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The following lessons were created by **Sue Drummer**, a teacher participating in the National Endowment for the Humanities Summer Institute for Teachers entitled Touch the Past: Archaeology of the Upper Mississippi River Region.

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Exploring Physics with the Atlatl

Grade Level	9th
Subjects	Physical Science
Objectives	Students should know the importance of the atlatl in early cultures. Students should be able to relate Newton's 2 nd law of motion to the throwing of atlatls. Students should be able to explain how mechanical advantage and lever systems apply to atlatls.
Standards	Florida Physical Science standards on motion: <u>Motion</u> can be measured and described qualitatively and quantitatively. Net forces create a change in motion.
Duration	5 class days plus days in between
Materials/Supplies	atlatl and dart of a historic type, worksheets, computers, PowerPoint presentations, calculators, rubric
Vocabulary	atlatl, force, mass, acceleration, lever, mechanical advantage
Background	Teachers will need to have a basic understanding of atlatls and their place in history as well as knowledge of the laws of motion, levers and mechanical advantage

Setting the Stage	Students will prepare for this lesson by completing a unit on simple machines. The introduction to the unit will involve examination of a replica atlatl to pique interest.
Procedure	See lesson plan attached
Closure	Students will compete in a competition with their homemade atlatls.
Evaluation	Quiz over motion laws and levers; rubric on atlatl construction
Links/Extension	See attached sheet
References	See attached sheet
Attachments	Atlatl references; lesson plan

Lesson Plan: Exploring Physics with the Atlatl

Day	Activity	Objectives	Materials	Duration
1	Introduce atlatl and show samples		Atlatl and darts	10 min
1	PowerPoint presentation on motion	Understand and be able to give examples of 3 laws	Ppt presentation and projector	15 min
1	Worksheets on Newton's laws	Be able to work problems involving Newton's laws Given a scenario based on the laws of motion be able to predict the outcome.	Worksheets, calculators	15 min for problems; 10 min for answers
1	PowerPoint presentation on atlatls	Be aware of the history of the atlatl Be able to discuss factors that affect the use of an atlatl	Ppt presentation and projector	20 min
2	Practice throwing atlatls	Become familiar with the atlatl and how it is thrown so that the principles of science can be applied to it	Atlatls and darts	30 min
2	Review steps of designing an experiment	Be able to develop a hypothesis and test it using a controlled experiment		10 min
2	Examine web sites on atlatl construction and use; take notes to share with your group		Computers	20 min
3	Group development of a testable hypothesis for use with atlatls	Be able to develop a hypothesis and test it using a controlled experiment		20 min
3	Students will construct atlatls and darts of their own to be tested in a group setting	Use of the scientific method in developing and carrying out an experiment	Rubric for atlatl and dart construction	1 week of home time
4	The great atlatl competition	Be able to collect data and organize it into a neat table		60 min
4	Construct data table for atlatl values	Be able to collect data and organize it into a neat table		20 min
4	HW: Complete the writing of a lab report for the atlatl competition	Be able to write a complete lab report		HW
5	Quiz over levers and motion laws		quiz	30 min

Atlatl References

<http://www.historyforkids.org/learn/northamerica/before1500/economy/atlatl.htm>

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Atlatls:throwing for distance by Craig Ratzat; Primitive Technology: A book of earth skills; David Wescott ed. 1999; Gibbs Smith Publisher, Salt Lake City

Survival with the atlatl. Bill Tate. Tate Enterprises Unlimited, Inc. 1987

Web sites

<http://www.atlatl.com/archeology.php>

<http://associations.missouristate.edu/mas/macquest/desk/atlatlindex.htm>

<http://www.texasbeyondhistory.net/kids/hunting/atlatl.html>

http://waa.basketmakeratlatl.com/?page_id=177

<http://www.instructables.com/id/How-to-make-an-Atlatl/>

http://ilovehistory.utah.gov/fun_stuff/how_to_make_an_atlatl.pdf

<http://makezine.com/projects/make-12/the-atlatl/>

<http://www.wikihow.com/Make-a-Simple-Atlatl>

Name:

Newton's laws worksheet

1. Explain why it is not wise to quickly pull in front of a large truck coming up on a red light.
2. To launch a rocket requires a lot of fuel with a lot of boosting power. This is often done in stages to get maximum boost. Once in space, even large satellites only need small thruster rockets to change course. What is the difference in the two situations that makes the rockets needed so different?
3. Why do large trucks slow down but try to keep rolling when approaching a red light? What is the advantage of this practice according to Newton's first law of motion?
4. You have a sled that has a mass of 82 kg when you are on it. What force would you need to apply to get the sled to accelerate at $+1.8 \text{ m/s}^2$?

5. Your friend Henry has a sled which has a mass of 85 kg when he is on it. If he applies 390 N of force will he be able to accelerate faster or slower than you? Show your calculations.

6. If you add a 10 kg mass to your sled and apply the same force as calculated in question 4, will you accelerate faster or slower? By how much?

7. 200 N of force is applied to an atlatl dart that has a mass of 0.6 kg. How fast will it accelerate?

8. If you want to increase the acceleration on the atlatl dart from question 7, what 2 things could you do?

9. You and your friend Sally are standing facing each other on skateboards. You have a mass of 58 kg and Sally has a mass of 65 kg. If you both push off of each other with the same force, which of you should travel farther from the starting point? (Consider all other factors as equal)

10. You are standing against the wall on your skateboard. You push against the wall. Explain what should happen and why.

Rubric for Building an Atlatl

1. Atlatl structure resembles traditional structure (5 pts)
2. Atlatl can be thrown in the usual manner (5 pts)
3. Atlatl can actually be used to throw a dart (5 pts)
4. Dart thrown is capable of going a long distance (at least 20 yd) (5 pts)
5. Atlatl stays together over continued use (5 pts)
6. Atlatl is decorated in a traditional manner (5 pts)

Extra points:

7. Traditional style spear/ dart is made (3 pts)
8. Dart can be thrown over 40 yd (2 pts)