SCIENTIFIC AMERICAN FRONTIERS

TEACHING GUIDE

www.pbs.org/saf/1206

On the Ball

Activity 2: Grades 5-8

Video Umpires

Though they use their best judgment in calling what they see, even the best umpires make mistakes. In this segment of SAF, you learned about new technology that will allow umpires to view recorded clips of all pitches during a game and assess the accuracy of their calls with the help of 3-D graphics.

This activity page will offer:

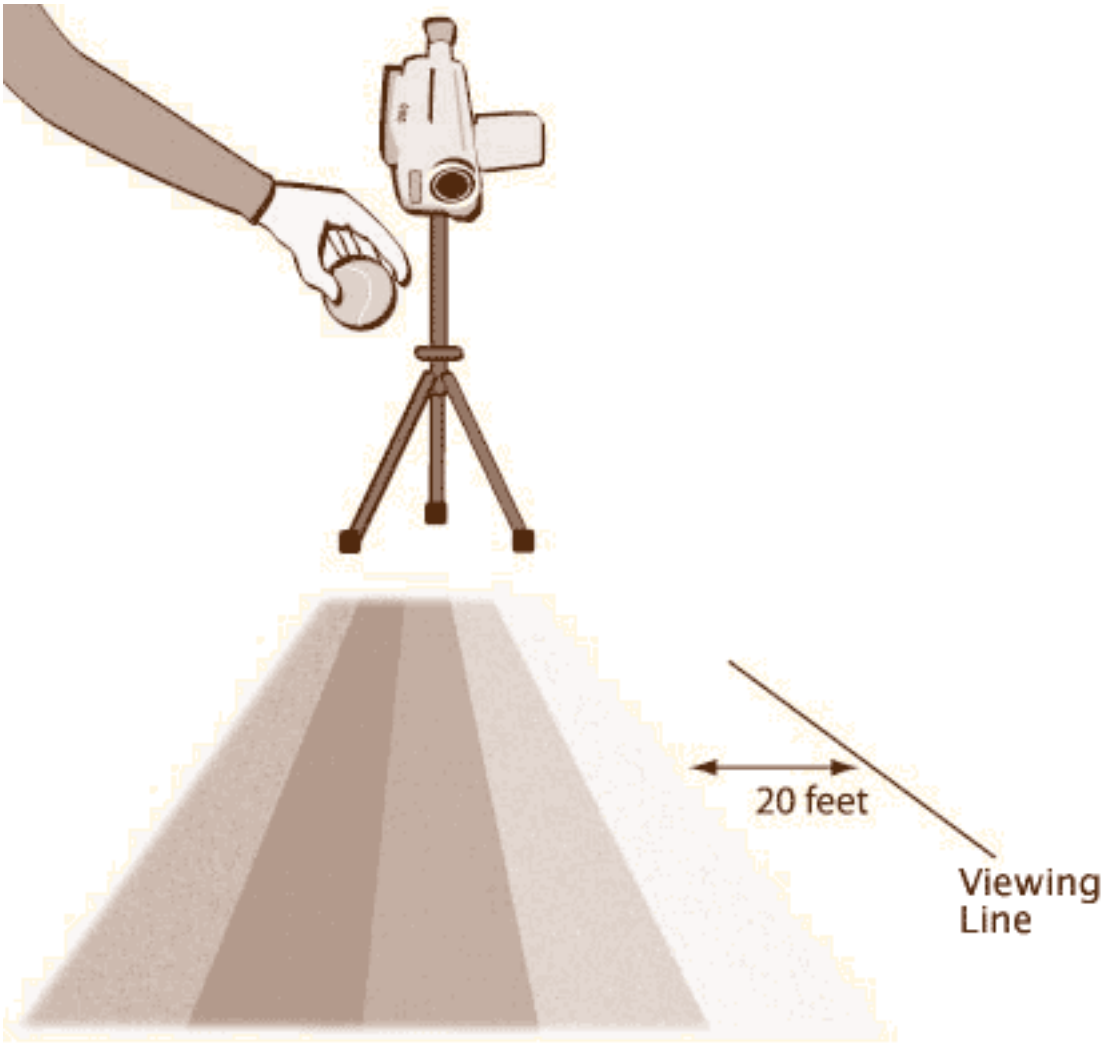
- An experience in judging or "calling" the location of a ball
- A critical examination of accuracy in judging
- A minds-on analysis of judging rules

Watching the Line

As you have seen, an umpire's call may not be consistent with a videotaped record of that same event. Is this disparity limited to professional umpires? You be the judge. In this activity, you will play umpire and then examine the accuracy of a "line call" when compared to a taped record of a ball's exact impact location.

MATERIALS

- Video camera
- Tripod
- Colored chalk
- Tennis balls
- Measuring stick



PROCEDURE

1. Work in teams of three. Use colored chalk and a measuring stick to draw a series of side-by-side chalk lines. Each line should be about three feet long and about the width of a tennis ball. Neighboring lines should be filled in with contrasting colors, making them easy to see and distinguish one from another.
2. Set up a video camera and tripod several feet from the chalk pattern. The camera's vantage point should offer a "parallel" view to the line pattern. Zoom in on the lines. The image captured by the camera should include all of the lines.
3. Make a viewing line on the opposite side of the pattern. This line should be drawn perpendicular to the pattern and positioned about 20 feet away.
4. When you are ready to begin the testing, position each of the three teammates as follows. The "line judge" stands at the viewing line. The videographer works the camcorder. The "dropper" stands immediately to the side of the line pattern.
5. The dropper holds a tennis ball at shoulder height above the pattern. He or she releases the ball so that it falls and strikes any of the pattern's colored lines.

6. The judge observes, identifies and records the line that has been struck. The videographer makes sure that the image has been captured on videotape.
7. Perform nine more ball drops.
8. When the drop sequence is completed, the whole team reviews both the videotaped falls and the record maintained by the judge. How do they compare?
9. Exchange roles so that all students have experience in each of the tasks.
10. Once this round is finished, double the judging distance to the drop zone and repeat the experiment.

QUESTIONS

1. What factors affect a judge's accuracy?
2. How did the accuracy of the judge's calls compare with the videotaped record?
3. What happened to the judge's accuracy when the distance to the ball drop was doubled?
4. Were there differences among the records of the three judges? If so, what might be the possible causes for these differences?

EXTENSIONS

A Different Slant

Suppose the line judge had a perpendicular vantage point to the chalked area. Would this affect the accuracy of the calls? Why or why not? With your instructor's approval, develop a method of inquiry that would uncover how a person's vantage point affects what they see and perceive.

Final Judgement

Imagine that a judge's dubious call is critical to the outcome of a game. Is the player out or safe? Should a taped record that clearly shows the event be used to reverse a judge's call? Why or why not?

Behind the Cage

With your instructor's and your parents' permission, set up a camcorder and tripod behind the protective cage that surrounds home plate. Focus in on both the pitcher and catcher. Use a high-speed shutter to capture this fast-moving action. Record a series of thrown pitches. At what point of the ball's movement can you judge the throw as a strike or ball? How far must the ball travel before you can accurately predict its destination? *Be sure to wear a helmet when performing this activity*.

Courtroom Fiction

With your instructor's approval, create a transcript of a fictional court case. The defendant is an umpire who is accused by a ballplayer of making an error in judgement. The prosecution bases its case upon a taped record of the incident. Select other students to play the umpire, a witness and the prosecutor, and perform this work as a classroom play.

Web Connection

The Plate Umpire

http://www.amateurumpire.com/mech/mech04.htm
Here's a primer on assuming the role of umpire in baseball.

Can electronic umpires replace the human kind?

http://www.iisc.ernet.in/scouncil/scampus/online/cricket.html

The activities in this guide were contributed by Michael DiSpezio, a Massachusetts-based science writer and author of "Critical Thinking Puzzles" and "Awesome Experiments in Light & Sound" (Sterling Publishing Co., NY).

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ANSWERS

QUESTIONS

1. What factors affect a judge's accuracy?
   (Accept all reasonable answers such as eyesight, concentration, focus, interest and emotional stress.)
2. How did the accuracy of the judge's calls compare with the videotaped record?
   (Answers will vary.)
3. What happened to the judge's accuracy when the distance to the ball drop was doubled?
   (The accuracy decreased.)
4. Were there differences among the records of the three judges? If so, what might be the possible causes for these differences?
   (Answers will vary.)

CURRICULUM LINKS

General Science :

Observation and Inference

NATIONAL SCIENCE STANDARDS (Grades 5-8)

Science as Inquiry- Content Standard A

Students think critically and logically to make the relationships between evidence and explanations by deciding what evidence should be used and forming logical arguments.