Science and Technology: Prusik Knot

An Interdisciplinary Education "Function to Flow" Approach to Learning About Climbing

<table>
<tr><td>Grade: Junior/Intermediate

Teacher:</td><td colspan="2">Subject/Course: Science and Technology
Strand: Understanding Structures and Mechanisms</td><td>Time: 50 - 65 mins</td></tr>
<tr><td colspan="4">Lesson Description
- Students will create a Prusik knot and describe/show how it functions
- Students will be able to connect their 'fixed line' climbing experience to their understanding of knots</td></tr>
<tr><td colspan="4">Desired Results</td></tr>
<tr><td colspan="4">Fundamental Concepts/Skills
- Function2Flow (Function)
- Climbing
- Knot tying and recognizing forms of technology/mechanisms</td></tr>
<tr><td colspan="4">Big Ideas
- Through the Function2Flow model, students can explore function with the equipment of climbing and different climbing knots through hands-on inquiry
Essential Questions
- How does technology/mechanisms (understanding structures and their function) help us in activities such as climbing?</td></tr>
<tr><td colspan="4">Overall Expectation(s)</td></tr>
<tr><td colspan="4">Specific Expectation(s)</td></tr>
<tr><td colspan="4">Lesson Goals
- Introduce students to concrete examples of knots, how they are examples of mechanisms, and encourage them to make cross-curricular connections</td></tr>
<tr><td colspan="2">Key Concepts and/or Skills to be learned/applied
- Critical thinking, questioning, performing, recording, problem-solving and experimentation
- Relate science and technology to society, the environment and physical literacy</td><td colspan="2">Prior Knowledge
- Basic structures and mechanisms
- Prior knowledge of climbing is an asset but not required</td></tr>
<tr><td colspan="4">Planning Learning Experience and Instruction</td></tr>
<tr><td colspan="2">Student Groupings
- Whole class, small group (3-4, decided by teacher), individual</td><td colspan="2">Instructional Strategies
- Whole group discussions, small group work, individual (or group) reflection</td></tr>
<tr><td colspan="2">Materials
- Two pieces of climbing rope per group of 3-4 students (diameter: approximately 9-11mm, preferably one piece slightly thicker than the other, length: approximately arm's width)</td><td colspan="2">Considerations
- The motivational hook is open to the teacher, if the teacher chooses to show a video clip (i.e. of knots being used in climbing) be sure to preview the full clip ahead of time</td></tr>
</table>

- Handout: steps to tying a Prusik knot, 1 per group of 3-4 students - Handout: Prusik knot worksheet, 1 per student or 1 per group of 3-4 students - Motivational hook (video, internet, computer, images, books, real samples of knots, etc.)	- The thinner piece of rope can be pre-tied in a Double Fisherman's knot, or the teacher can have the students learn how to tie this knot as well* - New vocabulary terms

Accommodations

- Be aware of IEPs in the class and modify accordingly i.e. pairing students who can help others, providing extra direction and instruction, etc.

Learning Experience and Instruction

Motivational Hook (5 mins)

- Begin the lesson by introducing the students to knots, either through a video clip, passing around examples of knots, showing images, etc.

Open (10 mins)

- As a class, discuss the motivational hook (video, images, etc)
- *What are the purposes of knots? What are specific uses? How do they relate to climbing/ human activities? Do you know any kinds of knots?*

Body (30 – 45 mins)

- Divide class into groups of 3-4 students
- Provide each group with two pieces of climbing rope and a Prusik knot handout (alternatively challenge them to replicate the knot without using the step-by-step images)
- *If you are going to have the students also tie the Double Fisherman's knot with the thinner rope prior to tying the Prusik knot, supply them with the Double Fisherman's knot handnout and provide extra time
- In groups, have students follow the visual image for tying a Prusik knot to tie their own
- Provide each student or group of students (teacher to decide) with a Prusik knot worksheet to fill out

Close (5 mins)

- As a class, discuss the function and possible uses of this knot
- *How does the knot work? What does this knot look like? What could it be used for? Have you ever seen it before? Does it remind you of anything?*

Extension Activities

- Encourage students to explore/research other types of knots (i.e. figure 8) or mechanisms used in climbing

Assessment / Connections to "Function to Flow" chart

- Knowledge and Understanding – knowledge of energy levels, principles of effort and awareness
- Thinking and Inquiry – critical/creative thinking and planning strategies involved in climbing that prepare a climber to experience an effortless connected and flowing climb
- Function: function of the knot, link to climbing
- Form: form of the knot, mechanism behind it
- Feeling: feeling of sliding the knot along the fixed rope
- Flow: flow in the effortless use of the knot during a climb

Resources

Resources for tying knots:

- http://www.animatedknots.com/doublefishermans/index.php
- http://www.animatedknots.com/prusik/index.php?Categ=climbing&LogoImage=LogoGrog.jpg&Website=www.animatedknots.com

Prusik Knot worksheet:

Check if your knots look like these knots:
Double fisherman's knot:
http://www.animatedknots.com/doublefishermans/index.php

- Prusik Knot:
  http://www.animatedknots.com/prusik/index.php?Categ=climbing&LogoImage=LogoGrog.jpg&Website=www.animatedknots.com

Describe how close your knots match the knots on the website:

_____
_____
_____
_____

1. Are all three loops of your knot in alignment? *(In other words, the first loop you made should be the outermost loop, the second loop is the next one and the final loop is the middle loop).* If not, make the appropriate adjustments, describe what changes you needed to make.

_____
_____
_____

2. Does your knot slide up and down the stationary rope?

3. If the knot slides easily, what happens when you pull really hard on the lose end of the knot?

_____
_____

4. If it does not slide easily but seems to be locked, how can you loosen the knot to be able to move it up and down?

_____
_____
_____

5. Now that you have experimented with the knot, describe how it works.

_____
_____
_____

6. What might this knot be useful for?

_____
_____
_____
_____