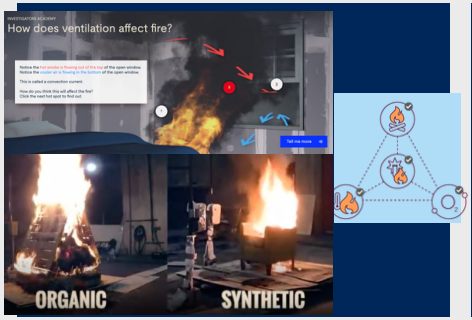
Xplorlabs Learning Experience- Structure & Spark: Engineering for Fire Safety

By integrating UL Xplorlabs: Science of Fire Forensics curriculum, students participated in an immersive, inquiry-based exploration of combustion and fire dynamics. After completing these specialized labs, they applied their foundational knowledge toward the architectural design of a fire resilient model home. Using foam board and grid paper to translate their concepts into scale models, students investigated how fuel sources and oxygen levels influence fire behavior, how energy is transferred from a fire, researched what materials should be used in their model homes, and ultimately how their design helps them in their real-world home. This learning experience had a profound impact on students. Having the opportunity to experiment with controlled variables in a laboratory setting provided a level of engagement rarely found in the typical curricula. Beyond the science of the fire tetrahedron which had students implement scientific methodical analysis, students demonstrated a sophisticated understanding of safety engineering, specifically regarding strategic smoke detector placement and the critical importance of limiting ventilation and compartmentalizing heat. By developing comprehensive escape plans, students cultivated a strong sense of situational awareness and systems thinking. This unit proved that applied, project-based learning effectively bridges the gap between theoretical science and life-saving real-world applications, resulting in a memorable and high-impact educational experience.

	Build Community & Secret Skill Building	***Xplorlabs: Science of Fire Forensics***	***Researching and Building***	***Presentations and Reflections***
Visual of Experiences				
NGSS	MS-PS1-6 Matter and its Interactions, MS-PS1-2 Matter and its Interactions, 3-5-ETS1-3 Engineering Design			
Time	Week 1	Weeks 2--4	Weeks 5-7	Week 8
Anticipated Outcomes	Students will learn and practice the skills of a Claim Evidence Response (CER) by playing a game (super showdown or superfight) which helps introduce the CER and has students distinguish between subjective opinion and evidence-based justification. In addition it helps students practice communicating and presenting in a low stakes environment. Additionally students practice the engineering design process along with architectural basics with the game floorplan.	Following a kitchen fire event, students act as investigators to identify evidence and develop models that explain the system of fire. By exploring fire at different scales and conducting investigations into chemical reactions, students identify the components required for ignition and the effects of thermal energy transfer on materials of varying density and shape. Learners observe how specific properties of matter affect energy release during combustion and construct explanations for how ventilation influences fire growth. Using knowledge of energy and matter, students analyze evidence from real burn scenes and apply scientific reasoning to their observations. The unit culminates as students explore a virtual burn scene to gather data and construct a formal argument regarding the fire's origin. Ultimately, they utilize the Claims, Evidence, and Reasoning (C.E.R.) format to organize their findings into a professional investigation report.	Students research materials and best practices for fire safe homes. They transfer their understanding about how fire essentially works and behaves to design their model fire resistant homes. Students must include 10-15 components and will label their models. They will also write explanations of how these items and their model is fire safe along with the scientific concepts as to why this makes them safe. Students will use the labels and explanations in a 2 minute “elevator pitch” to get their houses built by a “developer”.	Students Practice their presentations, and present them to peers, school staff, community members, fire department officials, etc. The last day of class is time for reflection and feedback through discussions and//or google forms. Teachers will use this information to change/adapt the unit as needed.
Supporting Documents	*Super Showdown Example explanation, guide, and judges scoring* *Floor Plan Files*	*Science of Fire Forensics* *Science of Fire Forensics- teachers overview*	*Student Checklist and Developer Scorecard*	*Student Reflection Survey*