

Using Smart Devices to Monitor and Control Energy Consumption to Reduce Carbon Emission

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Abstract

The demand of energy in our communities today continues to grow, thus rendering doubts to a continued energy supply to meet future demand for a sustainable development without considerable harm to the environment. The challenges of running a power system, such as the deadly 2021 Texas power grid failure, the increase in carbon footprint from use of fossil fuel, and climate change have raised serious questions regarding energy efficiency and energy conservation. The control of energy usage by residents to decrease energy consumption during peak periods, can lead to a decrease in demand on the grid and maintain electricity reliability. Our smartphones and smart devices now offer us a better way of achieving this goal by allowing us to more easily control the flexible appliances in our homes.

This hands-on activity was geared at enhancing students' knowledge on energy control and conservation at home and at the classroom level. Students in one class were divided into six groups to rotate through six activities set on different tables. Students were engaged in table one activity to measure and record the power input of five classroom electronic equipment using a practical power meter. Also, to use data obtained to find out which classroom equipment uses the greatest amount of energy. Table two activity engaged students in the measurement and recording of the power input of five different light bulb types provided, to find out which type is energy efficient for homes. Table three activity looked at the effect of power consumption of two phones at different battery levels during charging and at 100% completion. During this activity students measured and recorded the power consumption of those two phones every two minutes for five minutes. Students were instructed in this activity to use Google sheets to construct line graphs and find out patterns of energy consumption during charging. In table four activity, students used a smart phone with installed and interconnected apps to remotely control smart light bulbs and home electrical equipment connected to smart plugs. The smart devices are either paired with WiZ app or Smart life app which are in turn

linked to Alexa's app or Google home. Verbal commands through the Alexa app or Google home operated those smart devices. This activity required students to change a smart light bulb through possible colors while measuring the power output of each of those colors using a power meter. At the end of this activity students determined from the data collected which light color was best at energy conservation. Table five activity required students in their group to review essential electrical energy vocabularies using a crossword puzzle. In this activity students also learned the conversion from meter reading in watts to kilowatts hour and the calculation of a device's energy usage per day using the provided examples. Table six activity required students to measure power input for five classroom equipment in watts and to calculate the daily consumption of those equipment per day given that each continued to work for 24 hours a day. In this activity students used the data obtained to determine which of those equipment consumed the greatest amount of energy per day. All Students at the end of the activities held a general discussion with the to articulate what they gained during the session.

The result showed that students were very engaged in the group activities in the classroom as they were using smart devices that they very well liked and were also eager to obtain results to promote their groups. This hands-on class activity augmented student's knowledge on the use of smart devices to control energy in home as they had a practical application of how the control process functions. Raising students' awareness on energy control in the classroom in this way, may act as a buster to energy conservation, as they can encourage parents to adapt such control measures to minimize household energy cost. More importantly, if energy companies provide incentives in the form of low energy pricing to residents willing to adapt the model of curtailing their electric energy usage during the peak period, there will be great improvement in energy reliability.

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