***LESSON PLAN***

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**Task Objective Number:** Next Generation Standards K-2 ETS-1-1

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| **GENERAL INFORMATION** |

**Lesson Title & Subject(s):** Simply Machines – Work

**Topic or Unit of Study:** Science and Engineering Design

**Grade/Level:** Second

**Instructional Setting:**

The suggested location is a classroom setting with three open desk spaces around which students can gather, and between which students can move easily. Students should be able to gather as one unit to participate in an introductory lesson and then be placed into three approximately equal groups of five to seven students for a group work phase. The total number of students the project can accommodate will depend on available space, number of teachers, and level of teacher comfort, and can be scaled up or down accordingly.

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| **STANDARDS AND OBJECTIVES** |

**Nevada Core Curriculum/Student Achievement Standard:**

K-2 ETS-1-1: Ask questions, make observations, and gather information about a situation people want to change to define a simple problem that can be solved through the development of a new or improved object or tool.

**Lesson Goals:**

The lesson is designed to introduce students to the concept of work in physics, show how simple machines are used to do work, and introduce engineering design by enabling students to brainstorm situations where tools are needed, and how the design of tools can be changed or improved to solve specific problems.

At the end of the lesson students should be able to understand and apply the concept of work, identify several simple machines, and describe ways to modify these simple machines to make them better suited to solve particular problems.

**Lesson Objectives:**

Students should be able to explain the concept of work and correctly identify applications where work is being done. Students should be able to describe and identify each of the simple machines used in the project. Students should be able to explain how each of the simple machines could be modified to better suit a given problem or situation. Student performance in class discussion and a final multiple choice assessment will be used to assess achievement of these objectives.

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| **MATERIALS AND RESOURCES** |

**Instructional Materials:**

Jugs, sand, ribbon, particle board, dowels, spindles, pulleys

**Resources:**

Effective and Creative Lesson Plans (website). Retrieved from https://aminghori.blogspot.com/2016/04/lesson-plan-of-simple-machines-general.html

National Geographic (website). Retrieved from

http://www.nationalgeographic.org/activity/simple-machine-challenge/

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| **INSTRUCTIONAL PLAN** |

**Sequence of Instructional Procedures/Activities/Events:**

1. **Identification of Student Prerequisite Skills Needed for Lesson (5 minutes):**

Students should already be aware of the existence of a variety of tools which are designed and used to solve problems. Students should also have an intuitive awareness of the difficulty of moving heavy objects via different means, such a lifting, pushing, or pulling. Prior student knowledge, experience, and lessons relating to these topics should be reintroduced and reemphasized.

1. **Presentation of New Information or Modeling (10 minutes):**

Students should be introduced to the concept of work, defined in age-appropriate terms as applying force or effort to make an object move. Students should be introduced to the concept of simple machines, defined as several types of tools that are used to make it easier for people to do work. Students should then be given concrete examples of the simple machines and the work they do via demonstration. By showing how the simple machines are operated and explaining how work is being done, the new definitions and concepts should be reinforced.

1. **Guided Practice (10 minutes):**

*(e.g., teacher directed, scaffolding, check for student understanding – including any questions to ask or anticipate from students)*

While working in groups, students will spend approximately two-thirds of the allotted time in guided practice, where the teacher at each simple machine station will lead discussion and experimentation using the simple machine at that station as a focal point. The teacher should solicit students for questions and ideas that emphasize engineering design.

1. **Independent Student Practice (5 minutes):**

*(e.g., teacher monitored, check for student understanding – including any questions to ask or anticipate from students)*

While working in groups, students will spend approximately one-third of the allotted time in independent use of the simple machines, monitored by the teacher at that station. Ideally, each student should get some hands-on time with each simple machine by using it to do some work. For example, each student should be able to use the pulley to lift one of the jugs, and compare that experience with lifting by hand.

1. **Culminating or Closing Procedure/Activity/Event (15 minutes):**

*(e.g., review terms, concepts, and/or learning process; establish connections to the next lesson; check for student understanding – including any questions to ask or anticipate from students)*

After the group work phase has concluded and all students have had access to each of the simple machines, the class should gather once more for to review the new concepts and terms they have learned, namely work and simple machines. A final question and answer session should be conducted to solidify concepts and measure understanding.

**Pedagogical Strategies:**

Directed Instruction – The students will participate in direct instruction during the introductory review, lesson on work, and initial demonstration of the simple machines.

Cooperative Learning Groups – The students will be placed in groups of approximately five to seven students, which will rotate between the simple machines. While together, the students will be able to experiment with the machines, share questions and ideas amongst themselves and with the instructor, and participate in discussion about how the simple machine might be used and modified.

**Differentiated Instruction:**

Students who are English Language Learners can be assisted by the addition of a vocabulary guide relating the English keywords of the lesson to the corresponding words of another language, given on printed sheets or on available board space. Hearing impaired students can be assisted via the addition of instructors capable of explaining the machines and answering student questions in sign language. Students with learning disabilities can be assisted by modifying time requirements and assessment criteria as necessary. Physically disabled students can be assisted by direct assistance from teaching staff to facilitate operation of the simple machines. Gifted or accelerated learners may benefit from additional assessment criteria or the addition of new units, such as constructing the simple machines from scratch.

**Student Assessment/Rubrics:**

Students have met the objectives of the lesson if they can identify and describe the concepts of work and simple machines, suggest simple machines well suited to given problems, and suggest modifications to simple machines that might make them better suited to solving a given problem. In addition to evaluation of class discussion, student questionnaires should be filled out and analyzed to measure learning success. If a student can identify work, simple machines, and engage those concepts in discussion of real-world problems, then the lesson was a success.