# THE USE OF INVERTER POWER CCTV IN MONITORING EXAMINATION


WRTTING BY

DIKE PRECIOUS CHIDINMA

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CERTIFICATION

This is to cer fy that this research work was carried out by DIKE PRECIOUS CHIDINMA with Matric No. ND/23/COM/PT/0081, and it has been

read and approved as meeting part of the requirements for the award of Na onal Diploma

(ND) in Computer Science, Ins tute Of Informa on and Communica on Technology, Kwara State Polytechnic, Ilorin.

_____ _____

DR. AGBOOLA F.S DATE
(Project Supervisor)

_____ _____

Mr. OYEDEPO F.S DATE
(Head if Department)

_____ _____

EXTERNAL

## DEDICATION

This Project is dedicated to Almighty God whose Supremacy in the knowledge of everything is absolute.

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## ABSTRACT

This project presents the design, installa on, and evalua on of an inverter powered analogue CCTV surveillance system to sustain con nuous monitoring during examina ons in se ngs prone to power interrup ons. Focusing on Lecture Room 28 at Kwara State Polytechnic, the study began with a needs assessment to iden fy power vulnerabili es and op mal camera placements. Key components analogue cameras, DVR, 600 VA 1.5 kVA inverter, 12 V 100 Ah ba ery, and RG59 cabling were selected and integrated following a structured workflow. System tests under simulated blackout scenarios demonstrated seamless switchover to backup power, uninterrupted video capture, and reliable recording quality. Feedback from invigilators and security personnel confirmed enhanced coverage and deterrence of malprac ce. The findings affirm that inverter-backed CCTV effec vely upholds examina on integrity in unstable-power environments and recommend rou ne maintenance, strategic placement reviews, and ins tu onal investment for broader deployment.

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# CHAPTER ONE

## INTRODUCTION

### 1.1 BACKGROUND TO THE STUDY

As the word continuously evolves and develops new technologies for the improvement of communities and individuals from all works of life, it is necessary to keep pace and adapt these innovations for the common good, creating a more comfortable and secure way of life.

Examination malpractice has become a significant issue in educational institutions, threatening the reliability and validity of academic evaluations. The increasing sophistication of cheating methods has rendered traditional invigilation techniques inadequate (Okafor, 2021). Consequently, schools and examination bodies have turned to technological solutions to reinforce the integrity of examinations.

One of the most effective innovations adopted in recent years is the use of ClosedCircuit Television (CCTV) systems during examinations. CCTV cameras offer continuous, real-time surveillance and act as a deterrent to dishonest practices (Chris Norman, 2023). Furthermore, the availability of video recordings enables post-examination investigations and accountability for both students and staff (Adewale & Musa, 2022).

The significant contribution of the internet to improving lives has been well documented with the integration of various technologies, new innovations has been increasingly relevant in today's generation.

One of such innovation has been emerged prominently over the years is the use of closed-circuit television (CCTV) cameras in communities, owing to their substantial contribution to community development.(Chris Norman 2023) However, the deployment of CCTV systems is not without challenges—chief among them is the issue of unreliable power supply, particularly in developing countries. Power outages during examinations can disrupt surveillance and create opportunities for malpractice (Nwachukwu, 2024). To overcome this, many

institutions have begun integrating inverter systems that store electricity and provide backup power during outages. Inverter-powered CCTV systems ensure uninterrupted monitoring, thereby enhancing the efficiency and reliability of examination supervision (Eze & Johnson, 2023).

Several techniques such as use of invigilators to monitor examination accrediting candidates for examination with photo albums from examination regulatory bodies, use of candidates identity cards or biometric machines have been made to salvage the situation in the past.

Through video surveillance system the behavior and activities of people can be monitored using electronic equipment such as close circuit television (CCTV)system. (Wiley 2020)

Installing video surveillance systems will help student focus on their studies and lectures more dedicated to their work and to checkmate insecurity in classes. These installation represent a huge amount of video to transit ,view and archive, making itimpossible for a human monitor to analyze all of those videos recording in order to detect suspicious behavior or events.

Over the past decade, activities of examination malpractice, lack of dedication of personnel to services they are to render, security of individuals and properties has been a global issues. Among the solutions proposed, video surveillance is one of the oldest and most widespread security technologies.( Asimobi Nnaemeka Daniel(2020).

Moreover, the shortage of invigilators and human limitations make it difficult to monitor every activity within examination halls effectively.

To address these challenges, institutions have started adopting Closed-Circuit Television (CCTV) surveillance systems to enhance transparency and accountability during exams. However, one major challenge in implementing these systems—especially in regions with unstable electricity supply—is the lack

of uninterrupted power. This has necessitated the integration of inverter-powered CCTV systems, which can operate independently of the national power grid.

Inverter-powered CCTV systems ensure continuous monitoring even during power outages, thereby providing a reliable solution for examination supervision. They help in detecting, deterring, and recording malpractice incidents, while also promoting discipline among students and staff. The integration of such technology not only boosts the integrity of the examination process but also reduces the workload on human invigilators.

The relevance of this research also lies in its potential for scalability and adaptability. The model of inverter-powered CCTV systems can be implemented in primary, secondary, and tertiary institutions, as well as in professional examination centers. With the increasing emphasis on remote and digital learning environments, the need for credible assessment processes continues to grow. This research thus provides a practical solution to an ongoing challenge and sets the stage for future innovations in educational monitoring systems.

The present study, therefore, aims to explore the design, development, and implementation of a CCTV system powered by an inverter, tailored specifically for use in monitoring examination environments. It investigates the technical components required, evaluates the system's performance under simulated and real conditions, and highlights the advantages and limitations of the proposed solution. By documenting and analyzing the process, this research seeks to contribute to the body of knowledge on examination integrity, power solutions in technology-driven systems, and the role of surveillance in academic settings.

## 1.2 STATEMENT OF THE PROBLEM

Examination malpractice remains a persistent issue in educational institutions, undermining the integrity of academic assessments. Despite efforts to curb this problem through human invigilation, the lack of sufficient personnel, human error, and lapses in attention often allow dishonest practices to go unnoticed. In regions with unstable electricity supply, the use of electronic surveillance systems like

CCTV is further limited due to frequent power outages. This has made it difficult to maintain continuous monitoring during examinations, thereby creating loopholes in the system. There is a need for a reliable, uninterrupted, and efficient method of monitoring examinations to ensure fairness, discipline, and security.

## 1.3 AIM AND OBJECTIVES

The aim of the study is to implement inverter-powered CCTV systems as a reliable method for monitoring examinations in order to curb malpractice and ensure academic integrity. The Objectives of the study are to i,Install the camera ii,connect the inverter to the battery

## 1.4. SCOPE OF THE STUDY

The study was implemented in department of computer science at Kwara state polytechnic in one of the classrooms at LR 28.

## 1.5. LIMITATION OF THE STUDY

This study faced several limitations that may have affected the depth and scope of its findings. One of the primary challenges was the limited availability of technical resources such as high-capacity inverters, durable batteries, and highdefinition CCTV cameras. These limitations influenced the quality and extent of the surveillance setup used during the study.

Another challenge was the dependence on technical expertise for the proper installation and maintenance of the system. The limited number of trained personnel available made it difficult to ensure a perfectly optimized and professional setup. Moreover, the inverter system's performance was influenced by battery storage capacity, which in some cases did not support extended periods of power outage.

Lastly the cost of the installation and maintenance of the system might be high.

## 1.6 SIGNIFICANCE OF THE STUDY

This study is significant as it addresses one of the pressing challenges in the educational sector—ensuring the credibility and integrity of examinations in environments with unreliable power supply. By examining the use of inverterpowered CCTV systems, the study aims to contribute to the development of sustainable and effective examination monitoring strategies.

## 1.7. ORGANISATION OF THE REPORT

This researched work is divided into five chapter as follows: -

Chapter one discusses the Background to the study, Statement of the problem aim and Objectives of the study, Methodology, Scope of the Study, Limitation of the Study,significance of the study,organization of the report,and Definition of terms.Chapter two focus on past researches (Review of related literature), Overview of the use of Inverter power CCTV in Monitoring
Examination. Chapter three focus on methodology . Chapter four emphasize on overall design of the research work. While the last chapter discuss the summary, conclusion of the research work and reference.

## 1.8. DEFINITIONS OF TERMS

CCTV(closed-circuit television) : refers to a system of video cameras that transmit signals to a specific, limited set of monitors . CCTV is used for surveillance and security purposes, allowing for real -time monitoring or recording of activities in a designated area.

INVERTER: refers to a device that converts direct current (DC) into alternating current (AC). This is particularly useful in applications where AC power is needed but only DC power is available. Such as batteries or solar panel.

Surveillance: the monitoring of behavior, activities or information for the purpose of ensuring security and preventing misconduct, typically using technological tools like CCTV cameras.

Power Outage: A temporary or prolonged loss of electrical power supply, often affecting the functionality of electronic devices like CCTV systems.

Backup Power Supply: An alternative energy source, such as an inverter or generator, that provides electricity during a power failure to ensure uninterrupted operation of systems.

Educational Institution: An establishment dedicated to education, such as a school, college, or university, where examinations and learning take place.

Monitoring System: A structured setup comprising hardware and/or software used to observe, record, and manage activities within a specific environment.

# CHAPTER TWO

## 2.1. LITERATURE REVIEW

Asimobi Nnaemeka Daniel (2020) monitoring is the regular observation and recording of activities taking place in a project or program. It is the process of routinely gathering information on all aspects of the projects.

Students and lecturers behavior is a problem that cannot be regarded as trivial. The problems of students behavior academically in the examination hall or during classes and lectures involving In malpractices.

Installing video surveillance system will help students focuses on their studies and lectures more dedicated to their work and to checkmate insecurity in class.

The purpose of the project is to achieve a secondary backbone monitoring system. It will checkmate security of staffs, students and properties.

According to Adebayo and Ojo (2018), the presence of CCTV cameras in examination halls significantly reduces the likelihood of cheating and other forms of misconduct. Their research shows that the psychological effect of being watched creates a deterrent for students who might otherwise engage in malpractice.

In a related study, Nwachukwu et al. (2019) explored the effectiveness of surveillance systems in Nigerian universities. The findings revealed that institutions that adopted video monitoring systems recorded a notable decline in examination irregularities and improved general discipline among students and staff.

A study by Musa and Ibrahim (2021) found that inverter-backed surveillance systems improved reliability in monitoring and enhanced overall security in schools, even in low-resource environments.

Moreover, technological advances in intelligent video analytics now allow surveillance systems to not only record footage but also detect unusual behavior and alert administrators in real time. This has further increased the usefulness of CCTV in education monitoring.

According to Alabi (2016), institutions that implemented video surveillance during examinations experienced a reduction in reported malpractice cases. CCTV was seen not only as a deterrent but also as a reliable source of evidence in disciplinary cases.

Similarly, a study by Onuka and Amoo (2017) revealed that the presence of surveillance cameras creates a psychological effect on students and staff, encouraging them to adhere to institutional rules and regulations.

A recent study by Bello et al. (2023) developed and tested an automated CCTV surveillance system powered by a solar-inverter hybrid for a university's examination center. Their system maintained 24/7 monitoring capability and recorded consistent footage across multiple examination sessions without any power-related disruptions. The study highlighted significant improvements in examination supervision and student behavior, supporting the case for scalable deployment in other academic institutions.

According to Oko & Adie (2016), the cries and hues being raised about exam cheating taking place at all levels of the Nigerian educational system are nothing more than a reflection of the deterioration in the value system of the society as a whole. Cheating is seen as a sign of intelligence in Nigerian culture, which leads to widespread acceptance of the practise.

The success story of an individual is not something that the society is interested in hearing about.

The accomplishment is the most essential

factor. In point of fact, Nigeria is one of those countries where the end justifies the means rather than the other way around. In point of fact, unethical behavior at examination is a form of the wrongdoing and corruption that exists in the society.

Eneh and eneh (2014),recommended that appropriate education technology (AET) should be mainstreamed into the education system inorder to foster an entrepreneurial drive and build entrepreneurial skills,in self-confidence in learners, and empower and position them to tap into the numerous business opportunities that are all around them, particularly based on the bountiful natural endowments in Nigeria. AET will cultivate functionality, marketability, self-employability, and job creation capacities among the school-leavers and graduates,thereby contributing to the alleviation of poverty and increasing self-reliance. A way of reducing or eliminating examination malpractice will have to do with watching or monitoring the examination process without actually interfering with the examination and a more convenient way is to use the CCTV system.

Adegbite and Hassan (2020) discussed how features such as motion detection and automated alerts facilitate real-time identification of suspicious activities, reducing reliance on human supervision.

While the deployment of CCTV surveillance in examination settings offers numerous benefits, it also raises ethical and privacy concerns. Udo and Okeke (2020) cautioned that constant monitoring could infringe on individuals' privacy rights, emphasizing the need for clear policies and guidelines to govern the use of surveillance technologies in educational institutions.

## CHAPTER THREE

METHODOLOGY

Analogue design was use in installations of the device Installing an inverterpowered analogue CCTV system involves integrating a CCTV surveillance setup with a power backup system (inverter + batteries), ensuring continuous operation even during power outages. This are the step-by-step guide tailored to analogue CCTV systems (e.g., using coaxial cables and DVRs):

3.2 Components Required

A. CCTV System (Analogue)

- CCTV cameras (BNC-type, typically 12V DC powered)
- DVR (Digital Video Recorder)
- BNC cables or RG59 coaxial + power cable
- Power supply adapter (12V DC)

Inverter Power Setup

- Inverter (sine wave, 600VA–1.5kVA depending on load)
- Battery (12V deep cycle battery – 100Ah recommended)

3.3 Estimate the Power Load

Calculate total power consumption:

| Device | Power (W) | Quantity | Total (W) |
|---|---|---|---|
| 2 analogue cameras | 5 | 2 | 20 |
| DVR 20–30 | 1 | | 30 |
| Monitor (LED) | 30 | 1 | 30 |
| Total | | | 80W |

Inverter Rating: Choose at least 300–600VA pure sine wave inverter.

Battery Sizing Example:

To run 80W for 6 hours:

→ 80W × 6h = 480Wh

→ 480Wh / 12V = 40Ah

→ Choose at least 100Ah battery for safety and longevity.

3.4 Step-by-Step Installation 1. Mount Batteries &

Inverter o In a ventilated, dry enclosure near your DVR

rack.

o Install a DC-rated fuse/breaker as close to the battery's positive terminal as possible.

2. Connect Batteries to Inverter o Run short, thick cables (e.g. 25 mm²)

from battery +/− to inverter +/−. o Observe correct polarity, secure

connections.

3. Powering the DVR o Plug DVR's 230 VAC input into one of the inverter's AC outlets or hardwire via a distribution board.

4. Powering Cameras o Connect the 12 VDC CCTV power supply's AC

input to the inverter as well.

o Run 12 VDC output to each camera (use appropriate gauge; 2.5 mm² for runs under 30 m).

5. Video Cabling o Run RG-59 coax from each camera's BNC video out to

the DVR's BNC inputs. o Secure and label cables.

6. Grounding & Surge Protection o Ground the battery negative, chassis of inverter, CCTV PSU, and DVR to a common earth rod. o Consider surge protectors on AC mains and coax lines.

7. Initial Power-Up & Testing o With no load, switch on inverter—verify 230 VAC output. o Power DVR and CCTV PSU—confirm they boot correctly. o Turn on each camera—check video feed on DVR.

o Simulate a grid failure (switch off solar/grid) and confirm continuous operation on battery/inverter.

3.5 Testing the System

- Turn off the main grid power to test backup.
- The inverter should seamlessly power the cameras, DVR, and monitor.
- Check camera feed and recording functionality.

3.6 Safety & Best Practices

- Use a fuse or circuit breaker between battery and inverter.
- Install in a ventilated, dry area.
- Use surge protectors to protect DVR and cameras.
- Periodically check battery voltage and inverter health.
- Use deep cycle batteries for longer backup life.

CHAPTER 4

SYSTEM IMPLEMENTATION AND TESTING

System implementation tools

System implementation tools are the hardware, software, and utilities used to install, configure, test, and deploy a system — such as a CCTV system, a computer network, or a software application.

To implement an analog CCTV surveillance system, you'll need a set of essential tools and components.

.Installation tools

These tools are used during the physical mounting and positioning of CCTV cameras and other hardware components

◦ Drilling machine: For creating wall or ceiling holes to install cameras and mounting brackets.

◦ Screwdrivers and Screws: For assembling and securing cameras and casing unit

◦ Cable cutters: are hand tools used to cut wires and cables cleaning and safely

FIG 4.1. BNC (bayonet Neil concelman).

BNC(bayonet Neil-concelman)connectors , commonly use for coaxial cable connectors.

It is widely used to connect analog security cameras to DVRs

FIG 4.2 BATTERY

Battery is commonly used for backup power systems, inverters, and vehicles like cars or solar energy storage systems.

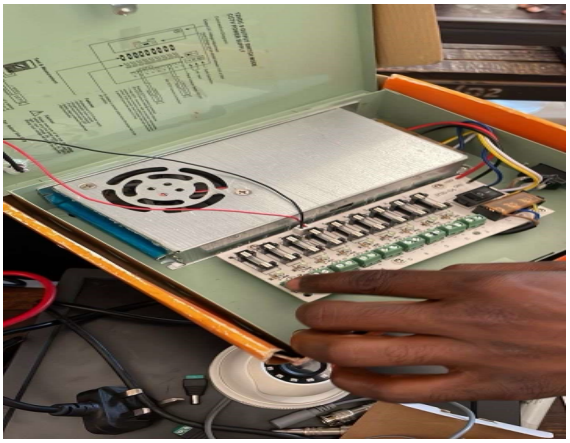

FIG 4.3. CCTV power supply box

CCTV POWER SUPPLY BOX.

A CCTV power supply box is a centralized device used to distribute electrical power to multiple CCTV cameras from a single location. It's essential for

installations where multiple cameras need consistent and organized power management.


FIG 4.4 DVR( digital video recorder)

DVR( digital video recorder)

A DVR (Digital Video Recorder) is the central component in an analog CCTV surveillance system. It records and stores video footage captured by analog security cameras, typically using BNC connectors for video in


FIG 4.5 INVERTER

INVERTER

An inverter is a critical component in a CCTV system where uninterrupted power supply is needed, especially during power outages. It converts DC (Direct Current) power from a battery into AC (Alternating Current) power used by most CCTV components, including the DVR, monitor, and sometimes the camera.outdoor CCT withstand external temperatures,

FIG 4.6

Installation of camera 1

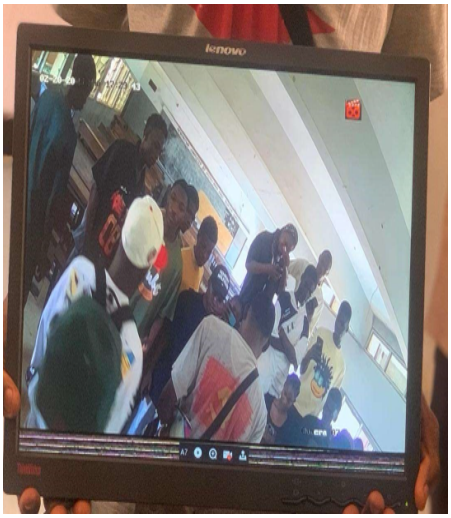


FIG 4.7 output installation of camera

FIG 4.8 installation of camera 2

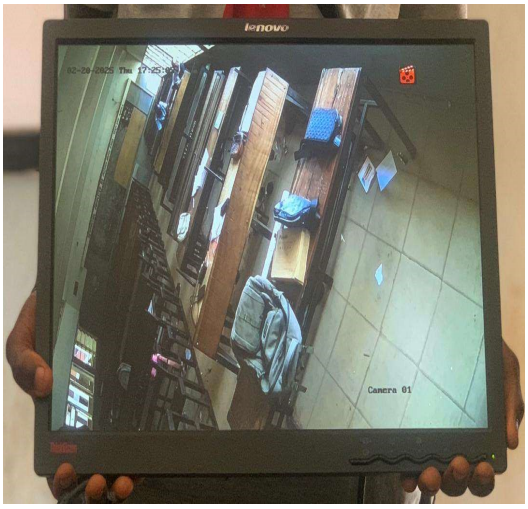


FIG 4.9 output of camera 2

# CHAPTER FIVE

## 5.1. SUMMARY

Examination malpractice continues to pose a serious threat to the credibility of academic institutions, especially in regions with limited access to reliable power supply. Traditional invigilation methods are no longer sufficient to deter or detect dishonest practices during examinations. The integration of technology, particularly Closed-Circuit Television (CCTV), has proven to be an effective solution for enhancing examination monitoring.

However, the efficiency of CCTV systems is often hindered by frequent power outages. This proposal explores the use of inverter-powered CCTV systems as a sustainable and effective approach to maintaining uninterrupted surveillance during examinations. The study aims to assess the impact, feasibility, and benefits of this technology in educational settings.

By focusing on inverter-powered CCTV systems, the study provides valuable insights for school administrators, policymakers, and technology providers. The findings will help improve examination integrity and inform the development of smarter, more secure examination environments.

## 5.2. CONCLUSIONS

The use of inverter-powered CCTV systems in examination monitoring emerges as a practical and innovative solution to the persistent challenges of ensuring security and academic honesty in educational institutions. Given the background of unreliable electricity in many developing regions, the need for an uninterrupted surveillance system becomes not only relevant but essential. Traditional CCTV systems, though effective in monitoring, become vulnerable during power outages—potentially leaving critical moments unmonitored and opening opportunities for examination malpractice.

By integrating an inverter as a backup power source, educational institutions can guarantee that surveillance continues seamlessly, regardless of power disruptions. This not only enhances the reliability of the system but also reinforces the institution's commitment to transparent and fair examination practices. The technology ensures that invigilators and administrators have real-time access to events in the examination environment and can review footage retrospectively when needed.

Furthermore, the presence of a consistent and dependable surveillance system acts as a deterrent to students who may otherwise attempt to engage in dishonest practices. The recorded evidence can also serve as an impartial tool for resolving disputes or allegations of misconduct.

While the initial installation costs and technical requirements may pose some limitations, the long-term benefits—such as reduced malpractice, improved institutional reputation, and enhanced examination integrity—make inverterpowered CCTV systems a valuable investment. In conclusion, the integration of this technology reflects a forward-thinking approach to academic supervision, especially in contexts where power supply is not guaranteed.

## 5.3. RECOMMENDATIONS

Based on the anticipated findings and the significance of inverter-powered CCTV systems in securing examination environments, the following recommendations are proposed:

1.Adoption of Inverter-Powered CCTV Systems: Educational institutions, especially those in regions with unreliable electricity, should adopt invertersupported CCTV systems to ensure continuous surveillance during examinations.

2. Government and Stakeholder Support: Ministries of Education and relevant stakeholders should provide financial and technical support to schools for the installation and maintenance of inverter-CCTV systems.

3. Training and Capacity Building: Staff and ICT personnel should be trained on the operation, maintenance, and troubleshooting of inverter and CCTV systems to maximize their effectiveness.

4. Development of Monitoring Policies: Institutions should establish clear policies and guidelines for the ethical and secure use of surveillance systems during examinations to protect privacy while ensuring transparency.

5. Pilot Programs in Rural Areas: A pilot implementation of inverter-powered CCTV systems should be carried out in rural and underserved areas to assess performance and scalability before broader adoption.

6. Regular Evaluation and Maintenance: Schools should conduct regular assessments of their surveillance infrastructure and ensure timely maintenance of both inverter and CCTV components to prevent system failures during examinations.

## REFERENCE


Okafor, A. (2021). Introduction to examination malpractice.

Adewale & musa. (2022). The effective of CCTV camera in examination malpractice.

Chris, .N. (2023). The impact of CCTV on community development and security.

Nwachukwu. (2024). Evaluating the effectiveness of video surveillance systems.

Eze&johnson .(2023). Effectiveness of examination supervision.

Wiley. (2020). Surveillance systems and behavioral monitoring in educational institutions.

Asimobi,N.D.(2020). Monitoring and evaluation in education.

Adebayo & ojo.(2018). Effectiveness of CCTV camera in curbing examination malpractice in higher institutions.

Nwachukwu. et al.(2019). Evaluating the effectiveness of video surveillance systems in curbing examination malpractice in Nigeria.

Musa & Ibrahim.(2021). Enhancing school security through inverter-backed surveillance systems in monitoring security in schools.

Alabi. (2016). Surveillance technology and examination ethics in tertiary institutions.

Onuka & Amoo. (2017). The psychological impact of surveillance technology on academic behavior.

Bello et al.(2023). Development of a solar-inverter hybrid CCTV surveillance system for examination centers.

Eneh & eneh. (2014). Recommend that appropriate education technology should be mainstreamed into the examination system.

Adegbite & Hassan.(2020). Discussed how features such as motion detection and automated alerts facilitate in real time.

Udo & okeke. (2020). Cautioned that constant monitoring could infringe on individual privacy.