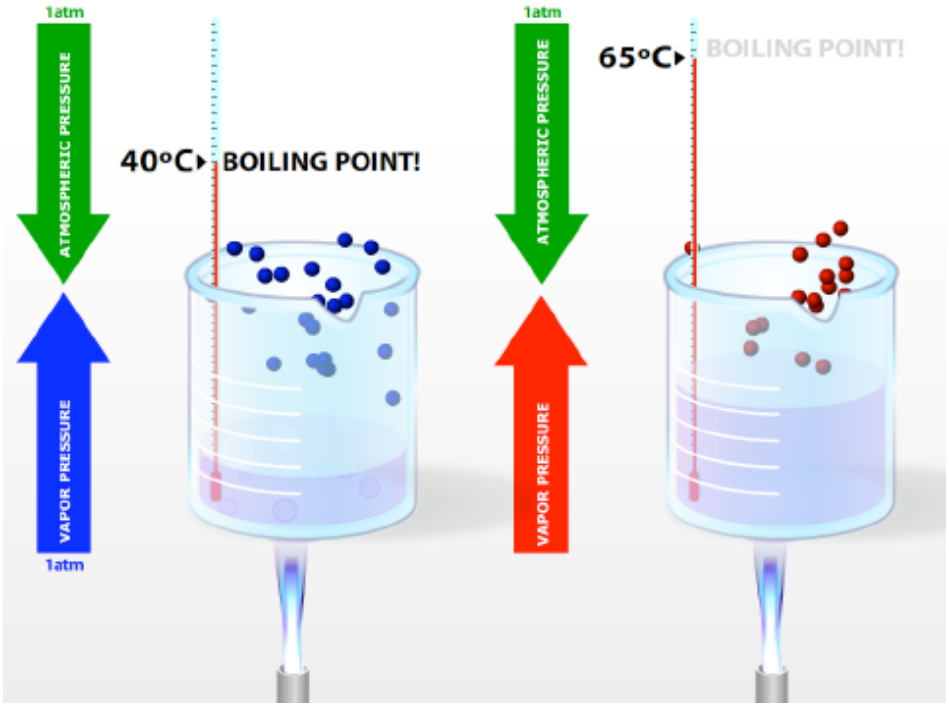
I&IT learning
INSTRUCTIONAL & INFORMATION TECHNOLOGY

Case Study Liquid Distillation Tutorial



Dr. Laurie Starkey, a professor in the College of Science, initiated this project during the Teacher Quality Enhancement (TQE) workshops conducted by I&IT Learning.

Dr. Starkey had encountered the ongoing challenge of preparing student in her Chemistry 317L Laboratory class to conduct experiments. The chemistry class includes the general techniques of the organic laboratory for the separation, purification and identification of organic substances. CHM 317L is the first quarter of the year-long Organic Chemistry Laboratory sequence.

The goal was to create an online pre-lab tutorial that would teach students, prior to the class session, how to correctly set-up the laboratory apparatus to perform a distillation.

The Challenge

As explained by Dr. Starkey, “I would like to create an online tutorial. It would include the theory of distillation, simple vs. fractional distillation, how to set up the apparatus, what common mistakes to avoid and what to do with the data collected.” The goal was to help students prepare better for lab and to help them retain this knowledge in subsequent lab courses.

A few of the challenges encountered by the I&IT Learning team included delivering the tutorial online, demonstrating how to set-up laboratory equipment for simple and fractional distillation, and providing an explanation of the theory of distillation. The tutorial would need to include demonstrations as well as animations of a molecular view of distillation.

In addition some form of assessment was required to gauge students’ learning and comprehension of the material.

The Solution

I&IT Learning offered Adobe Connect (formerly Breeze) as the final solution to deliver the tutorial online. Using Adobe Presenter, an Adobe Connect plug-in for Microsoft PowerPoint, I&IT Learning created a multimedia presentation that combined videos, audio narrations, Adobe Flash animations, and accessible text content.

Animations were created using Adobe Flash in order to demonstrate the gradual process of fractional and simple distillation, vapor molecules reacting to vapor pressure and volatility, vapor pressure vs. boiling point, and atmospheric pressure in the mixture of liquids. The animations helped demonstrate concepts that otherwise may not be visible to the naked eye.

The I&IT Learning team elected to use Flash streaming video to demonstrate setting up the distillation equipment hence giving students a visual of what they would be working with later in the actual distillation lab. These videos were divided into short demonstrations that included the processes of properly greasing a ground-glass joint, setting up and using heating equipment, setting up the actual distillation apparatus, dismantling the distillation apparatus, and identifying common mistakes that occur when using the equipment.

The tutorial proved to be an effective tool in helping students prepare for the lab and for providing students with a more clear understanding of the subject. According to Dr. Starkey, the feedback she received from her students was "gratifying".

“The students who watched the pre-lab tutorial were significantly better prepared for lab and had a better understanding of the underlying concepts. The most gratifying result, however, was the feedback received from students who appreciated my efforts to improve their learning.”

Behind the Scenes

I&IT Learning approached this project using a team-oriented strategy. The first phase involved filming laboratory scenarios of Dr. Starkey explaining the different distillation procedures. She worked with Karen Brzoska to create storyboards that would later develop into video productions. She then used Mediavision professionals to help with the actual production and editing of the video. The videos involved setting up film equipment on-location, where Dr. Starkey worked with Terry Hogan and Rick Cass to capture her distillation experiments on film. Student assistant (and later instructional designer), Bo Y. Soh, compressed the videos into a format that was supported by Adobe Presenter. These videos were then delivered online using Adobe's Flash Media Server.

The next phase involved storyboarding and illustrating a series of animations with multimedia developer, Erick Zelaya. The animations were to help students visualize the different steps in a distillation as well as the molecular reactions of a liquid as it went from a liquid to a gas phase. The animations started out as rough hand illustrations that were put into a storyboard. These conceptual drawings were then fully rendered into colorful illustrations using Adobe Illustrator. They were finally imported into and animated using Adobe Flash. The illustrations were taken

from concept to completion within a six week period. The animations along with the videos would later give the final tutorial an additional layer of learning that would help bring concepts to life as Dr. Starkey agreed.

"Teaching with technology introduces extraordinary possibilities. The use of animations and video really brings the concepts to life. "

Working with instructional designer and Adobe Connect coordinator, April McKettrick, the Flash animations and videos were integrated with Dr. Starkey's Microsoft PowerPoint presentation. Audio narrations were added along with the text version of the script for added accessibility compliance. The tutorial was then published to Cal Poly Pomona's Connect server yielding a Flash based tutorial that is accessible 24-7 from any computer with an internet connection.

The People Involved

Subject Matter Expert: Dr. Laurie Starkey

Instructional Design: Karen Brzoska

Audio/Video Production: Terry Hogan, Rick Cass

Adobe Presenter Support: April McKettrick, Bo Y. Soh

Multimedia Production: Erick Zelaya