Development of Undergraduate Teaching Laboratories in the Analysis of Maple Syrup Antioxidants and Phenolics

To address the perpetual need for STEM education resources that foster an interest in scientific research, promote a positive public perception of science, and create an appreciation for the relevance of scientific data in decision-making, we developed a modular set of undergraduate laboratory exercises influenced by ongoing basic research towards elucidating the chemical composition of pure maple syrups. Maple syrup has garnered attention in the chemical literature due to the abundance of phenolic and antioxidant compounds that impart both flavor and therapeutic potential. These experiments feature liquid-liquid extraction techniques and instrumental analysis using Gas Chromatography-Mass Spectrometry (GC-MS) as well as UV-visible spectroscopy. These lab modules can be adapted to different levels of technical rigor for use in courses designed for chemistry majors as well as those designed as introductory courses for nonmajors. Two versions of these exercises were implemented in the spring of 2023: one in a majors-level sophomore organic chemistry, and another in a 100-level food chemistry course. Learning outcomes were specified and survey data was collected from students to assess the ability of the exercises to facilitate student learning.