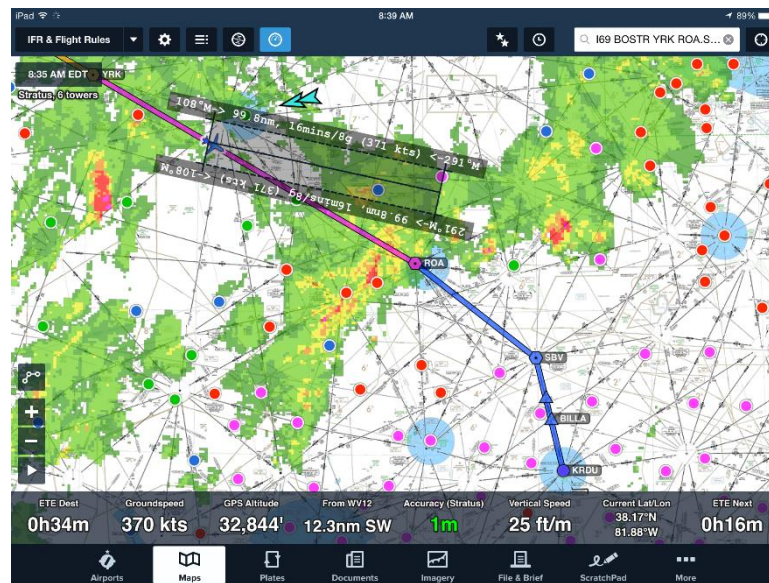
Game Design 202 - Mechanics

- **Visible Progress** – Where am I in this process?
 - Pull out the syllabus and mark it off!



Game Design 202 - Mechanics

- **Story** – An account of events, real or imagined
 - Scenario Based Training
 - Practicing part of a cross-country flight before diverting to the practice area.



Game Design 202 - Mechanics

- **Reward** – Recognition of effort and achievement
 - Verbal praise
 - Spruce Goose Cafe at Jefferson Co (0S9) has great pie!
 - Airport they want to visit
 - Flight over interesting place
 - cross-country route

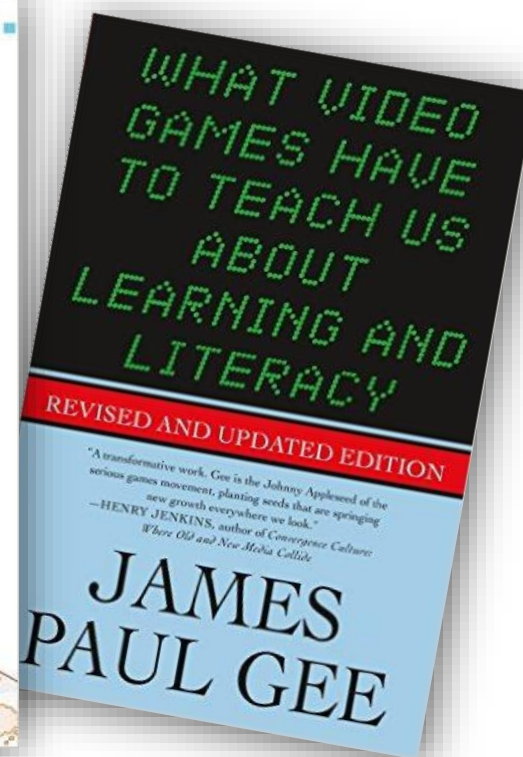
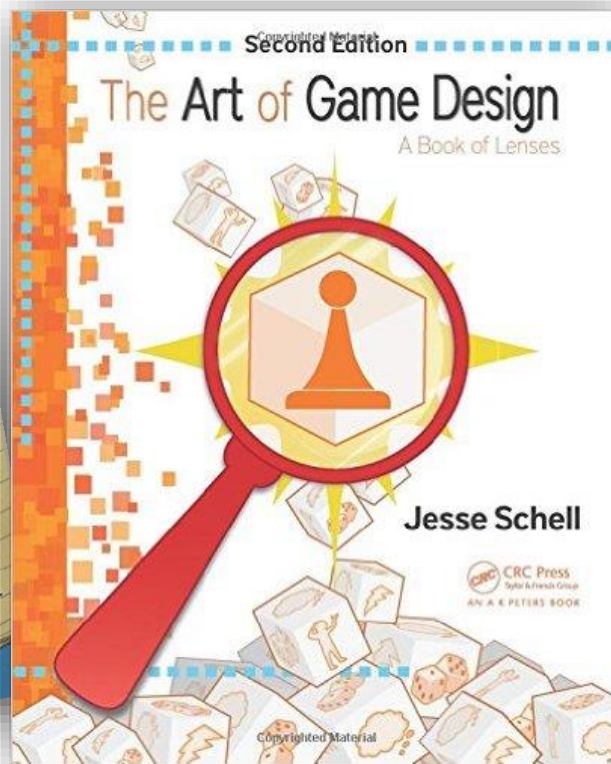
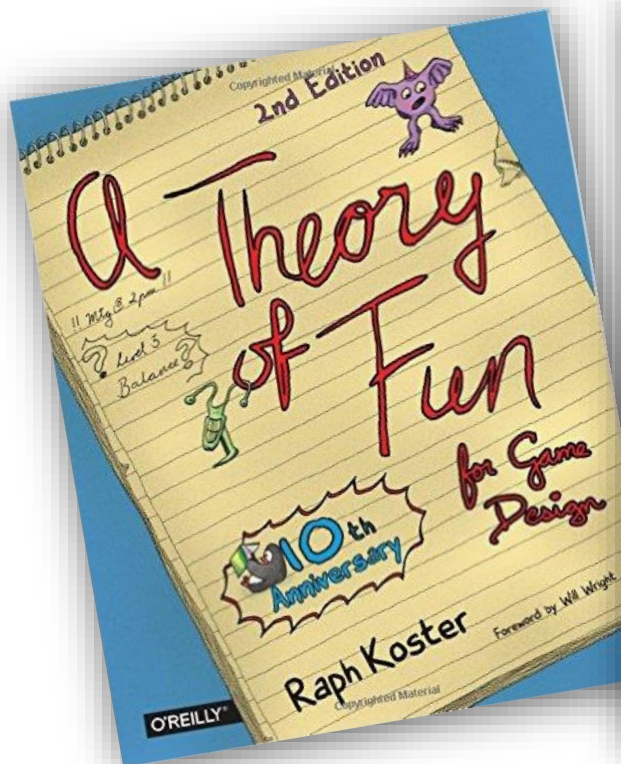


<https://www.youtube.com/watch?v=xogCGINfsEU>

Game Design 202 - Summary

- Understanding game design and mechanics provide tools in your CFI toolbox to drive engagement, fun and keep students on track to certification, and create safer and more capable pilots.
 - Interest Curves
 - Surprise
 - Clear Goals & Measures
 - Problem Solving
 - Curiosity
 - Chance
 - Meaningful Choices
 - Story
 - Visible Progress
 - Reward

More on Game Design?



Intro to TakeFlight



Lowering the barriers to aviation for all

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Intro to TakeFlight Interactive

- Our Vision
 - Teach fundamentals in a standardized way
 - In a high repetition and cost effective environment
 - So that the aircraft can be used for more advanced concepts
 - To create safer more capable pilots



Intro to TakeFlight Interactive

It's tempting to be skeptical of untried technologies, but we must be visionary in assessing, adapting, and accepting them. – **Greg Brown**

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Intro to TakeFlight Interactive

Virtual Flight Instructor

Game
Design

Artificial
Intelligence

Data
Analytics

Legacy Flight Simulation

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TakeFlight Academy

TakeFlight Academy

A self-guided simulation training platform

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TakeFlight Academy



The screenshot displays the 'TakeFlight Academy' interface. At the top left, it says 'LIBRARY DEVELOPER'. The main title is 'TakeFlight Academy'. Below that, it indicates 'PRIVATE' and 'Pre-Solo'. The main content area is titled 'PRE-SOLO' and features a grid of lesson cards. Each card shows a different flight maneuver with an 'EVAL SCORE' bar and percentage. The lessons include: 'INTRO FLIGHT' (78.2%), 'STRAIGHT & LEVEL' (84.3%), 'CLIMBS & DESCENTS' (94.8%), 'LEVEL TURNS' (94%), 'NORMAL TAKEOFF' (99.9%), and 'CROSSWIND TAKEOFF' (95.7%). There are also two more cards at the bottom that are partially visible. On the left side, there is an 'UPDATES' section dated 'September 14 2018' with a welcome message and contact information for support@takeflightinteractive.com. The interface is powered by 'TakeFlight INTERACTIVE'.

LIBRARY DEVELOPER

TakeFlight Academy

PRIVATE
- Pre-Solo

Powerd by TakeFlight INTERACTIVE

PRE-SOLO

Lesson Title	EVAL SCORE	Percentage
INTRO FLIGHT	78.2%	78.2%
STRAIGHT & LEVEL	84.3%	84.3%
CLIMBS & DESCENTS	94.8%	94.8%
LEVEL TURNS	94%	94%
NORMAL TAKEOFF	99.9%	99.9%
CROSSWIND TAKEOFF	95.7%	95.7%

UPDATES

September 14 2018
Welcome to the TakeFlight Academy Early Access Beta!

Watch this space for information about updates, bug fixes, and new lessons.

Please send any issues to:
support@takeflightinteractive.com

LIVE

TakeFlight Academy

File
bseitz@takeflightinteractive.com

LIBRARY DEVELOPER
Powered by **TakeFlight** INTERACTIVE

TakeFlight Academy

PRIVATE

- Pre-Solo

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INTRO FLIGHT

STEP 1

Primary control surface	Airplane movement	Axes of rotation
Aileron	Roll	Longitudinal
Elevator/stabilator	Pitch	Lateral
Rudder	Yaw	Vertical

Airplane Flying Handbook - Figure 3-2

The Elevator controls pitch

- Pulling back on the controls increases pitch
- Pushing forward on the controls decreases pitch
- Your pitch affects your airspeed.

Maneuver Description

All pilots have that first flight, where they have an opportunity to experience what it's like to take the controls. In this lesson, you'll use each primary flight control and see how it affects the aircraft. Then you'll fly through a hoops course to put it all together.

Key Concepts

The Four Forces of Flight

- **Thrust** - The force to create speed and wind over the wing
- **Lift** - The force that opposes gravity and lifts the aircraft
- **Weight** - The force of the aircraft's weight pulling toward earth
- **Drag** - Resistance to speed caused by the creation of lift and wind against the aircraft

FLY NOW!

BACK

PREVIOUS

NEXT



TakeFlight Academy

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Lesson Type	Location	Aircraft	Score
TRAINING	KRNT	A172	100%
EVALUATION	KRNT	A172	75.2%
CHALLENGE	KRNT	A172	100%

Learn the maneuver with full feedback and scoring.

Test your mastery of the maneuver with no feedback.

Practice your skills in a fun and challenging scenario.

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TakeFlight Academy

“Just sit back and relax, I have the flight controls...”

“...now, put your left hand on the yoke. Use a loose grip.”



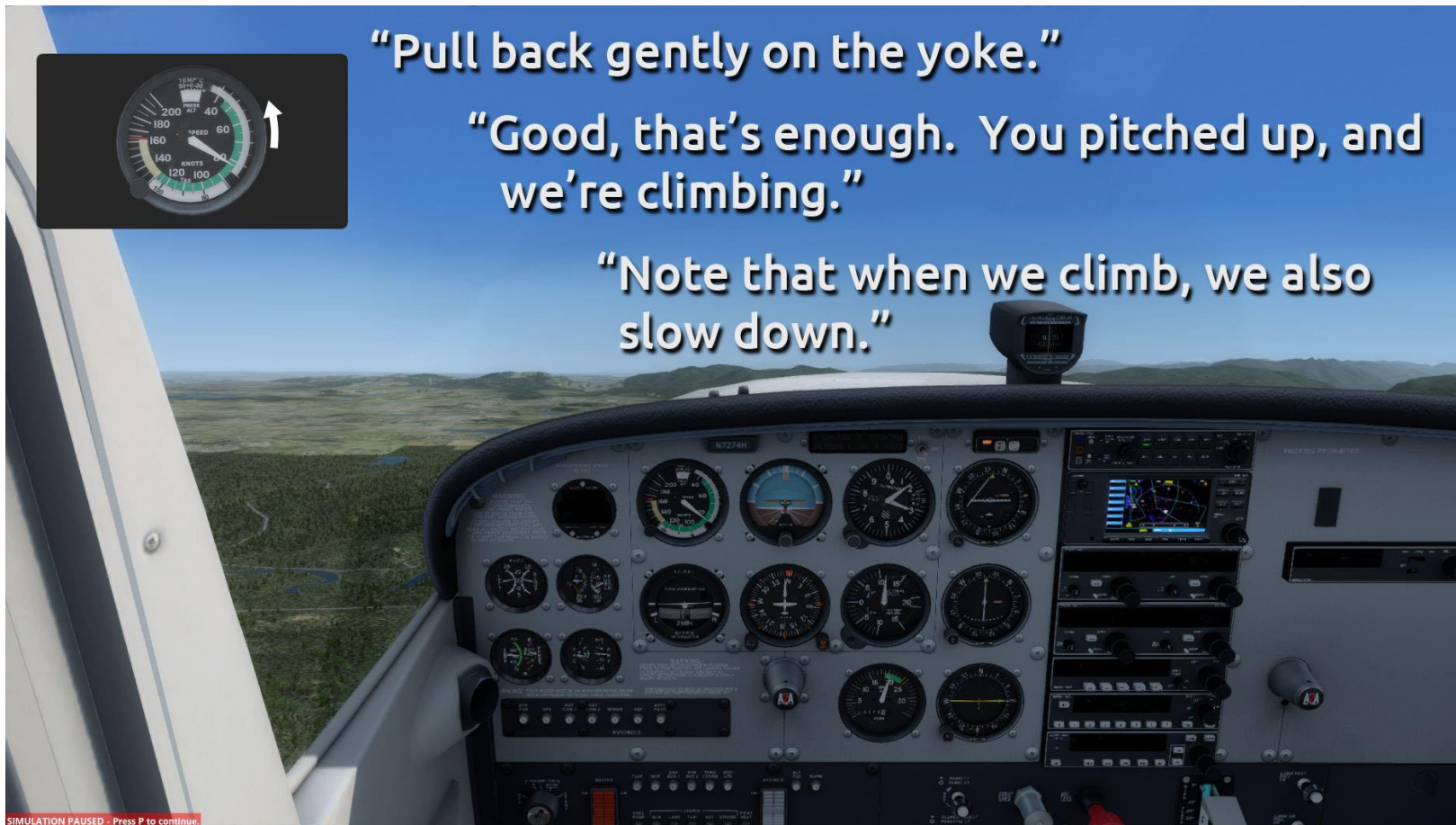
LIVE

TakeFlight Academy

“Pull back gently on the yoke.”

“Good, that’s enough. You pitched up, and we’re climbing.”

“Note that when we climb, we also slow down.”



SIMULATION PAUSED - Press P to continue.

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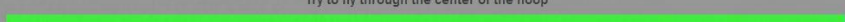
TakeFlight Academy



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TakeFlight Academy

Intro Flight | TakeFlight Academy | KRNT TakeFlight INTERACTIVE

Aerial Course		90.6%
Gate 1	Try to fly through the center of the hoop	+85.00 points
Score:		85%
Gate 2	Try to fly through the center of the hoop	+100.00 points
Score:		100%
Gate 3	Try to fly through the center of the hoop	+85.00 points
Score:		85%
Gate 4	Try to fly through the center of the hoop	+100.00 points
Score:		100%
Gate 5	Try to fly through the center of the hoop	+100.00 points
Score:		100%
Gate 6	Try to fly through the center of the hoop	+70.00 points
Score:		70%
Gate 7	Try to fly through the center of the hoop	+85.00 points
Score:		85%
Gate 8	Try to fly through the center of the hoop	+100.00 points
Score:		100%

90.6%

Try Again Exit

SIMULATION PAUSED - Press P to continue.

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TakeFlight Academy

File LIBRARY DEVELOPER bsetlz@takeflightinteractive.com

TakeFlight Academy

PRIVATE
- Pre-Solo

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Lesson Name	EVAL SCORE	Percentage
LEVEL TURNS		94%
NORMAL TAKEOFF		99.9%
CROSSWIND TAKEOFF		95.7%
NORMAL LANDING		94.7%
CROSSWIND LANDING		92.9%
TRAFFIC PATTERN		96.6%
ENGINE FAILURE		N/A
MINIMUM AIRSPEED		96.7%
STEEP TURNS		94.8%

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Start a Steep Turn to the left when ready.

Steep Turns - Evaluation | TakeFlight Academy | KRNT



First Turn			87.8%
Bank	Maintain 45°, ± 10°	+12° -4°	85.8%
Airspeed	Maintain 90 knots, ± 10 knots	+7 Kts -0 Kts	87.1%
Altitude	Maintain 3000 feet, ± 100 feet	+0 ft -98 ft	84.6%
Rollout Heading	Rollout on 120°, ± 10°	+0° -4°	88.5%
Coordination	Keep the turn coordinator ball centered	+0% -0%	100%
Second Turn			91.9%
Bank	Maintain 45°, ± 10°	+2° -4°	97.1%
Airspeed	Maintain 90 knots, ± 10 knots	+0 Kts -3 Kts	91.8%
Altitude	Maintain 3000 feet, ± 100 feet	+0 ft -50 ft	88.2%
Rollout Heading	Rollout on 120°, ± 10°	+0° -5°	84%
Coordination	Keep the turn coordinator ball centered	+0% -0%	100%

89.8%

Try Again

Exit

TakeFlight Academy



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Alaska Airlines/TakeFlight Interactive Solo Academy

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Solo Academy



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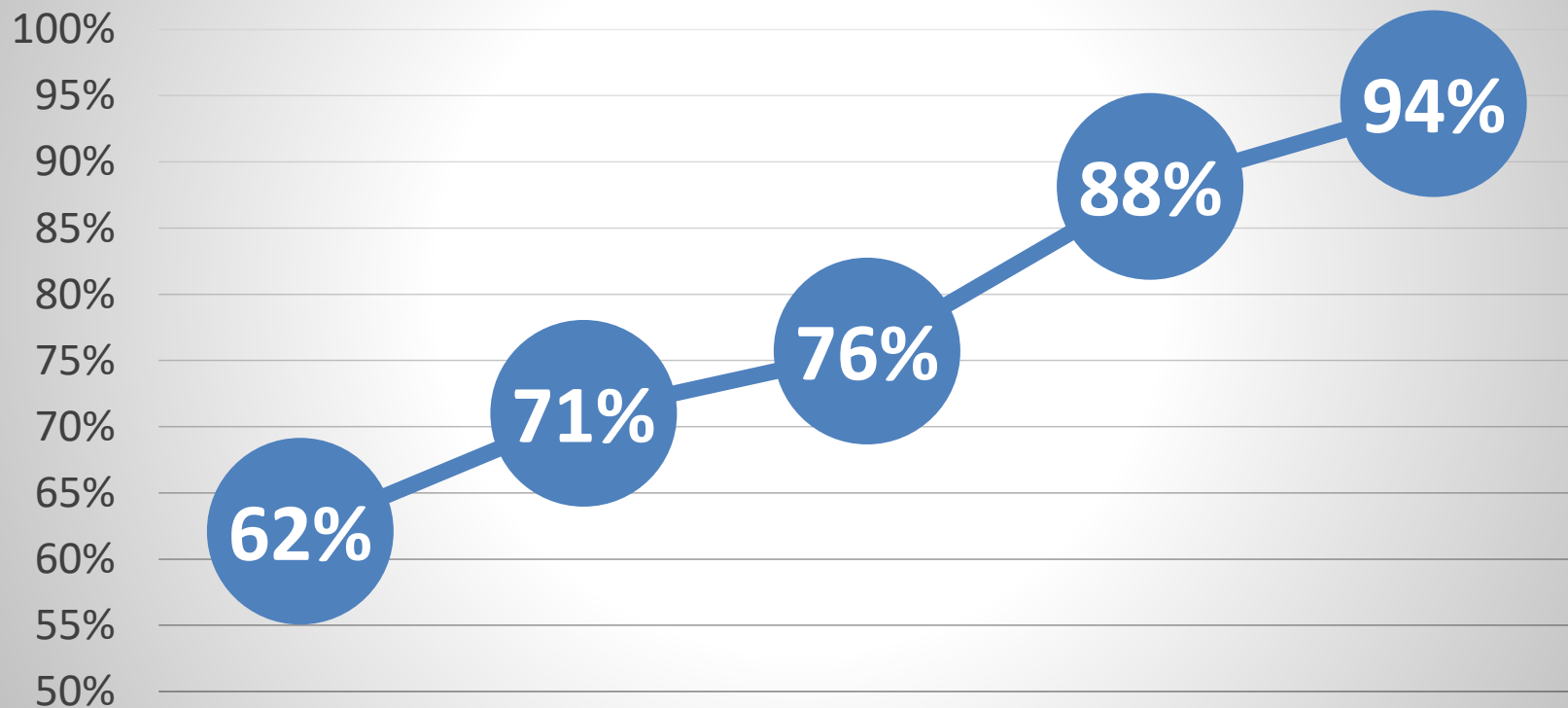
Solo Academy



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Solo Academy

Normal Takeoff Training



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Solo Academy



Soloed 40% faster than those not using TakeFlight

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EAA – Virtual Flight Academy



MEMBERCENTRAL
MEMBERS/CHAPTERS IN ACTION

EAA Virtual Flight Academy Takes Off at Chapter 1067

BY BRANDON SELTZ, EAA 1274869, TAKEFLIGHT INTERACTIVE FOUNDER AND CEO

CHAPTER 1067 HAS BEEN developing strategically in recent years. A refreshed crop of volunteers have revitalized chapter meetings with regular presentations and are now holding monthly Young Eagles rallies. The chapter is about to occupy its own hangar for the first time and is putting together a youth build program. It is also one of the first chapters to see how successfully it can integrate EAA's Virtual Flight Academy (VEA) into its activities.



Chapter members pulled together an old laptop computer they had lying around, installed Microsoft Flight Simulator, and connected a \$35 Logitech joystick. They also brought a more powerful laptop with a modern graphics processor, which they outfitted with a yoke and pedals.

Starting with the September meeting, the chapter introduced the EAA VEA program to members, bringing both simulators for test flights of the VEA's virtual flight instructor — the heart of the new EAA member benefit. Member tests of their virtual instructor-assisted flying skills yielded enthusiastic results. There was plenty of merriment as pilots looked on as their friends got used to the simulator and saw their performance scores.

At the September Young Eagles rally, two simulators in similar configurations were used. This time, they were able to see how Young Eagles would respond to the Aviore-inspired Young Eagles version of VFA. The response was no surprise: kids grinning from ear to ear, beaming when they saw how well they performed. The chapter did the same exercises during the October members meeting and Young Eagles rally. This time, one of the members brought a 40-inch TV, which added to the fun at no cost. The TV is a breeze to connect with an HDMI cable, and then you just need to configure the TV for that video source. Again, the results were fun, enthusiasm, and group engagement.

In the EAA Virtual Flight Academy, the primary focus was on two of the six available maneuvers: the introductory flight and the normal landing. These provide distinct accomplishments for young flyers to focus on. The introductory flight has an especially fun element: after the orientation segment, young flyers run an aerial hoop course in which they fly through concentric circles along a serpentine flight path. It's a real crowd-pleaser and a perfect way to challenge and evaluate just-acquired flying skills.

Something unexpected and delightful happened at the October rally. One of the parents indicated a past interest in a flying career but noted that cost and family obligations got in the way. After watching the Young Eagles on the simulator, he asked if he could dive in, which he did — with gusto. He graciously gave up the controls when the next Young Eagle arrived for his turn, but it was obvious he would have flown the entire day if he didn't need to take his family home.

The best part was that the rally itself was transformed. Young Eagles events always require extra effort to keep the kids engaged while waiting for their flights. Too often the hangar feels like a waiting room and not terribly exciting for high-energy kids as they wait for their name to be called. But with the VFA running in the hangar, now there are flights happening on the ground, not just in the air. More than a few volunteers remarked how much — and how positively — it changed the energy of the rally.

Young Eagles eat this stuff up. They gain these flying skills quickly — far faster than most adults. Several got scores in the 90th percentile after only a few tries. The VFA also gives young people a way to continue engaging with aviation beyond the first Young Eagles flight. When they come back to the chapter having high scores on the maneuvers, the chapter would be more than happy to give them an additional Young Eagles flight.

"The EAA Virtual Flight Academy, along with Sporty's Private Pilot Ground School, our Young Eagles flights, the opportunity to actually build an airplane, and the mentoring from our many qualified and experienced members, will allow us to create a more complete career-focused aviation program for our local young people," said Chapter President Joan Zaleski, EAA 1191719.



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EAA – Virtual Flight Academy



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Civil Air Patrol



LIVE



The Next Generation of Aviators

- No barriers to technology
- Already playing games
 - Why not learn to fly while they're doing it?
- Greatly increased access to training

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The Next Generation of Aviators



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Sim for Primary Training?

- Simulation not for Primary Training?
 - Mainly for IFR due to?
 - We're interested in your opinions in Q&A!
- Why now?
 - Computing power
 - Increased visual realism & larger displays
 - Better simulation fidelity
 - New capabilities in AI and Virtual CFI

Understood Limitations of Sim



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Benefits for the Student

- Primacy
 - What's learned first is best remembered
- Availability of Training
- Efficiency
 - Less time in the aircraft focusing on maneuvers
 - Lower costs = higher completion rates
- More fun!
 - Increased confidence in the aircraft is more fun.



Benefits for the Instructor

- Primacy
 - Overcoming primacy is very difficult
- Better Prepared Students
- Increase Completion Ratio
- Higher Instructor/Student Ratio?

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Benefits for the Flight School

- Happier Customers
 - More Business via Social Media
 - Higher completion rates
- Simulator Rentals
 - Higher profit margins
 - When the weather isn't conducive to flying
- Better visibility in Student Progress

How can I Integrate this Tool?

- How can I use this tool?
 - Student who is interested, or looking to get started
 - Homework before a flight lesson
- What do I need to get started?
 - PC – Gaming PC with dedicated graphics card.
 - Flight Controls (Joystick/Yoke)
 - Lockheed Prepar3D
- Questions for us?
 - support@takeflightinteractive.com

Other Great Sim Tools

-  – Human ATC for flight simulation
 - AIN Article – Learning to Fly on Simulated Wings



<https://www.ainonline.com/aviation-news/general-aviation/2019-01-29/learning-fly-simulated-wings>



Conclusion

- Using game design techniques can help you keep your students engaged and on-track to certification.
- New tools can transform the training process, getting students to certification with more knowledge, experience, creating safer and more capable pilots.

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Questions

Thank you!

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