

# EXPLORING THE BEST PRACTICES OF VIRTUAL TRAINING DELIVERY FOR THE PROSPECTIVE AIR TRAFFIC CONTROLLERS

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# OUTLINE

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- Objectives
- Assessments
- Results
- Application of Augmented Reality and Virtual Reality in ATC
- Recommendations
- Acknowledgement

BEST PRACTICES AND METHODS FOR VIRTUAL TRAINING DELIVERY, CA-I, LULU SUN, PH.D. ERAU

# INTRODUCTION

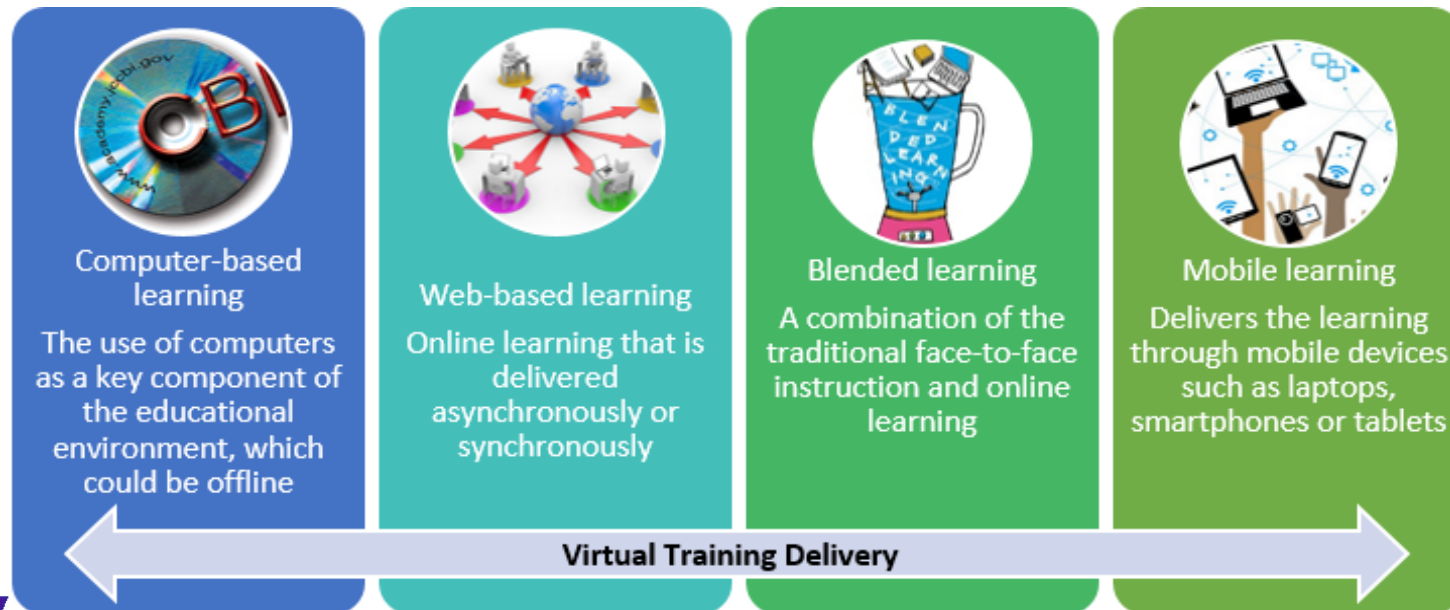
- Why are we doing this?
  - FAA training delivery methods, such as instructor led-courses, and PowerPoint with no accompanying assessment, have not kept pace with advances in simulation technologies.
  - Air traffic volume and complexity have steadily increased, along with innovative technologies and methodologies.
  - Millennials have expertise in media, tools, and technology than boomers. The FAA must change its traditional means of training since the new hires grew up in a digital world and prefer digital technologies to the more static teaching methods used to train their predecessors.

# OBJECTIVES

- What do we hope to accomplish?
  - Best practices and methods, including synchronous and asynchronous delivery techniques, will be synthesized and presented to the FAA.
  - Training courses including the Air Traffic Basics (AT Basics) and the Initial Tower Cab offered by the FAA academy and Air Traffic Collegiate Training Initiative (AT-CTI) schools research findings will be presented.
  - Develop recommendations for changes to the FAA Training process.
  - Identify potential impacts on training for both current and future training delivery systems.

# METHODS

- How will we accomplish it?
  - Examine training courses offered by the FAA academy, CTI schools, and other training area.
  - Conduct surveys and face-to-face interviews to understand the current controller's training experiences and expectations.
  - Collaborate with industry partners and consultants to research potential training curriculum and delivery improvements and identify potential impacts



# ASSESSMENTS

- Face to face interviews
  - FAA Academy, DCA tower, and MCO tower
- Online surveys
  - FAA Academy, and CTI schools

# RESULTS

- What did our students and instructors at the FAA academy say? (August 2017)
  - Responded unanimously that they believe they should have more hours in the simulation labs with a virtual format.
  - Current course videos and animations are outdated. Poor quality of graphics and videos.
  - No automated pre-test and post-test to ascertain students' understanding before and after each topic.
  - Instructors' personal style and pacing should be tailored in the virtual training environment.
  - More teamwork is needed for AT Basics course.
  - Students believe that as millennials, they have the ability to use new technology to teach themselves in a virtual environment.
  - Students preferred hybrid learning with information online and traditional hands-on training methods, rather than a completely virtual format.

## RESULTS: FACE-TO-FACE INTERVIEWS

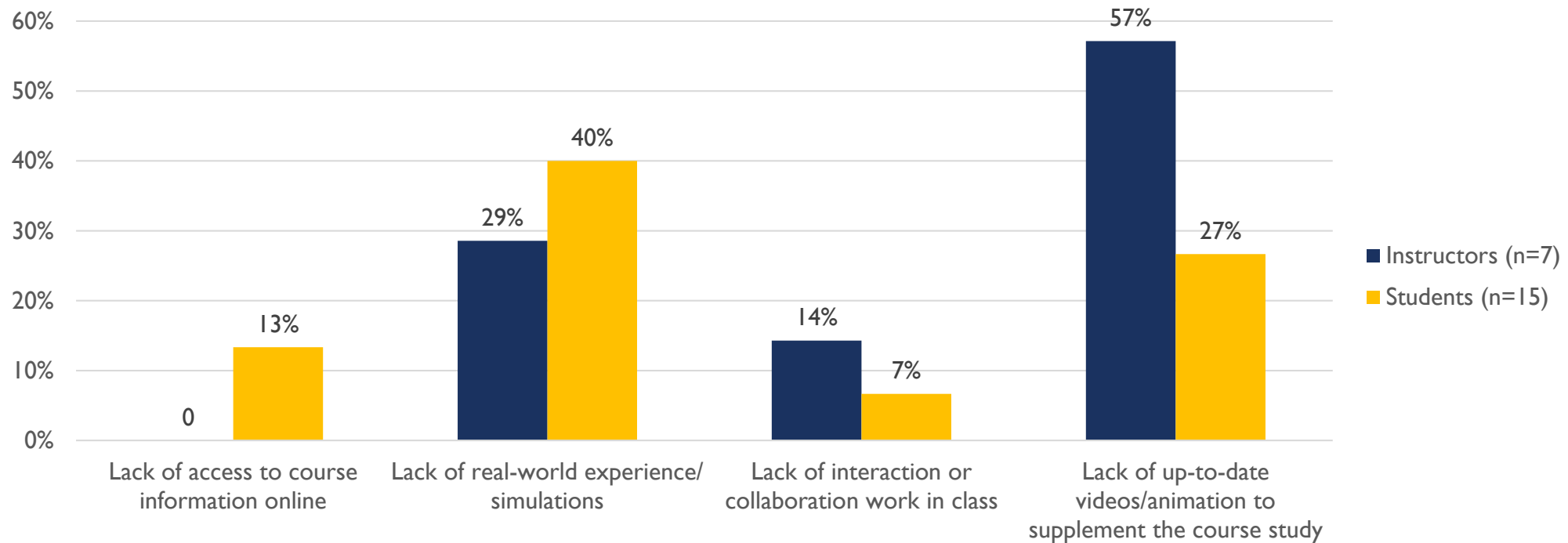
- What did our managers and instructors at DCA and MCO towers say?
  - Do not take the instructor away completely, but just add additional effective resources.
  - Start with something small like a learning management system.
  - Focus on key areas that enhance controllers technical abilities.
  - Sharing senior controllers' experiences in a virtual format is desirable.
  - Team building activities are important for controller success.
  - Passing tests is important, but instructors prefer students who are passionate about learning everything there is to know about air traffic control. Stories such as the US Airways Hudson River landing and other ATC events need to be compiled and shared virtually with all, not in a single one or two classes.
  - Find ways to get training materials to the user faster, more robust, and easier to adapt.
  - Some simulation labs are outdated.
  - Interactive and scenario driven videos/animations are needed.



# RESULTS: ONLINE SURVEYS

- FAA Academy, and CTI schools

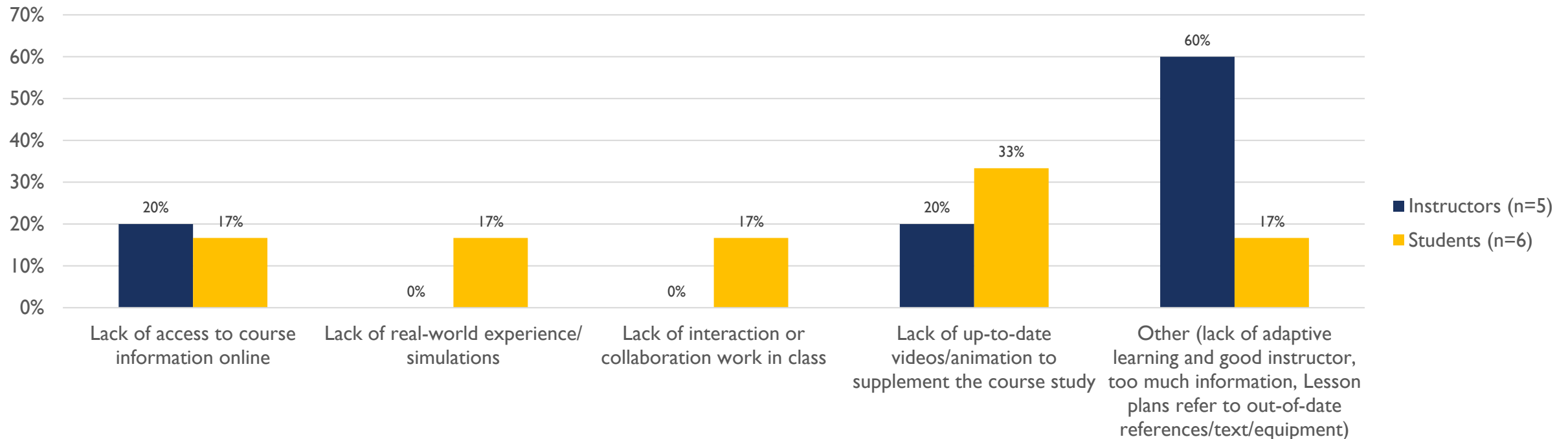
What is the biggest factor that negatively impacts your teaching/learning with the current Air Traffic Basics courses?



# RESULTS: ONLINE SURVEYS

- FAA Academy, and CTI schools

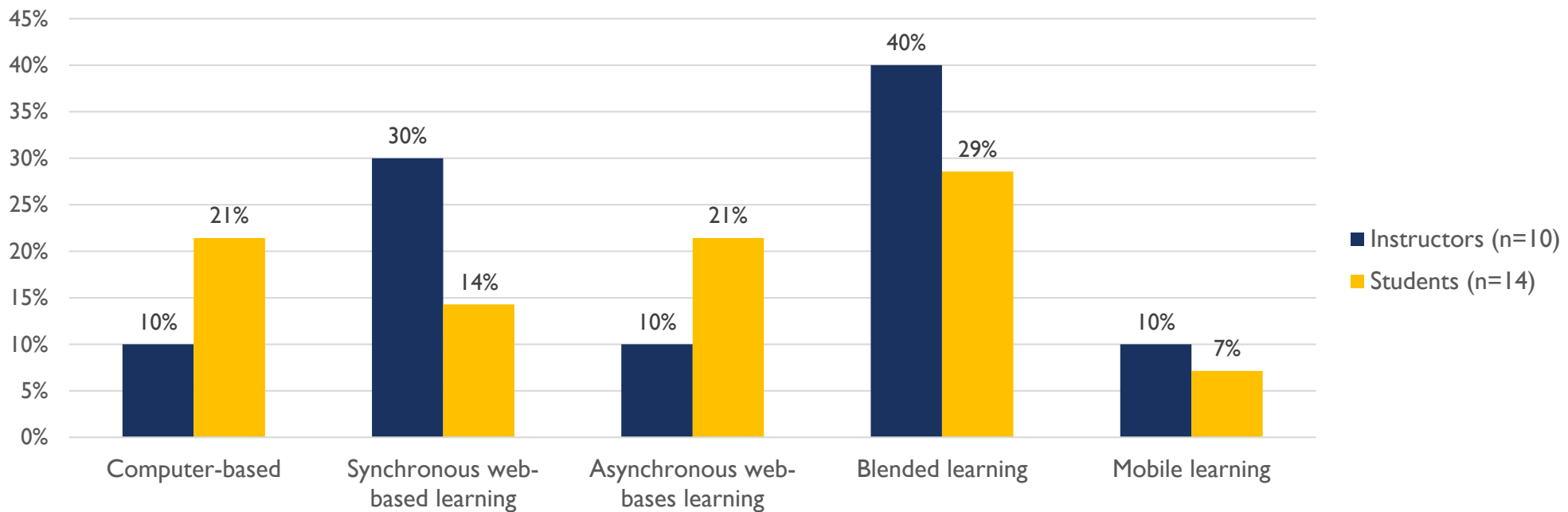
What is the biggest factor that negatively impacts your teaching/learning with the current Initial Tower Cab Training courses?



# RESULTS: ONLINE SURVEYS

- FAA Academy, and CTI schools

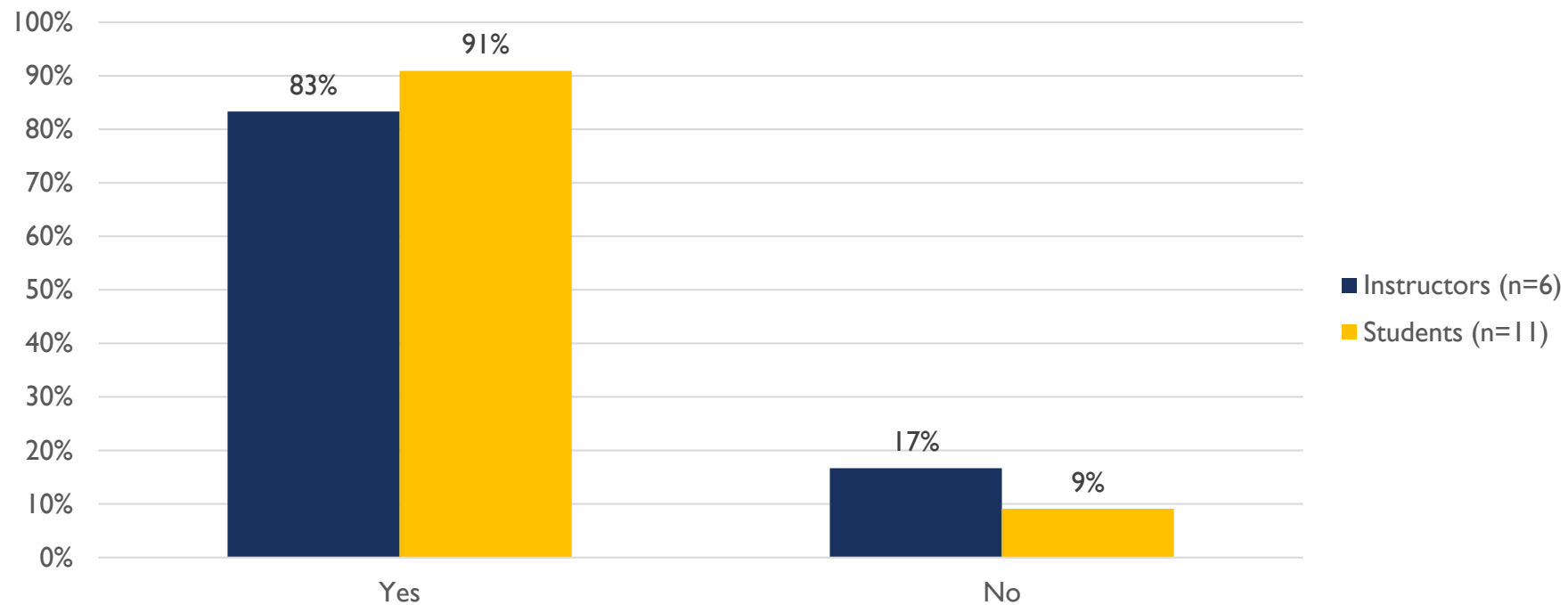
If the course is switched to a virtual format, which modality would you be interested in using? (Select all that apply)



# RESULTS: ONLINE SURVEYS

- FAA Academy, and CTI schools

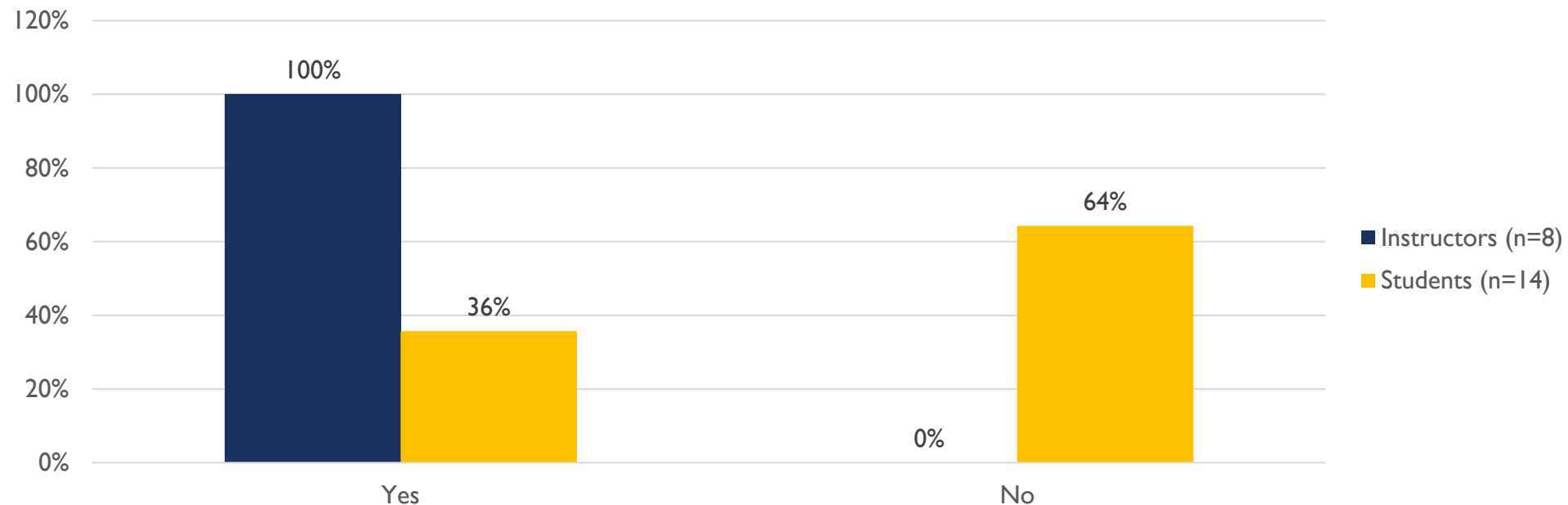
Do you feel your students/you have the technology skills needed to succeed in a virtual course?



# RESULTS: ONLINE SURVEYS

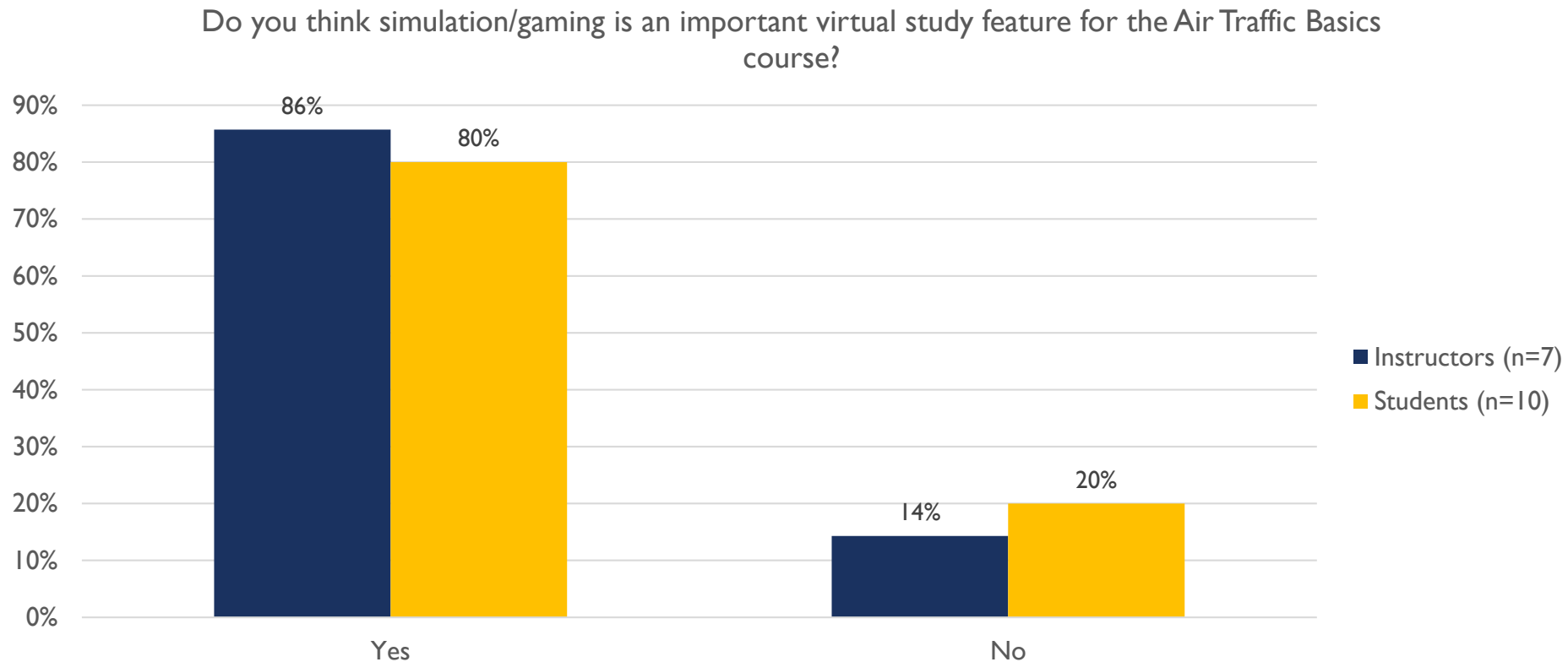
- FAA Academy, and CTI schools

As an instructor/student, would you like to see both courses being switched to a virtual training delivery or not?



# RESULTS: ONLINE SURVEYS

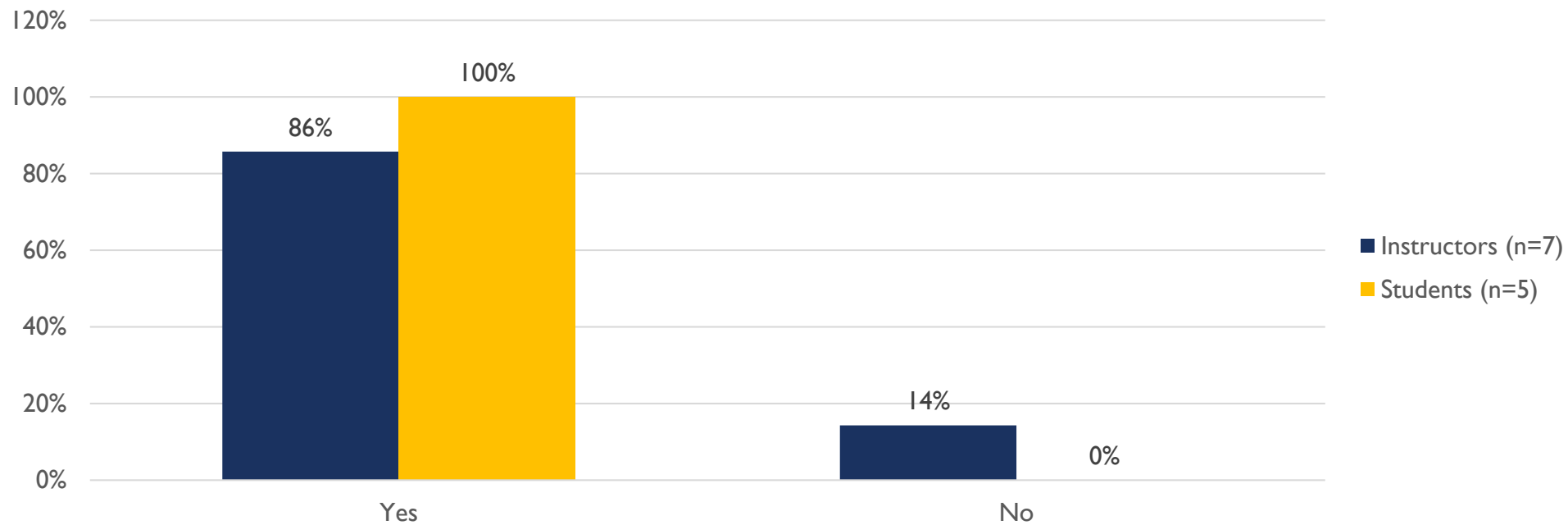
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# RESULTS: ONLINE SURVEYS

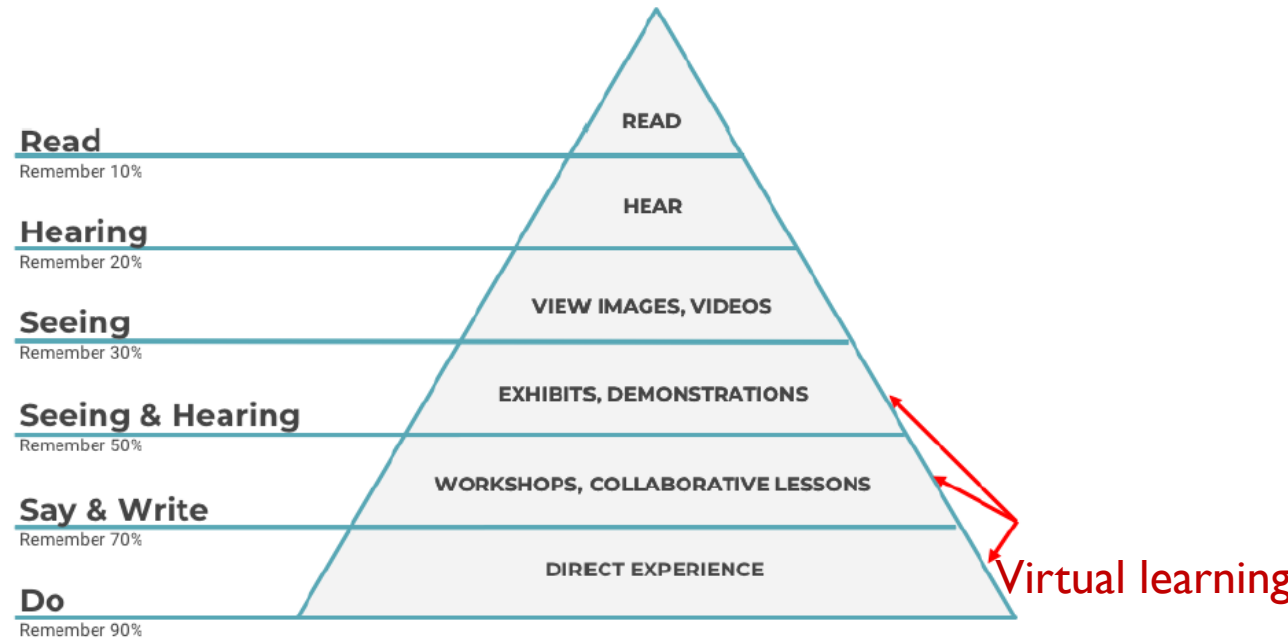
- FAA Academy, and CTI schools

Do you think simulation/gaming is an important virtual study feature for the Tower Cab Training course?



# APPLICATION OF AUGMENTED REALITY AND VIRTUAL REALITY IN ATC

- Multi-sensory learning
  - Vision (sight); Auditory (hearing); Gustatory (taste); Olfaction (smell); Vestibular (balance/movement); Somatic sensation (touch)
- Application of Virtual Reality (VR) in ATC ([https://www.youtube.com/watch?time\\_continue=4&v=MDv0CJVudoo](https://www.youtube.com/watch?time_continue=4&v=MDv0CJVudoo))
  - Offer more interactive and immersive learning environment
  - More engaged and adaptive gamification learning environment
  - Enhancing the ability of understanding and memorizing knowledge
- Application of Augmented Reality (AR) in ATC
  - Enhanced visual information under low-visibility condition
  - Reduction of head-down time
  - Clear blocking of important line-of-sights



Edgar Dale, Cone of experience (1969)



# RECOMMENDATIONS

- A learning management system and infrastructure requirements is needed so that all course materials can be accessed in a virtual environment.
- Based on the study courses, a **blended learning** should be designed and implemented.
- New high quality short screencasts should be created with **interactive** questions/answers to test their understanding online.
- Emphasize teamwork and discussion in class time with the facilitation of the instructor.
- Reduced lecture time and extended simulation practice of the Tower Cab Training course with virtual training.
- Animation/simulation/gaming should be included in the virtual training so that students are more **engaged** to study by themselves.
- Virtual reality can be incorporated into virtual learning to improve student engagement and retention.
- Augmented reality can be a great learning tool especially helping ATC-in-training at the facility.
- Create a **virtual community** so that students can help each other and support each other.
- People learn more from **mistakes**. For example, simulations that are used to illustrate wrong directions given by the controllers causing a pilot to come dangerously close to a mountain are especially important.
- An adaptive learning should be applied so that based on the test performance students can have the options to either repeat or move on to the next topic of study.

- **ACKNOWLEDGEMENT**

The FAA has sponsored this project through the Center of Excellence for Technical Training and Human Performance. However, the agency neither endorses nor rejects the findings of this research. The presentation of this information is in the interest of invoking technical community comment on results and conclusions of the research.