Electronics Fun Lab Modules
MP4a-09

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Background and Motivations
In recent years, rapid developments in electronic and computer technologies have made the study of electronic engineering discipline more difficult. Apart from technical knowledge, it is aimed that students should be well-equipped with multi-dimensional problem solving skills and innovative thinking capabilities with the help of a student-centered curriculum under the new high school academic structure.

Objectives
The project aims at developing various comprehensive fun lab modules which employ a top-down problem-oriented approach for students to learn engineering concepts, and serve as a tool for educators to raise students’ interest in electronic technologies.

Methodology
Survey and Analysis
Call survey task from high school students on their interest in electronic products

Hardware Implementation

data analysis

Define electronic products to be built for each module

Evaluation of the modules by involving students from high schools to test the products

Testing and Evaluation
A total of 319 students from five local secondary schools participated in the pilot workshops and gave feedbacks on the two modules. They were asked to evaluate the module based on the educational value, interest, user-friendliness and sense of achievement on a five-point scale.

Implementation
Before the module design phase, a comprehensive questionnaire-based survey completed by about 300 students was conducted. Eight different modules were proposed to students. The best rated Auto-adjusted Fan and Lamp Modules and the lowest ranked Electronic Chess Module were chosen for comparison purpose. Laboratory experiment, which was perceived as the best learning method, was used as the main format of the two modules.

Auto-adjusted Fan and Lamp Module
Pre-lab:
In each module, a computer-based pre-lab quiz in multiple-choice format was designed for students to learn about the engineering concepts involved in the experiment task.

Students were asked to write a set of instructions to control the 10-bit analog output which represents a chessboard.

Post-lab:
A computer-based post-lab quiz was designed for each module to consolidate the concepts learned.

Electronic Chess Module
Pre-lab:

Hardware and Software Testing

Testing and evaluation of each electronic product

Evaluating the students on their understanding of each module

Conclusions
The project objectives are met by the two highly-rated lab modules which enable students to learn engineering concepts via a top-down approach. The project also acts as a cornerstone for future research and development.

From the testing and evaluation phase, it is found that low-ranking modules are not necessarily bad. Foremost on the sense of achievement and the usefulness of the lab modules experienced by students should be the main considerations for future lab module designs.