

Educational Product	
Educators	Grades 3-5

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The Case of the Physical Fitness Challenge


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



N A S A ' s C E N T E R F O R D I S T A N C E L E A R N I N G



NASA Langley
Research Center

 VirginiaTech



Program Overview

In *The Case of the Physical Fitness Challenge*, the tree house detectives are excited about their school's participation in the upcoming President's Challenge. All the detectives are hoping to be physically fit in time for the competition so they can win the Presidential Physical Fitness Award. Therefore, when RJ has difficulty keeping up with the fitness routine, the detectives go into action to help him get back on track. They do some research and discover that researchers at NASA Johnson Space Center in Houston, Texas are also interested in good health and nutrition. Tony heads over to speak with Mr. William Amonette, an Astronaut Strength and Conditioning Specialist. Mr. Amonette explains the importance of physical activity and how astronauts must exercise before, during, and after space flight. While talking with Mr. Amonette, Tony learns that physical activity is not possible without muscles, so he goes to see Dr. Don Hagan, who explains what muscles are and the various types of muscles in the body. After reading Tony's reports, the detectives are not sure what to do next. They decide to stop by to talk with Dr. D. As Dr. D works on his car, he explains how the body is similar to a car because it has many systems. Thinking of systems, the tree house detectives decide that they might need to learn a little more about the skeletal system.

Back at the tree house, RJ and Kali dial up Dr. Scott Smith at NASA Johnson Space Center, who explains how muscles and bones work together in the musculoskeletal system. He also makes clear the importance of nutrition and physical activity for the growth of healthy bones and explains why astronauts must continue to exercise in space to maintain bone health. Deciding that bones are an important part of being physically fit, RJ and Bianca check out the NASA SCI Files™ Kids' Club to learn more, and they dial up a classroom in Dundee, Scotland. Mr. David Shand's class at the Harris Academy has just finished conducting an experiment on how calcium loss affects bones. The detectives begin to realize that nutrition plays an important role in being physically fit and staying healthy. They decide to contact a doctor to learn more about nutrition. Bianca is on her way to Washington, D.C. and is able to get an appointment with Vice Admiral Richard H. Carmona, M.D., M.P.H., FACS, the U.S. Surgeon General! Vice Admiral Carmona explains what nutrients are and why they are important to good health. Meanwhile, back at Dr. D's lab, Dr. D explains that a calorie is a unit of measure that tells us the amount of energy stored in food and how our bodies combine oxygen with nutrients to produce energy. The detectives are sure they are on the right track but realize that there is much more to learn.

While jogging at Sandy Bottom Nature Park in Hampton, Virginia, the detectives remember that the U.S. Surgeon General, Vice Admiral Carmona, had suggested that they need to learn more about the new food guide pyramid. They email Tony, who heads over to Texas A&M University in College Station, Texas to visit Dr. Joanne Lupton, Regents Professor and Program Leader for the National Space Biomedical Research Institute (NSBRI). Dr. Lupton also worked with the Food and Drug Administration (FDA) to help create new dietary guidelines, and she explains the new food guide pyramid categories and how to determine the correct number of portions in each group for an individual. Dr. Lupton recommends that they speak with Dr. Ted Mitchell of the Cooper Clinic in Dallas, Texas and a member of the Science Board for the President's Council of Physical Fitness and Sports. Bianca and Blake dial up Dr. Mitchell to learn about a person's basal metabolic rate (BMR) and why it is important to calculate BMR. Bianca and Blake also get some help from a NASA SCI Files™ Kids' Club member, Callum Mackie, who visits Ms. Gill Poulter at the Discovery Point Antarctic Museum in Dundee, Scotland. Ms. Poulter explains the importance of nutrition in exploration and tells them that when the RRS *Discovery* made the first exploration expedition to Antarctica, nutrition was a concern but little was known about it.

As the tree house detectives start to pull all the pieces together, they are beginning to realize that being physically fit involves more than they thought and that they need to make lifestyle changes. For some advice on how to be physically active for life, they visit Mr. Lynn Swann, former NFL football player and ABC Commentator, who also just happens to have been the Chairman for the President's Council for Physical Fitness and Sports. Mr. Swann helps the detectives learn that physical activity should be fun and something you enjoy doing so that you continue to be active. Meanwhile, the kids back in Scotland have been doing some more research of their own, and they head to the RRS *Discovery* to meet astronaut Alvin Drew to learn what NASA is doing to help keep astronauts healthy during long-duration space travel. Finally, the detectives are ready to put all the pieces together to help RJ get in shape, and they meet Dr. D for a wrap-up explaining that a healthy lifestyle includes many things, but especially proper nutrition and daily physical activity.

National Science Standards (Grades K-4)

STANDARD	SEGMENT			
	1	2	3	4
Unifying Concepts and Processes				
Systems, orders, and organization	•	•	•	•
Evidence, models, and explanations	•	•	•	•
Change, constancy, and measurement	•	•	•	•
Form and function	•	•	•	•
Science and Inquiry (A)				
Abilities necessary to do scientific inquiry	•	•	•	•
Understandings about scientific inquiry	•	•	•	•
Physical Science (B)				
Light, heat, electricity, and magnetism	•	•	•	•
Science and Technology (E)				
Abilities of technological design	•	•	•	•
Understandings about science and technology	•	•	•	•
Science in Personal and Social Perspective (F)				
Personal health	•	•	•	•
Types of resources	•	•	•	•
Changes in environments	•	•	•	•
Science and technology in local challenges	•	•	•	•
History and Nature of Science (G)				
Science as a human endeavor	•	•	•	•

National Science Standards (Grades 5-8)

STANDARD	SEGMENT			
	1	2	3	4
Unifying Concepts and Processes				
Systems, order, and organization	•	•	•	•
Evidence, models, and explanations	•	•	•	•
Change, constancy, and measurement	•	•	•	•
Form and function	•	•	•	•
Science as Inquiry (A)				
Abilities necessary to do scientific inquiry	•	•	•	•
Understandings about scientific inquiry	•	•	•	•
Physical Science (B)				
Transfer of energy		•		
Life Science (C)				
Structure and function in living systems	•	•	•	•
Science and Technology (E)				
Abilities of technological design	•	•	•	•
Understanding about science and technology	•	•	•	•
Science in Personal and Social Perspectives (F)				
Personal Health	•	•	•	•
Risks and benefits	•	•	•	•
Science and technology in society	•	•	•	•
History and Nature of Science (G)				
Science as a human endeavor	•	•	•	•
Nature of science	•	•	•	•
History of science			•	

National Mathematics Standards for Grades 3-5

STANDARD	SEGMENT			
	1	2	3	4
Number and Operations				
Understand meanings of operations and how they relate to one another.		•	•	
Compute fluently and make reasonable estimates.		•	•	
Algebra				
Represent and analyze mathematical situations and structures using algebraic symbols.			•	
Use mathematical models to represent and understand quantitative relationships.			•	
Analyze change in various contexts.			•	
Measurement				
Understand measurable attributes of objects and the units, systems, and processes of measurement.		•		
Apply appropriate techniques, tools, and formulas to determine measurements.		•		
Data Analysis and Probability				
Formulate questions that can be addressed with data and collect, organize, and display relevant data to answer them.		•		
Select and use appropriate statistical methods to analyze data.		•		
Develop and evaluate inferences and predictions that are based on data.		•		
Understand and apply basic concepts of probability.		•		
Problem Solving				
Solve problems that arise in mathematics and in other contexts.	•	•	•	•
Apply and adapt a variety of appropriate strategies to solve problems.	•	•	•	•
Monitor and reflect on the process of mathematical problem solving.	•	•	•	•
Communication				
Communicate mathematical thinking coherently and clearly to peers, teachers, and others.		•	•	

National Educational Technology Standards Performance Indicators for Technology-Literate Students 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.	•	•	•	•
Discuss common uses of technology in daily life and the advantages and disadvantages those uses provide.	•	•	•	•
Social, Ethical, and Human Issues				
Discuss common uses of technology in daily life and the advantages and disadvantages those uses provide.	•	•	•	•
Discuss basic issues related to responsible use of technology and information and describe personal consequences of inappropriate use.	•	•	•	•
Technology Productivity Tools				
Use general-purpose productivity tools and peripherals to support personal productivity, remediate skill deficits, and facilitate learning throughout the curriculum.	•	•	•	•
Use technology tools for individual and collaborative writing, communication, and publishing activities to create knowledge products for audiences inside and outside the classroom.	•	•	•	•
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.	•	•	•	•
Use telecommunication efficiently and effectively to access remote information, communicate with others in support of direct and independent learning, and pursue personal interests.	•	•	•	•
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.	•	•	•	•
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.	•	•	•	•
Use technology resources for problem solving, self-directed learning, and extended learning activities.	•	•	•	•
Determine when technology is useful and select the appropriate tools and technology resources to address a variety of tasks and problems.	•	•	•	•

National Educational Technology Standards Performance Indicators for Technology-Literate Students Grades 3-5

(concluded)

STANDARD	SEGMENT			
Technology Problem-Solving and Decision-Making Tools				
Use technology resources for problem solving, self-directed learning, and extended learning activities.				
Determine when technology is useful and select the appropriate tools and technology resources to address a variety of tasks and problems.				

International Technology Education Association Standards for Technological Literacy Grades 3-5

STANDARD	SEGMENT			
The Nature of Technology	1	2	3	4
Standard 1: Students will develop an understanding of the characteristics and scope of technology.	•	•	•	•
Standard 2: Students will develop an understanding of the core concepts of technology.	•	•	•	•
Standard 3: Students will develop an understanding of the relationships among technologies and the connections between technology and other fields of study.	•	•	•	•
Technology and Society				
Standard 6: Students will develop an understanding of the role of society in the development and use of technology.	•	•	•	•
Standard 7: Students will develop an understanding of the influence of technology on history.	•	•	•	•
The Designed World				
Standard 14: Students will develop an understanding of and be able to select and use medical technologies.	•	•	•	•

National Geography Standards

STANDARD	SEGMENT			
	1	2	3	4
The geographically informed person knows and understands:				
Places and Regions				
The physical and human characteristics of places			•	
That people create regions to interpret Earth's complexity			•	
How culture and experience influence people's perceptions of places and regions			•	
Environment and Society				
How human actions modify the physical environment			•	
How physical systems affect human systems			•	
The changes that occur in the meaning, use, distribution, and importance of resources			•	

National Health Education Standards For Grades K–4

STANDARD	SEGMENT			
	1	2	3	4
Comprehend concepts related to health promotion promotion and disease prevention.				
Describe relationships between personal health behaviors and individual well-being.	•	•	•	•
Identify indicators of mental, emotional, social, and physical health during childhood.	•	•	•	•
Describe the basic structure and functions of the human body systems.	•	•		
Describe how physical, social, and emotional environments influence personal health.	•	•	•	•
Demonstrate the ability to access valid health information and health-promoting products and services.				
Identify characteristics of valid health information and health-promoting products and services.	•	•	•	•
Demonstrate the ability to locate resources from home, school, and community that provide valid health information.	•	•	•	•
Demonstrate the ability to locate school and community health helpers.	•	•	•	•
Demonstrate the ability to practice health-enhancing behaviors and reduce health risks.				
Identify responsible health behaviors.	•	•	•	•
Identify personal health needs.	•	•	•	•

National Health Education Standards For Grades K–4

STANDARD	SEGMENT			
	1	2	3	4
Demonstrate the ability to practice health-enhancing behaviors and reduce health risks.				
Compare behaviors that are safe to those that are risky or harmful.	•	•	•	•
Demonstrate strategies to improve or maintain personal health.	•	•	•	•
Develop injury prevention and management strategies for personal health.				•
Apply skills to manage stress.	•			•
Analyze the influence of culture, media, technology, and other factors on health.				
Describe ways technology can influence personal health.	•	•	•	•
Demonstrate the ability to use goal-setting and decision-making skills to enhance health.				
Demonstrate the ability to apply a decision-making process to health issues and problems.	•	•	•	•
Explain when to ask for assistance in making health-related decisions and setting health goals.	•	•	•	•
Predict outcomes of positive health decisions.	•	•	•	•
Set a personal health goal and track progress toward its achievement.	•	•	•	•
Demonstrate the ability to advocate for personal, family, and community health.				
Describe a variety of methods to convey accurate health information and ideas.	•	•	•	•
Express information and opinions about health issues.	•	•	•	•
Identify community agencies that advocate for healthy individuals, families, and communities.	•	•	•	•
Demonstrate the ability to influence and support others in making positive health choices.	•	•	•	•