

# PEER-LED TEAM LEARNING LEADER TRAINING

## *Tres Caballeros*: A Learning Strategy for “Plus Two” Peer-Led Team Learning

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Students have different learning styles, different approaches to solving problems, and different ways to remember how to approach the solution process. *Tres Caballeros* (three men) takes advantage of these differences within the context of the ‘Plus Two’ Peer-Led Team Learning Workshop Program created at UTEP in the fall of 2000.

### How the *Tres Caballeros* Game is Played

- *Tres Caballeros*: a process by which six problems of the same type or different type can be worked on simultaneously while still promoting beneficial team work.
- *Tres Caballeros* divides the students in Workshop into three groups.
- One person from each group is selected to go to the board to solve an individual problem from the present chapter.
- These three *caballeros* cannot use their books; they can only use each other and the Peer Leader for help.
- The remaining members of the three groups work on problems from different previous chapters (so they do not forget how to do them).
- The groups at the tables can use their books and each other, but not the Peer Leader.
- At the end, the three *caballeros* report out how they arrived at their answers as do representatives from the groups at tables.



## Examples of Problems

### Percent Concentration

Seawater is typically 3.5% sea salt and has a density of about 1.03 g/mL. How many grams of solid sea salt would be needed to prepare enough seawater solution to completely fill a 62.5 L aquarium?

### Molality

An experiment calls for a 0.150m solution of sodium chloride in water. How many grams of NaCl would have to be dissolved in 500.0 g of water to prepare a solution of this molality?

### K<sub>b</sub> Expression for a Weak Base

Hydrazine is a weak base. It is a poisonous substance that's sometimes formed when a "chlorine bleach," which contains hypochlorite ion, is added to an aqueous solution of ammonia. Write the equation for the reaction of the hydrazine with water and write the expression for its K<sub>b</sub>.

### Raoult's Law

Carbon tetrachloride has a vapor pressure of 100 torr at 23° C. This solvent can dissolve candle wax, which is essentially nonvolatile. Although candle wax is a mixture, we can take its molecular formula to be C<sub>22</sub>H<sub>46</sub> (molar mass 311 g/mol). What is the vapor pressure at 23° C of a solution prepared by dissolving 10.0 g of wax in 40.0 g of CCl<sub>4</sub> (molar mass 154 g/mol)

### LeChatelier's Principle

The reaction  $\text{N}_2\text{O}_4 \rightleftharpoons 2\text{NO}_2(\text{g})$  is endothermic, with  $\Delta H^\circ = +56.9\text{kJ}$ . How will the amount of NO<sub>2</sub> at equilibrium be affected by (a) adding N<sub>2</sub>O<sub>4</sub>, (b) lowering the pressure by increasing the volume of the container, (c) raising the temperature, and (d) adding a catalyst to the system? Which of these changes will alter the value of K<sub>c</sub>?

### Advantages and Conclusion

Students at the board gain confidence in themselves, each other, and in asking for help without feeling shame. *Tres Caballeros* emphasizes a constructivist manner of teaching where the students are the ones helping each other, rather than the Peer Leader providing the solution for them or lecturing.

*Tres Caballeros* has been helpful for understanding processes instead of memorizing them. As students begin to work problems in teams, they begin to perfect problem solving techniques and begin to develop an understanding of chemistry. With constant practice of successful problem solving, they gain confidence in themselves and in what they are capable of accomplishing. This gain in confidence and problem solving ability helps students become successful learners and exam takers.

## Background

The “Plus Two” Peer-Led Team Learning Workshop Program is an award-winning (Texas Higher Education Coordinating Board Star Award, 2006) program that divides the students into small learning communities (Workshops), has improved student success (the percentage of students passing with grades of A, B, or C increased from 53% to over 70%), and has improved the percentage of students achieving the undergraduate degree at the milestones of 4, 4 ½, and 5 years subsequent to the first semester general chemistry course (26, 36, and 44% compared with post-implementation rates of 41, 50, and 52%, respectively). Many more students now successfully progress into their majors; more students are graduating. Peer Leaders in the chemistry course have diverse undergraduate science, mathematics, or engineering majors and have created diverse problem-solving strategies to develop a quality interaction between the Peer Leader and their students in Workshop.

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