Teaching Science

At Kuumba, Science Standards in K-3 are addressed during Module and Lit Labs. Students learn through discovery which inspires students to lead in questioning, investigating, and solving problems (Celebration of Learning: Sun, Moon, and Stars).

Teachers support students to read, write, think, and work as scientists do by cultivating scientific thinking and disciplinary skills in close reading, questioning, experimenting, using data, and communicating scientifically. When possible, student research contributes to the school or broader community. In addition, because appreciation and stewardship of the natural world is part of the EL Education model, teachers address environmental literacy as part of the science curriculum at all levels.

In the EL Education model, teachers prioritize students' understanding of enduring science concepts so that they can apply that understanding to the modern world. Teachers view science as a way to develop students' capacity to interpret the natural world critically and to engage productively in it. Teachers support students to read, write, think, and work as scientists do. They use learning expeditions, case studies, projects, problem-based content, collaboration with professional scientists and engineers, and interactive instructional practices to foster inquiry and enable authentic student research. When possible, student research contributes to the school or broader community.

Teachers reinforce the connections among science, mathematics, engineering, and technology as they lift up enduring ideas that cut across these disciplines. They cultivate scientific thinking and disciplinary skills in close reading, questioning, experimenting, using data, and communicating scientifically. Students learn to be logical, accurate, insightful, and unbiased when supporting statements with reliable scientific evidence. In addition, because appreciation and stewardship of the natural world is part of the EL Education model, teachers address environmental literacy as part of the science curriculum at all levels.

A. Planning for Science Instruction

1. Teachers unpack and bundle science standards to focus on significant and enduring ideas that cut across science disciplines (e.g., cause and effect, systems and systems models, structure and function).
2. In collaboration with colleagues, teachers plan the year's science scope and sequence to "cover" the broad scope of topics required by standards—a survey approach—and also to "uncover" key concepts through a case study (or deep dive) approach (e.g., a case study of ants within a broader study of animal groups and classification). Long-term planning entails the following:
    A. Crafting standards-aligned learning targets for knowledge, skills, and scientific thinking (e.g., questioning)

    B. Creating engaging lessons that provide a broad overview (e.g., cellular structures in biology)
    C. Selecting case studies or narrow topics that illuminate enduring concepts (e.g., a local frog as a study of indicator species and ecosystem relationships)
3. Teachers choose scientific topics as the basis of learning expeditions, case studies, and projects at all grade levels. They identify controversial scientific issues or local connections that animate topics and have strong potential for original research.
4. Teachers design research opportunities and products that engage students in authentic research that contributes to their communities (e.g., kindergartners analyzing conditions for optimal growth in their school garden, high school students testing indoor air quality in the school to inform recommendations to the board of education).
5. Teachers structure opportunities for scientific inquiry that allow students to participate in scientific research and problem solving that approximate adult science, including framing questions, designing methods to answer questions or test hypotheses, determining appropriate timelines and costs, calibrating instruments, conducting trials, writing reports, and presenting and defending results.
6. Teachers select a variety of primary and secondary source materials to supplement or replace textbooks (e.g., trade books, peer-reviewed journal articles, government documents). These texts serve as both anchor texts to bolster students' conceptual understanding and mentor texts to model the structure and style of scientific writing.
7. Teachers supplement texts with rich experiences to support conceptual understanding, including labs, fieldwork, and interaction with experts.
8. Teachers design assessments for lessons that address content knowledge, scientific thinking, and integrity in applying the scientific method.

B. Teaching Scientific Concepts and Skills

1. Teachers use complex scientific text to build students' understanding of scientific content and teach scientific literacy skills through the following actions:
    A. Conducting close reading lessons of informational text (and sometimes fiction) that includes accurate scientific information
    B. Teaching students to comprehend multiple forms of scientific documents, including texts, maps, models, diagrams, charts, graphs, tables, and timelines.
    C. Explicitly teaching domain-specific vocabulary related to the topic of study
2. Teachers engage students in complex, problem-based labs and investigations that require students to:
    A. Ask testable scientific questions
    B. Design and/or conduct experiments
    C. Use the tools of science with accuracy, care, and expertise d. Collect, represent, analyze, and report data e. Interpret results and reflect on methodology

3. Teachers encourage rich scientific discourse in which students evaluate multiple perspectives on a topic, take and defend positions, and consider alternative viewpoints.
4. Teachers require students to construct arguments and make written and verbal claims supported by scientific evidence so that students practice:
    A. Making logical assumptions
    B. Collecting accurate data
    C. Drawing insightful conclusions
    D. Supporting statements with reliable and unbiased scientific evidence
5. Teachers ask students to represent and reflect on their thinking (e.g., develop science notebooks, create analogies, make graphs, create technical drawings, build models).
6. Teachers use both student work samples and professional models (e.g., reports, lab notebooks, informational books, scientific diagrams) to explicitly teach what quality writing in science looks like and sounds like.
7. Teachers sometimes incorporate service-learning projects connected to content.

C. Creating a Culture of Science Inquiry

1. Teachers empower all students to see themselves as scientists by refuting stereotypes about who can succeed in science and celebrating the past and current scientific contributions of diverse individuals and groups.
2. Teachers, students, and school leaders celebrate, display, and discuss the natural and physical world throughout the school.
3. Teachers support student appreciation and stewardship of the natural world through experiences, projects, and service learning.
4. Schools develop indoor and outdoor areas, such as science labs, computer labs, workshops, gardens, and natural areas, to stimulate students' interest in science and technology.
5. Teachers display student work that provides evidence of scientific research and learning in public areas of the school.
6. Teachers welcome curiosity, reward creativity, and encourage thoughtful scientific questioning. They make students' questions visible and create opportunities for students to pursue answers to their own questions.

D. Assessing Scientific Understanding

1. Teachers create opportunities for students to demonstrate their understanding (not memorization) of science concepts (e.g., evolutionary adaptation, Newton's laws of physics). Opportunities include explaining concepts accurately to others using graphic representations, models, demonstrations, writing, and peer teaching.

2. Teachers regularly check for understanding and misconceptions. They support students in tracking their own progress toward learning targets and provide feedback that helps students make progress.
3. Teachers debrief learning by inviting students to generalize and apply concepts and procedures to other contexts and problems. They encourage students to reflect on what they learned, how they learned it, and how they can transfer it to new contexts.
4. Teachers and students use multiple methods of assessing understanding, such as one-on-one discussions, observations, Science Talks, science notebooks, portfolio reflections, and student-constructed scientific models, as well as quizzes, tests, and performance assessments.

KUUMBA ACADEMY WORK PLAN NORMS

REFLECTION

WE WILL INCORPORATE THE **NGUZO SABA PRINCIPLES** IN OUR COMMUNICATION AND HAVE STUDENTS PRACTICE AND REFLECT ON THEM DAILY.

DISCUSSION PROTOCOLS

- WE WILL EMPOWER STUDENTS TO USE **NIA** TO CONTRIBUTE THEIR IDEAS TO DAILY INSTRUCTION AND CULMINATING EVENTS.
- WE WILL EMBODY **UJIMA** USING A VARIETY OF CONFERENCES, PEER CRITIQUE, AND SELF-REFLECTION TO EMPOWER STUDENTS TO ACHIEVE THEIR HIGHEST QUALITY OF WORK.

CHECKS FOR UNDERSTANDING

- WE WILL USE **KUUMBA** TO ASSESS STUDENT LEARNING BY PRIORITIZING ARTS INTEGRATION ACROSS ALL CONTENT AREAS.
- WE WILL USE **IMANI** TO FOLLOW THROUGH WITH OUR DAILY MISSION AND VISION.
- WE WILL USE OUR **KUJICHAGULIA** AND KNOWLEDGE OF STUDENT UNDERSTANDING AND MISUNDERSTANDING TO DRIVE INSTRUCTION IN REAL TIME AND TEACH OUR STUDENTS TO BE DATA-LITERATE.
- WE WILL USE **UMOJA** TO UNPACK LEARNING TARGETS MULTIPLE TIMES THROUGHOUT THE LESSON.

CRITERIA FOR SUCCESS

- WE WILL USE **KUJICHAGULIA** TO CREATE EXEMPLARS, MODELS, AND RUBRICS TO PROMOTE STUDENT SUCCESS.
- WE WILL USE **KUUMBA** AND AUTHENTICITY IN STUDENT LEARNING THROUGH THE USE OF EXPERTS, FIELDWORK, EXPERIENCES, AND RESEARCH TO PROMOTE **UJAMAA** THROUGH REAL-WORLD CONNECTIONS.
- WE WILL TRACK OUR PROGRESS TOWARD HIGH QUALITY WORK THROUGH THE USE OF PORTFOLIO, STUDENT-LED CONFERENCES, DOC PANELS, AND DATA WALLS TO ENCOURAGE THE **NIA** FOR SCHOLARS TO BE LEADERS OF THEIR OWN LEARNING.

KUUMBA Academy Charter School