

***5E Lesson Planning Using NASA Resources
and STEM Project-Based Learning***

Jason Hornickel

Professional Development Project Final Paper

NASA Endeavor STEM Leadership Course

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School Information

The school where I currently teach 7th & 8th-grade science and STEM is Chinook Middle School in Lacey, Washington. I am in my third-year teaching at Chinook and have been an educator for a total of nine years. Our school, named after the Chinook Salmon (common name is King Salmon), key native species in our local ecosystem. Our mascot is the Warrior, commemorating the Nisqually people who historically resided on the tribal land on which our school is. Our academic mission statement is: “Cultivating Critical Thinkers and Contributing Citizens for a Better World!” Our school name, mascot, and mission statement resonate with me as a teacher leader. I think of the Chinook as a metaphor for the stakeholders of our school; administration, teachers, students, and families, all of which are key to the balance of our school’s learning ecosystem. Our school motto is “once a warrior, always a warrior,” which reminds me to continue fighting for the best interest of students and always defend my actions with that mindset. Finally, I think of our mission statement as the motivation in which I teach, preparing my students with the skillsets they will need to grow into the scientists and leaders of tomorrow.

The culture and diversity of our nearly 800 students are as rich as the natural history and heritage of the Pacific Northwest region itself. 54% of our student demographics are minorities. We rank in the top twenty percentile of most diverse schools in Washington State with student’s ethnicities of American Indian, Asian, Hispanic, Black, White, Pacific Islanders, two or more races. Many students that have lived around the world having military families long with many students immigrating to the U.S. My students have shared incredibly positive life stories with me, as well as ones of struggle. For me, the most difficult factors to deal with as a teacher leader are the outside factors that negatively impact learning. In our school, they include homelessness, abuse, and volatile family situations. A countless number of my students experience adverse childhood experiences (ACES) and come to our school for safety, security, and to seek positive influences. These students serve as my motivations for why I strive to create a safe classroom environment that promotes learning through student-centered activities, rigorous expectations, positive encouragement, and being a warm demander to help my students find success.

Professional Development Focus and Audience

The focus of my professional development project was to advocate the effectiveness of 5E Lesson Planning when used in combination with valuable NASA educational resources, cross-cutting STEM concepts, and incorporating project-based learning. The audience for my professional development is five science co-teachers: two-sixth grade, one-seventh grade, and two-eighth grade teachers (three female and two males), in addition to myself being the second seventh-grade teacher.

The six of us make up the Science Department Professional Learning Community (PLC), which I have been appointed leader of for the past two school years. This responsibility includes facilitating monthly meetings, being a liaison for the needs of our department, developing teaching collaboration initiatives, organizing outside of school learning opportunities, and constructing and presenting department annual student learning objectives (SLO). The SLO is one criterion used to evaluate us on professional performances, and we are responsible for collecting student data that we use to support learning through interventions. This year our SLO goal is to increase the proficiency of interpreting and analyzing visual scientific data.

What I Set Out to Do

When I was contemplating topics and brainstormed ideas for my professional development (PD) project, I had several goals that I was aiming to meet. Based upon my previous personal PD experiences, I began to outline objectives I wanted to provide to my audience and constructed them with the perspective of benefiting my co-teachers as the priority of my pedagogical process. Here are the five objectives I identified as imperative:

- **Goal #1:** Align with our Science PLC's Student Learning Objective (SLO) that incorporates real-world connections for students.
- **Goal #2:** Provide take-aways that can be useful immediately.
- **Goal #3:** Build a platform that serves as a foundation to add to throughout the year.
- **Goal #4:** Make it accessible to be utilized in the brick and mortar classroom in addition to remote instruction.
- **Goal #5:** Utilize it as evidence for yearly evaluations that highlight PLC collaboration.

With these objectives in mind, I determined I would focus my professional development on effectively building 5E lesson plans. I realized that several of my co-workers most likely are already aware of 5E lesson plans, but I was unsure if they relied on them regularly or to what extent. Since I started consistently using 5E lesson planning as a result of my coursework through the NASA Endeavor Program, I feel my lesson planning has evolved into being more efficient, meaningful, and engaging. It provides me a consistent framework to meet the needs of students through differentiation, to better align resources to learning targets, and to ensure standards align through each step of the lesson planning process.

Pre-Professional Development Survey

Before my PD presentation, I surveyed during our monthly PLC meeting in October. I created a Zoom Poll my co-teachers on their previous implementation of 5E Lesson Planning and their current use of NASA Resources. Here were the Question and Results:

Question	Results of 5 Participants
1) Do you know the components of a 5E Lesson Plan?	3/5
2) Have you personally created a 5E Lesson Plan?	2/5
3) Do you regularly use 5E Lesson Planning?	0/5
4) Have you ever used a NASA Resource?	5/5
5) Have you used any NASA Resources not relating to a Space Lesson?	1/5

*While I informally interviewed the teachers following the survey, they shared they use pieces of 5E lesson plans, such as Engage, Explain, and Evaluate, but rarely every step and not in any specific order. Additionally, the teacher that used the NASA resource outside of the space unit was an Ocean Vs. Continental Ice Melt Lab that I shared.

Planning the Professional Development Training

Now that I outlined my goals, surveyed teachers, and decided on my topic, I began planning the PD itself. I decided to create a 5E lesson plan as an exemplary model to present to my PLC. My long-term goal would be that it could serve as the first of six lessons, with the hope that each teacher would create one, share, and we all would teach those lessons to our students to support our PLC SLO. I started my planning by using backward design, another teaching strategy that I was introduced to in this coursework. I identified the key components I would include in the lesson, followed by the Learning Targets. These are the four key components that the lesson incorporated:

- Analyzing and interpreting visual data (to align with our PLC SLO).
- A topic that would resonate with a real-world connection with our students.
- Extensions to allow for adapting to time constraints and differentiation.
- Two versions of the lesson plan: one for in-person instruction and the second an electronic version available through our Canvas Online Learning System to facilitate through remote instruction.

Delivery of the Professional Development Training

There were many obstacles I faced for delivering this PD opportunity to my co-teachers. We are all remote teaching, our daily to-do lists are extensive, and all my co-teachers are in a limbo of delivering daily instruction, supporting struggling students, end-of-the quarter grading, and managing their own children at home. One teacher has a three-month-old baby he is caring for while teaching, and everyone except for myself, has several young children that are constantly interrupting every meeting. I initially tried to schedule a time to deliver the PD outside of our monthly PLC meeting, that was nearly impossible. I decided my only option was to incorporate my PD into our monthly PLC meeting. Our meetings are short and very rigorous to accomplish the mandates set forth by the administration. I emailed my team prior to and let them know that I would be including a PD opportunity during our next PLC meeting and that it was interconnected to our PLC SLO.

Overall, I feel the delivery of my PD went well. My initial concern was that my team-members would think that it was a waste of valuable collaboration time. I think the silver lining was I started my presentation by explaining and highlighted the previously listed Four Key Components to validate the PD. The other positive was that they were all excited about the idea of each of us individually creating a lesson plan to share and teach that would support the requirements for our SLO. In the past two years, we all were using separate strategies and methods of integrating the SLO into our teaching units. The ideology of collaborating and all contributing equally to create well planned out lessons and to all teach six of the same lessons, was well supported and made the reason for more valid student data collection across grade levels.

Description and Activities of the Professional Development

Next, I shared each of my goals and objectives for the PD. In each of the goals below, I described how the PD presentation met each of the five goals I set forth and the collaborative activities that were built upon this PD.

Goal #1: Align with our Science PLC's Student Learning Objective that incorporated real-world connections for students. The Exemplary 5E Lesson Plan that I created and demonstrated during the PD was connected to the real-world phenomenon of wildfires. This year in Washington State, we experienced a record-breaking wildfire season. Even though it was not an immediate threat to the area we lived, it was a hot topic in the news, amongst families, and a topic that was brought up often by students. During the PD, I modeled the Wildfire lesson by demonstrating each step, including investigating the NASA Resources, and explained the extensions and project-based learning that could be included in the lesson. The lesson was formatted as a master lesson for the teachers, and an electronic version to post into their Canvas modules for remote instruction. **Attachment #1: Exemplary Model of 5E Lesson Planning-Impacts of Wildfires**

Goal #2: Provide a take-away that can be implemented immediately. I provided my co-teachers with an immediate take-away. First was a blank 5E Lesson Plan Template that was formatted in both Microsoft Word and as a Google Doc. The second was ready to teach 5E Lesson Plan on

Wildfires. I walked the teachers through the lesson, thoroughly explaining each step of the 5E lesson and why I chose the activities and resources for each step. I also explained how the lesson plan could be differentiated to be used in all science classes 6th-8th grade, aligning to several units covered in each grade that include the weather and climate unit (6th), ecosystems unit (7th), and human impacts unit (8th).

Goal #3: Build a platform that serves as a foundation to add to throughout the duration of the year. Each teacher volunteered to sign up for due dates to complete their 5E lesson plan and share it during that month's PLC meeting. Then we agreed to all find time to teach that lesson within that month, therefore having a shared experience that we can reflect upon during each PLC meeting.

Goal #4: Make it accessible to be utilized in the brick and mortar classroom in addition to remote instruction. For the lessons we will each create, teachers agreed to complete the 5E lesson plan template to share, along with an electronic version that would be shared through our Canvas Online Learning System. That way, each teacher will have a master 5E plan and a student accessible plan through Canvas. **Attachment #2: Student Friendly Modified Remote Learning Lesson Plan Created through Canvas Online Learning System.**

Goal #5: Utilize it as evidence for yearly evaluations that highlight PLC collaboration. As a PLC, we will all collect evidence that we will use in each of our evaluations. One piece of evidence will be our individual 5E lesson plan, another will be the PLC collaboration and reflection included in our PLC meeting notes, and lastly will be the student data that we collect from our lessons that demonstrates student's level of proficiency for our SLO.

NGSS Standards Addressed in the Professional Development in the Exemplary 5E Lesson

NGSS Standards: These are the Engineering Standards that will be included in the lessons.

- **MS-ESS2-2.** Construct an explanation based on evidence for how geoscience processes have changed Earth's surface at varying time and spatial scales.
- **MS-ETS1-2:** Evaluate competing design solutions using a systematic process to determine how well they meet the criteria and constraints of the problem.
- **MS-ETS1-4:** Develop a model to generate data for iterative testing and modification of a proposed object, tool, or process such that an optimal design can be achieved.
- **MS-PS3-3:** Apply scientific principles to design, construct, and test a device that either minimizes or maximizes thermal energy transfer.

NASA Data & Resources Included in the Modeled 5E Lesson

- 1) **NASA's Earth Research and Analysis Program:** <https://science.nasa.gov/earth-science>
- 2) **NASA Global Temperature Data:**
<https://www.jpl.nasa.gov/edu/teach/activity/graphing-global-temperature-trends/>
- 3) **NASA Frequency of Wildfire Data:** <https://climate.nasa.gov/blog/2830/six-trends-to-know-about-fire-season-in-the-western-us/>
- 4) **Extended Learning Option: Explore Additional NASA Wildfire Resources and Lessons Plans:**
 - <https://www.jpl.nasa.gov/edu/news/2016/8/22/back-to-school-burn-the-science-of-wildfires>
 - <https://www.jpl.nasa.gov/edu/teach/activity/fired-up-over-math-studying-wildfires-from-space/>
 - <https://www.jpl.nasa.gov/edu/teach/activity/pixels-on-fire/>
 - <https://www.jpl.nasa.gov/edu/news/2019/10/18/nasas-eyes-on-extreme-weather/>
 - <https://www.jpl.nasa.gov/edu/news/2016/8/22/back-to-school-burn-the-science-of-wildfires/>
 - <https://earthobservatory.nasa.gov/images/147293/a-meeting-of-smoke-and-storms>
 - <https://earthobservatory.nasa.gov/images/147277/historic-fires-devastate-the-us-pacific-coast>
 - <https://www.nasa.gov/feature/goddard/2019/nasa-tracks-wildfires-from-above-to-aid-firefighters-below>
 - <https://climate.nasa.gov/news/2761/studying-weather-to-help-see-the-likelihood-of-fires/>

STEM Project-Based Learning Included in the Modeled 5E Lesson

- **Student GIS Mapping:** Have students use local data or GPS coordinates to map fires that are or were occurring in Washington State. Maps can be created with paper handouts or created electronically using ESRI ArcGIS software.
- **Math Graphing Activity.** Instead of initially providing the NASA graphs to students, give them the data to graph on their own. Then as a class, compare their graphs to the NASA graphs and then elaborate with the data driven student inquiry questions.
- **Independent Exploration Project:** Students will conduct independent research to create a written report, slide show, or 1-page infographic to demonstrate understanding of causes and conditions that contribute to wildfires.
- **STEAM Project-Based Learning Activity.** Create an invention or strategy to help prevent, control, manage, predict, or protect people and property from wildfires. This project can be completed as a drawing (hand or electronically created), it can be a blueprint of a prototype, you can build a prototype, or it is open to your imagination with approval. Projects can be presented in class or using an electronic resource such as Flip Grid to have students present their work.

Post Survey Questions

Post survey questions were completed in a Google Form. I received feedback from 4 of the 5 participants (one is on unknown personal leave and has a substitute at this time).

Question	Results of 5 Participants
1) Was the profession development on 5E Lesson Plans beneficial to you?	Yes=4 No=0
2) Will you rely on using the 5E lesson plan in the future?	Yes=2 No=1 Maybe=1
3) Did you discover any NASA resources that would find useful in future lesson plans?	Yes=4 No=0
4) On a scale of 1-5, how engaging are the NASA resources to students that we explored?	5=3 responses 4=1 response
5) On a scale of 1-5, how beneficial was this training to the PLC as a team?	5=4 responses

Additional Comments to Post Survey:

- It was a good refresher on the steps and components of the 5E plan and the blank template is also a useful tool for planning.”
- This is a great method of planning for remote instruction.
- 5E lesson plans are good in theory but are too complex and time demanding for day to day lessons. More effective in using to design a unit.
- Time demanding to complete the entire template, great to use for observations and evaluation evidence.
- I loved the NASA resources, I never realized there is so much data available.
- NASA data is often too complex for middle schoolers, more in-line with high school and college level students.
- NASA lesson plans are useful for hi-cap students as extensions to learning and adding the “M” to STEM lessons.
- I will research further to find more additional NASA data to incorporate into my lessons.

Summary of Outcomes

Content of PD: Regarding content and lesson planning, teachers often have used their own format of creating lesson plans and rarely veer from those methods. During the training, we discussed the harsh reality of teaching and how lesson planning often takes place on the fly, rarely written down, and at best, the scope and sequence are jotted down in a planner. Additionally, the best-made lessons are typically modified after the first few periods of instruction. My co-teachers all agree that the steps of the 5E Lesson Plans are very helpful for identifying the best resources to use for each lesson. One teacher shared that especially in remote teaching, the resources are overwhelming and difficult to sort through to find the most effective resources and reflecting on the components or steps of the 5E plan will help them to better categorize those resources. The teachers all agreed that the Wildfire 5E Lesson Plan was well thought out, included engaging NASA resources, and were excited to teach the lesson.

Pedagogy of the PD: The teachers appreciated that this training was beneficial to the overall goals of our PLC. During the training, it was mentioned that they appreciated my effort in considering how this training could be included as an important piece of evidence to use in their

evaluation. Collaboration is often overlooked and under-rated as an essential use of time. It was agreed that the only time that is typically available for collaboration is before and after contract hours. Two grade-level co-teachers shared the extent of their collaboration takes place Sunday afternoon with a phone call while they are both making dinner. All teachers also believed that sharing common lessons would greatly reduce the amount of individual work to support our SLO goals and have more accurate student data to collect.

The success of the Training: Based on the results of my Post Survey Questions and Comments, in addition to the reflection discussions that occurred during our PLC meeting, I believe the PD training was useful and successful in many ways. As previously mentioned, 5E lesson planning has evolved my personal approach to planning and organizing available resources. Even if teachers only create this one lesson plan using the 5E approach, I am hopeful that the purpose, pedagogical processes, and steps taken to create the lesson will resonate with them. Additionally, I think the training served as an important reminder of the significance of including STEM activities and project-based activities for student-centered learning with online instruction. Another conversation was, due to remote teaching, many of us have reverted to teacher-centered instruction versus student-centered learning activities. This is partially due to the expectations set forth by the administration. I intend to continue discussions around STEM activities and project-based learning that are feasible and equitable to all students at home. I hope these conversations stimulate innovative strategies to increase student engagement and intrinsic motivation.

Final Reflection & Connection to STEM Leadership

The content of this training was not as significant as the results of initiating and promoting the pedagogy of teamwork to exhibit teacher leadership within our school. As much as I hope my co-teachers found the 5E lesson plan useful or discovered engaging NASA resources to use in the future, I hope that this initiative of collaboration becomes contagious and is a new way of approaching our annual SLO's. This training connected with many of the readings discussed throughout this semester in this STEM Leadership course. First, I believe that if I provided one take away or a useful piece from this PD opportunity, it was a worthwhile experience. Based on this philosophy, the reading of Luft et. Al (2016) resonated with me as the authors described the

need for a support system when working towards the role of a teacher leader. My PLC has been my support system and that I appreciated my co-teachers provided validation for me throughout this training. The other facet of this training that was important to my role as PLC leader, is helping each other accomplish responsibilities through dividing and conquering. This conceptual framework of this training was outlined and supported by Sato et. Al (2014), and included the three main categories of leadership roles:

1. Appointing Roles- each creating a meaningful 5E lesson to share.
2. Activities-sharing, teaching, and reflecting on each lesson.
3. Behaviors-- collaborating and innovatively thinking as a team to find best practices to benefit our students).

Prior to this course, I was going through all the motions and actions required to be a teacher leader, without knowing or fully understanding my roles. The discussions and readings explored this semester have allowed me to become cognitively aware of my purposes and the distinctions that are associated with leadership. As I move forward, The NASA Endeavor Program has helped me transition to find fruition as a teacher leader. Thank you!

Attachment #1: Exemplary Model of 5E Lesson Planning-Impacts of Wildfires

Unit or Lesson Title:	Exemplary Model of 5E Lesson Planning-Impacts of Wildfires
Grade Level	6th-8th Grade
Topic/Theme/Nature of the Investigation:	Students will investigate the phenomenon of wildfires, and research causes, impacts, effects on natural ecosystems/environment/humans, identify patterns, examine connections to climate change, and engineer solutions to help prevent or manage wildfires, or advance human protection while fighting wildfires.
NGSS Performance Expectation(s) Next Generation Science Standards	<p>NGSS Standards: These are the Engineering Standards that will be included in the lessons.</p> <ul style="list-style-type: none"> • MS-ESS2-2: Construct an explanation based on evidence for how geoscience processes have changed Earth's surface at varying time and spatial scales. • MS-ETS1-2: Evaluate competing design solutions using a systematic process to determine how well they meet the criteria and constraints of the problem. <ul style="list-style-type: none"> • MS-ETS1-4: Develop a model to generate data for iterative testing and modification of a proposed object, tool, or process such that an optimal design can be achieved. • MS-PS3-3: Apply scientific principles to design, construct, and test a device that either minimizes or maximizes thermal energy transfer.
Duration:	This lesson will take a minimum of 1-2 class periods, up to a week with extended learning and engineering.

Engage	
<p>🎯 Learning Target: Introduction to the Primary Causes of Wildfires.</p> <ul style="list-style-type: none"> ✓ Do Now- Make a Claim to answer the Essential Question: “What are the major causes of wildfires?” ✓ Think/Pair/Share Claims of Possible Causes of Wildfires. ✓ Conduct an Online Student Survey using www.Pollev Everywhere. 	
<p>What is the teacher doing? What are the students doing?</p> <ol style="list-style-type: none"> After students make claims, teacher will create an online survey. Teacher will read-aloud article: Humans Blamed for Starting Most Wildfires in the U.S. https://www.climatecentral.org/news/humans-blamed-for-most-wildfires-us-21197 <ul style="list-style-type: none"> ✚ Extended Learning Option: Reading for Meaning: Distribute article to students to add to interactive science notebook, students will highlight causes of wildfires as you read aloud. ✚ Extended Learning Option: Mathematical Analysis: Analyze visual data in the article, use the information to connect to real-world data. Example: In 2020, there were a total of 33,917 wildfires. Using the statistics of causes, how many fires were started by each cause? 	
Explore	
<p>🎯 Learning Target: Organize Student’s Previous Knowledge, Student Inquiries, and New Information.</p> <ul style="list-style-type: none"> ✓ Create an KWL Anchor Chart, watch short video, answer Driving Questions. 	
Activities (list)	Driving Questions
<ol style="list-style-type: none"> 1) Create a graphic organizer anchor chart to display student’s prior understanding in the Know section of the chart. Add new information from the reading into the Learn section. 2) 3) 2) Brainstorm and construct questions to add to the What section. Watch short video: 4) National Geographic How Wildfires Get Started and How to Stop Them: https://www.nationalgeographic.com/environment/natural-disasters/wildfires/ 5) 6) 3) Post the Driving Questions to start a class discussion, or small groups can be assigned for student collaboration. Students can replay video asynchronously (encourage them to play and pause as needed to answer the driving questions). Add the collected information to the Learn section. <ul style="list-style-type: none"> ✚ Extended Learning Option: AVID Notetaking: Students will extract information from the Learn section of KWL chart and use AVID notetaking strategies to organize key concepts and examples. ✚ Extended Learning Option: Project-Based Learning Activity: Students will conduct independent research to create a written report, slide show, or 1-page infographic to demonstrate understanding of causes and conditions that contribute to wildfires. 	<ul style="list-style-type: none"> -Can you identify the primary causes of wildfires? -What are the three main types of wildfires? (forest, brush, and peatland) -What are the three components known as the “Fire Triangle” that all fires need? (heat source, fuel, and oxygen) -What weather trends do scientist use to predict potential high-risk wildfire conditions? (El Nino weather patterns, drought, high temperatures, and strong winds,

	thunderstorms)
Explain	
<p>🎯 Learning Target: Use NASA Real-Time Data to Investigate Patterns of Wildfires.</p> <p>✓ Use NASA maps to observe patterns of wildfires in the U.S & World.</p> <p>✓ Students will work in groups to research and explain the patterns they observe.</p>	
<p>1) Explain NASA’s Earth Research and Analysis Program- clarify that NASA specializes in space exploration, but also is the largest sources of Earth data.</p> <ul style="list-style-type: none"> ➤ NASA has collected decades of data on Atmospheric Compositions, Weather, Climate, Water & Energy Cycle, Carbon Cycle & Ecosystems, and Earth’s Surface and Interior. https://science.nasa.gov/earth-science <p>2) Explain Goals for this Activity: In small groups, students will be investigating a real-time map to see if there are currently any fires burning in the U.S. or the World (represented by red dots). Each group will be responsible for recording the following:</p> <ul style="list-style-type: none"> ➤ Observations of any patterns you see worldwide or in the U.S. ➤ Make inferences on how your group believes scientists locate and collect data on wildfires? <p>3) Student Communication Product: Construct questions you have about the map. Pick one or two questions to research and find valid evidence and reasons that help explain your questions.</p> <ul style="list-style-type: none"> ➤ Create a slide with your question and answers to share with the class. Include at least one picture with your slide. <p>✚ Extended Learning Option: Digital Map Exploration: As a class or independently, further explore the layers, filters, and prior years data patterns.</p> <p>✚ Extended Learning Option: Student GIS Mapping: Have students use local data or GPS coordinates to map fires that are or were occurring in Washington State. Maps can be created with paper handouts or created electronically using ESRI ArcGIS software.</p>	
Elaborate	
<p>🎯 Learning Target: Evaluate NASA Data to Analyze Connections Between Global Wildfires and Temperature Trends.</p> <p>✓ Display graphs to analyze 70 years of data to see if frequency of wildfires is directly correlated to climate change.</p>	
<p>1) Analyze NASA Graph Data: Display both Global Wildfires and Temperature Trends maps to students, provide a worksheet, or have them access them on their Chromebook.</p> <ul style="list-style-type: none"> ➤ ➤ NASA Global Temperature Trends: https://www.jpl.nasa.gov/edu/teach/activity/graphing-global-temperature-trends/ ➤ NASA Frequency of Wildfire Graph: https://climate.nasa.gov/blog/2830/six-trends-to-know-about-fire-season-in-the-western-us/ <p>2) Data Driven Student Inquiry Questions:</p> <ul style="list-style-type: none"> ➤ What possible factors would cause these patterns to occur? ➤ What additional data or evidence could we need to gather to support your claims? <p>✚ Extended Learning Option: Math Graphing Activity. Instead of initially providing the NASA graphs to students, give them the data to graph on their own. Then as a class, compare</p>	

<p>their graphs to the NASA graphs and then elaborate with the data driven student inquiry questions.</p>	
<p>Evaluate</p>	
<p>🎯 Learning Target: Evaluate the Pros and Cons of Wildfires and their Impacts.</p> <p>✓ Use Resources to Allow Students to Evaluate the Negative and Positive Impacts of Wildfires on Ecosystems, Climate, and Humans.</p>	
<p>Skill/Reasoning Learning Objectives</p>	<p>Assessment Instrument</p>
<p>1) Application of Real-World Connections: Students will use two resources below to construct an explanation on the pros and cons of wildfires.</p> <ul style="list-style-type: none"> ➤ <u>Benefits of Fire:</u> https://www.fire.ca.gov/media/5425/benefitsoffire.pdf ➤ <u>Wildfire Hazards-A National Threat:</u> https://pubs.usgs.gov/fs/2006/3015/2006-3015.pdf 	<p>-Students will write a Claim, Evidence (CER) explanations that will support the learning target that wildfires can have both negative and positive impacts.</p>
<p>Knowledge Learning Objectives</p>	<p>Assessment Instrument</p>
<p>2) Demonstration of Gained Knowledge: Students will be assessed upon the comprehension and understanding of the Learning Targets of this lesson:</p> <ul style="list-style-type: none"> 🎯 Causes of Wildfires 🎯 Application of New Information 🎯 Patterns of Wildfires 🎯 Climate Change and Wildfire Correlation 🎯 Impacts of Wildfires 	<p>-A summative assessment will be administered to evaluate student learning and ability to accurately analyze visual data.</p>
<p>✚ Extended Learning Option: STEAM Project-Based Learning Activity. Create an invention or strategy to help prevent, control, manage, predict, or protect people and property from wildfires. This project can be completed as a drawing (hand or electronically created), it can be a blueprint of a prototype, you can build a prototype, or it is open to your imagination with approval. Projects can be presented in class or using an electronic resource such as Flip Grid to have students present their work.</p>	
<p>✚ Extended Learning Option: Explore Additional NASA Wildfire Resources and Lessons Plans:</p> <ul style="list-style-type: none"> ➤ https://www.jpl.nasa.gov/edu/news/2016/8/22/back-to-school-burn-the-science-of-wildfires ➤ https://www.jpl.nasa.gov/edu/teach/activity/fired-up-over-math-studying-wildfires-from-space/ ➤ https://www.jpl.nasa.gov/edu/teach/activity/pixels-on-fire/ ➤ https://www.jpl.nasa.gov/edu/news/2019/10/18/nasas-eyes-on-extreme-weather/ ➤ https://www.jpl.nasa.gov/edu/news/2016/8/22/back-to-school-burn-the-science-of-wildfires/ ➤ https://earthobservatory.nasa.gov/images/147293/a-meeting-of-smoke-and-storms ➤ https://earthobservatory.nasa.gov/images/147277/historic-fires-devastate-the-us-pacific-coast ➤ https://www.nasa.gov/feature/goddard/2019/nasa-tracks-wildfires-from-above-to-aid-firefighters-below ➤ https://climate.nasa.gov/news/2761/studying-weather-to-help-see-the-likelihood-of-fires/ 	

Attachment #2: Student Friendly Modified Remote Learning Lesson Plan

Created through Canvas Online Learning System

Wildfire Lesson



Learning Target: How do wildfires impact our world?

Step 1: What are wildfires?

- Make a Claim: What are the major causes of wildfires? Read- [Blamed for Starting Most Wildfires in the U.S. \(Click Here\)](#)

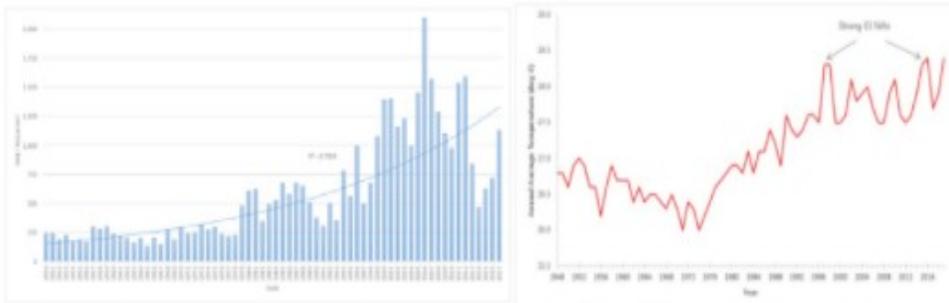
Step 2: What is your prior knowledge of wildfires? Has anyone ever seen or experienced a wildfire?

- Watch: [Here's how wildfires get started and how to stop them \(Click Here\)](#)
- Essential Questions: Where in the world do wildfires occur? Where in the U.S. are the most wildfires? What are the negative and positive impacts of wildfires?

Step 3: Investigation-Are there currently wildfires burning in the U.S.? In the World?

- In Breakout Rooms, you will be investigating a real-time map to see if there are currently any fires burning in the U.S. or the World (represented by red dots).
- In each group: 1) Make observations of any patterns you see 2) How do you think scientists locate and collect data on wildfires? 3) Construct a question to share about this map?
- [NASA Real-time Fire World Map \(Click Here\)](#) https://firms2.modaps.eosdis.nasa.gov/map/#d:2020-10-20_2020-10-21:@0.0,0.3z

Step 4: Data Analysis- NASA collects data on both global wildfires and temperature trends. What do the past 70 years of data show us?



- What possible factors would cause these patterns to occur? What additional data or evidence could we need to gather to support your claims?

Step 5: Can wildfires be beneficial to the health of forests?

- Read: [Benefits of Fire \(Click Here\)](#) <https://www.fire.ca.gov/media/5425/benefitsoffire.pdf>
- Answer Questions- [Benefits of Fire Reading Comprehension \(Click Here\)-5 point assignment](#)

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