Madison Public Schools

Brown Math Enrichment - Science Competition

Unit Focus
Students will work collaboratively in groups of 2 - 4 students to submit a project to Exploravision. The groups are immersed in real world problem solving with a strong emphasis on STEM. Students are challenged to envision and communicate a new technology 20 years in the future through collaborative brainstorming and research of current science and technology.

STAGE 1: DESIRED RESULTS – KEY UNDERSTANDINGS

ESTABLISHED GOALS

NGSS Science & Engineering Practices

NGSS Science & Engineering Practices: 6-8

SE.6-8.1 Asking Questions and Defining Problems: A practice of science is to ask and refine questions that lead to descriptions and explanations of how the natural and designed world(s) works and which can be empirically tested. Engineering questions clarify problems to determine criteria for successful solutions and identify constraints to solve problems about the designed world. Both scientists and engineers also ask questions to clarify ideas.

• SE.6-8.1.4 Ask questions to clarify and/or refine a model, an explanation, or an engineering problem.

SE.6-8.3 Planning and Carrying Out Investigations: Scientists and engineers plan and carry out investigations in the field or laboratory, working collaboratively as well as individually. Their investigations are systematic and require clarifying what counts as data and identifying variables or parameters. Engineering investigations identify the effectiveness, efficiency, and durability of designs under different conditions.

• SE.6-8.3.1 Plan an investigation individually and collaboratively, and in the design: identify independent and dependent variables and controls, what tools are needed to do the gathering, how measurements will be recorded, and how many data are needed to support a claim.

SE.6-8.6 Constructing Explanations and Designing Solutions: The end-products of science are explanations and the end-products of engineering are solutions. The goal of science is the construction of theories that provide explanatory accounts of the world. A theory becomes accepted when it has multiple lines of empirical evidence and greater explanatory power of phenomena than previous theories. The goal of engineering design is to find a systematic solution to problems that is based on scientific

TRANSFER

T1 Make observations and ask questions to define a problem based on prior knowledge and curiosity that stimulates further exploration, analysis, and discovery.

T2 Communicate effectively based on purpose, task, and audience to promote collective understanding and/or recommend actions.

T3 Make sense of a problem, initiate a plan, execute it, and evaluate the reasonableness of the solution.

T4 Evaluate the accuracy and efficiency of a given solution.

MEANING

UNDERSTANDINGS	ESSENTIAL QUESTIONS
U1 Established knowledge provides the foundation for future scientific and engineering advances. U2 Good experimental design leads to precise and accurate data. U3 Conclusions can only be as strong as the quality of the evidence and the relevancy to the original question or problem.	Q1 What is the problem? Q2 How can I break a problem down into manageable parts? Q3 What do I need to support my answer? Q4 How can I use what I know in the world?

ACQUISITION OF KNOWLEDGE AND SKILL

KNOWLEDGE	SKILLS
K1 Technology has an origin story K2 Technology can have both positive and negative consequences on people and the environment K3 In order for technology to advance, breakthroughs in science and/or engineering must occur first.	S1 Identify problems for which technology can play a role in the solution S2 Evaluate information on the internet S3 Work collaboratively as integral members of a group to develop a solution to a problem S4 Construct a proper bibliography

STAGE 1: DESIRED RESULTS – KEY UNDERSTANDINGS		
knowledge and models of the material world. Each proposed solution results from a process of balancing competing criteria of desired functions, technical feasibility, cost, safety, aesthetics, and compliance with legal requirements. The optimal choice depends on how well the proposed solutions meet criteria and constraints. • SE.6-8.6.2 Construct an explanation using models or representations. • SE.6-8.6.3 Construct a scientific explanation based on valid and reliable evidence obtained from sources (including the students' own experiments) and the assumption that theories and laws that describe the natural world operate today as they did in the past and will continue to do so in the future. • SE.6-8.6.4 Apply scientific ideas, principles, and/or evidence to construct, revise and/or use an explanation for realworld phenomena, examples, or events. • SE.6-8.6.5 Apply scientific reasoning to show why the data or evidence is adequate for the explanation or conclusion. • SE.6-8.6.6 Apply scientific ideas or principles to design, construct, and/or test a design of an object, tool, process or system. • SE.6-8.6.7 Undertake a design project, engaging in the design cycle, to construct and/or implement a solution that meets specific design criteria and constraints. • SE.6-8.6.8 Optimize performance of a design by prioritizing criteria, making tradeoffs, testing, revising, and retesting. **Student Growth and Development 21st Century Capacities Matrix** • Critical Thinking • Collaboration/Communication		