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# Introduction

Imagine giving youngsters a brief talk and a book on basketball and asking them to learn the necessary skills of the game for a written test. How much enthusiasm for basketball would you create? Little, no doubt. But this same technique is used over and over again to teach science in today's classrooms. To expect students to be motivated to study science by this approach is just as shortsighted as it would be to assume they could use it to learn how to shoot baskets, play the piano, or act on stage.

The return of Halley's Comet rekindled excitement and public interest in science. The need to understand comet trajectories, supercooled gases, and orbital motion underscored the importance of quality science education. But while the comet sped by, surveys and studies revealed disturbing news about the success of our science endeavors: fewer and fewer students were motivated to study or pursue careers in science.

A good place to learn about motivation is a change room, a music studio, or a stage. Athletic coaches, music teachers, and drama instructors know that study and discussion are not enough. They know that to be motivated, players and students have to become actively involved, try new experiences, feel a sense of achievement, and enjoy what they are doing. Shouldn't science teachers share the same approach?

Most schools have sports, music, and drama programs to coach students to play basketball, play an instrument, or act. Talented students are identified, given proper training, and offered the opportunity to develop. Shouldn't similar training exist for science and maths? Although we meet the needs of sports and science stars differently, both thrive under good coaching.

*Coaching Science Stars* adapts the pedagogy used on the playing field, the studio, and the stage to the classroom. This method, which I call *pep talk*, encourages teachers to:

- **Create a need to know**
- **Challenge students to know**
- **Show how to know**
- **Apply know-how**
- **Know how to inspire cooperation**

Pep talk is the method coaches use when they cheer their players to step onto the pitch and hit at the ball, to play by the game plan, and to practise, practise, practise! Putting pep talk into action in the science classroom will (1) involve students in doing science; (2) encourage students to risk developing their own ideas; (3) create a “can-do” attitude; (4) show the significance of science to daily life; and (5) communicate that it’s okay to have fun.

Does pep talk work? Coaches look for enthusiasm, risk taking, mental preparation, and a desire to achieve. Together, these signal confidence. Research on learning shows that achievement and confidence are strongly related. If confidence is coachable, then achievement (whether in sports or science) is within the reach of anyone. The biggest payoff is that players enjoy what they are doing.

Having fun creates the motivation to repeat something and thereby establishes a pattern for future involvement. A youngster who continues to practise after training or seeks out more Hemingway stories has been

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# 1 Pep Talk: Pedagogy for Real-World Problem Solving

## Create a Need to Know: Invite Youngsters to Play

As part of an excursion to a robotics factory, students were hosted by a dynamic, knowledgeable engineer. Before the tour, he introduced the topic of robotics through two 10-minute videos, followed by a 15-minute briefing of how the factory was organized. He was rudely interrupted by yawns and nodding heads as he was about to show the second video. The engineer was puzzled by why a seemingly motivated group of youngsters, given the opportunity to see the cutting edge of robotics firsthand, would respond with disinterest and boredom.



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## Chapter 1

There is a pattern to the responses. Although they expressed it differently, both teachers and coaches identified involvement as the key to motivating youngsters. It doesn't matter whether the activity is sports, music, or science. Involvement, getting youngsters to play, creates a need to know. The difference between the excursion to the robotics factory and the visit to the fish farm was due to the magnitude of involvement. Interest in fish farming was piqued by first involving the novices physically and mentally in the culture operation. The robotics field trip would have inspired greater enthusiasm if a firsthand experience had been offered before the information on robotic technology was presented.

Research confirms what teachers and coaches already know intuitively. Studies tells us that we remember 10 percent of what we hear, 20 percent of what we read, and 90 percent of what we experience. Formal education for the most part ignores what intuition and research tells us about motivation. Reading and talking still account for over 80 percent of instructional time.

**G**George Plimpton knows that experience is the best teacher. In order to describe the feelings of a marathon runner to his readers, George Plimpton signed up to run the Boston Marathon. This was his first attempt at participatory journalism, and it launched a writing career that produced *Paper Lion*, *Mad Ducks and Bears*, and *Open Net*. To gain insight about professional football, boxing, and hockey, Plimpton took up each sport as an amateur.

His insight into boxing was heightened by a ring encounter with champion Archie Moore. Looking up from the canvas through a bloodied eye gave Plimpton a view of boxing never written about before. His brief tenure as quarterback of the Detroit Lions led to a unique, realistic account of American football. And his ability to write about hockey came as a result of fending the puck for the Boston Bruins.

George Plimpton is an ideal model for how to learn science. To become knowledgeable about a topic, first let experience become the teacher.