



CA Science Framework

6th Grade: Global Warming on Living Systems
3D5E Learning Sequence Tool

STEM Standards/Performance Expectations (NGSS) - What is your standards-based content learning goal?

STANDARDS / PERFORMANCE EXPECTATIONS: Topic: What are students going to learn?

GOAL: MS-LS1-5 Construct a scientific explanation based on evidence for how environmental and genetic factors influence the growth of organisms.

Clarification Statement: Examples of local environmental conditions could include availability of food, light, space, and water. Examples of genetic factors could include large breed cattle and species of grass affecting growth of organisms. Examples of evidence could include drought decreasing plant growth, fertilizer increasing plant growth, different varieties of plant seeds growing at different rates in different conditions, and fish growing larger in large ponds than they do in small ponds.

Assessment Boundary: Assessment does not include genetic mechanisms, gene regulation, or biochemical processes.

MS-ESS3-5 Ask questions to clarify evidence of the factors that have caused the rise in global temperatures over the past century.

Clarification Statement: Examples of factors include human activities (such as fossil fuel combustion, cement production, and agricultural activity) and natural processes (such as changes in incoming solar radiation or volcanic activity). Examples of evidence can include tables, graphs, and maps of global and regional temperatures, atmospheric levels of gases such as carbon dioxide and methane, and the rates of human activities. Emphasis is on the major role that human activities play in causing the rise in global temperatures.



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Social Justice

[Learning for Justice Website](#)

What is your Goal for Social Justice in this lesson?

SOCIAL JUSTICE STANDARD: Justice 12 JU 6-8.12

I can recognize and describe unfairness and injustice in many forms including attitudes, speech, behaviors, practices and laws.

Culturally Responsive Phenomenon [SHS]:

What is the WHY behind the learning?

The August 6, 2012 Chevron Explosion
How do humans contribute to rising global temperatures and how does this affect life on earth?

DO - Science, Math and Engineering Practices	KNOW - Disciplinary Core Ideas	THINK - Cross Cutting Concepts
<u>*choose 1-2</u> Questioning Modeling Investigating Analyzing Computing Explaining Arguing Communicating Ask questions that arise from careful observation of phenomena, models, or unexpected results, to clarify and/or seek additional	What DCIs are associated with this topic? - Life Science - Earth and Space Science - Physical Science - Engineering, Technology, and Science What additional math/ELA? LS1.B: Growth and Development of Organisms Genetic factors as well as	<u>*choose 1-2</u> Patterns Cause and Effect Scale, Proportion, Quantity Systems and System Models Energy and Matter Structure and Function Stability and Change Patterns Cause and Effect Scale, Proportion, Quantity Systems and System Models Energy and Matter



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information. Construct explanations: Apply scientific ideas, principles, and/or evidence to construct, revise and/or use an explanation for real-world phenomena, examples, or events.	local conditions affect the growth of the adult plant. (MS-LS1-5) ESS3.D: Global Climate Change Human activities, such as the release of greenhouse gases from burning fossil fuels, are major factors in the current rise in Earth's mean surface temperature (global warming). Reducing the level of climate change and reducing human vulnerability to whatever climate changes do occur depend on the understanding of climate science, engineering capabilities, and other kinds of knowledge, such as understanding of human behavior and on applying that knowledge wisely in decisions and activities. (MS-ESS3-5)	<i>Structure and Function</i> Stability and Change Stability might be disturbed either by sudden events or gradual changes that accumulate over time. (MS-ESS3-5)
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Differentiation for Students (SPED, ELD standards)

ENGLISH LANGUAGE LEARNERS

Exchanging information and ideas with others through oral collaborative discussions on a range of social

and academic topics (SL.6.1, 6; L.6.3, 6)

Evaluating how well writers and speakers use language to support ideas and arguments with details or

evidence depending on modality, text type, purpose, audience, topic, and content area (RL.6.4-5; RI.6.4, 6, 8; RH.6.4-6, 8; RST.6.4-6, 8; SL.6.3; L.6.3, 5-6)



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STUDENTS WITH SPECIAL NEEDS

Providing opportunities for one-on-one student check-ins to follow IEP

CASE STUDY STUDENTS

Connection to local bay area communities such as Richmond, CA

Teacher Preparation

What preparation do you need to do for the lesson?

Pre-burn tea-light candles so that there is about 1 hour left of burning.

MATERIALS

Materials necessary for learning sequence.

- Candles
- Something to light candles
- Post-its
- Dead computers
- 2 household fans
- blindfolds
- Chocolate



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5E Learning Sequence Overview

ENGAGE SHS: <i>Standard-Hook-Society</i> Introduce culturally responsive phenomenon	EXPLORE ABC: <i>Activity Before Content</i> Plan learning activities before formal explanations	EXPLAIN Teacher → Student Student → Teacher Student ↔ Student Opportunities for Academic Talk
ELABORATE <i>Diversify Your Content</i> <i>Tell the Counter Narrative</i>		EVALUATE CER: <i>Claim-Evidence- Reasoning</i> YA: <i>Youth Action</i>

5E Learning Sequence

5E	Academic Discourse	Learning Activity	Student Work
+ Engage + Explore + Explain + Elaborate + Evaluate	+ Partner Talk + Small Group + Whole Group	Describe what the teacher is doing, what the students will be doing and how they will be thinking about the concept.	This artifact will capture student sense-making. Analyzing this provides a lens into student thinking. Examples include written and oral



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			work.
"E"ctivity	Academic Discourse	Learning Activity	Student Work
ENGAGE		Pre-plan: Pre-burn tea-light candles so that there is about 1 hour left of burning. Demonstration: Begin the class by lighting all the candles, demonstrating that as long as the candle is lit, we will have energy in this room to power all of our phones, computers, etc. Proceed to teach class. Where does most of the energy on Earth come from? Cue Video: The Chevron Oil Explosion of 2012 Actual Surveillance Video Students ask questions to clarify how human activities such as this oil refinery have contributed to global warming.	Question Board: students list sticky notes of questions on their table. Students categorize their questions into groups.



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		How do humans contribute to rising global temperatures? Oil Refinery Argumentation Activity	
EXPLORE	Small Group Talk -	Webquest: Students explore websites to seek answers to the questions. Take turns exploring the websites with each person contributing one fact and asking one question https://climate.nasa.gov/interactives/climate-time-machine Causes of Global Warming Oil Refineries and Low-Income Communities How does burning fossil fuels and rising temperatures connect to organisms? Simulation: Do Monarchs Help Me Get Chocolate? Round 1: Using two household fans, two	Group Sheet: 1 fact and 1 question for each person in the group



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		groups of 5 students (with blindfolds) will migrate to the other side of the room once the fan turns on. The cold air is their cue to migrate and pollinate. Students end with a piece of chocolate after the migration. Round 2: The fan doesn't turn on (due to rising global temperatures). The students do not get the cue to migrate, and there is no chocolate.	
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EXPLAIN	Partner Talk	Read this article on the decline of Monarch butterflies Decode simulation: Explain how this simulation relates to this article. Draw out the simulation and explain to your partner the relationship between rising temperatures, monarch butterflies, and food production. More articles on Monarch declines: Monarch Blog How has the burning of fossil fuels affected human life?	Model: explain how this simulation shows the relationship between rising temperatures, monarch butterfly populations and food production.
ELABORATE	Whole class	Pose question: Why is this such a problem now? Let's compare life from ancient human life vs. modern human life. Ancient humans vs. modern humans Human population growth Dead computers: We will then have students turn on the	



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ELABORATE		computers to research energy consumption. However, the computers will all be dead. There is only one charger and one outlet. Demonstrate energy scarcity. *Students also observe burnt out tea light candle. Simulation: Environmental Musical Chairs Question: Explain how this simulation affects energy consumption	
	Small Group	Rising global temperatures affect climate change Analyze Data -Pictures/graphs of climate change -Local issues on heat -Local issues on drought -Local issues on wildfire Draw a model of the milkweed plant and	Model of Milkweed Plant



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ELABORATE		explain how the milkweed plant will be affected by the local issues.																																																																																																																																																																																																																																																																																																																																																															
	Small group	Math connection Graph: Create an appropriate graph to illustrate the change of Global temperature highs and lows over time. <table><tr><th>Year</th><th>Jan</th><th>Feb</th><th>Mar</th><th>Apr</th><th>May</th><th>Jun</th><th>Jul</th><th>Aug</th></tr><tr><td>1981</td><td>55</td><td>41</td><td>49</td><td>31</td><td>23</td><td>31</td><td>34</td><td>33</td></tr><tr><td>1982</td><td>8</td><td>15</td><td>-3</td><td>9</td><td>15</td><td>5</td><td>12</td><td>9</td></tr><tr><td>1983</td><td>52</td><td>40</td><td>42</td><td>30</td><td>36</td><td>18</td><td>15</td><td>30</td></tr><tr><td>1984</td><td>31</td><td>17</td><td>29</td><td>10</td><td>34</td><td>5</td><td>15</td><td>15</td></tr><tr><td>1985</td><td>21</td><td>-7</td><td>16</td><td>11</td><td>18</td><td>16</td><td>-2</td><td>14</td></tr><tr><td>1986</td><td>29</td><td>38</td><td>29</td><td>25</td><td>26</td><td>12</td><td>13</td><td>11</td></tr><tr><td>1987</td><td>35</td><td>45</td><td>16</td><td>24</td><td>26</td><td>35</td><td>46</td><td>28</td></tr><tr><td>1988</td><td>56</td><td>41</td><td>48</td><td>44</td><td>44</td><td>42</td><td>34</td><td>45</td></tr><tr><td>1989</td><td>16</td><td>34</td><td>36</td><td>33</td><td>17</td><td>14</td><td>33</td><td>35</td></tr><tr><td>1990</td><td>40</td><td>40</td><td>75</td><td>54</td><td>46</td><td>37</td><td>43</td><td>29</td></tr><tr><td>1991</td><td>42</td><td>50</td><td>35</td><td>52</td><td>39</td><td>54</td><td>51</td><td>41</td></tr><tr><td>1992</td><td>45</td><td>42</td><td>46</td><td>23</td><td>32</td><td>23</td><td>13</td><td>9</td></tr><tr><td>1993</td><td>37</td><td>38</td><td>35</td><td>26</td><td>26</td><td>23</td><td>27</td><td>13</td></tr><tr><td>1994</td><td>30</td><td>3</td><td>26</td><td>40</td><td>28</td><td>41</td><td>31</td><td>22</td></tr><tr><td>1995</td><td>50</td><td>78</td><td>44</td><td>46</td><td>28</td><td>44</td><td>48</td><td>48</td></tr><tr><td>1996</td><td>27</td><td>48</td><td>34</td><td>36</td><td>29</td><td>26</td><td>35</td><td>48</td></tr><tr><td>1997</td><td>32</td><td>37</td><td>51</td><td>36</td><td>38</td><td>54</td><td>36</td><td>42</td></tr><tr><td>1998</td><td>60</td><td>88</td><td>61</td><td>63</td><td>71</td><td>77</td><td>70</td><td>68</td></tr><tr><td>1999</td><td>47</td><td>67</td><td>32</td><td>33</td><td>32</td><td>37</td><td>41</td><td>34</td></tr><tr><td>2000</td><td>26</td><td>58</td><td>59</td><td>59</td><td>39</td><td>43</td><td>42</td><td>42</td></tr><tr><th>Year</th><th>Jan</th><th>Feb</th><th>Mar</th><th>Apr</th><th>May</th><th>Jun</th><th>Jul</th><th>Aug</th></tr><tr><td>2001</td><td>44</td><td>45</td><td>57</td><td>52</td><td>59</td><td>54</td><td>60</td><td>49</td></tr><tr><td>2002</td><td>74</td><td>76</td><td>90</td><td>58</td><td>65</td><td>54</td><td>60</td><td>54</td></tr><tr><td>2003</td><td>72</td><td>54</td><td>57</td><td>54</td><td>62</td><td>48</td><td>54</td><td>65</td></tr><tr><td>2004</td><td>57</td><td>69</td><td>65</td><td>62</td><td>42</td><td>42</td><td>27</td><td>45</td></tr><tr><td>2005</td><td>72</td><td>57</td><td>69</td><td>69</td><td>65</td><td>66</td><td>65</td><td>63</td></tr><tr><td>2006</td><td>57</td><td>72</td><td>63</td><td>50</td><td>47</td><td>64</td><td>54</td><td>72</td></tr><tr><td>2007</td><td>97</td><td>69</td><td>71</td><td>75</td><td>68</td><td>57</td><td>62</td><td>61</td></tr><tr><td>2008</td><td>26</td><td>35</td><td>73</td><td>53</td><td>51</td><td>47</td><td>61</td><td>44</td></tr><tr><td>2009</td><td>61</td><td>53</td><td>54</td><td>61</td><td>64</td><td>66</td><td>72</td><td>67</td></tr><tr><td>2010</td><td>74</td><td>79</td><td>92</td><td>87</td><td>75</td><td>64</td><td>62</td><td>65</td></tr><tr><td>2011</td><td>51</td><td>52</td><td>65</td><td>65</td><td>54</td><td>59</td><td>75</td><td>74</td></tr><tr><td>2012</td><td>46</td><td>50</td><td>58</td><td>69</td><td>77</td><td>62</td><td>57</td><td>64</td></tr><tr><td>2013</td><td>67</td><td>57</td><td>66</td><td>54</td><td>62</td><td>65</td><td>59</td><td>66</td></tr><tr><td>2014</td><td>74</td><td>51</td><td>78</td><td>79</td><td>87</td><td>66</td><td>58</td><td>82</td></tr><tr><td>2015</td><td>82</td><td>87</td><td>91</td><td>74</td><td>79</td><td>79</td><td>73</td><td>78</td></tr><tr><td>2016</td><td>111</td><td>133</td><td>129</td><td>111</td><td>****</td><td>****</td><td>****</td><td>****</td></tr><tr><th>Year</th><th>Jan</th><th>Feb</th><th>Mar</th><th>Apr</th><th>May</th><th>Jun</th><th>Jul</th><th>Aug</th></tr></table> Now that you have found, and graphed the average temperature analyze the data. Draw a trend line on your graph, and interpret trends in the temperature. Identify the significance of the trend in the temperature.	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EVALUATE	Individual	Create a presentation to Chevron explaining the effects of the oil refinery on the climate and how environmental factors affect the surrounding life. In writing, propose an idea to mitigate, or reverse the effects of global warming to provide Chevron with renewable alternatives.	Final Presentation
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HELPFUL RESOURCES

RESOURCE TITLE: Learning Activity The Chevron Oil Explosion of 2012 Actual Surveillance Video

<https://www.youtube.com/watch?v=QjILbGbK8Qk>

RESOURCE TITLE: Time Machine

<https://climate.nasa.gov/interactives/climate-time-machine>

RESOURCE TITLE: Causes of Global Warming Oil Refineries and Low-Income Communities

<https://www.wwf.org.au/what-we-do/climate/causes-of-global-warming#gs.lts21q> ;



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<https://www.inverse.com/article/52340-monarch-butterfly-california-decline>

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HOURS:
As needed