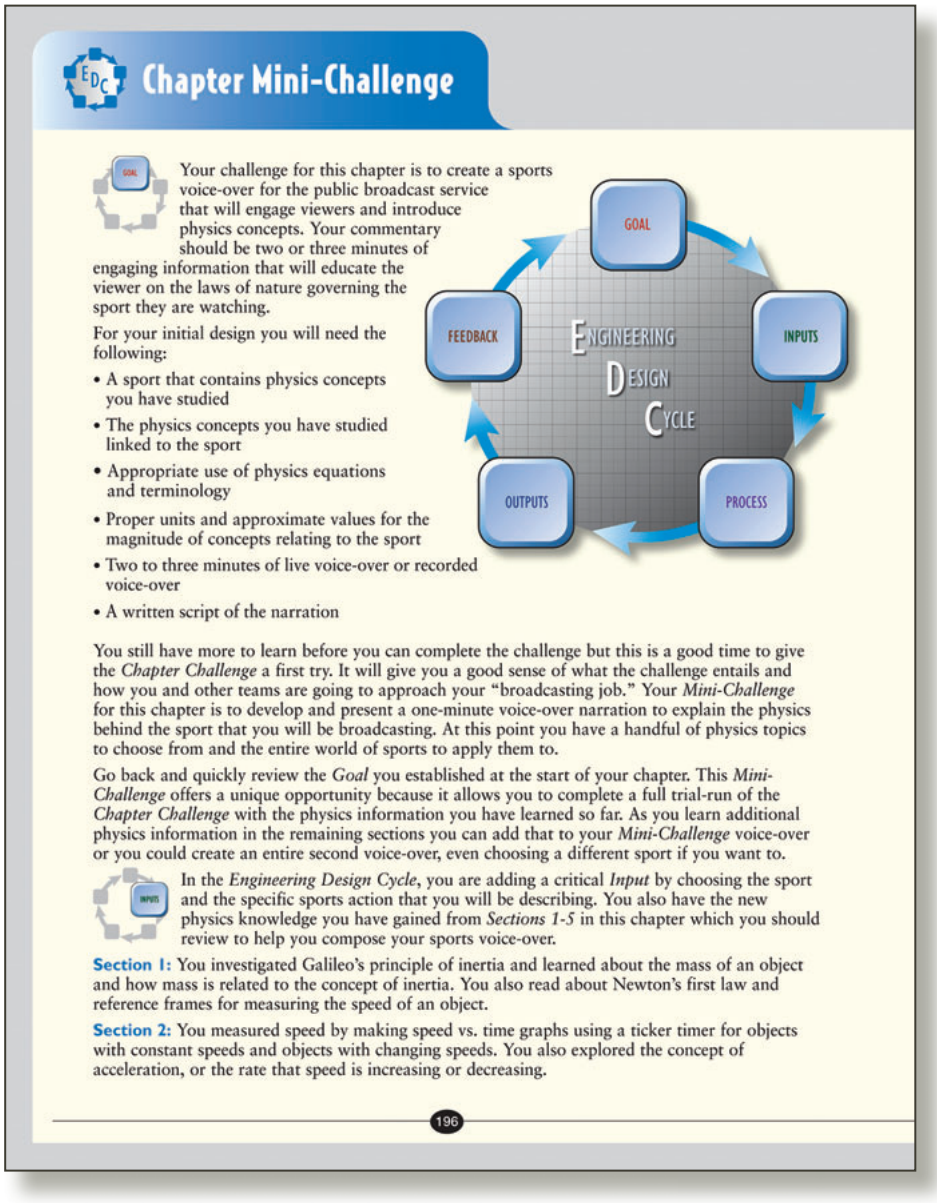
Chapter Mini-Challenge

Review the *Goal* with your students and brainstorm strategies to accomplish the *Chapter Challenge*. Establish a framework that students can work from by using the initial design given in the Student Edition of *Active Physics*. Draw attention to key words and phrases (e.g., "engaging information," "educate the viewer," "vocabulary words," etc.) that define the purpose of the *Mini-Challenge*. This is a time for you to gauge students' understanding of the physics concepts they have explored so far.

Pair up students and have them share a quick review of the physics content in *Sections 1-5* of *Chapter 2*. Point out that at this stage they should be able to relate the sport they are about to choose to the physics concepts that they will be highlighting. Refer to the *Engineering Design Cycle* and ask students to identify how they are moving through each stage of the cycle—what *Inputs* they are adding, how they *Process* information, how the *Output* or trial run of the *Chapter Challenge* is presented, and how they are giving and receiving *Feedback* for their presentation.



Chapter Mini-Challenge

Your challenge for this chapter is to create a sports voice-over for the public broadcast service that will engage viewers and introduce physics concepts. Your commentary should be two or three minutes of engaging information that will educate the viewer on the laws of nature governing the sport they are watching.

For your initial design you will need the following:

- A sport that contains physics concepts you have studied
- The physics concepts you have studied linked to the sport
- Appropriate use of physics equations and terminology
- Proper units and approximate values for the magnitude of concepts relating to the sport
- Two to three minutes of live voice-over or recorded voice-over
- A written script of the narration

You still have more to learn before you can complete the challenge but this is a good time to give the *Chapter Challenge* a first try. It will give you a good sense of what the challenge entails and how you and other teams are going to approach your "broadcasting job." Your *Mini-Challenge* for this chapter is to develop and present a one-minute voice-over narration to explain the physics behind the sport that you will be broadcasting. At this point you have a handful of physics topics to choose from and the entire world of sports to apply them to.

Go back and quickly review the *Goal* you established at the start of your chapter. This *Mini-Challenge* offers a unique opportunity because it allows you to complete a full trial-run of the *Chapter Challenge* with the physics information you have learned so far. As you learn additional physics information in the remaining sections you can add that to your *Mini-Challenge* voice-over or you could create an entire second voice-over, even choosing a different sport if you want to.

In the *Engineering Design Cycle*, you are adding a critical *Input* by choosing the sport and the specific sports action that you will be describing. You also have the new physics knowledge you have gained from *Sections 1-5* in this chapter which you should review to help you compose your sports voice-over.

Section 1: You investigated Galileo's principle of inertia and learned about the mass of an object and how mass is related to the concept of inertia. You also read about Newton's first law and reference frames for measuring the speed of an object.

Section 2: You measured speed by making speed vs. time graphs using a ticker timer for objects with constant speeds and objects with changing speeds. You also explored the concept of acceleration, or the rate that speed is increasing or decreasing.

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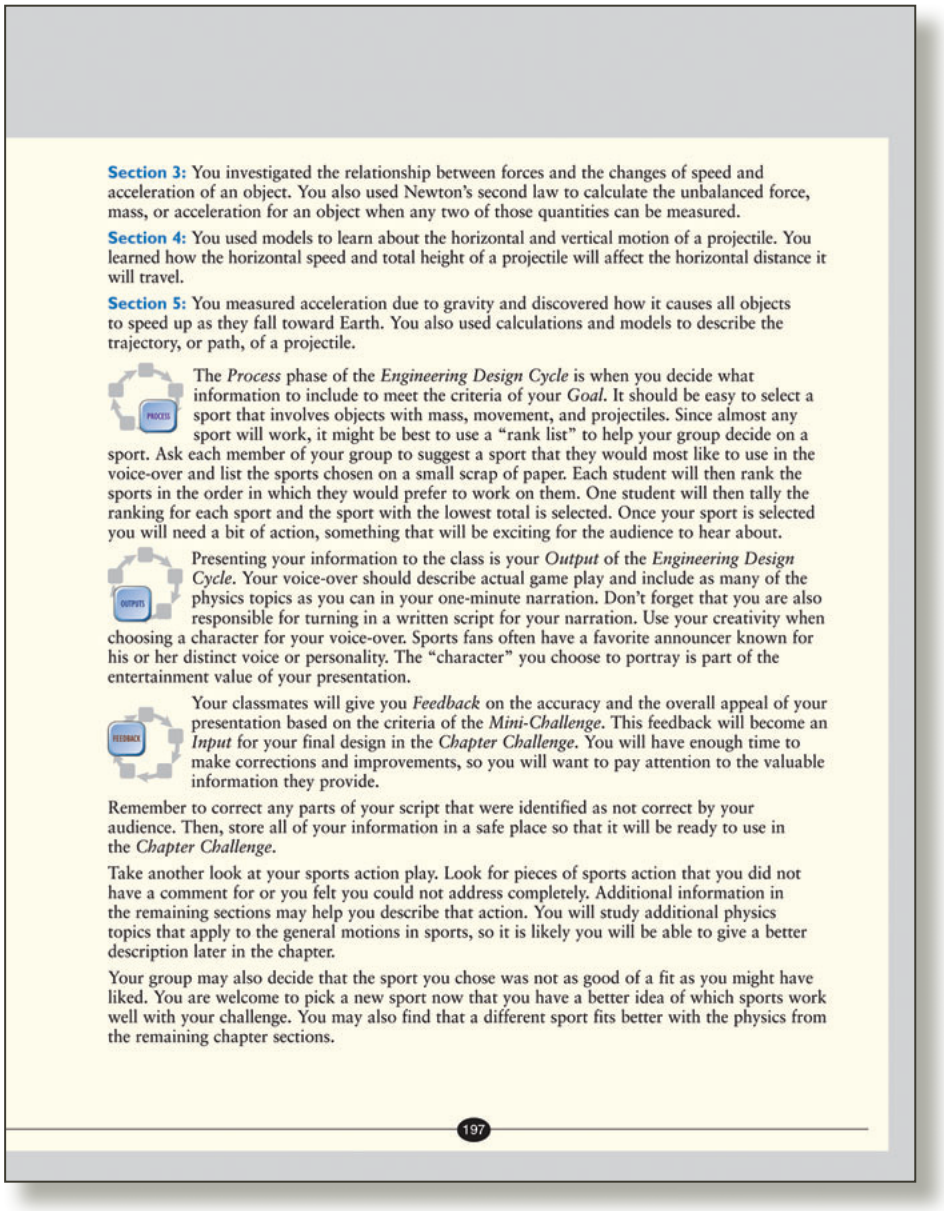

Section 3: You investigated the relationship between forces and the changes of speed and acceleration of an object. You also used Newton's second law to calculate the unbalanced force, mass, or acceleration for an object when any two of those quantities can be measured.

Section 4: You used models to learn about the horizontal and vertical motion of a projectile. You learned how the horizontal speed and total height of a projectile will affect the horizontal distance it will travel.

Section 5: You measured acceleration due to gravity and discovered how it causes all objects to speed up as they fall toward Earth. You also used calculations and models to describe the trajectory, or path, of a projectile.

The *Process* phase of the *Engineering Design Cycle* is when you decide what information to include to meet the criteria of your *Goal*. It should be easy to select a sport that involves objects with mass, movement, and projectiles. Since almost any sport will work, it might be best to use a "rank list" to help your group decide on a sport. Ask each member of your group to suggest a sport that they would most like to use in the voice-over and list the sports chosen on a small scrap of paper. Each student will then rank the sports in the order in which they would prefer to work on them. One student will then tally the ranking for each sport and the sport with the lowest total is selected. Once your sport is selected you will need a bit of action, something that will be exciting for the audience to hear about.

Presenting your information to the class is your *Output* of the *Engineering Design Cycle*. Your voice-over should describe actual game play and include as many of the physics topics as you can in your one-minute narration. Don't forget that you are also responsible for turning in a written script for your narration. Use your creativity when choosing a character for your voice-over. Sports fans often have a favorite announcer known for his or her distinct voice or personality. The "character" you choose to portray is part of the entertainment value of your presentation.

Your classmates will give you *Feedback* on the accuracy and the overall appeal of your presentation based on the criteria of the *Mini-Challenge*. This feedback will become an *Input* for your final design in the *Chapter Challenge*. You will have enough time to make corrections and improvements, so you will want to pay attention to the valuable information they provide.

Remember to correct any parts of your script that were identified as not correct by your audience. Then, store all of your information in a safe place so that it will be ready to use in the *Chapter Challenge*.

Take another look at your sports action play. Look for pieces of sports action that you did not have a comment for or you felt you could not address completely. Additional information in the remaining sections may help you describe that action. You will study additional physics topics that apply to the general motions in sports, so it is likely you will be able to give a better description later in the chapter.

Your group may also decide that the sport you chose was not as good of a fit as you might have liked. You are welcome to pick a new sport now that you have a better idea of which sports work well with your challenge. You may also find that a different sport fits better with the physics from the remaining chapter sections.

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Engineering Design Cycle

Ask your students to make a bulleted list of all the physics concepts they have learned so far. Discuss why they should treat these concepts as *Inputs* for their *Engineering Design Cycle*. Have a student read aloud a few concepts from their list. To increase student focus write each concept on the board or use an overhead projector. After students have reviewed the *Inputs* phase, draw their attention to the *Process* phase. Remind them that each time they reflect on how they should meet their *Goal*, they will be moving through the *Process* phase. It is important that students recognize which requirement they have met and what they still need to learn in order to complete their *Mini-Challenge*. During the *Process* phase students should select the physics principles that are related to their sport and work on developing an entertaining narration.

In the *Outputs* phase encourage students to present their *Mini-Challenge*. *Mini-Challenge* presentations should not take more than 30 s. Make sure that all students work around a set of established requirements and that the environment is relaxed and forthcoming. Refer to the *Criteria* in the *Goal* and ask students to base their *Feedback* on how they see their peers meeting the established requirements. Student engagement in preparation of the challenge is reflected in this phase. Remind students that they should evaluate their peers based on the merits of the presentation alone to be objective and helpful.

CHAPTER 2