

# LESSON OF ELECTRIC COURSE IN THE HIGH SCHOOL FOR ENERGY-DEPLETED AREAS THROUGH ENERGY SECURITY AND SOCIAL SERVICES

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## ABSTRACT

*This article was aimed to bring the knowledge to Classroom by applying the content of electric courses through teaching lessons on solar cells for High schools in energy-depleted areas and social services. Siseangtham School was a secondary school located in Ubon Ratchathani Province. Away from the border with the Kingdom of Thailand and the Lao People's Democratic Republic Located in Hauyyang Sub-district, which is an area of hump area (Khok) Sloping down to the Mekong River, which considered to be in an energy-depleted area. Therefore, knowledge of sunlight is brought to the classroom by applying the content of the electric course. Method of studying was a descriptive of the application on Electrical course for teaching practice to teaching lessons on solar cells. Teaching results of solar cells for middle school with teaching cycle on learning by doing. The student was able to create a career in sola learning by doing installing for external agencies. The ability to have professional skills is a response to the teaching and learning reform correspond to Thailand 4.0 and generate income to the community. A model school with the role of developing science and technology curriculum and building academic communities for sustainable community development.*

## Keywords

Electric course, High school, Energy-depleted area, Social service

## INTRODUCTION

Siseangtham school, a small high school in the countryside along the border. But it was known in abroad and in the country by the name “Model Renewable Energy School” visited of whom coming for study tour from the government and private agencies. As well as general interested people came to receive short-term education and training in order to further enhance their knowledge and occupation. Including the students of Siseangtham School could still apply their knowledge to university level. A large number of engineering faculties or at a higher education until receiving a free scholarship from the South Korean government. Until the Prime Minister, as the leader of the country, praised the model renewable energy, Sisaengtham school and students via public media with the efforts of teachers in the development of teaching materials in many forms. There has innovation, invention to solve problems such as, an equipped trolley with solar panel that used at night in rice field, a flashlight with a solar cell charger through integrated teaching with various disciplines for students to learn, easy to understand and applied it in daily life, social services which able to help in times of disasters

or helping hospitals in the 77 provinces for gathering 77 solar hospital projects to reduce electricity bills by 720,000 baht per year over a period of 30 years also a community learning center, Khok Nong Na Royal Project of Kindness and Hope, “Wat Pa Sisaengtham” Temple. The faculty, teachers and students had worked together to create agricultural works at the school's demonstration field.



Figure 1 School entrance sign, taken in 2016

## HISTORY OF SISEANGTHAM SCHOOL

At the Year 2010, Phrapanyavachiramoli (formal name was Phravimolpanyakun) has requested permission to establish a charity school of the temple in Buddhism called Siseangtham School. by the donation of Wat Pa Siseangtham, join together to raise funds by offering Jevara robe, for gathered budget to build a school. Although it was only 10 years, there was a lot of work to be seen. Because the school was located in a remote area of prosperity. Most of people in the community worked in agriculture. And as a laborer in a large city. When having children, they let grandparents and grandchildren raised their grandchildren at home so little warmth of the family. There was a problem, not interested in wanting to go to school, or the problem of premature pregnancy causing divorce problems various family problems

and most importantly poverty. Wat Pa Siseangtham, as a social development organization, although it was only a small point, when seeing the problem in the area all the time, then found a solution to the problem by human development. How to make people in the community had quality, knowledge and morality, so Siseangtham School was established free education, free shuttle, free lunch.



Figure 2 Students helped monk's teacher to stump base of the school building.

### SCHOOL ENERGY SHORTAGE PROBLEM

"Educational management on scarcity" It has been presented on many occasions due to the establishment of a school with only 1 building, the stationed teacher does not have a professional license. School supplies or buildings where wood chips need to be added to Not enough classrooms require clay house molding. So that students could have a seat to study Initially, there was no budget to support everything. And during the development phase, it will require a budget to supporting. The school has received support from the Ministry of Education. But the conditions have not yet opened the school for 3 years and therefore do not meet the criteria unable to provide support. It has been done in conjunction with the request for donations and support from private agencies 23 state-owned enterprises appeared no places to reply for supporting. It was the origin of the clay house molding as a classroom. Even, taking private land and selling houses for built school.



Figure 3 The first school building was made of clay

The school had 18 million, school buildings were built in 2013 and completed in 2015 without government funding. By the funds raised offering from Phrapanyavachiramoli Funding from his sale of private land and got the money from the sale of the house which added to complete the construction in time for the school's opening.

Because the number of students has increased a lot. From the first year of school there were 96 students, the third year had about 130 students. Until now, there are about 200 students because of the shortage of utilities, lack of water and electricity. Although, found the condition that was derived from nature near the body to teach, focus on the environment, soil, water, wind, fire, sunlight as an easy-to-find medium of teaching. Therefore, emphasizes on science for students to practice and practice as the main. The budget for the provision of teaching materials was insufficient, therefore, the existing items must be utilized. For example, taking a student with a single seedling, collecting data on the yield test when harvesting rice or planting different forms of forest to compare growth. Including the damaged solar cells but still can be used that the state gave to the people but could not use, used as an introductory material for teaching electrical subjects, Finding the relationship between Ohm's Law allows students to experiment with the real thing in order to see the real thing or to imagine it and understand more.



Figure 4 A new school building, 3-storey building, equipped with solar panels.

### SCHOOL UTILITIES WAS BEEN SCARCE

Water and electricity shortages was the problem of every school. Because it was necessary and inevitable cost. How to not pay a lot, but must be economical. But at Siseangtham School, the underground water system was pumped up on a high tank then released into the school using solar energy to cut costs. Reducing the problem of power outages, the water system would also be absent. But when using a solar water pumping system to help solve the problem, everything that used enough water was also available. agricultural plots and the water used within the school.

As, the electricity bill, if all solar cells were not installed in the school, there would be electricity bills about 14,000 baht, but when all solar cells are turned on, the electricity cost will be only 40 baht. Through caused a group teaching,



recruiting students who were interested in installing various systems available in the world to simulate for students to learn, and take action.



Figure 5 Integration of knowledge, course content, electricity and solar energy



Figure 6 Teachers design lessons and practice doing exercises for installing solar panels on and off hours.

### APPLICATION OF THE CONTENT ON ELECTRIC COURSE TO TEACHING LESSON

The initial purpose of using solar cells was to reduce the cost of teaching aids on electric circuits from using multiple batteries. The cubes were connected in parallel or in series for students to see. It was very wasteful, if it was to reduce costs, it should be a non-wasteful medium. Therefore, took the damaged solar cells and adapted calculate the exposure area. Seeing the detailed information on production of each type of solar cell to know the voltage of each cell. And try to find the electric current in the circuit. Teaching data collected in the school's renewable energy club (Energy student club) each week. Making it possible to design a solar cell course. And produce teaching materials in each content in accordance with the school context. Not be a cost burden but explained to students to understand and take action.

The effect of teaching solar cells for medium high school. Fortunately, the national core curriculum requires 70% of the

centralized education and 30% of the school curriculum. Bringing local wisdom or the context of the community to provide teaching and learning for students to learn according to their aptitude, according to the strengths of each area. For example, Siseangtham School has taken the matter of the environment as a starting point. Have energy matters and agriculture separated into sub-topics. Therefore, it was suitable for the context of most farmers communities. Teachers and students were knowledgeable diversity and transmitted to other communities, other schools that came to see the work, ask to take the solar cell courses of Siseangtham School to organize many schools also brought innovative media and invention that worked of the Srisangtham School to be their own work for creation of commercial value added, etc.



Figure 7 Curriculum and instruction Learning activities by doing



Figure 8 Off-site solar teaching and exhibitions in the contest

### THE CYCLE OF PEDAGOGICAL LESSONS AND THEIR ACHIEVEMENT

It was difficult for students to understand most electrical circuits or remember, but didn't dare to actually use it Because most of them would only study theories, not put into action or fear of danger with uncertainty in the



knowledge, contained in the textbook, teaching electric circuits or various electrical connections so use a simple picture In communication, sort the electrical operation or the flow of current in a circuit. Therefore, bringing experiments to become more proficient.

It was also important to make teaching materials for students to understand. Each material deepens the teaching of knowledge, as it was the basis for more complex cycles. Safety ought to increase gradually according to the level of electrical work as well. By giving students knowledge about the basic systems low voltage to reduce the dangers of teaching and learning to suit the ages of students.

The teaching and learning were more diverse in their application, including lighting. Home used systems. Systems for farm applications, in gardens, systems with batteries. Systems without batteries Teaching to achieve a holistic understanding of the system, such as the basic system schematic diagram of the solar cell, as said that the power generation system available in this world was simulated at Siseangtham School.

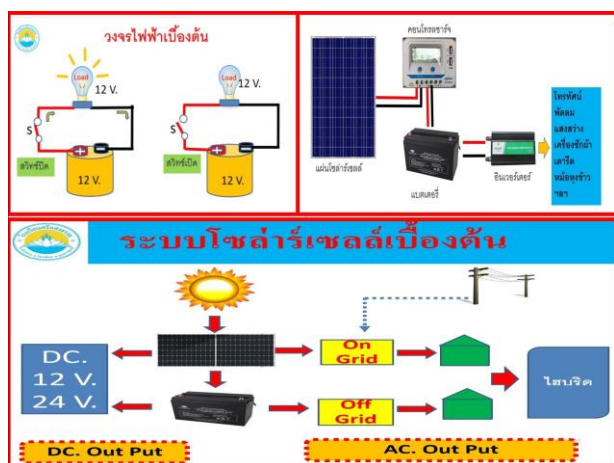


Figure 9 Basic schematic diagram of solar photovoltaic systems utilizing various forms of solar energy

Summarizing the contents of the electric course to teaching lessons on solar cells, there are mainly 3 forms: 1) Stand alone with batteries. And without batteries, there is an advantage, anywhere, just have sunlight, it can be used already. 2) Another popular model is On grid system, a system that is popular in homes. Industrial, hospital or commercial factories installed in large areas called solar farms. On grid systems were low investment because they did not need batteries to store energy, but there was a disadvantage when the power from the transmission line was off. The photovoltaic system would also be extinguished as well. 3) Hybrid type took the advantages of Stand-alone and the advantages of on grid, which was gaining popularity in residential homes because of its ability to work in a variety of ways. Meet the needs of more users.

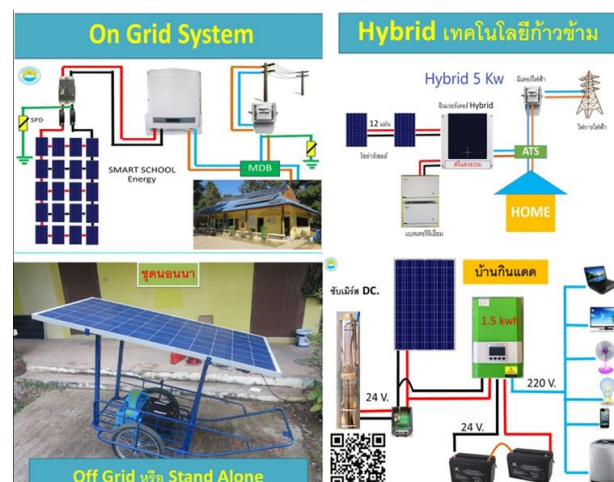


Figure 10 on grid system and Hybrid charts

### THE ABILITY TO HAVE PROFESSIONAL SKILLS TO INSTALL SOLAR CELLS

Curriculum management still had limitations on budget, time frame, safety, measurement and evaluation according to the principles of educational management. But if the body of knowledge above the basic level was a training course for the people who were interested. And students who had passed the basic level could learn on the actual job site Set up as a team of "chang kho kao" (Definity name mean a man teams who working for requested rice for release hunger)



Figure 11 Atmosphere of the working of installing Solar plate by a rice requesting mechanic teams

In the early stages of the school's establishment, the budget was limited, but the student transportation and lunch costs had to rely on donations. If there is no donation, how will we live? How to have sustainable income to support yourself so a team of technicians from the renewable energy club went out to get solar cells installation work in the area around the school. Or holidays in order not to affect the study During the lunch fee, it does not go. During the absence, go to receive the job indefinitely. But now, there are people who come in contact to help with installation work in other provinces across the country, starting with graduating students to study in electrical engineering coming back to

work at school. To help teaching the children and getting the job to install solar cells in other provinces. And system design Including authorization with the authorities relevant.



Figure 12 Off-site installation work of students, rice technician team

From where to install solar panels at various locations, works that have appeared to the public and the quality of the equipment is number one in the world Skill and installation skills of a team of experienced rice technicians In addition to being worth the investment. There is also a beautiful example for many solar cell technicians. Many places that come to train short-term courses in occupation as well.

### RESPONDING TO THE SOLAR INSTALLATION OF THE ORGANIZATION AND THE OUTSIDE COMMUNITY

Even if there is a factory or residential houses, contact a team of technicians to request a lot of rice. But, with the limitations of the work team, it must be focused on the hospital first, because the hospital can help a lot of people, temples, schools, factories if they are in the same zone. Or in the same province, it can be installed together, which is the project 77 Province 77 Hospital, also known as “Siadaidad Hospital”. (informal name of hospital, it mean upset to waste solar for storage)



Figure 13 Solar cell installation services in various departments

Ban Tak Hospital, Tak Province, equipped with 134 kilowatts with a budget of 3.3 million baht, which can help save electricity costs about 80,000 baht per month. 2) Thawatchaburi Hospital, Roi Et Province, 134-kilowatt

installation size 3) Ban Phaeo Hospital, Samutsakorn Province, 110-kilowatt installation 4) Sangkhom Hospital, Nong Khai Province, 110-kilowatt installation



Figure 14 Hospital solar installation



Figure 15 Khong Chiam Hospital, Ubon Ratchathani Province, 110 kw. Installation



Figure 16 Ku Kaew Hospital, Udon Thani Province, 110 kw. Installation

In addition, several other hospitals are pending. Which had to wait for the donation of the “Wat Pa Siseangtham temple” and the hospital helped raise funds through the project, so it was good to present the results of teaching and learning how to install solar cells in the classroom. In training organizing the “Khok Nong Na” training course. Therefore, it was considered a public relation and a good project dissemination, will have Thai people to help build 77 hospitals with zero-baht power in the near future.



### SUMMARY

Bringing knowledge of science and energy technology to be integrated in the teaching and learning management of Siseangtham School, designed hands-on instructional management and applied action research to be a new subject in the medium school curriculum. To teach students to practice professional skills Must have patience or bring the 4 virtue principles to teach morals and bring knowledge and practice. To help solve problems in the community as a livable rural society like Silicon Valley . In California, USA. But, to build a remote rural area as a gathering of people of genius, called the "Khok Edo Valley". Focus on building children and youths building people in the community to have professional skills in their own area. Is to create a country person to live in a country house happily It is another way of managing professional education.

Siseangtham School, a prototype of a research-based school, the world's leading international research organization Advance research in classroom management. Which is promoting and stimulating the dialogue of knowledge, enhancing teaching and bringing wisdom to integrate sustainability in mainstream education circles from thought leaders (Cognitive Leaderships) . Focus on innovative teaching and learning There is a learning method that can help teaching and learning how to address today's global sustainability challenges and offer solutions to address the shortage of educational resources. As a case study presented from Malaysia to Australia, discuss curriculum development and integrating sustainability within the core philosophy of leadership studies. There is a need to innovate to meet current sustainability challenges. Empowering our children to change the world of the future (Learning for a Sustainable Future) LSF is transforming Canada's education system through innovative programs that empower youth and educators to create more sustainable communities.

### SUGGESTION

Author viewed of this article, we aimed all in promoting sustainable development. Education is an important platform for educating students on sustainability and sustainable development and for producing research on key issues. Able to set sustainable development goals and strategies into strategic plans and institutional cultures. As the survey results Nigeria, Sub-Saharan Africa, Italy and the Middle East explore how these goals can be achieved in the face of changing expectations. Corresponds to higher management at the tertiary level when high schools prepare well, it is with the global Higher Education Teaching and Learning network; HETL helps education leaders and scholars around the world work together effectively in a meaningful and impactful way. High in improving education policies and outcomes. And fostering democracy and human rights by creating a sustainable model of education and lifelong learning in collaboration with Policy. Theory and Practice, these collaborations have resulted in numerous publications and academic initiatives, as well as new theories , principles, models, methods, frameworks. And the Center-for-Advanced-Research-in-Education; CARE aims to contribute to research that has Research advances in classroom conversation: learning outcomes and key word assessments. Class dialogue, learning outcomes, assessments, participation in discussions. Solutions to create abstract identities, the goals of special

problems. When teaching some form of classroom discussion can affect students' learning outcomes. This article shares the concept of classroom discussion as a problem-oriented discussion. In other words, it is an exchange of ideas between students and teachers, which goes beyond most of the monologue methods of class discussion. Each contribution to this special issue has a different type of learning outcome study. This is a result of a particular way of organizing classroom conversation. In conclusion, the studies in this article illustrate field as an effective research area. Provide evidence for the possibility of the assumption that organizing classroom conversation may produce desired learning and developmental outcomes in students, depending on the outcome we want. The need for clear solutions to problems during classroom administration and assessment methods. Although studies in the work produce promising results for future improvements in classroom practice, further research is needed. (Especially in the long term) . And having a classroom dialogue is also a learning language, which is an effective context in learning in schools. For this reason, classroom dialogue research is focused on identifying and promoting teacher-child interactions, or children-to-children in a school environment, which can be very beneficial to children's learning and development. most (Nystrand Gamoran, 1991)

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