

Journey to the Moon: A Study Guide for Educators

*"We choose to go to the Moon in this decade and do the other things,
not because they are easy, but because they are hard."* President John F. Kennedy

JOHN F. KENNEDY
LIBRARY FOUNDATION

In 1962, President John F. Kennedy told a cheering crowd of more than 40,000 people at Rice University that American astronauts would land on the Moon by the end of the decade. With much of the needed technology not yet invented, it was a bold promise many people didn't think was possible. In his speech, the president paints the "Space Race" as not only an opportunity to advance in technology, but also as a crucial battlefield in the burgeoning Cold War with the Soviet Union. President Kennedy stated, "If this capsule history of our progress teaches us anything, it is that man and his quest for knowledge and progress is determined and cannot be deterred. The exploration of Space will go ahead, whether we join in it or not. And it is one of the great adventures of all time. And no nation which expects to be the leader of other nations can expect to stay behind in this race for Space."

In celebration of this vision on the 50th anniversary of the Apollo 11 voyage to the Moon, the John F. Kennedy Library Foundation released *JFK Moonshot*, an immersive, augmented reality experience. Created by Digitas and sponsored by Raytheon, *JFK Moonshot* features the first-ever full-scale augmented reality simulation of the Saturn V Rocket launch and takes users on the five-day journey from the Earth to the Moon. The app is available for Apple and Android devices on [iTunes](#) and [Google Play](#).



How can teachers use this exciting virtual reality experience and other tools about Space on the John F. Kennedy Presidential Library and Museum's website? To answer that question, we asked five Massachusetts educators – two STEM teachers and three Social Studies educators-- to examine these resources and suggest activities that teachers can do tied to specific resources from the app or the website. The app is organized into four sections: Launch, Track, Log, and Play. Most of the resources cited by teachers are found in the Log and Play sections of the app.

In this guide, you will find their ideas, mapped to Massachusetts and national standards and suggested for specific grade levels and topics. These educators have provided other teachers a guide to using primary source material to teach the history of the "Space Race", international relations, and the science and math behind rocketry.

We hope that you and your students will enjoy using these resources as you lift off into your own journey to the Moon!

Subject Area (Course)	Topic	Grade Level	Resource Link and/or Location in App	Suggestions for using the resource	Anticipated Learning Outcome(s) for Students	Massachusetts standards to which aligned	National standards to which aligned
Civics History Social Studies	Civics History Social Studies	Grades 3-12	Photo archive, specifically JFK and entourage viewing Mercury-Atlas Launch Complex at Cape Canaveral Stanford Reading Like a Historian protocol	Using Primary Sources to Understand the "Space Race" Students have opportunities to use critical thinking skills to analyze photographs as primary sources to understand details of the "Space Race". Have students use the digital resources to analyze photographs as primary sources to learn about the Space Program. Students can use Stanford's <i>Reading Like a Historian</i> protocol, lesson plans for "close reading" of visual imagery and/or Visual Thinking Strategies (VTS) protocols. Guiding questions for students to use with a think-pair-share strategy: a. Who might be in each image? b. What messages are being conveyed? c. Who is the target audience for the image? d. What background knowledge might someone need in order to understand the meaning of the image? e. Raise questions to ask about each image.	Students will be able to analyze photographs as primary source documents to understand details of the "Space Race".	HSS Appendix B History and Social Science Inquiry: Designing Questions and Investigations (Designing Student-Developed Questions to Promote Inquiry)	C3FSSSS.D1.1.6-8 C3FSSSS.D1.2.6-8
Civics History	Civics	Grades 5-12	1. Lesson Plan on debating the use of federal funds to put a man on the Moon. Why Choose the Moon? 2. App - Play: Neil Armstrong Walks on the Moon	Funding a Major National Initiative Students analyze evidence found in primary source documents and make a claim to support or oppose the use of government agencies for placing a man on the Moon. Ask students to find one piece of evidence that supports or undermines the argument for using government funds to put a man on the Moon. Then have them work with peers to share evidence and formulate an opinion. Enrichment: In the Play section of the app, use activity to help Neil Armstrong land and walk on the Moon.	Students will understand JFK's reasoning behind the manned Moon mission, the context in which it happened, and some opposing arguments he may have faced at the time.	USII.T5 (#1); WHII.T5 (#11)	C3FSSSS.D1.5.3-5 C3FSSSS.D1.5.6-8 C3FSSSS.D1.5.9-12 ELA.CCR.ARS1 ELA.CCR.ARS7 ELA.CCR.ASL51
Civics	US Government: - Separation of Powers - How a Bill Becomes Law - Executive Branch Powers	Grades 6-8	1. Overview on Kennedy's Space Goals 2. Special Message to Congress on Urgent Needs, May 25, 1961 3. Primary Source Documents: Americans in Space 4. Address at Rice University on the Nation's Space Effort	From Goal to Reality Students determine the extent to which cooperation among the three branches of government and support of the American people is necessary in order to achieve a goal for the country. Have students create a flow chart of three main events in the "Space Race": Sputnik, Yuri Gagarin's flight, landing a man on the Moon. Ask students to engage in collaborative work with their peers to compare and contrast the goals and outcomes of these three developments by: a. using the documents to gather background knowledge of each of the three events b. creating a diagram that compares and contrasts or finds the relationship between these events c. exploring how funding, support, messaging, and interagency cooperation works within the government	Students will be able to determine how a goal becomes reality within the US government with support from the people in a democratic society.	HSS 8T3.1-3 HSS RCA-H 1-3 HSS Guiding Principle 9	C3FSSSS. D2.Civ.1.3-5 C3FSSSS. D2.Civ.1.6-8 C3FSSSS. D2.Civ.1.9-12 C3FSSSS. D2.Civ.4.6-8 C3FSSSS. D2.Civ.4.9-12 C3FSSSS. D2.Civ.5.6-8 C3FSSSS. D2.Civ.5.9-12 C3FSSSS. D2.Civ.4.6-8 C3FSSSS. D2.Civ.13.9-12

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History	Campaigns and Elections	Grades 6-8	Acceptance speech, "The New Frontier" at Democratic National Convention	<p>Defining the "New Frontier"</p> <p>Students analyze The "New Frontier" speech by John F. Kennedy at the Democratic National Convention and his debates with Richard Nixon to articulate what JFK means by "The New Frontier."</p> <p>Ask students to look for phrases in the speech that help them understand the meaning of the "New Frontier."</p> <p>Have students engage in collaborative discussions with peers to share the phrases they selected and create a poster or document that highlights their understanding of the meaning of the "New Frontier."</p>	Students will be able to analyze JFK's political slogan, "The New Frontier", at the Democratic National Convention.	RL.7-4 RH.6-8:6 RH.6-8:7	D3.3.6-8
History	US and USSR Relationship Proxy Wars JFK's Legacy	Grades 6-8	<p>1. JFK Library - The Bay Of Pigs: Lessons Learned lesson plan</p> <p>2. JFK Library - Americans in Space lesson plan</p>	<p>Negotiating Foreign Policy Challenges</p> <p>Students utilize resources to provide context as to why tensions existed between the US and USSR. The Bay of Pigs can be used to contextualize the idea of proxy wars.</p> <p>Having understood the concept of proxy battles, the race to the Moon makes a little more sense. The culminating activity for this assignment is to have students research the reasons why The Bay of Pigs Invasion was such an embarrassment to JFK's administration and the United States and why the "Space Race" was so important to the president.</p>	<p>Students will be able to examine the lessons learned by the failed invasion and the president's reaction to this failure.</p> <p>Students will understand how to draw conclusions between two events - in this case, the failure of the Bay of Pigs and the desire to have a successful Space Program.</p>	RL7.1 & RI7.1 RH.6-8.1 RH.6-8.2 RH.6-8.3 RH.6-8.10	C3FSSSS. D3.3.6-8 C3FSSSS. D3.3.9-12. C3FSSSS. D4.1.6-8
History	Cuban Missile Crisis Response	Grades 8-12	JFK Library - World on the Brink microsite	<p>Advising a President in Times of Crisis</p> <p>Students use the content from The JFK Library's microsite on the Cuban Missile Crisis to help frame why it is often called the most dangerous moment in human history. Within the microsite, there are a wealth of simulators and modules that help students feel the pressure during the Cuban Missile Crisis.</p> <p>This lesson can be done in research form, culminating with asking students to roleplay presidential advisors and advise President Kennedy as to how he should handle the Cuban Missile Crisis.</p> <p>Students will understand the larger Cold War context of the "Space Race" by exploring the Cuban Missile Crisis.</p>	<p>Students will assess the facts and practice skills in argumentative writing to create an intelligence report advising President Kennedy on handling the Cuban Missile Crisis.</p> <p>Students will gain an understanding of the role of the president and advisors in a crisis.</p>	RL7.1 & RI7.1 RH.6-8.1 RH.6-8.2 RH.6-8.3 RH.6-8.10	C3FSSSS. D3.3.6-8 C3FSSSS. D3.3.9-12. C3FSSSS. D4.1.6-8
History Social Studies	Cold War Cuban Missile Crisis US vs. USSR	Grades 9-12	<p>1. Telegram to Premier Khrushchev, April 12, 1961</p> <p>2. Stanford Reading Like a Historian protocol</p>	<p>Using Primary Sources to Understand International Events</p> <p>Students participate in an exercise to contextualize the telegram to Premier Khrushchev using the Stanford 'Thinking Like a Historian' protocols in placing a primary source document within the context of its history.</p>	Students activate prior knowledge of the Cold War and use critical thinking skills to do a close read of the telegram to Soviet Premier Nikita Khrushchev, with special attention to contextualization, thinking about how this relates to the president's desire to speed up the US Space Program.	HSS 9-12.USII. Topic 5. The Cold War Era, 1945–1991 [WHII. T5]	C3FSSSS. D2.His.9 C3FSSSS. D2.His.10 C3FSSSS. D2.His.11 C3FSSSS. D2.His.12 C3FSSSS. D2.His.13

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Humanities	Cold War Civil Rights Movement "Space Race"	Grades 6-8	<p>1. JFK Library Space Media Gallery</p> <p>2. 1963: The Struggle for Civil Rights microsite</p> <p>3. Americans in Space lesson plan from the JFK Library</p>	<p>Taking a Stand and Supporting a Position Students use photographs and documents to examine domestic issues in the US, Cold War tensions with the "Space Race", and analyze the Space Program.</p> <p>Guiding questions:</p> <ol style="list-style-type: none"> 1. What were the reasons for JFK to announce his goal of sending an American to the Moon? What factors contributed to JFK's decision? 2. To what extent was the Space Program a distraction from issues in the US during that time? 3. Looking at the documents, what social, political, and/or economic issues/events were happening in the US at the same time as the Space program (1958-1969)? 4. To what extent did these events affect different groups in different ways? 5. Did the Space program push the civil rights Movement out of public consciousness or was it a unifier during a divisive time? 	<p>Students will be able to compare and contrast domestic issues (Civil Rights) with global issues (Cold War, "Space Race") during the 1960s.</p> <p>Students will be able to analyze primary sources and use that analysis to support an argument.</p> <p>Students will be able to write an essay responding to a Document Based Question, using evidence from primary and secondary source documents to support an argument.</p>	HSS.8.T4.10 RCA-H.6-8.1 RCA-H.6-8.2 RCA-H.6-8.7 WCA.6-8.1.b WCA.6-8.2.a	CCSS.ELA-LITERACY. RH.6-8.7 CCSS. ELA-LITERACY. RH.6-8.7 CCSS. ELA-LITERACY. RH.6-8.8
Humanities	Mood, tone, Reasons for Space exploration Persuasive writing and oration	Grades 6-8	<p>1. App - Launch feature, Address at Rice University on the Nation's Space Effort</p> <p>2. JFK Library - Text and video of "Address at Rice University on the Nation's Space Effort"</p> <p>3. Stanford Reading Like a Historian protocol</p>	<p>Analyzing Persuasive Speaking Students use the app Launch feature to watch the rocket launch and listen to the Hotspot portion of the Rice University as a hook to the activity.</p> <p>Provide students with the digital resource and ask them to read, annotate, and analyze text of "Address at Rice University on the Nation's Space Effort" for mood and tone. Ask students to work in triads to compare their work and discuss the mood and tone.</p> <p>Have students view the recorded version of the "Address at Rice University on the Nation's Space Effort" to compare mood/ tone from written text to the actual oration of the "Address at Rice University on the Nation's Space Effort." Students can engage in collaborative discussions with peers.</p> <p>Students participate in a 'close reading' of a primary source - comparing the text of the Rice University speech to the video, using the Reading Like a Historian protocol.</p> <p>Students also work to tease out context clues and a sentence-by-sentence analysis of what JFK is saying, and what action was being taken in regards to each point.</p>	<p>Students will be able to analyze mood and tone in a written text.</p> <p>Students will be able to analyze a persuasive speech to determine author's purpose.</p> <p>Students will be able to analyze how an oral delivery of a speech changes mood and tone.</p>	RI.6.4, RI 7.4, RI 8.4, RI.6.6	CCSS.ELA-LITERACY. RH.6-8.7 CCSS. ELA-LITERACY. RH.6-8.7 CCSS. ELA-LITERACY. RH.6-8.8, CCSS. ELA-LITERACY. RH.6-8.6
Humanities	Oral history Community engagement People's history, personal narratives and memories from the Moonshot	Grades 6-8	<p>1. App: Launch and Track features - rocket launch video, JFK speeches, timeline, interviews with Michael Collins</p> <p>2. JFK Speech: "Address at Rice University on the Nation's Space Effort"</p> <p>3. StoryCorps interview protocols</p>	<p>Capturing Oral History Students familiarize themselves with the app by using the Launch feature, watching the Saturn V launch and listening to President Kennedy's speeches in the hotspots within the app. Students can use the Track feature to create a timeline of the Saturn V's journey and to listen to interviews with Michael Collins.</p> <p>Provide an explanation of "people's history" and "oral history" to explain the performance task - interviewing a person who was alive during the Moonshot to get their perspective and help preserve that piece of history. Consider coordinating with a local nursing home, relatives, community members, etc. to find interviewees.</p> <p>Once interviewee has been selected, have students show them the features on the app and then conduct an interview - have students transcribe the interview and then write a personal reflection on the experience. Possibly use questions from StoryCorps interview protocol.</p>	<p>Students will be able to conduct and transcribe an interview with someone who was alive during the Moonshot/early days of Space exploration.</p> <p>Students will be able to chronicle this "people's history" to preserve part of the historical record from that time.</p> <p>Students will be able to write a reflection on the experience of interviewing/ takeaways from the interview.</p>	W.6.3 W.7.3 W.8.3	CCSS.ELA-LITERACY. RH.6-8.1

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Humanities	Moonshot Civics	Grades 6-8	<ol style="list-style-type: none"> Why Choose the Moon? Lesson Plan Address at Rice University on the Nation's Space Effort 	<p>Supporting Opinion with Facts</p> <p>Students use the lesson plan in the JFK Library Resources for Educators called <i>Why Choose the Moon?</i> In this lesson plan, students will be asked to analyze a portion of JFK's Address at Rice University on the Nation's Space Effort, as well as the Mary Lou Reitler and Myer Feldman letters to determine the rationale for developing the Space Program, as well as exploring the alternative viewpoint.</p> <p>Ask students to find one piece of evidence that supports or undermines the argument for using government funds to put a man on the Moon. Have students work with peers to share evidence and formulate an opinion.</p> <p>Extension: Play in-app activity to help Neil Armstrong land and walk on the Moon.</p>	<p>Students will develop an opinion and preliminary answer to the essential question, "How much money should the federal government devote to Space exploration?"</p> <p>Students will analyze primary source documents and explain JFK's rationale for going to the Moon/ developing a Space Program.</p> <p>Students will explain counterarguments.</p>	WHIII.37 USII.28	HTS 2.B, HTS 3.A, HTS 3.B
Humanities	Civil rights "Space Race"	Grades 6-8	<ol style="list-style-type: none"> 1963: The Struggle for Civil Rights microsite PBS American Experience video/resources on Ed Dwight PBS American Experience political cartoon lesson handout 	<p>Intersections: the Civil Rights Movement and the "Space Race"</p> <p>Students view a video about Ed Dwight, who was part of the Space training program. Provide students with handouts: transcript of interview with Dwight and others and a political cartoon analysis protocol.</p> <p>Ask students to read and analyze the transcript. Use a think-pair-share protocol for students to discuss their analysis. Next, ask students to complete the political cartoon handout and discuss with peers.</p> <p>Extension: use resources from JFK Library website about JFK and civil rights to compare Dwight's experience with other civil rights struggles/advances.</p>	<p>Students will be able to identify intersections of the civil rights movement and the "Space Race".</p> <p>Students will be able to analyze primary source documents.</p> <p>Students analyze different forms of media to compare personal and national experiences.</p>	R.PK-12.7 W.PK-12.9 RCA-H.6-8.9	CCSS.ELA-LITERACY.RH.6-8.1, D2.Civ.6.6-8., D2.Civ.10.6-8, D2.Civ.14.6-8.
Humanities	Cold War Cuban Missile Crisis US vs. USSR	Grades 6-8	<ol style="list-style-type: none"> World On The Brink microsite - primary source information about the Cold War and the Cuban Missile Crisis President Kennedy's speech "A Strategy of Peace", to graduating students at American University 	<p>Shaping Foreign Policy</p> <p>Students will use the time line of the Cuban Missile Crisis on the microsite to understand the Crisis.</p> <p>They will then use the text of the president's "A Strategy of Peace" to graduates of American University to answer the following question: How did the Cuban Missile Crisis shape the president's view on foreign policy?</p>	<p>Students will gain an understanding of the Cold War and the relationship between the US and the USSR during this time period and how the Crisis impacted the president's views on foreign policy.</p> <p>Students will further their understanding of the larger Cold War context of the Space Program.</p>	RL 7-4 RH:6-8:6 RH:6-8:7	D2.Civ.1.3-5



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Math	Similar figures Proportions	Grade 7	App - Rocket Assembly	Understanding Scale and Proportion Ask students to create similar figures of the rocket using the app.	Students begin to practice understanding scale factor and proportions by building similar figures to the Apollo 11 rocket.	MA.7.g.a.1	CC.7.G.a.1
Math	Systems of equations	Grade 8, Algebra I	App - Play: Rendezvous	Solving Systems Algebraically Have students use systems to find the point where the falling shuttle can be intercepted.	Students will practice using strategies to solve systems algebraically in a novel setting. Are there windows where an intercept is possible/not possible?	MA.A.REI.c.7	CC.HSA.REI.c.7
Math	Linear functions	Grade 8, Algebra I	App - Track feature	Constructing Linear Equations to Determine Fuel Needs Have students use linear equations to determine how much fuel is needed to return home from the Moon; students construct a linear equation. Emphasis should be placed on the real world meaning of the y-intercept (b) and the slope (m) here.	Students will construct their own linear equation to determine if the astronauts will have enough fuel to get home.	MA.8.F.b.4	CC.8.F.b.4
Math	Volume of composite shapes	Grade 8, Geometry	App - Play: Rocket Assembly	Determining Volume of an Object and Real-Life Applications of Volume Ask students to find the volume of each section of the Apollo 11 rocket.	Students will practice determining volume and combining shapes to get the entire rocket's volume. They will answer these questions: Did the astronauts live in that entire space? What are some reasons why the astronauts did not have that entire volume as living space? How could we determine the actual amount of living space for this journey?	MA.8.g.c.9	CC.8.G.c.9
Math	Pythagorean Theorem Distance Formula	Grade 8, Geometry	App - Play: Moon Walk	Using Math to Explore the Moon Have students use the Pythagorean Theorem and/or the Distance Formula to estimate distances Neil Armstrong is walking from the Lunar Module to collect Moon rocks	Students will use the Pythagorean Theorem/ Distance Formula to estimate distances for Neil Armstrong's path along the Moon. Given the app's ability to pick different pathways each time, this could be used to create open-ended questions.	MA.8.g.b.7 MA.8.g.b.8	CC.8.G.b.7; CC.8.G.b.8; HS.G.SRT.c.8
Sciences - Engineering	Technology	Grade 5	<ol style="list-style-type: none"> 1. Speech: "Address at Rice University on the Nation's Space Effort" - video 2. Speech: "Address at Rice University on the Nation's Space Effort" - written images 3. "Remarks at Aero-Space Medical Health Center," November 21, 1963 4. Speech: "Remarks at Aero-Space Medical Health Center" dedication, San Antonio, Texas, 21 November 1963 - written images 	<p>Envisioning New Technologies for Space Exploration</p> <p>Students use the "Address at Rice University on the Nation's Space Effort" to introduce the idea of developing new technologies and visions for the future of Space travel.</p> <p>Have students review the Aero-Space Medical Health Center speech for initial thoughts on medicine and technology (JFK's ideas on pollution, medical instrumentation, nursing services, medical safeguards)</p> <p>Have students work in pairs to discuss: What technology advancements does JFK promote in this speech?</p> <p>Use this example of early Space exploration to introduce the idea of problem solving, development, and the constraints of societal needs and wants.</p>	Students will recognize how the Cold War and its resultant focus on new technologies shaped a desire to accelerate the push for Space exploration.	3-5-ETS3-1	K-2-ETS1-1 MS-ETS1-1 HS-ETS1-1 HS-ETS1-3

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Sciences - Engineering	Communication systems	Grade 7	App - Log: View videos from the mission log (transmissions from mission control and the camera feeds from Space)	<p>Communicating From Space</p> <p>Examine the communication methods used and discuss the advantages and disadvantages of each method.</p> <p>Use the images from the lunar landing and Neil Armstrong's first steps to discuss the benefits of the televised viewing of this moment versus other methods of communication.</p> <p>Question: What additional communication methods could be used today to show Space travel?</p>	<p>Students will compare the different communication methods used to share information regarding the Apollo 11 landing.</p> <p>Students will identify the benefits of including visual communications with the audio of launch, landing, etc.</p> <p>Students will hypothesize how current technology could improve communications during Space travel.</p>	7-MS-ETS3-2	No NGSS equivalent
Sciences - Engineering	Engineering design Technological systems modification Problem solving	Grades 9-12	App - Launch: AR of rocket preparing for launch	<p>Engineering Design</p> <p>Have students use the AR to examine the design of the external portion of the Saturn rocket as a basis for creating modifications for lift, drag, friction, thrust and weight.</p> <p>Use the AR to define simple design problems and possible solutions for the Saturn rocket. Teachers can create questions asking students to identify possible reasons for the specific designs seen in the final rocket design.</p>	<p>Students will use models to analyze systems and make predictions, demonstrating an understanding of features of the rocket that relate to lift, draft, friction and weight.</p> <p>Students will justify modifications based on knowledge of lift, drag, friction, thrust and weight.</p> <p>Students will modify existing designs and use evidence to argue the design change.</p>	HS-ETS3-6	3-5-ETS1-1 3-5-ETS1-2 3-5-ETS1-3
Sciences - Life Science	Plant growth and development Plants Factors affecting life Plant diversity	Grades 2-3	Space Lab - Tomatosphere	<p>Can Plants Grow in Space?</p> <p>Use the Tomatosphere project to set up an experiment while also demonstrating the key factors needed for plants to survive. Resources from the Tomatosphere project help to understand plant development. Possible questions include: Can plants grow in Space? If so, what do they need to survive?</p> <p>Use the Tomatosphere project to set up an experiment while also allowing students to observe the development and growth of a plant from a seed.</p> <p>Possible questions include: How does a plant grow from a seed? How long does it take a plant to grow from a seed? Where do the seeds come from?</p>	<p>Students <i>will</i>:</p> <ul style="list-style-type: none"> understand the stages of growth for a plant; formulate questions related to the different growth phases of a plant; understand that plants require water, sunlight and nutrients from the soil for growth; understand the major components of an experiment; demonstrate ability to collect and analyze data; demonstrate knowledge of plant development by creating time lapse drawings or stop-motion videos. 	2-LS1-3 3-LS1-1 Sci/Eng Practice 3 Sci/Eng Practice 6 Sci/Eng Practice 7	K-LS1-1 2-LS4-1



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Sciences - Physical Science	Energy transfer Vibrations Models Observations	Grade 4	App - Launch: Lift-off sequence of Saturn rocket	<p>Energy Transfer</p> <p>Use the app Launch feature as an engagement/phenomenon activity for topics on energy transfer. Allow students to watch and feel the launch of the Saturn rocket via the JFK Moonshot App.</p> <p>Students record observations of the launch including what they see and feel. The vibration of the phone can be used as an example of an observation of energy transfer.</p> <p>Question: How were you able to identify energy transfer? (The vibration of the phone modeled the vibrations of the ground during energy transfer)</p>	Students will identify the process of energy transfer through tactile and visual representations of rocket launch.	4-PS3-2 Sci/Eng Practices 1 Sci/Eng Practices 2	<u>4-PS3-2</u>
Sciences - Physical Science	Chemical reactions Combustion	Grade 8	<p>1. App - Launch: Lift-off sequence of Saturn rocket</p> <p>2. App - Log: Mission Log video of S-IVB Separation</p>	<p>How do Chemical Reactions Impact Rocket Lift-Off?</p> <p>Use in conjunction with combustion demonstrations in class.</p> <p>Show how the use of these combustion reactions produce visible evidence (flame, heat, etc.).</p> <p>Pose questions to students such as: How can these combustion reactions apply to moving objects such as cars, planes and rockets?</p> <p>Give students an opportunity to watch examples of the rocket lift off, S-IVB separation and other forms of transportation to then conduct research to determine the reactant and products of the chemical reactions used in these objects.</p> <p>Guiding questions for research: 1. What are the properties of the substances before and after the chemical reactions; 2. What evidence is produced to support the idea that a chemical reaction has occurred?</p>	<p>Students will recognize the change in substances before and after a chemical reaction.</p> <p>Students will identify the flammability of substances used to produce the launch of the Saturn rocket.</p> <p>Students will construct explanations for the outcomes of the chemical reactions.</p>	8-MS-PSI-2	<u>MS-PS1-2</u>
Sciences - Space Exploration	Historical reasons for Space exploration Immediate goals of Space exploration Benefits related to Earth resources Technology and new products, international relations and cooperation	Grades 6-12	App (general)	<p>The Purposes of Space Exploration</p> <p>Students will use speeches, such as the Address at Rice University on the Nation's Space Effort and interviews, such as those with Michael Collins, included in hotspots within the app to research the historical basis of Space exploration.</p> <p>They will use the Rocket Assembly game in the Games section to learn about rocket assembly.</p>	<p>Students will recognize the purpose of Space exploration.</p> <p>Students will describe the purpose of Space exploration using sources such as informational text.</p> <p>The Merit Badge has a requirement for building, launching, and recovering a rocket. Under this requirement, scouts must identify and describe the purpose of major rocket parts. Scouts can use the Rocket Assembly game to learn more about the parts of the Saturn V rocket to compare to their model.</p>	None - this was created specifically for the Boys and Girls Scouts of America badge requirements	Scouts (BSA) Space Exploration Badge



We hope that you have found this guide valuable as you consider how to teach your students about the “*Space Race*”, *JFK Moonshot*, the historical context of the time, and the science, math, and engineering that was involved in reaching the Moon and safely returning. There are many other resources that you may find valuable on our website. We suggest that you share some of the resources from our recent [Space Summit and Space Fest](#) with your students. In addition, our [2-page overview](#) of our Space resources may be valuable.

We wish to acknowledge the five teachers whose work made this possible:

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James Voci, East Boston High School

Wherever and however you choose to help your students journey into Space, we wish you an incredible and adventurous trip!

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