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Solar-powered Surveillance Camera: A Strategy for Effective Prevention of Loss of Workshop Tools in Technical Colleges in Rivers State

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ABSTRACT

This study on Solar-powered surveillance cameras as strategy for effective prevention of loss of in workshop tools in technical colleges in Rivers State was necessitated by the frequent loss of tools in workshops in technical colleges. One research question guided the study and one null hypothesis was tested. Descriptive survey research design was employed for the study. The population for this study consisted of 120 (78 teachers and 48 workshop attendants) in four technical colleges in Rivers State. The entire population was studied without sampling since the size was not too large and was manageable. The instrument for data collection was a structured questionnaire titled 'Solar-powered Surveillance Cameras as a Strategy for Effective Prevention of loss of workshop tools. The instrument was validated by three experts from the Departments of Industrial Technical Education and Vocational Education and Educational Foundations of Ignatius Ajuru University of Education, Port Harcourt. Using the Cronbach alpha method to determine the reliability of the instrument, the reliability co-efficient of 0.78 was obtained. The data collected for the study were analyzed using mean and standard deviation to answer the research question and to determine the closeness of the respondents' mean ratings. The t-test was used to test the null hypothesis at 0.05 level of significance. The findings of study revealed that, the use of solar-powered Surveillance cameras will be very effective for prevention of loss tools in workshops in technical colleges. The findings also showed that there was no significant difference in the opinions of teachers and workshop attendants on the use of solar-powered Surveillance cameras as an effective strategy for prevention of loss tools in workshops in technical colleges. Based on the findings of this study, it was recommended that solar-powered Surveillance cameras should be installed in all workshops in technical colleges in Rivers State in order to prevent loss of tools.

KEYWORDS

technical college; solar-powered surveillance camera; workshop tools

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INTRODUCTION

The economic, scientific, and industrial development of any nation largely depends on the contribution of vocational and technical education. This aspect of education is powered by Technical Colleges at post primary level of education programmes. Technical college is an organized school where specialized type of education aimed at providing skills and knowledge required for employment in an occupation is conducted. One of the major aims of technical education as a programme offered in technical colleges is the acquisition of appropriate skills for the individual to live and contribute to the development of the society (Federal Republic of Nigeria, 2014; Amadike, &Agwi, 2015). The beauty of technical colleges is the availability and utilization of workshop tools.

Tools are particularly important in workshop practice. They are primarily used to put things together as in the case of hammers and nail guns; or to take things apart as in the case of jackhammers and saws. Tools are often classified as hand tools and power tools. Hand tools include all non-powered tools, such as hammers and pliers. Power tools are divided into classes, depending on the power source: electrical tools (powered by electricity), pneumatic tools (powered by compressed air), liquid-fuel tools (usually powered by gasoline), powder-actuated tools (usually powered by an explosive and operated like a gun) and hydraulic tools (powered by pressure from a liquid).

Availability of workshop tools is the key to get job done; which is essential for successful acquisition of skills. The availability and adequacy of workshop tools also increases efficiency. When teachers and students do not have the tools they need, it forces them to get creative and use what they have to the best of their ability. This can greatly hurt productivity among students and teachers and institution's bottom line. On the other hand, when the workshops are equipped with tools, teachers and students alike are focused on getting the job done as efficiently as possible rather than on how to get the job done with improvised or wrong tool. These tools appear in various shapes and sizes. The continuous existence and longevity of workshop tools requires adequate and effective protection from theft, vandalism, misplacement and destruction. Some experts allude that Solar-powered surveillance cameras play a vital role in this regards.

Solar powered surveillance camera just like security light, according to Nwakanma and Paius (2022) rely on small solar panels that convert sunlight to electricity to charge the cameras' built-in rechargeable batteries. Integrated inverters in the security cameras can also convert direct current (DC) power from solar panels into alternate current (AC) electricity to provide power when the sun is out. Power stored in their rechargeable batteries during the day is another way that solar-powered security cameras keep working through the night. Unlike wired security cameras, solar security cameras do not require running wires to connect them to power sources. They connect to home security systems via a Wi-Fi connection rather than data cables. The camera captures everything going on in the environment and records them in real time with good picture resolution.

Surveillance is the monitoring of behavior, many activities, or information for the purpose of information gathering, influencing, managing or directing (Lyon, 2021 & Monahan, 2018). This can include observation from a distance by means of electronic equipment, such as closed-circuit television (CCTV), or interception of electronically transmitted information like Internet traffic. It can also include simple technical methods, such as human intelligence gathering and postal interception.

Surveillance is used by citizens for protecting their neighborhoods. It is also used by governments for intelligence gathering - including espionage, prevention of crime, the protection of a process, person, group or object, or the investigation of crime. It is also used businesses to gather intelligence on criminals, their competitors, suppliers or customers. One of the devices used in surveillance is solar-powered camera.

Solar-powered surveillance cameras are video cameras used for the purpose of observing an area. They are often connected to a recording device and may be watched by a security guard or law enforcement officer. With cheaper production techniques, surveillance cameras are simple and inexpensive enough to be used in home security systems, and for everyday surveillance. As of 2016, there are about 350 million surveillance cameras worldwide. About 65% of these cameras are installed in Asia. The growth of solar-powered surveillance camera has increased in recent years (John, 2018). In 2018, China was reported to have a huge surveillance network of over 170 million surveillance cameras with 400 million new cameras expected to be installed in the next three years; many of which use facial recognition technology (Young, 2016).

The most common solar-powered surveillance cameras according to Scoth (2019) include the followings:

- Dark Fighter Cameras
- Automatic Number Plate Recognition (ANPR)/ License plate cameras (LPC)
- Internal and External Dome Camera

- Bullet Camera
- C-mount Camera
- Day/Night Camera
- PTZ Pan Tilt & Zoom Camera
- Discreet CCTV
- Thermal Image Cameras/Infrared Cameras
- Varifocal Cameras
- Network Cameras and
- High Definition Cameras

In the light of the benefits inherent in use of solar-powered surveillance cameras, Hugh (2014) stated that loss of workshop tools could have prevented if they were installed in workshops. The presence of surveillance cameras in workshops can checkmate the actions of teachers, students and workshop attendants either toward inappropriate use of tools or stealing of tools. In the context of this study, solar-powered surveillance camera is a security device that captures images and human activities in real time and transmit and store them for future use. Apart from solar-powered surveillance camera, tools tracking devices have also been identified as a strategy for prevention of loss of tools.

The camera creates the sensitive and consciousness in everyone around that their action is monitored. This consciousness checkmates and prevent those who have any motive and intension to steal tools from the workshop to desist from it. This strategy also helps to locate the position of misplaced tools in the workshop and the one responsible. Due to the importance attached to the functionality and effectiveness of workshops in Technical Colleges in Nigeria and especially in Rivers State, it is necessary to adopt appropriate strategies for effective prevention of loss of workshop tools in these institutions. Such strategies will not only ensure availability and adequacy of workshop tools and equipment but will also provide a basis for prevention of loss of workshop tools in other educational institutions across the country and in Rivers State in particular.

STATEMENT OF THE PROBLEM

The values of vocational and technical education through technical colleges are not only quantified on the basis of availability, adequacy and quality of teachers but also on the availability, adequacy and utilization of workshop tools. Workshop tools are instrumental in acquisition of practical skills by students in their various fields of study. Unfortunately, the condition of various workshops in technical colleges in the country and especially in Rivers State in terms of workshop tools is nothing to write home about. Fafunwa (1996) as cited in Amadike and Agwi (2015) observed that, one major setback in the teaching of technical subjects in many technical colleges is the lack of workshop tools. Adewumi (2010) also stated that some technical colleges in Rivers State were without workshops tools and equipment. The scenario is as a result of incessant loss of tools in workshops and not that the workshops were initially and periodically equipped with tools. The reoccurring loss of tools in technical college workshops is a bad omen for the development and sustainability technological advancement and skill acquisition. Undoubtedly, this situation may be as a result of lack of application of current and existing strategies for effective prevention of loss of workshop tools technical colleges. The present researcher is worried about this ugly situation, hence sought to examine the use of solar-powered surveillance camera as a strategy for effective prevention of loss of workshop tools in technical colleges in Rivers State.

PURPOSE OF THE STUDY

The aim of this study was to examine the use of the use of solar-powered surveillance camera as a strategy for effective prevention of loss of workshop tools in technical colleges.

RESEARCH QUESTION

The following research questions was raised to guide the study:

(1) how effective will the use of solar-powered surveillance camera prevent loss of workshop tools in technical colleges.

RESEARCH HYPOTHESIS

The following hypothesis was formulated and tested at 0.05 level of significance.

(1) Teachers and workshop attendants did not differ in their mean ratings on the effectiveness of the use of solar-powered surveillance camera as a strategy for prevention of loss of workshop tools in technical colleges.

METHOD

The study adopted descriptive survey research design. The population for this study consisted 120 (78 teachers and 48 workshop attendants) in four technical colleges in Rivers State. The entire population was studied without sampling since the size was not too large and was manageable. The instrument for data collection was a structured questionnaire titled "Solar-powered Surveillance Cameras as Strategy for Effective Prevention of loss of workshop tools". The instrument consisted seven (7) items with four response options of Very Effective (VE) , Effective (E), Ineffective (I) and Very Ineffective (IE) having the corresponding value of 4, 3, 2 and 1. The instrument was validated by three experts from the Departments of Industrial Technical Education and Vocational Education and Educational Foundations of Ignatius Ajuru University of Education, Port Harcourt. Using the Cronbach alpha method to determine the reliability of the instrument, the reliability co-efficient of 0.78 was obtained. The instrument for data collection was administered to the respondents through the help of research assistants. The data collected for the study were analyzed using mean and standard deviation to answer the research questions and to determine the closeness of the respondents' mean ratings. Decision on the questionnaire items and research questions were based on mean rating of 2.50 points. Therefore, items with mean ratings of 2.50 points and above were regarded to be effective while items with mean ratings below 2.50 points were regarded to Ineffective. The t-test was used to test the null hypotheses at 0.05 level of significance. A null hypothesis was rejected where the calculated p-value was less than the 0.05 level of significance; it meant that there was a significant difference between mean responses. Conversely, where the calculated p-value was greater than or equal to the level of significance 0.05; it meant that there was no significant difference and the hypothesis was accepted.

RESULTS

Data analyzed for research questions and hypothesis were presented in tables 1 to 3.

RESEARCH QUESTION

How effective will the use of solar-powered surveillance camera prevent loss of workshop tools in technical colleges?

Data collected in respect of research question was analyzed and presented in Table 1.

TABLE 1: Respondents mean ratings on the effectiveness of solar-powered surveillance cameras for prevention of loss of workshop tools.

S/No	Aspect of Solar-powered Surveillance Cameras	Mean	SD	Remark
1	Ability to capture and transmit images in real time	3.51	0.56	E
2	Ability to store captured images	3.50	0.50	E
3	Low maintenance level	3.59	0.49	E
4	Functionality despite weather conditions	3.51	0.54	E
5	Ability to give clear and quality picture and image quality.	3.61	0.41	E
6	Dependability	3.51	0.47	E
7	Environmental friendliness	3.54	0.49	E
	Cluster Mean	3.54	0.49	E

Table 1 reveals that all the items have a cluster Mean of 3.54. This shows that teachers and workshop attendants are of the opinion that the use of solar-powered surveillance cameras will be effective for prevention of loss of workshops tools in technical colleges in Rivers State. The standard deviation of 0.49 shows that the respondents are homogenous in their opinion.

RESEARCH HYPOTHESIS

Teachers and workshop attendants did not differ in their mean ratings on the effectiveness of the use of solar-powered surveillance camera as a strategy for prevention of loss of workshop tools in technical colleges.

Data collected in respect of research question was analyzed and presented in Table 2.

TABLE 2: Summary of z-test comparison of the mean ratings on the effectiveness of solar-powered surveillance cameras for prevention of loss of workshop tools.

Category of Respondents	N.	$\bar{x}$	SD	α	df	t-cal	p-value	Decision
Teachers	72	3.53	.49	0.05	118	1.47	.068	Not Significant
Attendants	48	3.61	.52					

Data in table 2 show that the respondents do not differ significantly in their mean ratings on the use of solar-powered surveillance cameras as an effective strategy for prevention of loss of workshop tools in technical colleges in Rivers State, with mean scores of 3.53 and 3.61, while the corresponding standard deviation is .49 and .52. The Table indicated a t-value of 1.47, at degree of freedom of 118 and a p-value of .068. Testing at alpha level of 0.05, the p-value is not significant since the p-value is greater than the alpha value (0.05). Therefore, the null hypothesis is not rejected.

DISCUSSION

Results of the study showed that teachers and workshop attendants are of the opinion that solar-powered surveillance cameras will be a strategy for effective for the prevention of loss of workshop tools in technical colleges in Rivers State. The study revealed that solar powered security camera captures and transmit images in real time, has clear image and picture quality, has high definition resolution, is not affected by weather condition, durable, low maintenance cost among others. The findings are line with that Freeman (2015) as cited in Nwakanma and Paius (2022) who stated that solar-powered security cameras can record continuously, regular wireless security cameras stay mostly in power-saving mode to conserve battery power and only wake up when they detect motion.

The study also agrees with that of Gang (2016) as cited in Nwakanma and Paius (2022) who stated that camera resolution, field of view, solar panel wattage, night vision, motion activation, remote monitoring and smartphone alerts makes it very remarkably efficient. The camera resolution determines the sharpness of the security footage captured by the security camera. The night vision and motion activation indicate that the camera can see at night and start recording when it detects motion within its coverage area. Also, Stanford (2018) added that the cameras are used to monitor the activities of staff and customers in most supermarkets and warehouses. The analysis of the hypothesis indicates that there is no significant difference in the mean ratings of respondents on the use of solar-powered surveillance cameras as a strategy for effective for the prevention of loss of workshop tools in technical colleges in Rivers State.

CONCLUSION

On the basis of the findings of the study, it was concluded that, solar-powered surveillance cameras are a strategy for effective prevention of loss of workshop tools in technical colleges in Rivers State.

RECOMMENDATIONS

On the basis of the findings of the study and the conclusion reached, it was recommended that:

(1) solar-powered surveillance cameras should be installed in all workshops in technical colleges by the Ministry of Education or Post-primary Schools Board.

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