

Role of School-Based Energy Supply and Conditional Cash Transfer Projects in Improving Primary Education: Case of Losimingori Primary School Project in Monduli District in Tanzania

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Abstract

This is a descriptive paper to report on the role of school-based energy supply and conditional cash transfer projects in improving primary education in primary schools. Educational components included in the analysis are learning motivation among pupils and their attendance rate. Literature review, real time data analysis, surveys, and interviews were employed as appropriate research methods for this study in which both pupils and teachers were the subjects. Findings show that the motivation for education through the supply of energy was found to improve attendance. Second, the number of runaway students decreased due to battery charging time. Third, the teaching-learning time was stabilized through the digital attendance management system. Fourth, self-study time increased due to solar battery lighting. In addition to improving attendance rates, stabilizing teaching-learning time, and improving self-study time at home, it is recommended that studies on the relationship between academic achievement and the system satisfaction of parents and children should continue.

Keywords: *attendance rate, conditional cash transfer, improvement of education*

Introduction

The Millennium Development Goals (MDGs) aiming to improve universal primary education in developing countries have achieved remarkable results in the primary school enrollment rates by making primary education mandatory and free in almost all countries globally. Although the free education system and policies did significantly increase the primary school enrollment rate, on the other hand, the dropout rate increased, and the graduation rate decreased due to other factors such as family poverty (Wambui, 2013).

In 2015, the Sustainable Development Goals (SDGs) were adopted to replace and extend the Millennium Development Goals. Sustainable Development Goals (SDGs) are based on a comprehensive framework that seeks to lead to

comprehensive sustainable development, including social and environmental aspects, rather than simply considering poverty issues in developing countries. Compared to MDGs, SDGs emphasize global governance and global environment sensibilities in which various actors such as companies participate for the purpose of comprehensive sustainable development (Kwon & Park, 2017).

To achieve the SDGs, the biggest goal of the international community from 2016 to 2030, the Korea International Cooperation Agency (KOICA) initiated creative technology solution (CTS) projects with Korean companies and institutions for official development assistance (ODA) under the Ministry of Foreign Affairs of the Republic of South Korea. This has not only contributed to finding solutions to development cooperation difficulties, which were challenging to solve with the existing approaches, but also encouraged the participation of companies to enhance the effectiveness of development cooperation projects.

To this effect, the Solar Cow project, a model for sustainable environment, education, and community development, was implemented for the first time in Pokot and Kwale districts, Kenya in 2018 – as a pilot project to demonstrate the effectiveness of an innovative technological solution. Following the promising results from the Pokot Pilot project, the Solar Cow project was conducted in Tanzania in 2019 with the same purpose of effectiveness and impact of this innovative technology on educational improvement. It was thus conducted in Tanzania to examine if the Solar Cow project would be effective in improving education by leveraging the energy supply in schools.

By recognizing how the expensive and inaccessible regular energy supply contributes to poverty in rural areas, in turn propagating child labour, a Korean company has developed the Solar Cow System to deal with this anomaly. With its portable batteries, the system is designed to provide reliable, safe, and environmentally friendly energy with easy access and at an affordable low cost while the children are studying at school during the battery recharging, especially to communities living in off-grid areas. The Solar Cow is a modular photovoltaic energy distributed system, installed in off-grid areas of developing countries of the sub-Saharan Africa. This system charges portable batteries, known as “Power Milk” which students bring to school and take home fully charged. “Power Milk” charges appliances, provides light but recently has been upgraded to facilitate radio education. The Solar Cow system also discourages the use of low-quality fuels such as kerosene and diesel that annually poison millions of people. From the manufacturing point of view, the modular nature of Solar Cow’s solar panels makes replacement and maintenance affordable and easy.

Installing Solar Cow charging systems in front of school facilities will encourage parents to allow children to go to school, while they receive clean energy for use and save on the household budget. This project not only directly contributes to SDG 4.1 on improving primary and secondary education, but also to SDG 7 on affordable and clean energy as well as SDG 8.7 on eliminating child labour.

Methodology

The project to improve the education in Tanzania through the Korea International Cooperation Agency was installed in 2019 in Losimingori primary school in Monduli district within Arusha region. A solar panel and charging station were installed in the school, and portable batteries that could be charged were distributed to 467 students. Students usually attended the school with a portable battery around their neck. In addition, students participated in the charging process by inserting their custom designed battery into the Solar Cow charging station themselves. When a battery is inserted into the charging station, the pupil's Identification Number (ID) is displayed, and the date and time are automatically recorded. After classes, students remove their batteries that have been charging from the station and take them to their homes. As soon as a battery has been removed from the charging station, the date and time are recorded again, allowing for automatic attendance confirmation.

To investigate the educational effect of installing a school-based solar power supply system, 467 pupils in grades 1 – 6, and six schoolteachers were chosen as the subjects. Literature review, real-time data analysis, surveys, and interviews were chosen as appropriate research methods for these subjects. The analysis of data was then conducted thematically.

Findings and Discussion

Perceived Influence of Solar Cow Project on Primary Education Improvement

The aim of the project was to improve educational outcomes by installing a solar power charging system in front of schools in unelectrified areas, in this case Simanjiro Primary school, where power infrastructure has not been established. To make children's education a priority for parents, the project utilized an unconventional energy distribution method in which students go to school and bring the energy needed for their homes through the portable battery. In general, parents in unelectrified regions tend to not send their children to school because they need to send their children to work for income generation purposes (Moyi, 2011).

Analysis of the attendance rate for three years of its establishment, the school-based solar power supply system showed the attendance rate improvement in all grade levels. The average attendance rate for the three consecutive years in all grades was 74.66%, 73.78%, and 85.18%, and the overall attendance increase rate was 11.4%. In particular, the attendance rates in grade 3 and grade 5 increased by 20.06% and 12.06% respectively. Responses from the focus group discussions showed that all six teachers at the school confirmed that the number of runaways during class period has been reduced. Teachers confidently assured that this decrease was caused by the wait time portable batteries needed for them to charge, and consequently for students to take them to their homes after the class. In the survey about students' study time at home, only about 9.9% of students studied at home for more than two hours before the school-based solar power supply system was installed. After the system was installed, this number increased to 52% of students who reported that they were studying at home for more than 2 hours after school with a portable battery LED lighting.

From these findings, it can be underscored that this project has not only motivated pupils to attend school more regularly, but also to study at home after school hours. Further, families have acquired a source of energy for lighting through their children's charged batteries. Thus, both parents and children feel the need and value of attending school, viz education.

Conditional Cash Transfer and Cow Project Compared

The average amount of CCT was TZS 21,000 per month, which corresponds to 21% of the consumption per household of the poor in the rural areas. The developed CCT programme had two conditions: In the field of education, children over the age of five years needed to register at school and maintain at least 80% attendance rate, which was checked every two months; In the field of health, children under the age of five years needed to visit the public health clinic and undergo a health checkup. Children under 24 months needed to receive health care at a local health clinic at least once a month, and children between 24 and 60 months old needed to visit a health clinic at least once every six months. Consequently, the effect on educational performance has shown to be insignificant from the CCT programme alone. 92% of enrolled students have been present, but 18% (between the ages of five and 19 years) have been repeating at least one grade and have not been promoted. This outcome indicates that academic achievement has not been improving as a product of the implemented single programme.

The CCT programme currently operating in Tanzania and the Solar Cow project, a pilot model conducted in a primary school for improving attendance

through energy supply were analyzed comparatively under the same budget input conditions. Two approaches were used for the comparative analysis on educational effects of the CCT and the Solar Cow programmes.

Analysis of the difference in number of beneficiaries that arise from the same financial investment

If the financial cost of installing one solar system is about USD 20,000, energy and education benefits are provided to 500 families. The average monthly payment for the Tanzania CCT programme is about USD 13 per household per month. If you apply the CCT programme to 500 families for a value of USD 20,000 then a CCT programme can be applicable for only 3 months.

i. Cost analysis for the same period

This analysis assumed that 500 families would benefit from the CCT programme, and the Solar Cow programme based on one and three years respectively. The programme cost to supply 500 families for one year of the CCT programme is about USD126, 000. The Solar Cow programme, on the other hand, is available at a price of USD 20,000, which is one-sixth the price of CCT. Furthermore, for a three-year investment in CCT programme (covering the cost for 500 families), USD 378,000 will be required. Solar Cow, on the other hand is available for USD 35,000, including management and operational expenses.

ii. Education efficiency

Due to the different nature of the two programmes, there is a limitation to this comparison, in that making a complete and accurate comparison is difficult. However, it is not difficult to see that the difference is significant for both the investment cost and educational effect of the two programmes. The CCT programme is subject to health and education but is not sustainable in terms of cost. On the other hand, the Solar Cow programme is sustainable because it does not only provide educational opportunity, but it also supplies the essential power that is necessary for the daily life of local people. The Solar Cow project is an eco-friendly renewable energy alternative using solar power. And it is economically sustainable because it is cheaper than the cost of building a power infrastructure at the government level, and it is much cheaper than charging a mobile phone at a private charging station far away. In addition, after the completion of the KOICA Creative Technology Solution (CTS) project, the Solar Cow system is still being operated independently by the local community committee. For instance, it can be deduced that at least six solar cows can be installed with a budget needed to operate the CCT programme for one year, and 10 Solar Cows can be installed with a budget needed for three years of

maintenance of CCT. Hence, the number of beneficiaries can be expanded to 3,000 households for one year and 5,000 households for three years.

Holistic School Attendance Improvement Programmes

Various efforts to improve educational conditions in developing countries have been made with the aim of improving learning motivation and attendance rates. Improving the attendance rate is an important indicator to ensure the stabilization of the teaching-learning environment. In addition, learning motivation is a factor that affects the attendance rate and the promotion rate, and the correlation between the absence and poor academic achievement was confirmed through the research results (Devadoss, & Foltz, 1996). Attendance rate is complexly related to the teaching-learning environment. To provide a stable teaching-learning time condition, school meal programmes, conditional cash transfer programmes and home-school partnership programmes were conducted for the attendance rate improvement. Attempts to improve the school attendance rate through school meals support programmes have been made in developing countries including Tanzania.

Conditional cash transfer (CCT) programmes are being implemented for the purpose of reducing poverty and creating a healthy and sanitized environment by making welfare programmes conditional upon the receivers' actions. The government (or governmental organizations) only transfers the money in cash to persons who meet certain criteria according to its conditions. These criteria may include enrolling children into schools, maintaining a constant attendance rate, getting regular health check-ups at the local clinics, and receiving vaccinations. CCT programmes aim helping the current generation to reduce poverty, as well as breaking the cycle of poverty for the next generation through the development of human capital.

Conditional cash transfer (CCT) programmes have proved to be successful in various countries globally. For instance, in Uruguay, an educational institution studied the correlation between the decrease of child labour and the improvement of school attendance through comparative analysis between the experimental group and the control group, by conditional cash transfer to poor families (Amarante et al., 2011); a case study by the UN Development Program and the Center for International Poverty, which simulated the effects of improving attendance rates in 15 African countries through conditional cash transfer programmes (Kakwani et al., 2005); and various conditional cash transfer programmes are ongoing through social action funds in African countries. There is further evidence that developed countries such as the United States of America are approaching attendance improvement through a system's approach, rather than school meals or cash support. For example, schools in Ohio, reported an

average 0.5% increase in student attendance through holistic school, home, and community partnership programmes (Sheldon, 2007). In addition, there is a case reported about increase of elementary school attendance and decrease in chronic absenteeism through partnerships programme between a home and school community within the same state of Ohio (Epstein & Sheldon, 2002).

Despite being instrumental in improving education, isolated strategies such as school meals and conditional cash transfer programmes are difficult to sustain because they require enormous financial responsibility. Unfortunately, holistic approaches such as partnership programmes linking home and school have not yet been widely applied in developing countries. Thus, innovative approaches are needed to improve educational conditions through school attendance in developing countries. Hence, for sustainable development, comprehensive application along with analysis of value propensity in users' lives is essential (De Vries, & Petersen, 2009).

Conclusion and Implications

It can be deduced from this case study that, In unelectrified areas in developing countries where there is no reliable power infrastructure, governments are trying to supply energy to households in various ways. The multi-channel solar charging system introduced in this project is a solar charging system installed in a school, so that students can return home after charging at school and supply energy for 500 households.

Generally, parents in this area have a natural tendency of not sending their children to school because they want their children to help them with house chores and taking care of livestock. However, this system can motivate parent to educate their children by distributing to their homes the energy that is charged at schools.

The research results are as follows: First, the motivation for education through the supply of energy was found to improve attendance; second, the number of runaway students decreased due to battery charging time; third, the teaching-learning time stabilized through the digital attendance management system; fourth, self-study time increased due to solar battery lighting.

Under the condition of supplying essential energy to villages and homes in non-electric regions, Solar Cow can not only provide education motivation, but can also stabilize the teaching-learning environment, improve attendance, and consequently increase academic achievement. Woman and girls can use the same LED lights contained in power milk portable batteries to ensure safety at night and prevent possible sexual assault attempts and other related crimes. In Tanzania's Solar Cow project, there were many cases where family members

and children reported being protected from physical dangers such as hyenas, poisonous snakes, centipedes, and scorpions by using power milk LED light.

In addition to improve attendance rates, stabilizing teaching-learning time, and improving self-study time at home, studies on the relationship between academic achievement and the system satisfaction of parents and children should continue. Looking at the ongoing effects from continued data collections in the future, it will be possible to prepare a plan for innovative educational support in unelectrified areas of other developing countries.

Finally, the program to improve educational conditions through energy supply was more effective than the high-cost short-term CCT programme to improve the enrollment rate and attendance rate. These results have great implications for providing a more efficient solution to the education support policies of developing countries.

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