UAS Jeopardy!

Session Time: One, 50-minute session

DESIRED RESULTS

ESSENTIAL UNDERSTANDINGS

Different forms of review will allow students to become familiar with concepts that will be tested on the Unmanned Aircraft General – Small exam and to understand these concepts at a deeper level.

ESSENTIAL QUESTIONS

1. What are the most important elements of UAS topics that will appear on the Unmanned Aircraft General – Small exam, and how can these best be taught in an informative and engaging way?

LEARNING GOALS

Students Will Know

- Topics that will appear on the Part 107 Commercial Drone Exam.

Students Will Be Able To

- *Construct* questions (along with their associated clues) of varying levels of difficulty on a topic they have researched. [DOK-L2]
- *Assess* the difficulty level of each question, and rank them accordingly. [DOK-L3]
- *Recall* knowledge learned thus far to discuss and answer questions as a team. [DOK-L1]

ASSESSMENT EVIDENCE

Warm-up
Students will familiarize themselves with the game *Jeopardy!* by watching a brief clip from a televised episode.

Formative Assessment
There is no formative assessment for this lesson.

Summative Assessment
There is no summative assessment for this lesson.

LESSON PREPARATION

MATERIALS/RESOURCES

- UAS *Jeopardy!* Presentation
- UAS *Jeopardy!* Student Activity
- UAS *Jeopardy!* Teacher Notes

UAS *Jeopardy!* Student Activity

- Notes and presentation from Lesson 8.A.1 (Group Project: Your Turn to Teach)
- At least 5 index cards (4 6) per group
- Pens or markers
- Tape
- Paper

LESSON SUMMARY

Lesson 1: Group Project: Your Turn to Teach
Lesson 2: UAS *Jeopardy!*

The lesson will begin with a warm-up in which students watch a video clip from an episode of *Jeopardy!*. This will familiarize students with how the game of *Jeopardy!* is played. The class will then briefly review the main topics from Lesson 8.A.1; each topic will become a category in the class game of *Jeopardy!*.

During the next part of the lesson, students will get back into their small groups from Lesson 1. Each group will choose a team name and brainstorm key facts relevant to its topic/category. Groups will choose five facts to turn into *Jeopardy!*-style clues (i.e., an answer followed by a question), which they will write on five index cards. Groups will tape their index cards to the game board, and the class will play a game of *Jeopardy!* to prepare for the Part 107 exam.

After the game, students will learn where they can take the Part 107 exam. They will also learn about accessing additional resources for studying for the test, finding test centers, and gaining Part 107 exam certification.

BACKGROUND

This unit guides students to review what they have learned to this point in the course, in preparation to take the FAA's certification exam for commercial drone pilots. (The FAA's official name for the exam is the "Unmanned Aircraft General – Small exam"; for the sake of brevity and convenience, however, this lesson shall refer to the Part 107 exam because this is how drone pilots typically refer to the exam in conversation.) Although people need to be 14 years old to take the exam, they need to be 16 years old to exercise the privileges of a commercial drone pilot. As 11th graders, nearly all students taking this course should meet the requirement to take the exam, and most who pass should be old enough to operate as commercial remote pilots.

As students have learned, drones are more than a consumer novelty—they are rapidly changing and evolving into useful tools for many industries. Industries in which drones are used include cinematography, energy, mining, utilities, real estate, customs and border protection, journalism, fire, police, agriculture, and construction. With this growth comes many job opportunities.

Taking the Part 107 exam to become a commercially licensed drone pilot is an important step for students—not only in terms of opening doors to a variety of careers, but also for fostering personal growth and overall UAS safety.

MISCONCEPTIONS

Students—particularly those who have been in AOPA's High School STEM Curriculum since 9th or 10th grade—may assume that because they have learned all of the material that the FAA's Part 107 exam will cover, outside study for the test will not be necessary. It is important to emphasize that the exam is challenging and that to do well on it, students should spend time studying on their own. It is only through self-study—in conjunction with AOPA's curriculum—that students can maximize their potential for success on test day.

Also, students may assume that the Part 107 exam will contain only questions that are relevant to sUAS pilots. This is not the case. Some questions on the exam will cover topics (e.g., airspace requirements, airport procedures, weather reports) that might seem more applicable to pilots of manned aircraft. It is important that students be as familiar with these topics as they are with topics that seem more directly related to sUAS. Many of these topics were covered in AOPA's grade 10 curriculum, and they will be reviewed over the course of this unit.

Finally, students who decide to take the Part 107 exam may expect to receive their commercial certificate with a sUAS rating as soon as they pass the exam. Instead, after taking and passing the exam, students will need to complete an application using IACRA—the FAA's airman application system—to apply for a certificate. Within 10 days, the application should be validated, which will allow students to print out a temporary drone certificate. The actual certificate will then arrive in the mail.

DIFFERENTIATION

While the activity in this lesson is already highly differentiated, there are still some things you can do to challenge or support students based on their needs. To challenge students during the **EXPLORE** section of the lesson plan, you might encourage groups to come up with more than just five *Jeopardy!* questions. To challenge students during the **EXPLAIN** section of the lesson plan, you might want to reduce the amount of time students have to answer the *Jeopardy!* questions from one minute to 30 or 45 seconds.

To support students during the **EXPLORE** section of the lesson plan, you might provide additional examples of how to write a *Jeopardy!*-style question or work more closely with groups that struggle to come up with their questions. To support students during the **EXPLAIN** section of the lesson plan, you might want to increase the amount of time students have to answer *Jeopardy!* questions beyond the recommended one minute.

LEARNING PLAN

ENGAGE

Teacher Material: UAS *Jeopardy!* Presentation

Session 1

Slides 1–3: Introduce the topic and learning objectives of the lesson.

Slides 4–5: Conduct the **Warm-Up**.

Teaching Tips

Explain to students that this lesson is entirely activity-based: it serves as a final full-class review to prepare them for the Part 107 exam, and it builds on the work they completed in the previous lesson (Lesson 8.A.1: Group Project: Your Turn to Teach). To this end, ask students to recall the topic they researched and taught for Lesson 1. They will continue to work with this topic for Lesson 2.

If you and your students are sufficiently familiar with the Jeopardy! game and creating a classroom version, you may find that reviewing the slides ahead of time to be beneficial. It is possible that you will only need to show a subset of the slides to your students.

Warm-Up

Poll the class to learn how many students have seen the popular TV game show *Jeopardy!*. For those who have not, explain that contestants in a game of *Jeopardy!* are given the answers to questions on a variety of topics. To score points, contestants must provide the correct question for each answer. Then show students the following clip from an episode of *Jeopardy!*; note that contestants are being tested on their knowledge of the Jet Propulsion Laboratory and that correct responses must be phrased in the form of a question.

- "The Jet Propulsion Laboratory – JEOPARDY!" (Length 1:46)
  https://video.link/w/6Wx1

For teachers unable to access Safe YouTube links, the video is also available here: https://youtu.be/g5pAw8wWIYk

Explain that students will be working in their groups from Lesson 1 to create their own game of *Jeopardy!* in preparation for the Part 107 exam; their game will review key topics relevant to both manned and unmanned piloting. Students will then play their game as a class.

EXPLORE

Teacher Materials: UAS *Jeopardy!* Presentation, UAS *Jeopardy!* Teacher Notes
Student Materials: UAS *Jeopardy!* Student Activity, **notes and presentations from Lesson 8.A.1**

Slide 6: Remind students that the purpose of this unit is to prepare them to take the Part 107 exam, a necessary step toward getting their certification to be a commercial drone pilot:

- The exam takes 2 hours and consists of 60 questions; to pass, a student must answer at least 42 questions correctly (70 percent).
- Taking the exam is not a requirement for passing this course; however, students are strongly recommended to take the exam because passing it will allow them to earn a valuable certification and work as commercial sUAS pilots.

Slide 7: Instruct students to get back in their small groups (3–5 students/group) from the previous lesson (Lesson 8.A.1: Group Project: Your Turn to Teach). Distribute **UAS Jeopardy! Student Activity**, along with the index cards and other supplies. Instruct students to read the activity's objective. Each group should choose a team name (relevant to the main topic that it researched and taught during the previous lesson) and record it on the activity worksheet.

Slide 8: Instruct each group to record its main topic from Lesson 1 and brainstorm key facts and concepts relevant to this main topic; encourage students to review their notes and presentations from that lesson. Groups will use these facts to create questions and answers for their contribution to the class game.

Teaching Tips

Display the following five slides to briefly review each of the main topics from Lesson 8.A.1. Inform students that each main topic will become one of the categories in the class game of Jeopardy!. Each group will be in charge of one category, creating five Jeopardy!-style questions and answers for that topic.

Slide 9: The first category is **Regulations**. These are the key concepts relevant to this category:

- Remote pilot certification and privileges
- Crew roles
- Accident reporting
- sUAS registration
- Preflight actions and inspection
- Daylight/night operations
- Line of sight, operating limitations
- Right-of-way rules
- Operations around people and vehicles
- Alcohol and drugs
- Operational waivers
- Change of address

Slide 10: The second category is **Airspace and Requirements**. These are the key concepts relevant to this category:

- Airspace classifications and requirements
- Flight restrictions
- NOTAMs
- Sectional charts
- Airport operations
- Preflight actions and inspection
- Airport markings and signs

Slide 11: The third category is **Weather**. These are the key concepts relevant to this category:

- Effects of weather
- Wind
- Atmospheric stability
- Air masses and fronts
- Visibility and clouds
- Thunderstorms, icing, and fog
- Density altitude
- Aviation weather services (e.g., METARs, weather reports and forecasts)

Slide 12: The fourth category is **Loading and Performance**. These are the key concepts relevant to this category:

- Loading considerations
- Center of gravity
- Weight and balance definitions and calculations
- Load factor
- Aerodynamics
- Performance
- Stalls

Slide 13: The fifth category is **Operations**. These are the key concepts relevant to this category:

- Communications procedures
- Emergency procedures (e.g., lost link, flyaways, loss of GPS, battery fires)
- Aeronautical decision making
- Physiology
- Maintenance procedures

Slide 14: Groups will now choose five key facts within their category to transform into *Jeopardy!*-style questions and answers. Instruct each group to write five *Jeopardy!*-style questions and answers. Write each question on one side of an

index card, and its answer on the opposite side of the same index card. See the example in **UAS *Jeopardy!* Teacher Notes**. Groups should aim for a range of difficulty: some facts should lead to relatively easy questions and answers, while other facts should lead to relatively difficult questions and answers. [DOK-L2; *construct*]

Teaching Tips

If possible, gather five separate colors of index cards and distribute one color to each group. When playing the game, this will make it easier to quickly identify the cards for each category.

Display the following six slides to illustrate for students how to "translate" a key fact into a Jeopardy!-style question and answer. Emphasize that students should not reuse either of these examples—each group should create five original questions and answers.

Slide 15: This first example uses a key fact from the "Regulations" category. Suppose that students in that group want to assess this fact:

- An unmanned aircraft system (UAS) that weighs more than 0.55 pounds must be registered with the FAA.

Slide 16: To convert this fact into a *Jeopardy!*-style question and answer, students need to identify the most important detail in the fact; this detail becomes the question, and the rest of the fact becomes the answer. In this case, the most important detail is the weight limit: more than 0.55 pounds. Students might turn this detail into the following question:

- What is a weight of more than 0.55 pounds?

Slide 17: Once students have their question, the *Jeopardy!*-style answer consists of the rest of the fact:

- The lightest weight at which an unmanned aircraft must be registered with the FAA.

Teaching Tips

Remind students that the "answer" in a game of Jeopardy! functions as the clue. A contestant who selected this clue would be given the following answer:

- The lightest weight at which an unmanned aircraft must be registered with the FAA.

To earn points, the contestant would have to provide the correct question for this answer:

- What is a weight of more than 0.55 pounds?

Slide 18: Once a group has created its five index cards (with five pairs of questions and answers), it should assign a value ($100, $200, $300, $400, $500) to each card; easier questions receive lower values, and more difficult questions receive higher values. [DOK-L3; *assess*]

As students work in their groups, you should create the game board: use chalk, markers, or masking tape to mark off a 5 5 grid. Write one of the five categories at the top of each column.

When a group has completed its cards and given each card a value, they should tape their cards to the game board with the values facing out. The $100 card goes at the top (immediately below the category label), and the $500 card goes at the bottom. See the slide for an example of what this might look like.

Once all groups have taped their cards to the game board, the game is ready to begin!

EXPLAIN

Teacher Materials: UAS *Jeopardy!* Presentation, UAS *Jeopardy!* Teacher Notes
Student Material: UAS *Jeopardy!* Student Activity

Slide 19: Explain that the class game of *Jeopardy!* will proceed similarly to the clip (from the televised game show) that they watched during ENGAGE. Because each small group will be playing as a team, however, there are several modifications to the official rules:

- Teams will take turns selecting clues.
    - The first team chooses the first clue by naming a category and value from the board (e.g., "Regulations for $100").
    - The teacher then reads the answer from the index card for that clue.
    - Teams then have 30 seconds to confer and decide on their response, which they write on a piece of paper. Each team MUST respond to each clue; remind students to respond in the form of a question.
    - The teacher then reads the question (i.e., the correct response) from the index card for that clue, and each team reveals the question that it wrote.
    - Teams that answered correctly earn the number of points for that clue; teams that answered incorrectly lose the number of points for that clue. (Failing to respond to a clue counts as an incorrect response.)
    - Another team then chooses the next clue. Play proceeds in this way until all teams have chosen a clue, at which point the first team chooses a new clue.
- Teams can choose clues from any category other than the category for which they wrote questions. However, teams should still provide the correct response for the clues in their category. (One team will always have the advantage of having written the clue, but this advantage will be evenly spread throughout the game.)
- The game can be played until all of the clues have been answered, at which time the team with the highest total score wins. If time does not permit all clues to be solved, then the team in the lead when time runs out can be considered the winning team.

[DOK-L1; *recall*]

Slide 20: Congratulate the winning team!

EXTEND

Teacher Material: UAS *Jeopardy!* Presentation

Slide 21: Inform students they have all reached a milestone in the course: they can begin the registration process for the Part 107 exam. They have been exposed to all of the information that will be covered on the test, but self-study until test time is crucial to earning a passing score. Test prep books and online services are great ways to remain prepared until test day. When they feel confident in their ability to pass the test, they should register for a test date at their local testing center.

Before taking the Part 107 exam, however, students will need to take additional steps on several FAA websites. If time permits, the **GOING FURTHER** section of this lesson walks students through this process.

Teaching Tips

The lesson may be done at this point, but giving students access to the links in the **GOING FURTHER** slides is important if they choose to sit for the Part 107 test. Even if there is not time to go over the resources during class, posting them in a place where students can access the information will be helpful to those who opt to take the exam.

EVALUATE

No separate evaluation will be required for this lesson because the lesson itself serves as an evaluation.

GOING FURTHER

Teacher Material: UAS *Jeopardy!* Presentation

Slide 22: Remind students that they must pass the Part 107 exam to earn a Remote Pilot Certificate and fly drones commercially. Before signing up to take the exam at a local testing center, however, students must register on the FAA's Integrated Airman Certification and Rating Application (IACRA) website: https://iacra.faa.gov/IACRA/Default.aspx

Slide 23: Registering on the IACRA website will provide students with a unique FAA tracking number (FTN) that will stay with them throughout the course of their aviation career. Additional FAA information regarding FTN numbers can be found here: https://www.faa.gov/training_testing/testing/acts/media/ftn_faqs.pdf

According to the FAA, "The FTN is a permanent and unique airman number. Please record and keep your FTN Number as it will be needed for future use in completing this application."

- Additional information can be found on the FAA's Airmen Certificate Testing Service (ACTS) page: https://www.faa.gov/training_testing/testing/acts/
- Additional information on how to become a drone pilot can be found here: https://www.faa.gov/uas/commercial_operators/become_a_drone_pilot/

Slide 24: Students can find approved FAA testing centers at the following website: https://faa.psiexams.com/faa/login

If time and resources permit, students should search the website for their nearest testing center. (You may also locate this information prior to class and tell students where they can go.) Emphasize that the Part 107 exam costs money to take and that each testing center may have its own specific requirements for sign up and payment.

Slide 25: Remind students that any drone that meets the weight requirements must be registered with the FAA. Students can do this before or after they pass the Part 107 exam. Even if they fail or decide not to take the exam, students still need to register their drone(s) to fly as a hobbyist. Information on registering drones can be found on the FAADroneZone website: https://faadronezone.faa.gov/#/

Slide 26: Once students pass their Part 107 exam, they will be provided with information from the testing center; they will need to return to the IACRA website to link their test results with their IACRA application. They will then be able to use the IACRA system to submit an application for FAA Remote Pilot Certification.

Slide 27: Additional helpful information for all the necessary steps required to sign up for and take the Part 107 exam can be found at the following site:
https://skyward.io/faa-update-part-107-certification-for-drone-pilots/

Teaching Tips

If you do not have time to walk students through the process, provide students with the following links so they can research the process outside of class:

- Register on the FAA IACRA website to obtain a FTN number here: https://iacra.faa.gov/IACRA/Default.aspx
- Information on FTN numbers can be found here: https://www.faa.gov/training_testing/testing/acts/media/ftn_faqs.pdf
- Additional information can be found on the FAA's Airmen Certificate Testing Service page: https://www.faa.gov/training_testing/testing/acts/
- Information on how to become a drone pilot can be found here: https://www.faa.gov/uas/commercial_operators/become_a_drone_pilot/
- Information on locating a local FAA testing center and signing up for the Part 107 exam can be found here: http://candidate.catstest.com/sitesearch.php
- The FAA website for registering drones can be found here: https://faadronezone.faa.gov/#/
- The Airman Knowledge Testing Supplement for Remote Pilots is a useful resource: https://www.faa.gov/training_testing/testing/supplements/media/sport_rec_private_akts.pdf

STANDARDS ALIGNMENT

COMMON CORE STATE STANDARDS

- **RST.11-12.2** - Determine the central ideas or conclusions of a text; summarize complex concepts, processes, or information presented in a text by paraphrasing them in simpler but still accurate terms.
- **RST.11-12.4** - Determine the meaning of symbols, key terms, and other domain-specific words and phrases as they are used in a specific scientific or technical context relevant to *grades 11-12 texts and topics*.
- **RST.11-12.7** - Integrate and evaluate multiple sources of information presented in diverse formats and media (e.g., quantitative data, video, multimedia) in order to address a question or solve a problem.
- **WHST.11-12.8** - Gather relevant information from multiple authoritative print and digital sources, using advanced searches effectively; assess the strengths and limitations of each source in terms of the specific task, purpose, and audience; integrate information into the text selectively to maintain the flow of ideas, avoiding plagiarism and overreliance on any one source and following a standard format for citation.
- **WHST.11-12.9** - Draw evidence from informational texts to support analysis, reflection, and research

REFERENCES

The Jet Propulsion Laboratory – JEOPARDY!
YouTube: https://youtu.be/g5pAw8wWIYk (Length 1:46)

https://www.businessinsider.com/drone-industry-analysis-market-trends-growth-forecasts-2017-7

https://www.faa.gov/data_research/aviation/aerospace_forecasts/media/FY2019-39_FAA_Aerospace_Forecast.pdf

https://www.theverge.com/2019/5/4/18529241/faa-annual-aviation-report-hobby-commercial-drones-prediction-2023

Part 107 Test Centers fan be found at the following website:
https://federaldroneregistration.com/part-107-test-centers

Use the following Step-By-Step Guide to Taking the Part 107 Exam at the following website:
https://www.altitude-university.com/blog/step-by-step-guide-to-taking-the-part-107-drone-license-exam

Use the following website for current FAA updates for: Part 107 certification for Drone Pilots:
https://skyward.io/faa-update-part-107-certification-for-drone-pilots/