

TABLE 1: ARISE units, NGSS standards alignment and description.

Unit	NGSS standards	Description
COVID-19 Data Science and Equity	MS-ETS1-2 MS-ETS1-3	Students explore the various ways data are used to communicate scientific information to the public and make policy decisions. Students practice making graphs and analyzing data related to COVID-19 and analyze the ways in which the COVID-19 pandemic, social issues, and health inequities have affected different communities. Students, for example, graph the relationships between factors such as employment as a frontline worker, availability of health services in the neighborhood, and COVID-19 infections.
Chemical Reactions and Asthma	MS-PS1-1 MS-PS1-3 MS-PS1-4 MS-PS1-5 MS-ESS3-3 MS-ESS3-5	Using computer models and drawings, students investigate greenhouse gas emissions and their effects on climate change and air quality. The unit introduces redlining and enables students to explore why people of color are more likely to live in an area impacted by air quality and climate change due to historical housing policies. Students use a virtual experiment to investigate alternative fuel solutions and their impact on greenhouse gas emissions and global temperature. Throughout the project students gather examples they can use to compose an evidence-rich letter to a local politician on how gasoline combustion impacts climate and health, and what they could do to take action.
Global Climate Change and Urban Heat Islands	MS-ESS3-3 MS-ESS3-5 MS-PS3-3	Students explore how solar radiation from the sun warms the Earth, and how greenhouse gases impact that energy cycle. They use an interactive model to investigate how human activities contribute to the greenhouse effect. Next, students investigate global climate change and identify the inequitable impacts of Urban Heat Islands caused by rising global temperatures. The unit culminates with students designing their own Climate Action Plan.

TABLE 2: Collaborative positioning activity modeled on knowledge integration.

Knowledge integration process	Prompt: Sample partner responses
Elicit ideas	<p>What do you think might be the reason for this disparity shown in the graph?</p> <p>What information are you drawing on to inform that perspective—how have your life experiences shaped your perspective and the information that was available to you to interpret this disparity?</p> <ul style="list-style-type: none"> • “Family experiences” • “I grew up in a marginalized community of color” • “News reports”
Discover new ideas	<p>Review other people’s posts. Do you see any new perspectives, or new pieces of information, different from your own?</p> <p>In light of these perspectives, what information can you share that supports someone’s view or provides an alternative to someone’s view? Respond to another’s post.</p> <ul style="list-style-type: none"> • “I see this reflected in my own personal experiences and circles” • “I agree and want to think more about how racism shows up across systems—healthcare, housing, education”
Distinguish ideas	<p>What makes you more or less likely to accept and incorporate a new idea from someone else, into your perspective?</p> <ul style="list-style-type: none"> • “It’s backed by personal experience or data” • “Close to my thinking, or a very stark contrast that compels me to think” • “Trust” • “It’s from someone in my community”
Reflect and connect	<p>What support do you feel like you, and your students, might need to engage in social justice issues in science class?</p> <ul style="list-style-type: none"> • “I’d like access to other perspectives, different from my own” • “I would also like to know more about my students, including their families to know where to begin the conversation”

TABLE 3: Example seventh-grade student reflections at the end of the Chemical Reactions & Asthma unit.

<p><i>Do you think the impacts of air pollution are different depending on where you live?</i></p>	<p><i>What are some ideas you have for policies or actions that make sure some communities do not experience more harmful impacts than others?</i></p>
<p>Some people that live near freeways, they have it worse because they can get sick from all of the gas that is going in the air. Also because of history it's affecting more African American people.</p>	<p>We could start off by getting rid of gasoline and moving people away from freeways and factories so we can help them not become sick.</p>
<p>The impacts are different depending on where you live because people in poorer places are closer to freeways and refineries which produce lots of pollution which can negatively impact people in those areas. For many years, people in "redlined" areas were not allowed access to mortgages and other credit, causing a cycle of disinvestment. Even though doing these practices are illegal today, the effects still linger.</p>	<p>I think that people who are a genuine big part of the community should be the one responsible with actions like that because somebody like that would need to know fully well how it would impact people. Also a person who is a part of the community will most likely not have a bias that puts money ahead of lives.</p>
<p>Impacts are very different depending on where you live because living closer to refineries or highways cause higher impact, but you could also live in a place that is poor and low funded which could make it hard to leave places with higher exposure to pollution.</p>	<p>First have inspections that regulate how much pollutants that come out of refineries and if they exceed a certain point tell them they need a way to stop producing that much pollution.</p>