# **VLASTOS Lesson Plan**

~ See page 2 below for the Problem Statement (concept/context of extended 'lesson')

Pretest Questions	How can we select a specific asteroid to extract its resources for the betterment of mankind?		
Objectives	Students collaborate to: create a feasibility plan, a SWOT (Strengths, Weaknesses, Opportunities, Threats) analysis, create a 3D model/simulation of their chosen asteroid, write code to select their asteroid among all documented asteroids.		
Catch	Is asteroid mining feasible?		
Activity	Pertaining to STEM (and RAMPED): students will use the SDSS Navigate Tool and Jupyter to chose their asteroid, will use Unity software to recreate their chosen asteroid in 3D.		
Review	Pertaining to STEM (and RAMPED): throughout the 4-week problem students will work daily in the computer lab reviewing their work with tutors and, during the final two weeks, work with and teach 5 <sup>th</sup> grade students how to create a 3D model/simulation		
Assessments	~ Formal presentation to authentic audience ~ Documentation of SWOT analysis ~ Placing 3D model/simulation on-line		
Posttest Questions (same as pretest questions)	How can we select a specific asteroid to extract its resources for the betterment of mankind?		
Standards	See page 3 below.		
Crosscutting Concepts from NGSS	From NGSS/NSTA: 3. Scale, Proportion, and Quantity 4. Systems and System Models 5. Energy and Matter		

Could asteroids be a source of raw materials in the future, both here on Earth and for further space exploration?

Using a mission lifecycle, work together as a Science Working Group (SWaG) to develop and prepare a preliminary definition of a mission to investigate the feasibility of mining an asteroid.

Using a SWOT analysis review your choice for STEC<sup>TM</sup> (science, technology, engineering and commercial) merit as related to the goal of the mission. You will present your initial SWOT analysis to a Neutral Assessment Team<sup>TM</sup> (NAT).

Your Final Phase B Preliminary Mission proposal will be presented at the Casper Planetarium.

Collaborate with the outside classrooms to create a presentation that incorporates *Blender* or other 3-D animation software to educate the public about the potential of asteroids in terms of exploration for resources.



Catch that Rabbit ~ short story by Isaac Asimov
The Little Prince ~ by Antoine de Saint-Exupery
The Moon is a Harsh Mistress ~ by Robert Heinlein

Language Arts	Science	Social Studies	Technology
BOE: Functional Feasibility study Persuasive speaking Research, Prioritizing sources Listening skills Literature	How do scientists know what they know about the Solar System? Properties of elements Spectrometry Origin and formation of the solar system Laws of motion	Who owns outer space? Solar system geography Impact of raw materials mined in space on the global economy	How is animation used to better presentation? What animation programs are available online? Multi-perspective thinking

#### **ASTEROID PROBLEM Standards 2016**

#### Science

# Concepts & Processes (1)

Structure and property of matter Interactions of energy and matter

### Science as Inquiry (2)

Students research scientific information and present findings through appropriate means

### History and nature of science in personal and social decisions (3)

Scientific information and decision making

# Language Arts

# Reading (1)

Variety of sources Understanding of informational resources

## Writing (2)

Biblography

Writing w/ audience in mind

Organization/focus

# Speaking & Listening (3)

Formal presentation

Details to support ideas

Group discussion

consider other's ideas before speaking

constructive criticism

lead, particpate & moderate

#### **Social Studies**

# **Production, Distribution and Consumption (3)**

How different economic systems are organized for production, distribution and consumption Impact of global economic interdependence

### People, Places and Environments (5)

Interpret charts, maps, graphs

Organize and process information about people, places and environments