

INTRODUCTION

PASCO scientific's *Advanced Chemistry through Inquiry* investigations move students from the low-level task of memorization or confirmation of science facts to higher-level tasks of exploration, data analysis, concept construction, and application. To learn science at a deep level, it is essential to combine the teaching of abstract science concepts with real-world science investigations. Hands-on technology-based laboratory experiences bridge the gap between the theoretical and the concrete, driving students toward a greater understanding of natural phenomena. Students also gain experience with important science practices that include: developing and using models, planning and carrying out independent investigations, interpreting data, and applying mathematics.

Each lab is divided into several *models*. A model is a set of data or symbolic representations that students build and use as they work through a set of questions designed to construct an understanding of chemical concepts. The models are sequential, with each model introducing a new aspect to the investigation. Guiding questions embedded in the procedure help generate insight into the chemical process and theory. As students follow the cognitive process to completion, they actively think about and work through chemistry-related problems. The entire approach, including the guiding questions and the models, is based on the POGIL™ (Process Oriented Guided Inquiry Learning) strategy.

What is POGIL?

POGIL uses guided inquiry – a learning cycle of exploration, concept invention, and application that is the basis for the carefully designed materials that assist students in constructing new knowledge. It is a student-centered strategy; students work in small groups with individual roles to ensure that all students are fully engaged in the learning process.

The lab activities focus on core concepts and encourage a deep understanding of the course material while developing higher-order thinking skills. POGIL develops process skills such as critical thinking, problem solving, and communication through cooperation and reflection, helping students to think analytically and work effectively as part of a collaborative team.

A POGIL lab consists of any number of students working in small groups on specially designed guided inquiry materials. These materials supply students with data or information followed by leading questions and experiments that guide them to their own valid conclusions—essentially a recapitulation of the scientific method. The instructor serves as facilitator, observing and periodically addressing individual and classroom-wide needs.

POGIL is based on research indicating that: a) *teaching by telling* does not work for most students, b) students who are part of an interactive community are more likely to be successful, and c) knowledge is personal; students enjoy themselves more and develop greater ownership over the material when they are given an opportunity to construct their own understanding.

A discovery-based team environment energizes students and provides instructors with instant and constant feedback about what their students understand *and misunderstand*. Students quickly pick up the message that logical thinking and teamwork are prized above simply getting “the correct answer.” This emphasizes that learning is not a solitary task of memorizing information, but an interactive process of refining one’s understanding and developing one’s skills.