



Educational Product	
Educators	Grades 3-5

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The Case of the Powerful Pulleys

An Educator Guide with Activities in Mathematics, Science, and Technology 



Program Overview

Accidents happen and Jacob has broken his foot. He is eager to get back into the tree house and join his friends, but the cast on his foot prevents him from climbing the ladder. The tree house detectives decide that devising a plan to get Jacob safely into the tree house will be their next case, and so begins *The Case of the Powerful Pulleys*.

As the tree house detectives research ways to get Jacob safely into the tree house, they visit Dr. D to learn about work, force, and energy. They decide that it is going to take a lot of energy to do the work needed to lift Jacob up to the tree house! There must be an easier way.

Dr. Textbook introduces the tree house detectives to the world of simple machines. Now they think they are getting somewhere. Dr. D invites them to visit him at a circus to learn more about simple machines. At the circus, they think they have solved the problem. However, the tree house detectives know that they need to do a lot more research before they jump to any conclusions.

The tree house detectives set off to visit NASA engineers at NASA Langley Research Center and NASA Dryden Flight Center. Bianca is excited to learn more about engineers because she is preparing a report for Career Day. The Society of Women Engineers (SWE) helps the NASA SCI Files™ Kids Club in Raleigh, North Carolina provide valuable information about pulleys to the tree house detectives. With that information and after a trip to Legoland®, they think they are ready to solve the problem.

Come join the tree house detectives as they learn about simple machines, force, energy, work, and the world of engineering to discover that “pulling” Jacob up into the tree house is not as “simple” as they thought.



National Science Standards (Grades K - 4)

Standard	Segment			
	1	2	3	4
Unifying Concepts and Processes				
Systems, orders, and organization	x	x	x	x
Evidence, models, and explanations	x	x	x	x
Change, constancy, and measurement	x	x	x	x
Evolution and equilibrium	x	x	x	x
Science and Inquiry (Content Standard A)				
Abilities necessary to do scientific inquiry	x	x	x	x
Understanding about scientific inquiry	x	x	x	x
Physical Science (Content Standard B)				
Properties of objects and materials	x	x	x	x
Position and motion of objects	x	x	x	x
Life Science (Content Standard C)				
Characteristics of organisms			x	
Organisms and their environments			x	
Science and Technology (Content Standard E)				
Abilities of technological design	x	x	x	x
Understanding about science and technology	x	x	x	x
Science in Personal and Social Perspective (Content Standard F)				
Personal health			x	x
Science and technology in local challenges	x	x	x	x
History and Nature of Science (Content Standard G)				
Science as a human endeavor	x	x	x	x



National Science Standards (Grades 5 - 8)

Standard	Segment			
	1	2	3	4
Unifying Concepts and Processes				
Systems, order, and organization	x	x	x	x
Evidence, models, and explanations	x	x	x	x
Change, constancy, and measurement	x		x	x
Evolution and equilibrium	x			
Science as Inquiry (Content Standard A)				
Abilities necessary to do scientific inquiry	x	x	x	x
Understanding about scientific inquiry	x	x	x	x
Physical Science (Content Standard B)				
Motion and forces	x	x	x	x
Transfer of energy	x	x	x	x
Science and Technology (Content Standard E)				
Abilities of technological design	x	x	x	x
Understanding about science and technology	x	x	x	x
Science in Personal and Social Perspectives (Content Standard F)				
Personal health			x	x
Risks and benefits			x	x
Science and technology in society	x	x	x	x
History and Nature of Science (Content Standard G)				
Science as a human endeavor	x	x	x	x
Nature of science	x	x	x	x
History of Science		x		



National Mathematics Standards (Grades 3 - 5)

Standard	Segment			
	1	2	3	4
Number and Operations				
Understand numbers, ways of representing numbers, relationships among numbers, and number systems.	x	x	x	x
Understand meanings of operations and how they relate to one another.	x	x	x	x
Compute fluently and make reasonable estimates.	x	x	x	x
Algebra				
Understand patterns, relations, and functions.			x	
Represent and analyze mathematical situations and structures using algebraic symbols.	x	x	x	x
Use mathematical models to represent and understand quantitative relationships.			x	
Analyze change in various contexts.			x	
Measurement				
Understand measurable attributes of objects and the units, systems, and processes of measurement.	x	x	x	x
Apply appropriate techniques, tools, and formulas to determine measurements.	x	x	x	x
Data Analysis and Probability				
Formulate questions that can be addressed with data and collect, organize, and display relevant data to answer them.			x	
Develop and evaluate inferences and predictions that are based on data.			x	
Problem Solving				
Build new mathematical knowledge through problem solving.	x	x	x	x
Solve problems that arise in mathematics and in other contexts.	x	x	x	x
Apply and adapt a variety of appropriate strategies to solve problems.	x	x	x	x
Monitor and reflect on the process of mathematical problem solving.	x	x	x	x
Communication				
Organize and consolidate mathematical thinking through communication.		x		
Communicate mathematical thinking coherently and clearly to peers, teachers, and others.		x		
Connections				
Understand how mathematical ideas interconnect and build on one another to produce a coherent whole.	x	x	x	x



National Technology Standards (ITEA Standards for Technology Literacy, Grades 3 – 5)

Standard	Segment			
	1	2	3	4
Nature of Technology				
Standard 1: Students will develop an understanding of the characteristics and scope of technology.	x	x	x	x
Standard 3: Students will develop an understanding of the relationships among technologies and the connections between technology and other fields of study.	x	x	x	x
Technology and Society				
Standard 6: Students will develop an understanding of the role of society in the development and use of technology.	x	x	x	x
Standard 7: Students will develop an understanding of the influence of technology on history.		x		
Design				
Standard 8: Students will develop an understanding of the attributes of design.	x	x	x	x
Standard 9: Students will develop an understanding of engineering design.	x	x	x	x
Standard 10: Students will develop an understanding of the role of troubleshooting, research and development, invention and innovation, and experimentation in problem solving.	x	x	x	x
Abilities for a Technological World				
Standard 11: Students will develop the abilities to apply the design process.	x	x	x	x
Standard 12: Students will develop abilities to use and maintain technological products and systems.	x	x	x	x
Standard 13: Students will develop abilities to assess the impact of products and systems.	x	x	x	x
The Designed World				
Standard 16: Students will develop an understanding of and be able to select and use energy and power technologies.	x	x	x	x
Standard 17: Students will develop an understanding of and be able to select and use information and communication technologies.	x	x	x	x
Standard 20: Students will develop an understanding of and be able to select and use construction technology.			x	x



National Technology Standards (ISTE National Educational Technology Standards, Grades 3 - 5)

Standard	Segment			
	1	2	3	4
Basic Operations and Concepts				
Use Keyboards and other common input and output devices efficiently and effectively.	x	x	x	x
Discuss common uses of technology in daily life and the advantages and disadvantages those uses provide.	x	x	x	x
Technology Productivity Tools				
Use general purpose productivity tools and peripherals to support personal productivity, remediate skill deficits, and facilitate learning throughout the curriculum.	x	x	x	x
Use technology tools for individual and collaborative writing, communication, and publishing activities to create knowledge products for audiences inside and outside the classroom.	x	x	x	x
Technology Communication Tools				
Use technology tools for individual and collaborative writing, communication, and publishing activities to create knowledge products for audiences inside and outside the classroom.	x	x	x	x
Use telecommunication efficiently and effectively to access remote information, communicate with others in support of direct and independent learning, and pursue personal interests.	x	x	x	x
Use telecommunication and online resources to participate in collaborative problem-solving activities for the purpose of developing solutions or products for audiences inside and outside the classroom.	x	x	x	x
Technology Research Tools				
Use telecommunication and online resources to participate in collaborative problem-solving activities for the purpose of developing solutions or products for audiences inside and outside the classroom.	x	x	x	x
Use technology resources for problem solving, self-directed learning, and extended learning activities.	x	x	x	x
Determine when technology is useful and select the appropriate tools and technology resources to address a variety of tasks and problems.	x	x	x	x
Technology Problem-Solving and Decision-Making Tools				
Use technology resources for problem solving, self-directed learning, and extended learning activities.	x	x	x	x
Determine when technology is useful and select the appropriate tools and technology resources to address a variety of tasks and problems.	x	x	x	x

