

## STEM Activity by Using Laboratory Instruments for Teachers and Students: Spectrophotometer- based Inquiry-Based Learning via STEM CAMP

P. Kitrunloadjanaporn<sup>1,2,3</sup>, D. Triampo<sup>3,4</sup>, and W. Triampo<sup>3,5</sup>

<sup>1</sup>School of Bioinnovation and Bio-based Product Intelligence, Faculty of Science, Mahidol University,  
Bangkok, Thailand

<sup>2</sup>Institute for Innovative Learning, Mahidol University, Nakhon Pathom, Thailand

<sup>3</sup>Thailand Center of Excellence in Physics, Ministry of Higher Education, Science, Research and Innovation,  
Bangkok, Thailand

<sup>4</sup>Department of Physics, Faculty of Science, Mahidol University, Bangkok, Thailand

<sup>5</sup>Department of Chemistry, Faculty of Science, Mahidol University, Bangkok, Thailand

### Abstract

STEM activities ( Science, Technology, Engineering, and Mathematics) were one of the effective ways of teaching and learning. STEM activities may be DIY, Exploration, Scientific Experiment, Project, and Challenge. It was to promote skills and competency in the 21st century to students for discovery and then take another step to the creative invention and innovation. Also, Academic Camping is usually a part of school activity, especially for the extra-curriculum purpose. For these expected outcomes, here we design STEM activities for students participating in our STEM CAMP applying Guided Inquiry-Based Learning to emphasize on students how to learn and how to effectively and collaboratively solve the problem. The situation of the detective mission was given, and the spectrophotometer was the main tool for them to use for the case investigation. It was found that the students were able to correctly demonstrate how to use laboratory instruments, analyze results, and make a standard curve. They also learned how to collaboratively solve the problem to make their mission accomplished. It was observed that with this activity designed, cognitively, affectively, and skills, students were promoted considerably. Therefore, this kind of STEM activity could be used to prepare students for learning in the future and creating new ideas for innovation.

**Keywords:** STEM, STEM CAMP, Inquiry-Based Learning, 21<sup>st</sup>-century skills, Spectrophotometer, Problem-solving