

## LEONARDO LIVES!!!

### Performance Standard 12D/11B/13B.G

Students will apply the processes of historic technological design to measure force and/or motion using simple machines and the principles of mechanics accordingly:

- *Knowledge*: Describe the force and motion factors applied in simple machines.
- *Application*: Design models which replicate or apply Leonardo daVinci's plans for inventions.
- *Communication*: Report investigation processes and findings.

### Procedures

1. ***In order to know and apply concepts that describe force and motion and the principles that explain them (12D), the concepts, principles and processes of technological design (11B), and the concepts that describe the interaction between science, technology and society (13B)*** students should experience sufficient learning opportunities to develop the following:
  - Compare the knowledge, skills and methods of Leonardo daVinci to modern scientific and engineering capabilities
  - Research and examine historic innovative designs associated with Leonardo daVinci for inclusion of simple machine components,
  - Consider success criteria, constraints and testing logistics faced by daVinci,
  - Sequence the logical steps for construction and sketch a progression of design stages,
  - Identify original and comparable simulation materials for construction,
  - Predict proportional scale for original designs,
  - Construct selected daVinci invention challenge model,
  - Test model according to success criteria,
  - Record appropriate data and anecdotal observations,
  - Correlate historic conditions and data to model testing,
  - Present research and investigation findings about historical design and its applications,
  - Generate possible alternatives which could have been considered by Leonardo daVinci to improve his designs historically or what his ideas could be in current times.

Note to teacher: This activity relates to knowledge associated with standard 12 D, while addressing the performance descriptors for stage G within standard 11B. Additional connections to the scientific technologies advanced in the past are applicable from standard 13B. (An interesting associated educational website which can be directly applicable is provided through the Science Learning Network from the Museum of Science in Boston, MA: <http://www.mos.org/sln/Leonardo/BeInventive.html>.

2. Have students review and discuss the assessment task and how the rubric will be used to evaluate their work.
3. Begin the investigation of simple machines by identifying the basic impact on forces and motion by simple machines. Consider how Leonardo daVinci may have seen simple machines in action during his lifetime and research his designs for inventions that he considered. A preliminary listing or display of his sketches may be provided for student or team choices for research, modeling and testing. Students should consider the parameters that daVinci would have encountered for his inventions and plan for construction of models (to scale, as necessary) for class testing. Their plans should include sequencing steps for construction, identifying applicable materials for use, sketching design stages, and building and testing their models according to class-determined success criteria. Classroom presentations should include reporting on the process and findings of their investigations and discussing the common obstacles they encountered or that daVinci could have encountered.
4. Evaluate each student's work using the Science Rubric as follows and add the scores to determine the performance level:
  - *Knowledge*: The applicable descriptions of force and motion in terms of simple machines were complete and correct.
  - *Application*: The model designs and testing processes for 'inventions' were completed accurately and correctly.
  - *Communication*: The explanations of the investigation processes and findings, as well as the comparative obstacles were well-reasoned, thorough and well-detailed.

**Examples of Student Work not available**

**Time Requirements**

- 1-2 days for introduction to inventive genius of Leonardo daVinci and the foundations of simple machines; 3-4 days for invention construction and testing; 1-2 days for presentation of findings and culminating discussion.

**Resources**

- Access to research resources about Leonardo daVinci and simple machines
- Access to applicable materials for construction of invention models
- Science Rubric