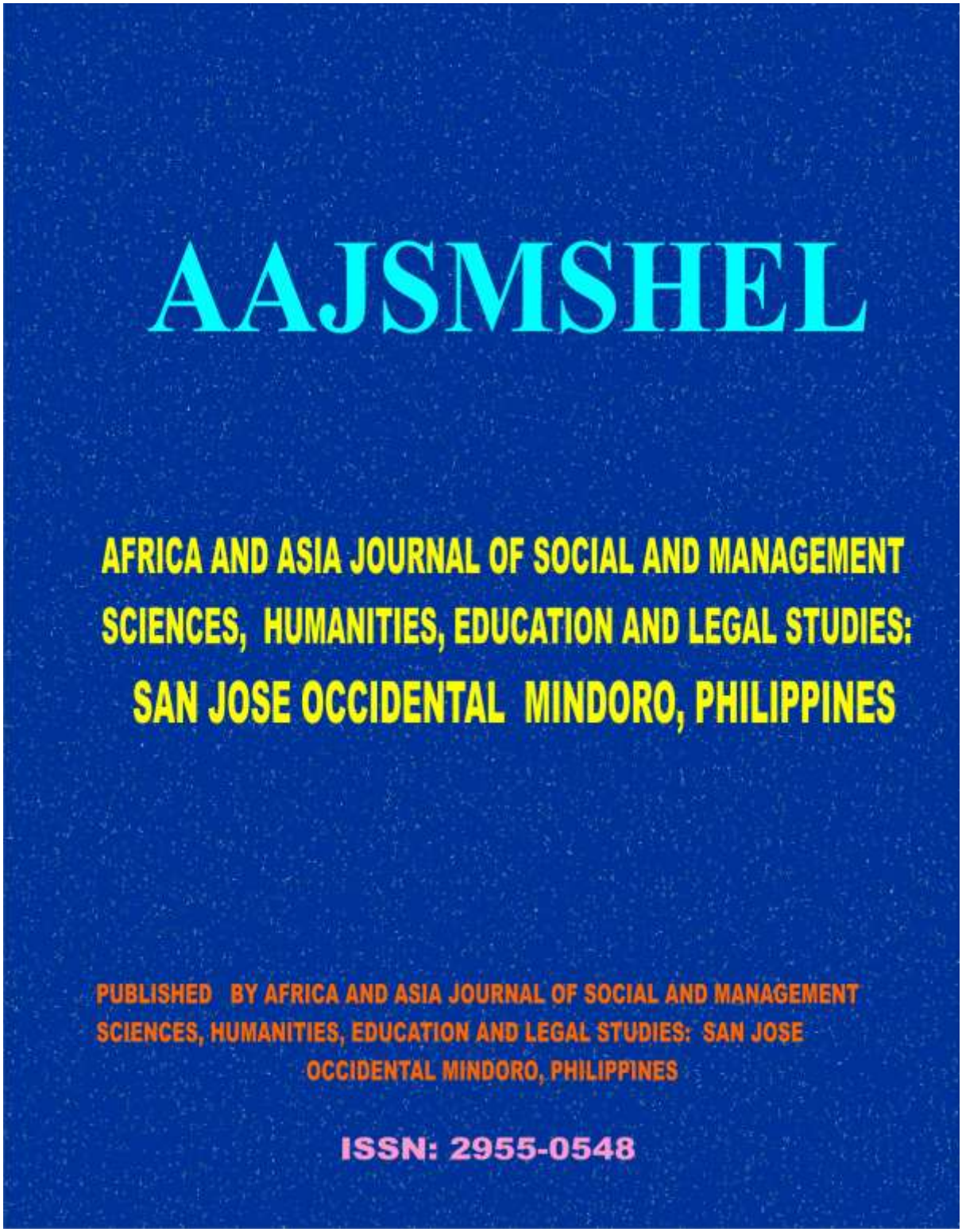
AFRICA AND ASIA JOURNAL OF SOCIAL AND MANAGEMENT SCIENCES, HUMANITIES, EDUCATION AND LEGAL STUDIES (AAJSMSHEL), SAN JOSE OCCIDENTAL MINDORO, PHILIPPINES Volume 2, Issue , 3 , 2022, ISSN:2955-0548, Indexed in Google Scholar Email:dynamicjou@gmsil.com



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ACHIEVING MANPOWER DEVELOPMENT IN MAINTENANCE OF SOLAR PHOTOVOLTAIC INSTALLATIONS FOR SUSTAINABLE AND EFFICIENT POWER SUFFICIENCY

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Abstract

This study was on achieving manpower development in maintenance of solar photovoltaic (SPV) installations for sustainable power sufficiency. The main objective of this study was to achieve manpower development by engaging learners in pragmatic instructional experiences in maintenance of SPV installations. The study was carried out in Federal College of Education (Technical), (FCE (T)) Omoku, Rivers State, Nigeria. The population was 60 subjects consisting of all the 55 final year students in the Department of Electrical Electronic in the 2021/2022 academic session and 5 electricians in Estate and Works Department of the college. The entire population was used for the study. The faulty 3.5KVA 48V SPV installation at the office of the Deputy Provost, FCE (T) Omoku was used for the study. A 15-item validated instrument with a reliability coefficient of 0.73 answerable on a 4- point scale of Very High Extent, (VHE- 4) High Extent (HE -3), Low Extent (LE -2) and Very Low Extent (VLE – 1) was used for this study. Data obtained were analyzed using mean statistic and standard deviation. Item with mean value of 2.5 and above were rated as VHE while item below 2.5 as VLE. Findings showed that learning by doing strategy, provision of real-life situation and project method to a very high extent enhance the achievement of manpower development in maintenance of solar photovoltaic installations. Among others, it was recommended that opportunity for instructional experiences based on learning by doing approach for achieving manpower development in maintenance of SPV be enhanced.

Keywords: Manpower, Omoku, Installation, Electronic, Works , Photovoltaic

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INTRODUCTION

In recent time, human activities have revolved around electrical energy utilization for achievement of socio-economic and political goals. The vital role of electrical energy in enhancing job delivery and comfort makes it imperative for several organizations to invest on it. Solar energy as one of several sources of energy generation is primarily obtained freely from the sun through Solar Photovoltaic Process (SPV). Solar devices generate electricity directly from sunlight through electronic processes that occur naturally in semiconductors.

Solar photovoltaic energy is a renewable energy and hence never deplete as a result of usage. The design for power generation has the advantage of being reliable and always available and does not cause noise or air pollution. It is environmentally friendly and easy to expand. It can also be used readily after installation by consumers (Alio, 2008). This could partly justify the choice of solar installations as alternative energy source in many institutions including Federal College of Education (Technical), (FCE (T)) Omoku. Achieving manpower development in maintenance of solar photovoltaic installations for sustainable power sufficiency could therefore be key to effective functioning of any solar installation.

For any installation to function continually at a satisfactory level for the purpose of achieving power sufficiency, maintenance is imperative. Maintenance is a deliberate activity such as testing, measurements, replacements, adjustments, and repairs intended to retain or restore functioning equipment to a specified state so that it can perform its required functions satisfactorily (Iloma & Amadike, 2015). Maintenance is strictly connected to the utilization stage of the product or technical system, in which the concept of maintainability must be included. In this scenario, maintainability is the ability of an item under stated conditions of use to be retained or restored to a state in which it can perform its required functions (Elliot, 2019). Resuscitation and Maintenance of Solar Installations is therefore all actions taken to restore and retain solar installations to a satisfactory level of usability and serviceability. It includes inspections, testing, servicing, classifications, repair, rebuilding and reclamation.

Maintenance carried out on Solar photovoltaic installations could be in the form of preventive, predictive and corrective maintenance. It is preventive when it is a routine to inspect the installation periodically with the aim of noticing fault and rectifying it before a major fault develops. This type of maintenance includes Time Based Maintenance (TBM), Failure Based Maintenance (FBM), Failure Finding Maintenance (FFM), Risk Based

Maintenance (RBM) and Condition Based Maintenance (CBM). On the other hand, Predictive Maintenance (PM) is a process that helps in determining the condition of in-service installation in order to predict when maintenance should be performed. Corrective maintenance is carried out on installation after it has broken down or malfunction and this is often most expensive due to its consequential repair and replacement costs. It is important to emphasize that the current state of solar installations especially in Federal College of Education (Tech) Omoku requires the combination of the different types of maintenance aforementioned. This makes manpower development in this area imperative.

Manpower development is the process of increasing productivity by engaging individuals in instructional process to acquire knowledge, experience or skills needed for present and future task accomplishment (Ofobruku, 2012). It is a conscious effort to increase human capacity by engaging them in specific instructions (Alio, 2008). Manpower development in maintenance of solar photovoltaic installations could therefore be defined as a continuous process of instruction which ensures the systematic acquisition and development of the knowledge, skills and attitudes required to adequately perform maintenance task or job to sustain or improve the performance of solar photovoltaic installations.

Manpower development is a cardinal and effective instrument for successful accomplishment of the goals and objectives of any organization and this could enhance productivity. It facilitates effectiveness, efficiency and motivation among workers, thereby enhancing the confidence and self-esteem of the engaged. The benefits of manpower development in maintenance of SPV installation is often taken as the most important resource for the continual survival of the installation. According to Iloma and Amadike (2015) organizational effectiveness rests on the efficient and effective performance of the maintenance workforce which often rely on the quality of the knowledge, skills and abilities possessed by the workforce.

Mbaba (2006) opined that poorly skilled manpower in technical college which has resulted to the inability of technical college students to become self-reliant on graduation is as a result of the use of inappropriate instructional method. Therefore, to achieve manpower development and sustainable power sufficiency, this study basically used instructional strategies anchored on pragmatism.

Pragmatism is firmly in the empiricist and experiential camp of philosophy, arguing against the metaphysical presumptions of rationalism and focusing on how humans adapt to their environment by incorporating new experiences during their practice, itself a starting point and terminus for knowledge (Hammersley 1989, in Ivayl, 2013). Pragmatism means being practical, paying attention to the particular context in which learners find themselves and not being weighed down by doctrine or ideology. Hammond (2013) opined that pragmatism is not a methodology but the logical stance of a pragmatic inquiry is to be action oriented – there is close link between pragmatism and action research. However, instructions such as discovery, experimentation, interactive pattern and laboratory methods are anchored on pragmatism and could result to acquisition of practical skills and manpower development (Schenkelberg, 2020). Pragmatism considers the practical effects of the objects of one's conception. It emphasizes the use of practical in solving problems. Thus, several pragmatic strategies for achieving manpower development in maintenance of solar photovoltaic could exist. In this study, the following pragmatic strategies were used:

Learning by Doing Strategy

Learning by doing which is a theory of education expounded by John Dewey emphasized that students must interact with their environment in order to adapt and learn. To achieve this, teachers were to present real-life problems to the students and then guide them to solve the problem by providing them with a hands-on activity to learn the solution. In corroboration, Verma (2020) opined that pragmatism is not in favour of old and theoretical methods of teaching but it believes in experimentation, demonstration and other pedagogical approaches anchored on constructivism. Verma stressed that education is not teaching or imparting knowledge but to encourage learning through self-effort and creative activity. Knowledge is not obtained from books but by actually doing things. Chris (2021) opined that pragmatism is about doing practical things that get results. Consequently, manpower development in maintenance of solar photovoltaic installation involves practical lessons that have value to the lives of learners.

In this study, subjects were presented with faulty and abandoned SPV installation and several instruments such as multi-meter, tester, screw driver, potable vacuum cleaner, plier, cutter and consumable materials for the purpose of identifying the fault and effecting the

maintenance. The researchers guided them during the process. This study will therefore determine the extent to which learning by doing strategy enhance the achievement of manpower development in maintenance of solar installations for sustainable power sufficiency in FCE (T) Omoku.

Provision of real-life situation

Providing subjects with real-life situation encourages action rather than reflection. In corroboration, pragmatist believe that the learners should be engaged in real situation so that the learner may solve the problems practically, which arise out of those situations. Learners must be engaged in purposeful creative activity and problematic acts such as resuscitation and maintenance of solar photovoltaic installations if manpower development for sustainable power sufficiency must be achieved. In this study, subjects were engaged in real-life situation by providing them with faulty SPV in the maintenance process. This study will therefore determine the extent to provision of real-life situation enhance the achievement of manpower development in maintenance of solar installations for sustainable power sufficiency in FCE (T) Omoku.

Project method

Project method could as well be a strategy of achieving manpower development in maintenance of solar installations for sustainable power sufficiency in FCE (T) Omoku. According to Adeleye (2017), most important contribution of pragmatism to educational practice is the project method, which is a problematic act carried to completion in its natural setting. Adeleye further explained that the child is given a real and purposeful task to carry out. While doing so, learner experiences the need of certain principles, skills and methods which is acquires, not formally but incidentally. Thus, subjects acquire knowledge and skills from the experiences gained during the process of accomplishing the task.

In this study, subjects were adequately engaged in project method during the maintenance process and this could enhance manpower development. This study will therefore determine the extent to which project method enhance the achievement of manpower development in maintenance of solar installations for sustainable power sufficiency in FCE (T) Omoku

Statement of the Problem

Despite several efforts by government and management to ensure power sufficiency in academic institutions in Nigeria through additional provision of solar installations, one major challenge faced is sustainable manpower in maintaining the solar installations of which Federal College of Education (Technical) Omoku is no exceptional. Consequently, abandonment of installations and hiring of experts which lay heavy financial burden on the institution becomes prominent. This has incidentally resulted to low power sufficiency and hence, disruption of important academic processes. Presently, most solar photovoltaic installations in FCE (T) Omoku have been abandoned. The high rate of abandonment suggests that there could be lack of manpower in maintenance of these installations. This study is therefore aimed at filling this gap.

Significant of the Study

On completion, the manpower developed will be of immense benefit to the college management. This could save them the stress and financial implications inherent in running generating set and hiring experts, it could minimize pressure from activities demanding light and its consequences thereof. Students in the Department of Electrical Electronic Technology used as subjects and other students can also be beneficiary in that they will acquire skill in maintenance of SPV. The skill acquired will increase their chances of employment, self-reliance and entrepreneurial competency in maintenance of solar photovoltaic installations. This could add value to the quality of their certificates and thus reduce unemployment and its consequences on them. Further, it could serve as instructional material, research site and a source for further research. This practical exercise will also add to the volumes of work done on maintenance of solar installations.

Objectives of the Study

The main objective of this study was to achieve manpower development in maintenance of solar photovoltaic installations for sustainable power sufficiency in FCE (T) Omoku. Specifically, this study determines the extent to which:

1. learning by doing strategy enhances the achievement of manpower development in maintenance of solar photovoltaic installations for sustainable power sufficiency
2 Provision of real-life situation enhances achievement of manpower development in maintenance of solar photovoltaic installations for sustainable power sufficiency

3 Project method enhances the achievement of manpower development in maintenance of solar photovoltaic installations for sustainable power sufficiency

Research Question

The study was guided by the following research questions

1. to what extent does learning by doing strategy enhance the achievement of manpower development in maintenance of solar photovoltaic installations for sustainable power sufficiency?
2. to what extent does provision of real-life situation enhance the achievement of manpower development in maintenance of solar photovoltaic installations for sustainable power sufficiency?
3. To what extent does project method enhance the achievement of manpower development in maintenance of solar photovoltaic installations for sustainable power sufficiency?

Methodology

Since solar photovoltaic installations are logical combination of several electrical components, pragmatic instructional methodology was used to achieve the purpose of this study. The study was carried out in Federal College of Education (Technical), (FCE (T)) Omoku in Ogba/Egbeme/Ndoni Local Government Area (ONELGA) of Rivers State, Nigeria. The population of the study was a total of 60 subjects consisting of all the 55 final year students in the Department of Electrical Electronic in the 2021/2022 academic session and 5 electricians in Estate and Works Department of the college. The entire population was used for the study. The strategy adopted were learning by doing strategy, real life situation strategy and project method. The faulty and abandoned SPV installation at the office of the Deputy Provost, FCE (T) Omoku with energy capacity of 3.5KVA 48V was used for the study. On completion of the study, a 15-item questionnaire answerable on a 4- point scale of Very High Extent, (VHE- 4) High Extent (HE -3), Low Extent (LE -2) and Very Low Extent (VLE – 1) was administered on the subject for the purpose of determining the extent to which the objective of this study has been achieved. The instrument used was validated by three experts from Federal College of Education (Technical) Omoku. Cronbach Alpha reliability was used to determine the reliability coefficient of the instrument which yields 0.73 indicating that the instrument was reliable for this study. Data obtained were analyzed using

mean statistic and standard deviation. Item with mean value of 2.5 and above were rated as VHE while item values below 2.5 were rated as VLE.

Results

Research Question 1

to what extent does learning by doing strategy enhance the achievement of manpower development in maintenance of solar photovoltaic installations for sustainable power sufficiency?

Table 1: Mean ratings and standard deviation on the extent to which learning by doing strategy enhance the achievement of manpower development in maintenance of solar photovoltaic installations for sustainable power sufficiency

N=60

S/N	Items	Mean X	Std	Decision
1	Learning by doing strategy makes instruction interesting and memorable thereby facilitating acquisition of SPV maintenance skills thereby enhancing power sufficiency	2.93	1.15	VHE
2	Improves learners' performances which enhances manpower development in SPV maintenance for sustainable power	2.85	1.01	VHE
3	Learning by doing strategy enhances acquisition of innovative skills and competency in maintenance of SPV which results to manpower development	3.4	0.73	VHE
4	Enables students to acquire quality personal instruction which enhances manpower development in maintenance of SPV	3.00	1.01	VHE
5	Learning by doing strategy makes learning concrete and hence enhances achievement for manpower development in maintenance of SPV installation for sustainable power sufficiency	3.00	0.83	VHE
	Grand Mean	**3.04**		**VHE**

Table 1 showed that to a very high extent, respondents agreed to each item of the instrument as the mean score of the items is higher than 2.50. The overall mean of 3.04 showed that respondents agreed to a very high extent that learning by doing strategy enhance the achievement of manpower development in maintenance of solar photovoltaic installations for sustainable power sufficiency

Research Question 2

to what extent does provision of real-life situation enhance the achievement of manpower development in maintenance of solar photovoltaic installations for sustainable power sufficiency?

Table 2: Mean rating and standard deviation on the extent to which provision of real-life situation enhance the achievement of manpower development in maintenance of solar photovoltaic installations for sustainable power sufficiency

N=60

S/N	Items	Mean X	Std	Dec
6	Provision of real-life situation in maintenance of SPV installations increases motivation thereby resulting to manpower development in maintenance of SPV for power sufficiency	2.73	1.04	VHE
7	Real life situation approach to maintenance of SPV installations improves retention and hence facilitate manpower development in maintenance of SPV for power sufficiency	3.00	0.83	VHE
8	Real-life instructional approach fosters team spirit which improves performances that yield to manpower development in maintenance of SPV installations for power sufficiency	3.20	0. 94	VHE
9	Learning is concrete and facilitative resulting to manpower development in maintenance of SPV	2.14	1.04	VHE
10	Real-life approach enhances acquisition of practical skills which increases chances for manpower development in maintenance of SPV	2.29	1.04	VHE
	Grand Mean	**2.49**		**VHE**

Table 2 showed that the respondents to a very high extent agreed to each item of the instrument as the mean score of the items is higher than the cut-off point of 2.50. The overall mean of 2.49 showed that respondents agreed to a very high extent that provision of real-life situation enhance the achievement of manpower development in maintenance of solar photovoltaic installations for sustainable power sufficiency.

Research Question 3

To what extent does project method enhance the achievement of manpower development in maintenance of solar photovoltaic installations for sustainable power sufficiency?

Table 3: Mean ratings and standard deviation on the extent to which project method enhance the achievement of manpower development in maintenance of solar photovoltaic installations for sustainable power sufficiency

N=60

S/N	Items	Mean X	SD	Dec
11	Project method increase learners' participation in the learning process and this enhances skill acquisition and manpower development in maintenance of SPV installations.	2.73	1.04	VHE
12	Encourages retention which facilitates manpower development	3.00	0.83	VHE
13	It improves problem solving skills which enhances manpower development in maintenance of SPV installations	3.20	0. 94	VHE
14	Practical method in maintenance of SPV improves mastery of the needed skills and hence, facilitate manpower development in SPV maintenance for power sufficiency	2.74	1.04	VHE
15	Motivation to learn is enhanced and this facilitates the achievement of manpower development in maintenance of SPV	2.29	1.04	

Grand Mean	**2.79**	VHE

Table 3 showed that the respondents agreed to each item of the instrument as the mean score of the items is higher than 2.50. The overall mean of 2.79 showed that respondents agreed that project method to a very high extent enhance the achievement of manpower development in maintenance of solar photovoltaic installations for sustainable power sufficiency

Discussion of Findings

The result as analyzed showed that learning by doing strategy to a very high extent enhance the achievement of manpower development in maintenance of solar photovoltaic installations for sustainable power sufficiency. This finding is in line with that of Verma (2020) that education is not teaching or imparting knowledge but to encourage learning through self-effort and creative activity. Knowledge is not obtained from books but by actually doing things.

The finding further showed that that provision of real-life situation to a very high extent enhance the achievement of manpower development in maintenance of solar photovoltaic installations for sustainable power sufficiency. This finding agrees with that of Hammond (2013) that pragmatism is not a methodology but the logical stance of a pragmatic inquiry is to be action oriented – there is close link between pragmatism and action research.

The finding also showed that project method to a very high extent enhance the achievement of manpower development in maintenance of solar photovoltaic installations for sustainable power sufficiency. This finding corroborates that of Schenkelberg (2020) instructions such as discovery, experimentation and laboratory methods are key to acquisition of practical skills.

Conclusion

Based on the findings, it was concluded that learning by doing strategy, provision of real-life situation and project method to a very high extent enhance the achievement of manpower development in maintenance of solar photovoltaic installations for sustainable power sufficiency

Recommendations

Based on the findings of this study, the following recommendations were made:

1. Provision of opportunity for effective instructional experience based on learning by doing approach for achieving manpower development in maintenance of SPV be enhanced by the college, government and non-governmental organizations
2. Enhancement of manpower development in maintenance of solar photovoltaic installations by engaging learners in real life situation approach be encouraged by the college authority
3. Achieving of manpower development in maintenance of solar photovoltaic installations by engaging learners in project method be encouraged by the college authority

REFERENCES

Adeleye, J. O. (2017). Pragmatism and its implications on teaching and learning in Nigerian schools. *Research Highlights in Education and Science*. *1*(1): 1 – 6

Alio, A. N. (2008). *Fundamentals of educational technology*. Enugu: Samireen Nig.

Christ D. (2021). The 4 Principles of Pragmatism in Education. Retrieved from https://helpfulprofessor.com/pragmatism-in-education/

Elliot, J. (2019). Causes of equipment failure https://www.fiixsoftware.com/blog/5-causes-of-equipment-failure-and-what-you-can-do-to-prevent-it/

Eric K. (2019). Types of maintenance. https://www.roadtoreliability.com/types-of-maintenance

Hammond, M. (2013). The contribution of pragmatism to understanding educational action research: value and consequences. *Educational Action Research*, 21(4), 603-618.

Iloma & Amadike, (2015). *Electrical Installation Maintenance*. Port Harcourt: Disbel Publishers.

Ivayl, I. (2013). A pragmatic approach to social science. https://www.e-ir.info/2013/03/01/a-pragmatic-approach-to-social-science/

Mbaba, U. G. (2006). *Teaching strategies, students' characteristics and academic performance in Introductory Technology in Akwa Ibom State*. (Unpublished Ph.D. Thesis) University of Uyo, Uyo

Schenkelberg F, (2020). Failure. Retrieved from https://accendoreliability.com/types-of-failure-data/

Ofobruku, S. A. (2012). Hospitality and tourism manpower training and education in Nigeria. Afro Asian Journal of Social Sciences.;3(3.4):1-18.

Verma, D. (2020). 3 Main Methods of Teaching in Pragmatism. Retrieved from https://www.shareyouressays.com/knowledge/3-main-methods-of-teaching-in-pragmatism/116655