Utah's Science Curriculum Standards and UCAIR's Idle Free Education's Alignment

Utah Clean Air Partnership (UCAIR) has officially launched its newest program *Idle Free Education*. This program will include students, teachers, and parents from schools to understand the impact and importance of not idling your car in carlines and parking lots. This program will start with observations involving students, staff, and parents counting the number of idling cars during drop-off and pick-up times (UCAIR Idle Free Education, 2024).

All information from Part 1 can be found in the 2023 Utah Science with Engineering Education (SEEd) Standards pamphlet or in the sources section below on page 7.

Part 1: Utah Science with Engineering Education Standards (SEEd)

Principles of Scientific Literacy:

- Science is Valuable, Relevant, and Inclusive: Science plays a crucial role in our society and culture, improving lives and addressing real-world challenges. It belongs to everyone, accessible and beneficial to all.

- Science is a Collaborative Process of Discovery: It thrives on curiosity, skepticism, and a commitment to precision. Core practices include asking questions, effective communication, critical analysis, collaboration, and thoughtful reflection.

- Science is Grounded in Principles and Continuity: Rooted in observations, inferences, laws, and theories, science is an ongoing, creative process supported by peer-reviewed evidence and collaborative efforts that stand the test of time.

Principles of Science Learning:

- Science Learning is Personal and Engaging: Students thrive when they reflect on their learning and collaborate with others. The process of learning involves creating and retaining knowledge through evidence and experience. Engagement is maximized when students tackle real-world, science-based challenges.

- Science Learning is Multi-Purposed: Science not only brings joy and sparks curiosity but also addresses real-world problems, informs society, and deepens understanding. It

empowers us to predict, improve, and mitigate challenges. Science is a tool for everyone—citizens, artists, and anyone who values the world around them.

- All Students are Capable of Science Learning: Science education should be accessible to every student, regardless of background, race, gender, or economic status. Learning is most effective when students have agency and engage in meaningful scientific practices. K-12 education should prioritize authentic, hands-on science instruction for all.

Three Dimensions of Science

- Science and Engineering Practices (SEPs): These practices highlight how engineers apply science in their work. Scientists do much more than conduct experiments—they engage in inquiry, wonder, designing, building, communicating, and collaborating. SEPs describe a wide range of activities necessary for doing science and illustrate how science connects with other subjects like writing, math, and the arts.

- Crosscutting Concepts (CCCs): These concepts provide a framework for organizing scientific knowledge and demonstrate how ideas evolve into overarching principles. Crosscutting concepts help us draw connections between different disciplines and subject areas.

- Disciplinary Core Ideas (DCIs): These are the foundational and explanatory building blocks of scientific knowledge within specific fields. They represent what we traditionally think of as science content and are categorized into physical, life, and earth sciences.

Table 1: Articulation and Recommendations of SEPs, CCCs, and DCIs

Science and Engineering Practices	Crosscutting Concepts	Disciplinary Core Ideas
Asking questions or defining problems: Students engage in asking testable questions and defining problems to pursue understandings of phenomena. **Developing and using models:** Students develop physical, conceptual, and other models to represent relationships, explain mechanisms, and predict outcomes. **Planning and carrying out investigations:** Students plan and conduct scientific investigations in order to test, revise, or develop explanations. **Analyzing and interpreting data:** Students analyze various types of data in order to create valid interpretations or to assess claims/conclusions. **Using mathematics and computational thinking:** Students use fundamental tools in science to compute relationships and interpret results. **Constructing explanations and designing solutions:** Students construct explanations about the world and design solutions to problems using observations that are consistent with current evidence and scientific principles. **Engaging in argument from evidence:** Students support their best explanations with lines of reasoning using evidence to defend their claims. **Obtaining, evaluating, and communicating information:** Students obtain, evaluate, and derive meaning from scientific information or presented evidence using appropriate scientific language. They communicate their findings clearly and persuasively in a variety of ways including written text, graphs, diagrams, charts, tables, or orally.	Patterns: Students observe patterns to organize and classify factors that influence relationships Cause and effect: Students investigate and explain causal relationships in order to make tests and predictions. Scale, proportion, and quantity: Students compare the scale, proportions, and quantities of measurements within and between various systems. Systems and system models: Students use models to explain the parameters and relationships that describe complex systems. Energy and matter: Students describe cycling of matter and flow of energy through systems, including transfer, transformation, and conservation of energy and matter. Structure and function: Students relate the shape and structure of an object or living thing to its properties and functions. Stability and change: Students evaluate how and why a natural or constructed system can change or remain stable over time.	Physical Sciences: (PS1) Matter and Its Interactions (PS2) Motion and Stability: Forces and Interactions (PS3) Energy (PS4) Waves Life Sciences: (LS1) Molecules to Organisms (LS2) Ecosystems (LS3) Heredity (LS4) Biological Evolution Earth and Space Sciences: (ESS1) Earth's Place in the Universe (ESS2) Earth's Systems (ESS3) Earth and Human Activity Engineering Design: (ETS1.A) Defining and Delimiting an Engineering Problem (ETS1.B) Developing Possible Solutions (ETS1.C) Optimizing the Design Solution **▸See the appendix for more information about the three dimensions.**

Table from: https://schools.utah.gov/curr/science/_science_/UtahSEEdStandards.pdf

Part 2: How is Idle Free Education following this?

Principles of Scientific Literacy:

- Science should be accessible and beneficial to everyone. UCAIR's Idle Free Education embodies this principle by empowering students to educate themselves and their families about the impacts of car idling. Utah faces unique air quality challenges due to its geography, population growth, and localized activities, with the west side of Salt Lake City being especially affected. Our focus on these communities reflects our commitment to ensuring that science benefits ALL!

- We aim to collaborate with teachers and students to address their questions about air quality. From recent events that UCAIR has attended, we've learned that most children in Utah are aware of poor air quality days. Our goal is to not only answer their questions but also to inspire curiosity and deeper learning, while encouraging reflection on how we can all help improve air quality, such as by reducing car idling, which aligns with our goal of this program.

- UCAIR is a non-profit organization that partners with the Department of Environmental Quality (DEQ) and its Division of Air Quality (DAQ). These agencies provide state-funded scientists and data that help us better understand the severity of air quality issues in Utah. The data from DEQ and DAQ is peer-reviewed and collaborative. Their "Be Idle Free" webpage served as part of the inspiration for our Idle Free Education initiative (Be Idle Free, 2023).

    - A recent study from the University of Utah shows that Idle Free Education materials and efforts are making a noticeable impact on reducing car idling. The study surveyed parents about their knowledge and willingness to avoid idling while dropping off students. The findings demonstrate both the desire of parents and students to improve local air quality and the effectiveness of campaigns in driving behavior change (Mendoza, 2022).

    - We are also inspired by another local non-profit organization, Utah Clean Cities Coalition (UCC), which launched the "Turn Your Key, Be Idle Free" campaign in 2006. This campaign has remained relevant and widely used by cities and organizations such as Intermountain Health and the Salt Lake City Health

Department. As one of UCAIR's partners, we continue to collaborate with UCC, incorporating key lessons from their campaign and utilizing their Idle Free logo (Idle Free, 2023).

- Collaborating with scientists, educators, and other non-profits is a powerful way to raise awareness, share resources, and reach a wider audience. By working together, we can more effectively educate communities, empower students to take action, and promote lasting changes that will improve Utah's air quality for everyone.

*****Areas for Improvement: How can we aim to enhance inclusivity by collaborating with Special Education educators to better support students with disabilities or other barriers to learning?**

Principles of Science Learning

- Science learning should be personal and engage students. UCAIR's Idle Free Education program will allow the option for students to count the amount of cars idling in a school's carpool lane. Engagement is best when students are tackling modern day challenges, as air quality is an important challenge that Utahn's have and will continue to face.
- Science learning is multi-purposed and we are hoping to spark curiosity about local air quality issues in Utah for students, but we are also hoping to help students understand and help find ways to mitigate local challenges within our state.
- By involving students in counting and collecting data on idling cars, we aim to engage all students. As mentioned previously, we are focusing on the West Side of Salt Lake City, an area historically home to underrepresented communities. According to the Utah Department of Cultural & Community Engagement, the West Side has long been noted for having underrepresented citizens (West Side Stories, 2021). UCAIR is confident that the Idle Free Program will provide underserved students with opportunities to participate in community work at a young age, helping them understand and contribute to meaningful change.

Three Dimensions of Science

- SEPs: As outlined in Table 1 on page 2, Idle Free Education aligns with the Science and Engineering Practices (SEPs) by encouraging students to ask questions and define the problem—specifically, air quality and car idling in carpool lanes. Students are also given the opportunity to plan and carry out investigations by counting idling cars and collaborating with schools to find solutions. UCAIR uses evidence-based air quality data

to educate students, aiming to prepare them to communicate with their parents about the impact of idling on air quality and, in turn, the effects of poor air quality on human health, particularly for younger children.

***Areas for Improvement: Idle Free Education currently lacks student involvement in explaining and designing solutions to the problem of car idling. While we hope students will educate their parents about staying idle-free, and this will help solve the problem, UCAIR may need to enhance the solution-based aspect of the program to more actively involve students in creating and implementing solutions.**

- CCCs: As outlined in Table 1 on page 2, Idle Free Education aligns with Crosscutting Concepts (CCCs) by encouraging students to observe patterns, in this case, car idling, and investigate its causes and effects. We aim to collaborate with multiple schools, allowing students to compare and measure the number of idling cars. Through this, we hope to help them understand the concept of change within an environment or system by explaining how car idling impacts air quality, which in turn affects the local environment and ecosystems.

- Disciplinary Core Ideas (DCIs) organize science education into four categories: physical sciences, life sciences, earth and space sciences, and engineering design. UCAIR's Idle Free Education program aligns with the Earth and Space Sciences curriculum by focusing on the local environment, specifically how air quality affects it. We also address the human impact on the environment, teaching students how they can contribute positively by reducing car idling and helping to protect the environment.

Conclusion:

- UCAIR's Idle Free Education program aligns with Utah's current science curriculum by giving students hands-on experience in scientific inquiry, specifically related to car idling and air quality. Our goal is to help students understand the importance of reducing idling to improve air quality.
- The west side of Salt Lake City, which historically experiences poorer air quality, is a key focus area, as we aim to involve underrepresented communities in this effort. By engaging students, we hope they will also educate their families about how small changes, like reducing car idling, can make a big impact—an essential part of UCAIR's mission.
- This program not only encourages students to participate in local science and problem-solving but also helps them and their parents understand the health risks associated with poor air quality in their community.

Sources

Dickson, S. (n.d.). *Utah Science with engineering education (SEED) standards*. Utah State Board of Education. https://schools.utah.gov/curr/science/_science_/UtahSEEdStandards.pdf

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