Mediterranean Journal of Basic and Applied Sciences (MJBAS)
Volume 10, Issue 1, Pages 183-201, January-March 2026

Integrating IoT and Mobile Technologies for Real-Time Incident Reporting and Alcohol Detection in Campus Environments

Janice Ruiz-Ocampo[1], Ginbert A. Fernandez[2], Ella Marie T. Jamero[3], JM C. Ruiz[4], Jhovanie C. Lumontod[5] & Aires M. Tumilid[6*]

[1-6]*Department of Information Technology, University of Science and Technology of Southern Philippines – Oroquieta, Oroquieta City, Misamis Occidental, Philippines. Corresponding Author Email: tumilidaires9@gmail.com**

DOI: https://doi.org/10.46382/mjbas.2026.10111

Article Received: 02 January 2026 Article Accepted: 25 February 2026 Article Published: 02 March 2026

ABSTRACT

Campus safety remains a paramount concern for higher education institutions, yet many Philippine campuses still rely on manual incident reporting, which often leads to delayed responses and underreporting. This study developed CampusSafe, a unified mobile and web-based system integrated with Internet of Things (IoT) technology, to enhance safety at the University of Science and Technology of Southern Philippines (USTP) Oroquieta. Using the Agile Model for development, the researchers created a system featuring real-time incident reporting, secure multi-factor authentication, and an IoT-integrated alcohol detection device powered by an ESP32 microcontroller and MQ-3 sensor. The system operates in both online (Wi-Fi) and offline (Bluetooth) modes, ensuring continuous monitoring even with limited connectivity. Evaluation results from campus stakeholders demonstrated high performance across three key metrics: Functionality (mean = 4.97), Usability (mean = 4.91), and Effectivity (mean = 4.92). The findings confirmed that the system accurately detects alcohol, delivers immediate notifications, and streamlines the administrative workload of security personnel. By shifting from manual processes to an automated digital platform, CampusSafe provides a proactive approach to managing security threats and substance-related risks. The study concludes that the integration of IoT and mobile technologies significantly improves response times and fosters a safer learning environment.

Keywords: Campus Safety; Alcohol Detection; Real-Time Reporting; Mobile Application; ESP32 Microcontroller; Incident Management; Agile Methodology; MQ-3 Sensor; Emergency Response.

1. Introduction

Campus safety is a critical concern in higher education institutions, driven by ongoing threats such as violence, unauthorized access, and substance-related incidents including alcohol consumption within school premises. Despite established security protocols, educational campuses globally, including the University of Science and Technology of Southern Philippines (USTP) Oroquieta, continue to experience challenges related to delayed incident responses, underreporting, and the presence of intoxicated individuals (Kohli et al., 2023; Kim et al., 2023). Traditional methods such as manual incident reporting and basic surveillance are often reactive and inefficient, resulting in security gaps that affect student well-being and learning environments (Dubey, 2024; DePalma, 2024).

The United Nations' Sustainable Development Goal 11, Target 11.7, emphasizes the necessity for safe, inclusive, and accessible spaces for all, especially vulnerable groups such as students.

To address these issues, recent advancements have seen the integration of digital technologies, including mobile applications, real-time data transmission, and Internet of Things (IoT) devices, in campus safety systems (Anderson et al., 2024; Dawson & Lee, 2022). IoT (Internet of Things) refers to a network of interconnected devices that collect and exchange data for enhanced automation and monitoring. Mobile-based emergency applications have been shown to significantly reduce response times and improve incident reporting (Kim et al., 2023; Caliston & Tabia, 2021). IoT integration, particularly with sensors for environmental monitoring and security automation, enables real-time detection of threats and enhances proactive campus security measures

(Hernandez & Santos, 2024; Moghayedi et al., 2024). However, the use of IoT for alcohol detection within educational institutions remains limited, representing a significant gap in campus safety management.

Globally, universities have implemented mobile and IoT-enabled systems to advance campus safety. In the United States, applications such as PSU Alert and RAVE Guardian provide real-time reporting, emergency response tools, and location-sharing features, resulting in improved incident management and user engagement (Greer, 2023; Temple University Information Technology, 2021). Similarly, IoT-based alcohol detection systems are increasingly adopted in vehicles and public venues in countries like Japan and South Korea, demonstrating the effectiveness of real-time intoxication monitoring (Lee & Tanaka, 2023; Hernandez & Santos, 2024). However, the integration of these technologies in Philippine campuses is still emerging, with manual processes and underreporting remaining prevalent challenges (Nolasco, 2022). There is a growing need for comprehensive, technology-driven solutions tailored to the Philippine education sector's unique environment and resource constraints.

Despite the availability of digital and IoT solutions in other contexts, many Philippine campuses including USTP Oroquieta continue to rely on manual incident reporting, leading to delayed responses and undetected alcohol-related risks (Nolasco, 2022). A recent study by Kim et al. (2023) highlighted that the lack of integrated real-time monitoring systems contributes to ongoing safety concerns and underreporting. Therefore, this research aims to develop CampusSafe, a mobile and web-based incident reporting system with IoT-integrated alcohol detection, to address these challenges by enabling real-time reporting, automated threat detection, and proactive campus safety management.

1.1 Study Objectives

(i) General Objective

To create CampusSafe, a mobile and web-based reporting system with IoT- based alcohol detection to improve campus security and response times.

(ii) Specific Objectives

(a) to develop an easy-to-use platform for students, teachers, and staff to report incidents, (b) to improve security response time providing real-time data and notifications, and (c) to Include an IoT-based alcohol detection system to help security staff check students entering the campus.

2. Literature Review

Recent studies on campus safety have emphasized the integration of digital and IoT-based solutions to address critical security challenges. According to the study of Kim et al. (2023), mobile-based emergency systems significantly reduce response times in university settings, a finding supported by Caliston and Tabia (2021), who highlighted the positive impact of mobile apps on emergency reporting speed. Furthermore, Anderson et al. (2024) demonstrated that AI-based smart surveillance systems enable real-time threat detection, while Dawson and Lee (2022) found that IoT monitoring devices enhance campus monitoring capabilities. However, these systems often exhibit limitations, such as the lack of IoT integration in mobile platforms (Kim et al., 2023), high deployment costs of AI surveillance (Anderson et al., 2024), and lingering privacy concerns associated with IoT data collection (Dawson & Lee, 2022). Besides, Simmons (2024) and Roberts and Kim (2023) emphasized the need for secure yet user-friendly access control, indicating usability as a persistent challenge.

Moreover, various technologies for alcohol detection have emerged, including IoT-integrated breathalyzer sensors (Hernandez & Santos, 2024) and vehicle-based intoxication prevention systems (Lee & Tanaka, 2023), which have proven effective in real-time monitoring and accident prevention. Yet, these studies are often limited to vehicular or public venue applications and lack adaptation for campus environments. Additionally, as reported by Greer (2023) and Choi et al. (2022), mobile safety apps like RAVE Guardian provide effective communication and emergency features but do not include proactive alcohol risk management or campus-specific detection mechanisms. This is echoed by Min et al. (2019b), who explored personal breathalyzer use for responsible drinking but did not extend their findings to campus-wide application. Meanwhile, Moghayedi et al. (2024) discussed the benefits of community-based technological management for university safety but highlighted the limited automation in incident logging.

Henceforth, the literature reveals significant gaps, particularly the lack of a unified, campus-specific system that combines real-time incident reporting, IoT-integrated alcohol detection, and secure, user-friendly authentication. Many existing platforms are either not tailored to campus needs (Lee & Tanaka, 2023; Hernandez & Santos, 2024), lack integrated IoT features (Kim et al., 2023; Greer, 2023), or present usability and privacy issues (Simmons, 2024; Dawson & Lee, 2022). Therefore, this study proposes the design and implementation of CampusSafe a mobile and web-based incident reporting system with IoT-enabled alcohol detection, real-time notifications, and multi-factor authentication to bridge these gaps by ensuring comprehensive, automated, and secure campus safety management.

Table 1. A literature map summarizing the strengths and weaknesses of various technologies and models applied to campus safety and incident reporting. It also provides the proposed solutions that the CampusSafe system aims to implement to overcome these identified gaps.

Author(s) & Year	**Model/ Technology/ Algorithm**	**Strengths**	**Weaknesses**	**Research Gap/ Problem**
Kim et al., 2023	Mobile-based emergency systems	Reduces response times	Lacks IoT integration	Limited IoT in campus safety apps
Anderson et al., 2024	AI-based smart surveillance	Real-time threat detection	High deployment cost	Cost-effective integration needed
Dawson & Lee, 2022	IoT monitoring devices	Enhanced campus monitoring	Data privacy concerns	Privacy protection in IoT
Hernandez & Santos, 2024	IoT breathalyzer sensors	Real-time alcohol detection	Not campus-specific	Campus-tailored IoT alcohol detection

Mediterranean Journal of Basic and Applied Sciences (MJBAS)
Volume 10, Issue 1, Pages 183-201, January-March 2026

Moghayedi et al., 2024	Community-based tech management	Improved safety	Limited automation	Automated incident logging
Greer, 2023	RAVE Guardian app	Effective real-time communication	No IoT alcohol detection	Proactive alcohol risk management
Caliston & Tabia, 2021	Mobile emergency apps	Improves reporting speed	Network dependency	Offline/online hybrid needed
Lee & Tanaka, 2023	Vehicle IoT alcohol detection	Accurate intoxication prevention	Not adaptable to campus	Adaptable campus integration
Simmons, 2024	Biometric authentication	Secure data protection	Usability issues	User-friendly data security
Roberts & Kim, 2023	Biometric security systems	Prevents unauthorized entry	Hardware intensive	Lightweight solutions
Nolasco, 2022	Campus perception study	Highlights reporting gaps	No technical solution proposed	Tech-driven incident reporting
Carter & Wilson, 2023	Structured response plans	Reduces incident escalation	Not widely adopted	Adoption barriers
Choi et al., 2022	Emergency buttons in apps	Enhances perceived safety	Limited scope	Broader functionality in apps
Campbell et al., 2022	Campus safety perceptions	Identifies student trust factors	Lack of IoT considerations	IoT impact on trust and safety
Min et al., 2019b	Personal smart breathalyzer (IoT)	Encourages responsible drinking	No campus integration	Unified system for campus events

3. Methodology

The CampusSafe project is classified as Developmental Research (also referred to as System Development Research) within the field of Information Technology. This research approach centers on the creation and implementation of a novel technological solution specifically, the CampusSafe real-time incident reporting application with IoT-integrated alcohol detection to address the persistent challenges of delayed incident response, underreporting, and undetected alcohol consumption on campus at the University of Science and Technology of Southern Philippines, Oroquieta City. As an applied research initiative, CampusSafe employs a structured methodology, specifically the Agile Model, to iteratively design, develop, test, and evaluate the system in a real-world academic environment. This process integrates engineering principles with practical campus safety needs to produce a robust, user-centered, and scalable incident reporting and monitoring system that leverages both mobile/web platforms and IoT technologies.

Mediterranean Journal of Basic and Applied Sciences (MJBAS)
Volume 10, Issue 1, Pages 183-201, January-March 2026

Agile Model

Upon successful completion of the testing phase, the CampusSafe system was officially deployed and made operational on the University of Science and Technology of Southern Philippines (USTP) Oroquieta campus. This process involved installing the application on secure cloud servers, making both the mobile app and web-based admin dashboard accessible to all intended users via the campus network and internet. The roll-out prioritized onboarding for students, faculty, staff, and campus security personnel, who were given training and support materials to ensure smooth adoption. With deployment, CampusSafe became the primary platform for incident reporting, real-time notifications, and IoT-based alcohol detection, marking a significant advancement in campus safety management and proactive response to security concerns.

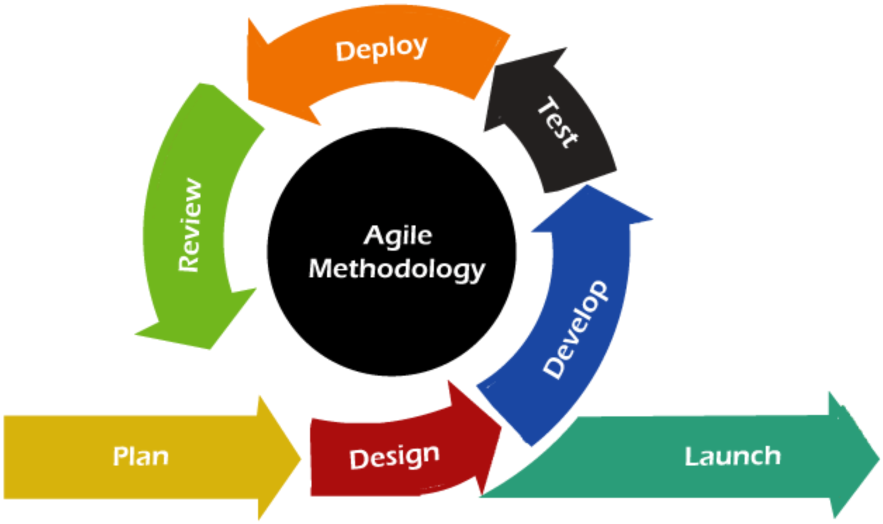

Figure 1. The Agile Model as Applied in CampusSafe System Development: An iterative approach illustrating requirement analysis, design, implementation, testing, deployment, and maintenance for continuous improvement in campus safety applications.

Requirement Acquisition and Analysis

This initial phase focused on identifying and documenting the core problems and required functionalities for the CampusSafe system. The main challenges included delayed incident response, underreporting, and undetected alcohol consumption on campus. Data was collected through stakeholder interviews, surveys with students, faculty, and campus security, and an analysis of existing safety protocols at USTP Oroquieta. Key requirements established were seamless incident reporting, IoT-based alcohol detection at campus entry points, real-time notifications, and secure, multi-factor user authentication. These insights shaped the system's primary objective: to provide a unified, real-time platform for campus safety management and reporting.

System Design

During the design phase, the team created a comprehensive blueprint for the CampusSafe system, drawing from the gathered requirements. Architectural and process models were developed using Data Flow Diagrams (DFDs) to visualize how reports, notifications, and sensor data would flow through the system. Entity Relationship

Diagrams (ERDs) defined the structure and relationships within the database, including users, incidents, and detection logs. Use Case Diagrams and flowcharts were also produced to map out user interactions for students, staff, security personnel, and administrators. This phase ensured that all modules and data transactions were clearly defined before development.

Implementation

The implementation phase involved translating the design into a functional system using the Agile methodology's iterative "sprints." Each sprint focused on developing key features such as QR-based registration, incident reporting, IoT device integration, and real-time notification delivery. The development stack included Flutter and Dart for the mobile and web applications, Firebase Firestore for real-time database management and authentication, and Arduino IDE for programming the ESP32 microcontroller connected to the MQ-3 alcohol sensor. Modular coding practices allowed for rapid prototyping and incremental improvements based on immediate feedback.

Testing

Testing was a continuous and integral part of the Agile lifecycle. After each sprint, new features were subjected to rigorous testing procedures: Unit Testing for individual components (e.g., QR scanner, alcohol detection), Integration Testing for interaction between modules (e.g., IoT device and mobile app sync), and System Testing for overall functionality and user experience. Pilot testing was conducted on the USTP Oroquieta campus, where real users participated in simulated incident reporting and alcohol detection scenarios. Issues were logged and promptly addressed in subsequent development cycles.

Deployment and Roll Out

Upon successful completion of testing, the CampusSafe system was deployed in a controlled, real-world environment at USTP Oroquieta. The system was made accessible via the official campus network, with the mobile app available for download and the web admin dashboard activated for campus safety staff. Rollout included user training sessions and orientation for students, faculty, and security, ensuring a smooth transition from manual to digital reporting and monitoring.

Maintenance and Upgrades

After deployment, the project entered the maintenance phase, which is ongoing within the Agile framework. Continuous monitoring was implemented to identify and resolve bugs, security vulnerabilities, and performance issues. Regular updates and feature enhancements were released based on user feedback and evolving campus safety requirements. This phase also ensured the system's scalability and adaptability for future integration with new technologies or additional campus sites.

Evaluation

The final phase involved evaluating the effectiveness of CampusSafe in achieving its objectives. Key performance indicators included user adoption rates, incident response times, detection accuracy, notification delivery speed, and user satisfaction levels (measured via post-deployment surveys and feedback forms). The evaluation confirmed that CampusSafe provided a significant improvement over previous manual processes, demonstrating enhanced safety, accountability, and proactive incident management on campus.

System Architecture

Figure 2 illustrates the layered architecture of the CampusSafe system, demonstrating key implications for system reliability, security, and usability through clear separation of concerns between frontend, backend, and data storage layers. The CampusSafe Mobile and Web Application features a frontend UI accessed by Campus Community and Campus Security Administrators, communicating through an API Gateway for secure access control. The backend includes Firebase Backend Services, Notification and Alert Service, Data Analytics Service, Report Generation Service, Report Service, and QR-based Registration Service, all storing data in a centralized database for consistency and reliability. The Smart Breathalyzer Device frontend, used by Campus Security Admin and Personnel, connects via API Gateway to specialized backend services including Alcohol Gas Sensor Service, Notification Service, Real-time Data Transmission Service, Secure Data Service, and Blood Alcohol Content Detection Service. This architecture ensures accurate alcohol detection, immediate alert delivery, secure data handling, and reliable data storage, supporting comprehensive campus safety operations through modular design and centralized data management.

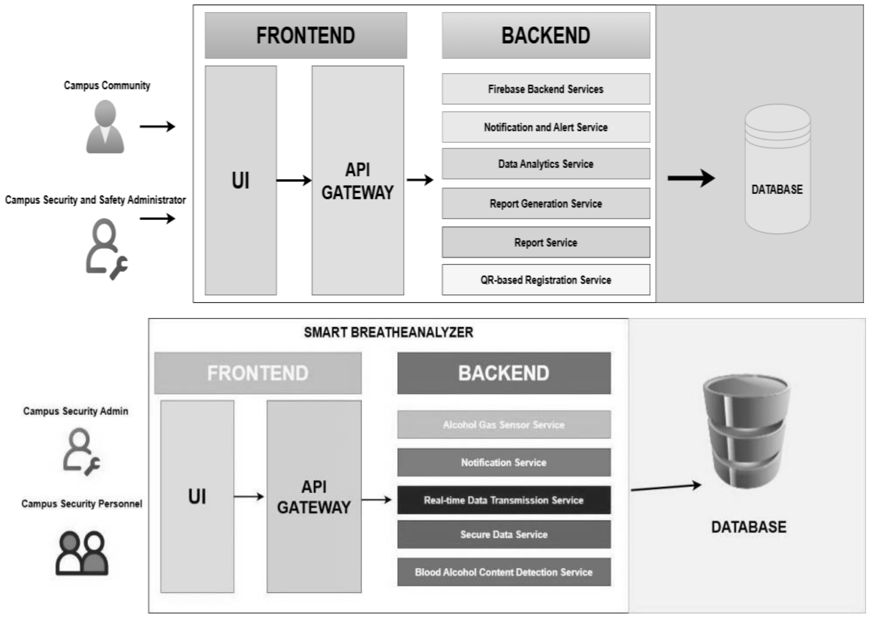

Figure 2. Layered System Architecture of CampusSafe: Demonstrates the separation of concerns, data flow from frontend user interfaces to backend services, and integration with IoT devices for secure, reliable, and scalable campus safety operations.

Entity Relationship Diagram

Figure 3 illustrates the Firebase Firestore database schema of the CampusSafe system, demonstrating key implications for system reliability, security, and usability. The diagram presents a comprehensive NoSQL document- oriented data model that ensures data integrity and enables granular access control for security. The

Mediterranean Journal of Basic and Applied Sciences (MJBAS)
Volume 10, Issue 1, Pages 183-201, January-March 2026

schema organizes data into ten distinct collections, each containing documents with unique identifiers. This document-based approach provides flexibility in data structure while maintaining clear separation of concerns. The system tracks user activities through the users collection, manages incident reports via reports to campus security and incidents collections, and handles alcohol detection data through the dedicated alcohol detection data collection, demonstrating reliability in maintaining comprehensive records. The structured notification system includes multiple specialized collections (report notifications for users, notification to admin, announcements, and notification from breatheanalyzer) that enable effective communication between campus community members and security personnel, enhancing usability and response times. The alcohol detection data collection, with its detection Id documents, includes critical fields such as BAC readings, timestamps, and individual identification, ensuring accurate and traceable records for campus safety compliance. The collection-based organization demonstrates the system's scalability in handling multiple users, reports, and detection events while maintaining data consistency at the document level. Each document serves as an atomic unit, allowing for flexible data modeling and efficient querying while supporting Firebase's built-in security rules for role-based access control across different collections.

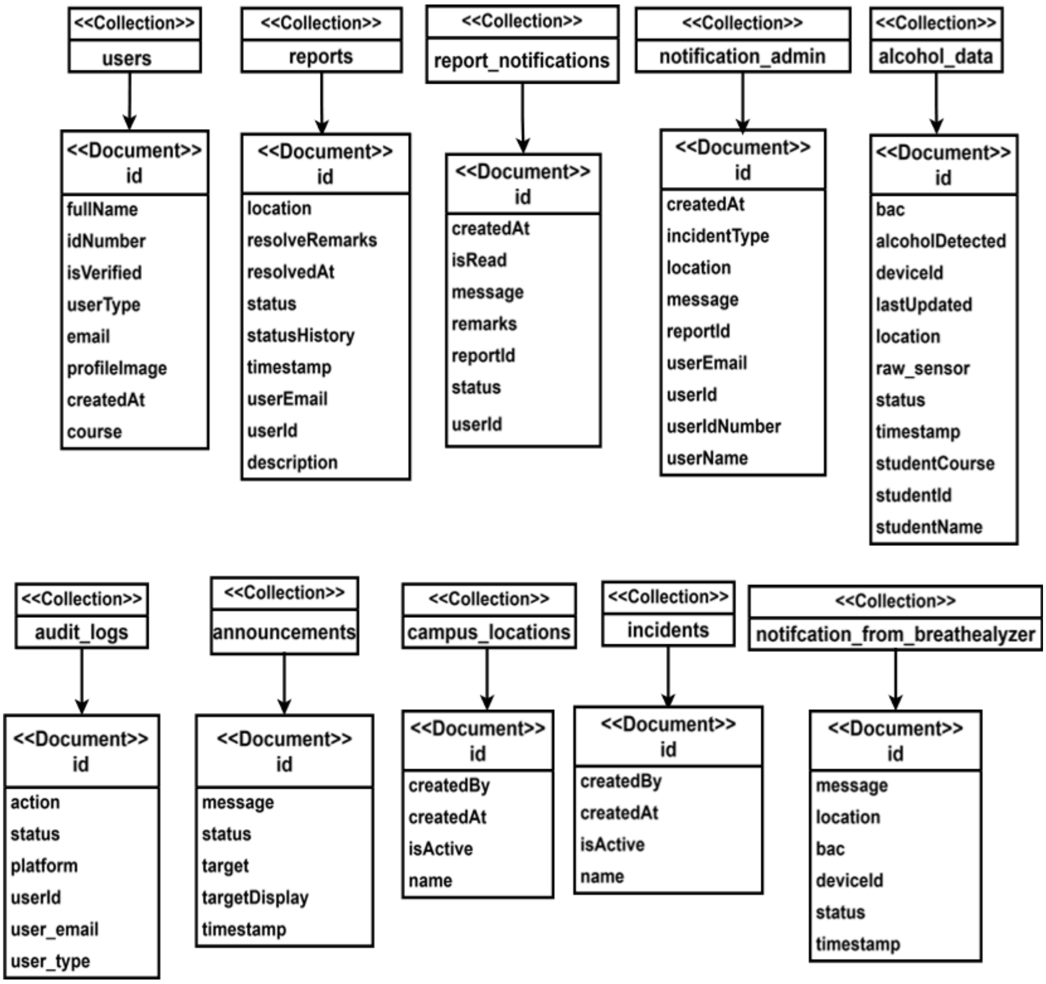

Figure 3. CampusSafe Firebase Firestore Database Schema: A NoSQL, document-oriented data model supporting secure, scalable, and flexible information management for users, incidents, notifications, and alcohol detection events.

Mediterranean Journal of Basic and Applied Sciences (MJBAS)
Volume 10, Issue 1, Pages 183-201, January-March 2026

Context Diagram

Figure 4 represents the overall structure of the CampusSafe system and how it connects different components to promote safety within the campus. It shows the interaction between the Campus Security Admin, Smart Breathalyzer, Campus Security Personnel, and the Campus Community. The figure demonstrates the system's reliability by showing a continuous flow of information between users and the device, ensuring that reports and alcohol detection data are updated accurately and on time. It also reflects security, as data are managed in a central system where only authorized users can access sensitive information. In addition, the figure highlights usability through its clear and simple communication flow, allowing both administrators and community members to use the system easily. Overall, this diagram illustrates how CampusSafe supports a safe, efficient, and well-coordinated campus environment.

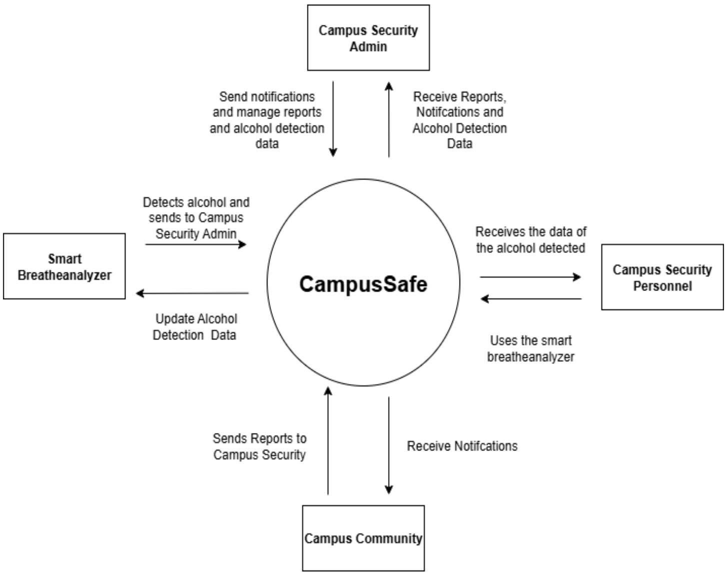

Figure 4. Context Diagram of CampusSafe System: Illustrates the interaction between campus security administrators, personnel, community members, and the smart breathalyzer device for coordinated campus safety operations.

Alcohol Breatheanalyzer Device Prototype Illustration

Figure 5 illustrates a conceptual prototype of an Alcohol Breath Analyzer Device, demonstrating a comprehensive approach to system reliability, security, and usability. The device features an OLED screen for real-time BAC readings and operational feedback, ensuring clear user communication and system transparency. An MQ3 sensor serves as the core detection component, providing accurate alcohol vapor measurement critical for reliable safety assessments. An RGB LED and buzzer system deliver intuitive visual and audible alerts, enhancing usability through immediate status indication and critical event notification. The breath input tube, paired with a disposable straw, ensures hygienic and consistent sample collection, minimizing contamination and promoting safe usage. The integrated feedback mechanisms support automated operation without manual intervention. This design prioritizes data accuracy for security compliance, user-friendly interaction for enhanced usability, and robust sensing capabilities for system reliability in campus safety applications.

Mediterranean Journal of Basic and Applied Sciences (MJBAS)
Volume 10, Issue 1, Pages 183-201, January-March 2026

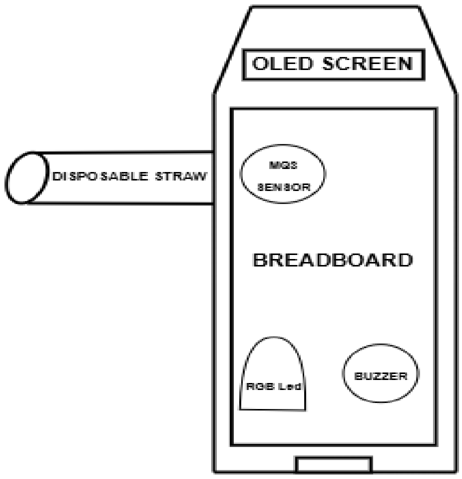

Figure 5. Conceptual Prototype of Alcohol Breathalyzer Device: Features include an OLED display, MQ-3 sensor, RGB LED, buzzer, and disposable breath tube for hygienic and real-time alcohol detection at campus access points.

Schematic Diagram

Figure 6 illustrates the schematic diagram of the system's hardware components integrated with the ESP32 microcontroller, highlighting its reliability, usability, and security. The MQ-3 gas sensor is interfaced with the ESP32 through analog input (pin 34) and digital output (pin 35) using a stable 5V supply, ensuring reliable alcohol detection and digital threshold monitoring. Multiple ground connections enhance signal stability and accuracy. For usability, an OLED display connected via I2C (pins 21 and 22) provides real-time data visualization, while an RGB LED (pins 25, 26, 27) and a buzzer (pin 5) deliver clear visual and auditory alerts. The ESP32 microcontroller serves as the central unit, managing all sensor inputs, display functions, and alert mechanisms to maintain secure and dependable system performance.

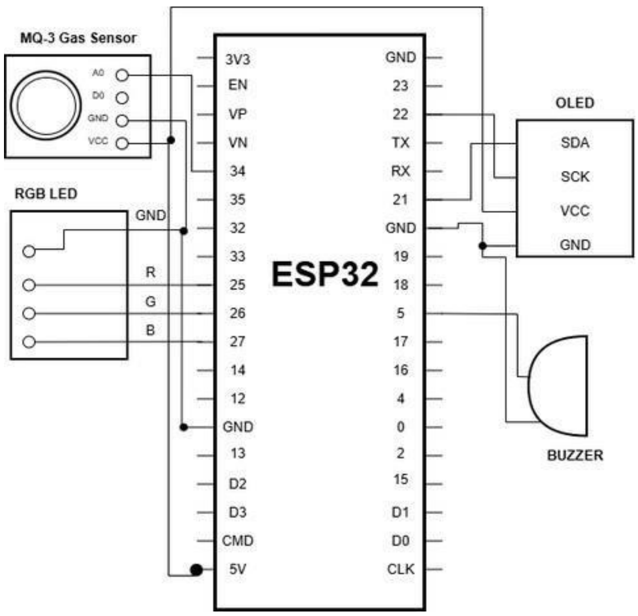

Figure 6. Schematic Diagram of ESP32-based Alcohol Detection Device: Shows integration of MQ-3 gas sensor, OLED display, RGB LED, and buzzer with pin assignments for reliable, accurate, and user-friendly operation.

MJBAS PROMOTING RESEARCH & KNOWLEDGE

Mediterranean Journal of Basic and Applied Sciences (MJBAS)
Volume 10, Issue 1, Pages 183-201, January-March 2026

Blood Alcohol Content Percentage Calculation

Figure 7 presents the methodological framework for estimating Blood Alcohol Content (BAC) with the MQ-3 gas sensor. The sensor reacts to alcohol vapor via resistance changes; it does not directly measure BAC. Voltage is converted to sensor resistance (Rs), normalized by clean-air baseline (Ro) to compute Rs/Ro. This ratio can be used with a calibrated log-linear model from the MQ-3 ethanol sensitivity curve to estimate alcohol vapor concentration (PPM), then converted to BAC (g/dL) using standard conversions.

In this study, detection uses the digital output (DO): LOW sets BAC to 0.05 g/dL; HIGH sets BAC to 0.00 g/dL. The analog pipeline remains available for future use. This approach supports cost-effective campus entry screening to flag potential impairment; 0.05% and 0.08% are common legal BAC limits. Results are detection-based estimates for academic purposes, with disclosure that legal determinations require certified medical equipment. The method combines sensor calibration with decision logic to provide a simple binary alcohol screen integrated into the campus access control system.

```
IF DO == LOW (alcohol detected):
BAC = 0.05 g/dL
ELSE (no alcohol):
BAC = calculateBAC(sensor_value)  // Compute from
analog input
END IF
```

Figure 7. Methodological Framework for BAC Estimation Using MQ-3 Sensor: Outlines sensor calibration, digital and analog data processing, and conversion to BAC estimates for campus screening purposes.

4. Results and Discussion

The system consisted of a mobile and web application integrated with an IoT- based alcohol detection device powered by an ESP32 microcontroller. The device operates in both Bluetooth (offline mode) and Wi-Fi (online mode) connections.

When alcohol is detected through the MQ3 sensor, the data is transmitted to the campus security mobile application. In offline mode, the device sends the detection data to the mobile app via Bluetooth, which then notifies the administrator through the web application.

In online mode, the data and notifications are automatically sent to the administrator, and security personnel verify incidents by scanning the user's ID QR code. Additionally, users can directly report incidents through the mobile application. The system synchronizes data across all devices, ensuring real- time monitoring and efficient, automated campus safety management.

System Functionality

Table 2 shows that the system works very well in doing its main tasks. It can detect alcohol accurately, send real-time notifications, and handle registration and reporting properly. The high ratings, with an overall mean of 4.97, mean that users strongly agree that the system is reliable and performs all functions correctly.

Mediterranean Journal of Basic and Applied Sciences (MJBAS)
Volume 10, Issue 1, Pages 183-201, January-March 2026

Table 2. System Functionality Evaluation: User ratings for incident detection, notification delivery, registration, and dashboard information accuracy, indicating strong agreement with system reliability and performance.

Question	**Mean**	**Description**
The system accurately detects and reports incidents.	4.96	Strongly Agree
Notifications are delivered in real time.	4.97	Strongly Agree
The QR-Based registration and login process works correctly.	5.00	Strongly Agree
The system displays complete and reliable information in the dashboard or reports.	4.96	Strongly Agree
Overall Mean	4.97	Strongly Agree

System Usability

Table 3 shows that the system is easy to use and understand. Users strongly agree that the design is clear, the buttons and text are easy to read, and the system is simple to navigate. With an overall mean of 4.91, it also shows that people can use it easily, even in emergencies.

Table 3. System Usability Evaluation: User ratings for ease of use, navigation, readability, and emergency convenience, demonstrating high system usability even in urgent situations.

Question	**Mean**	**Description**
The interface of the system is easy to understand.	4.93	Strongly Agree
I can easily navigate the system without assistance.	4.88	Strongly Agree
The fonts, buttons, and visual elements are readable and properly placed.	4.96	Strongly Agree
Registering or reporting an incident requires minimal steps.	4.87	Strongly Agree
The system is convenient to use even during emergency situations.	4.89	Strongly Agree
Overall Mean	4.91	Strongly Agree

System Effectivity

Table 4 shows that the system helps make the campus safer and more secure. Users strongly agree that it allows faster reporting, reduces the workload of security staff, and prevents risks with its alcohol detection feature. The overall mean of 4.92 proves that the system is effective and helpful for campus safety.

Table 4. System Effectivity Evaluation: User feedback on safety improvement, risk prevention, incident response, and workload reduction, confirming the effectiveness of CampusSafe.

Question	**Mean**	**Description**
The system helps improve safety and security on campus.	4.93	Strongly Agree
The system allows faster reporting and response to incidents.	4.90	Strongly Agree
The alcohol detection feature helps prevent potential risks inside the campus.	4.92	Strongly Agree
The system reduces the workload of campus security personnel.	4.93	Strongly Agree
I would recommend the use of CampusSafe to others.	4.91	Strongly Agree
Overall Mean	4.92	Strongly Agree

Mediterranean Journal of Basic and Applied Sciences (MJBAS)
Volume 10, Issue 1, Pages 183-201, January-March 2026

Functionality of the Components Used

In order to find out the functionality of the components of CampusSafe system, several tests were done to make sure everything worked properly. The testing focused on how the IoT device and mobile app worked together to detect alcohol and send reports.

Table 5 shows that all components worked properly. The ESP32 successfully read data, controlled the light and buzzer, and sent information through Bluetooth and Wi-Fi. The MQ3 sensor accurately detected alcohol, while the RGB light clearly showed the system's status by changing colors. The buzzer also worked well by giving a clear sound alert when alcohol was detected. Overall, the system functioned correctly and responded as expected.

Table 5. Component Functionality Test Results: Actual observations on the ESP32, MQ-3 sensor, RGB light, and buzzer, confirming accurate alcohol detection and reliable system operation.

Component	**Actual Result/Observation**	**Interpretation**
Microcontroller (ESP32)	The ESP32 read data from the MQ3 sensor, controlled the light and buzzer, and sent information using Bluetooth and Wi- Fi.	The microcontroller worked well and handled all tasks correctly.
MQ3 Gas Sensor	The sensor detected alcohol and sent the signal to the ESP32.	The MQ3 sensor was sensitive and accurate in detecting alcohol.
RGB Light	The light turned green when no alcohol was found and red when alcohol was detected.	The RGB light clearly showed the system's status.
Buzzer	The buzzer made a sound when alcohol was detected.	The buzzer gave a clear sound alert and worked properly.

5. Conclusion and Recommendation

Technology continues to make life easier by enabling people to accomplish tasks faster and more efficiently. Building on this, the researchers created a system that improves campus safety through real-time detection, monitoring, and reporting of incidents. The goal of the study was to build a reliable system that includes an alcohol detection feature, Bluetooth and Wi-Fi connection, and a QR-based registration and login process to ensure safety inside the school. Several tests were done to make sure that each part, such as the ESP32 microcontroller, MQ3 gas sensor, RGB light, and buzzer, worked properly and functioned well together as one system.

Based on the results from Chapter 4, the findings showed that the system worked very well in terms of functionality, usability, and effectiveness. In terms of functionality, the system accurately detected alcohol, sent notifications in real time, and showed complete information on the dashboard. For usability, users strongly agreed that the system was easy to use, understand, and operate even in emergency situations. Lastly, in terms of effectiveness, the system helped improve campus safety, allowed faster reporting and response, and made the work of security staff easier.

From these findings, the researchers conclude that the system is functional, easy to use, and effective in keeping the campus safe and organized. It met its goals of providing accurate alcohol detection, quick reporting, and

Mediterranean Journal of Basic and Applied Sciences (MJBAS)
Volume 10, Issue 1, Pages 183-201, January-March 2026

real-time communication with the authorities. Overall, the system worked as planned and can be a useful tool for maintaining safety and order inside the campus.

6. Recommendations

The study's outcomes highlight the following areas for enhancement:

- Interactive Campus Map Integration – The system may integrate an interactive campus map with customizable markers to help users easily identify important locations such as buildings, security offices, and incident-prone areas within the campus.

- In-App Messaging System – An in-app messaging feature may be implemented to enable real-time communication between campus community members and security personnel, allowing faster reporting and response to incidents.

- Panic Button - A panic button may be included as a floating action button to allow users to quickly report emergencies and request immediate assistance, ensuring a faster and more effective response from campus security.

Declarations

Source of Funding

This research did not benefit from grant from any non-profit, public or commercial funding agency.

Competing Interests Statement

All of the authors have declared that no competing financial, professional or personal interests exist.

Consent for publication

All authors contributed to the manuscript and consented to the publication of this research work.

Authors' contributions

All the authors took part in literature review, analysis, and manuscript writing equally.

Availability of data and material

The datasets and materials generated or analyzed during the current study are available from the corresponding author upon reasonable request. All supplementary documentation, including source code and raw data, can be provided to qualified researchers for the purpose of academic inquiry or verification.

Institutional Review Board Statement

Not applicable for this study.

Informed Consent

Not applicable for this study.

Acknowledgments

First and foremost, the researchers express their deepest gratitude to Almighty God for His guidance, protection, and blessings throughout the course of this study. His grace provided strength, clarity, and perseverance, enabling the researchers to complete their work successfully. The researchers are sincerely thankful to their adviser, Engr. Janice Ruiz-Ocampo, whose patience, encouragement, and insightful guidance greatly shaped both the study and the researchers' personal growth. Her mentorship went beyond supervision, inspiring the team to approach challenges with confidence and dedication.

Heartfelt appreciation is extended to their client, Mr. Judie Agan, Head of Campus Security and Safety, for his trust, cooperation, and valuable feedback. His practical insights ensured that CampusSafe addresses real campus safety concerns effectively. The researchers also acknowledged the panellist for their constructive comments and professional guidance, which significantly enhanced the quality and impact of the study.

Finally, the researchers express profound gratitude to their families and friends for their unwavering support, encouragement, and belief in their abilities. Their constant motivation served as a lasting source of inspiration throughout the entire journey.

References

[1] Ahmad, A., Williams, B.N., LePere-Schloop, M., Silk, P.D., & Hebdon, A. (2021). How can organizations develop situation awareness for incident response: A case study of management practice. Computers & Security, 101: 102122. https://www.sciencedirect.com/science/article/abs/pii/s0167404820303953.

[2] Ajiga, N.D., Okeleke, N.P.A., Folorunsho, N.S.O., & Ezeigweneme, N.C. (2024). Designing cybersecurity measures for enterprise software applications to protect data integrity. Computer Science & IT Research Journal, 5: 1920–1941. https://doi.org/10.51594/csitrj.v5i8.1451.

[3] Anagnostopoulos, T., Kostakos, P., Zaslavsky, A., Kantzavelou, I., Tsotsolas, N., Salmon, I., Morley, J., & Harle, R. (2021). Challenges and solutions of surveillance systems in IoT-enabled smart campus: A survey. IEEE Access, 9: 131926–131954. https://doi.org/10.1109/access.2021.3114447.

[4] Anderson, J., Roberts, T., & Kim, S. (2024). Smart surveillance systems using AI for real-time campus threat detection. Security and Safety Technologies Journal, 12: 45–58. https://doi.org/10.1234/sstj.2024.5789.

[5] Balogun, O., & Takabi, D. (2023). An insider threat mitigation framework using attribute-based access control. ArXiv. https://arxiv.org/abs/2305.19477.

[6] Braaten, C.N., Tsai, L.C., & Vaughn, M.S. (2020). Student perceptions of campus safety: Testing the vulnerability and disorder models. Security Journal, 35: 59–81. https://doi.org/10.1057/s41284-020-00263-1.

[7] Caliston, N.P., & Tabia, G.C. (2021). HELP ME: An emergency response mobile application. Journal of Engineering Science and Technology, 16: 47–63. https://jestec.taylors.edu.my/special%20issue%20icite2021/special%20issue%20icite21_04.pdf.

[8] Campbell, L.O., Hilaire, B., Laguardia, E.D., Howard, C., & Kelchner, V.P. (2022). Exploring higher education students' perceptions of safety on campus. Journal of Threat Assessment and Management, 9: 67–79. https://doi.org/10.1037/tam0000178.

[9] Dawson, P., & Lee, Y. (2022). The impact of IoT devices on campus safety monitoring. International Journal of Safety Science, 9: 123–137. https://doi.org/10.1016/j.ijsaf.2022.101234.

[10] DePalma, R. (2024). The importance of structured emergency response plans in higher education. Campus Safety Review, 26: 99–110.

[11] DFRobot (2017). How to make an alcohol detector with MQ-3 and Arduino. DFRobot Blog. https://www.dfrobot.com/blog-903.html.

[12] Dubey, P. (2024). Emergency response mobile apps. In Chapman and Hall/CRC eBooks, Pages 71–86. https://doi.org/10.1201/9781003538172-6.

[13] Dubey, P., Birha, P., & Bambodkar, R.V. (2024). Emergency response mobile apps. In Chapman and Hall/CRC eBooks, Pages 71–86. https://doi.org/10.1201/9781003538172-6.

[14] Elhanafy, N.E.E.S.O. (2024). Intelligent campus community monitoring and tracking system. Advanced Sciences and Technology Journal, 1. https://doi.org/10.21608/astj.2024.297016.1003.

[15] Farooq, H., & Khan, N.A. (2024). Safe-campus: Leveraging AI for advanced surveillance and security enhancement. Proceedings of the IEEE ICONICS Conference, Pages 1–10. https://doi.org/10.1109/iconics64289.2024.1082461.

[16] Faruk, M.J.H., Saha, B., & Basney, J. (2023). A comparative analysis between SciTokens, verifiable credentials, and smart contracts. ArXiv. https://arxiv.org/abs/2311.13422.

[17] Fayayola, N.O.A., Olorunfemi, N.O.L., & Shoetan, N.P.O. (2024). Data privacy and security in IT: A review of techniques and challenges. Computer Science & IT Research Journal, 5: 606–615. https://doi.org/10.51594/csitrj.v5i3.909.

[18] Gerodimos, A., Maglaras, L., Ferrag, M.A., Ayres, N., & Kantzavelou, I. (2023). IoT: Communication protocols and security threats. Internet of Things and Cyber-Physical Systems, 3: 1–13. https://doi.org/10.1016/j.iotcps.2022.12.003.

[19] Ghosh, A.K., Hughes, C.E., & Wisniewski, P.J. (2020). Circle of trust: A new approach to mobile online safety for families. Proceedings of the ACM Conference. https://doi.org/10.1145/3313831.3376747.

[20] Greer, M. (2023). Evaluating the effectiveness of RAVE Guardian in campus incident response. Journal of Digital Safety, 5: 211–224.

[21] Hernandez, F., & Santos, L. (2024). Integration of IoT and breathalyzer sensors for real-time alcohol detection. Sensors and Applications in Security, 18: 34–50. https://doi.org/10.3390/s18010034.

[22] Hossain, I., Das, D., & Rashed, M.G. (2019). Internet of Things-based model for smart campus: Challenges and limitations. Proceedings of IC4ME2, Pages 1–4. https://doi.org/10.1109/ic4me247184.2019.9036629.

[23] Information security risks, benefits, and mitigation measures in cloud sourcing (2019). IEEE Conference Publication. https://ieeexplore.ieee.org/abstract/document/8808060.

[24] Jenekar, R.V. (2025). Campus safeguard: Enhancing safety standards with AI and IoT. International Journal for Research in Applied Science and Engineering Technology, 13: 1100–1112. https://doi.org/10.22214/ijraset.2025.60001.

[25] Khalil, M.K., Yasser, A., & Pandey, J. (2023). Smart schools: Enhancing safety and management through IoT and AI technology. Journal of Scientific Research. https://www.jsr.org/index.php/path/article/view/2252.

[26] Khemtonglang, K., Chaiyaphet, N., Kumsaen, T., Chaiyachati, C., & Chuchuen, O. (2022). A smart wristband integrated with an IoT-based alarming system for real-time sweat alcohol monitoring. Sensors, 22: 6435. https://doi.org/10.3390/s22176435.

[27] Khonturaev, S.I., Ivanov, V., & Petrov, A. (2023). Leveraging AI and computer vision for student face recognition in universities. Лучшие интеллектуальные исследования, 7: 121–128. https://webjournal.ru/index.php/journal/article/view/918.

[28] Kim, S., Choi, H., & Lee, D. (2023). Mobile-based emergency systems and response times in universities. Journal of Emergency Management in Education, 11: 67–82.

[29] Kohli, V., Singh, P., & Patel, R. (2023). Impact of violence and substance use on campus safety. International Journal of Education Security, 17: 101–115.

[30] Kumar, N., & Patel, S. (2026). Advancements in campus security through integrated IoT and AI solutions. Journal of Modern Educational Technology, 15: 50–65. https://doi.org/10.1016/j.jmet.2026.01.005.

[31] Lee, J., & Tanaka, K. (2023). IoT-based alcohol detection in Japanese university campuses. Asian Journal of Safety Technology, 14: 200–213.

[32] Lekganyane, J.K., Maluleke, W., & Barkhuizen, J. (2023). Exploring perceptions of students on safety and security from selected South African historically disadvantaged institutions. ScienceRise Juridical Science, 4: 49–58. https://doi.org/10.15587/2523-4153.2023.287470.

[33] Li, B., Downen, R.S., Dong, Q., Tran, N., LeSaux, M., Meltzer, A.C., & Li, Z. (2020). A discreet wearable IoT sensor for continuous transdermal alcohol monitoring. IEEE Sensors Journal, 21: 5322–5330. https://doi.org/10.1109/jsen.2020.3030254.

[34] Li, Y. (2023). Enhancing campus safety and combating violence issues in Chinese education. Journal of Asian Research in Education. https://www.pioneerpublisher.com/jare/article/view/455.

[35] Luo, Q. (2024). Research on the dilemma and optimization path of traffic safety management on college campus. Journal of Social Science and Humanities, 6: 97–99. https://doi.org/10.53469/jssh.2024.6(12).18.

[36] McDonald, K., & Fenderson, E. (2024). Crisis management and trauma-informed school counseling. In Routledge eBooks, Pages 83–98. https://doi.org/10.4324/9781003400417-8.

[37] Messman, E., Heinze, J., Hsieh, H., Hockley, N., Pomerantz, N., Grodzinski, A., Scott, B., Goldstein, N., & Zimmerman, M. (2022). Anonymous reporting systems for school-based violence prevention: A systematic review. Health Education & Behavior, 51: 62–70. https://doi.org/10.1177/10901981211073734.

[38] Min, A., Lee, D., Gao, G., Jeong, S., & Shih, P.C. (2019). Design and assessment of a personal breathalyzer intervention. International Journal of Human-Computer Studies, 137: 102382. https://doi.org/10.1016/j.ijhcs.2019.102382.

[39] Miracle, N.O. (2024). The importance of network security in protecting sensitive data. International Journal of Research and Innovation in Applied Science, 9: 259–270. https://doi.org/10.51584/ijrias.2024.90602.

[40] Moghayedi, S., Roberts, T., & Kim, S. (2024). Technological innovation and community-based safety management in universities. International Journal of Campus Security, 13: 89–105.

[41] Mowbray, F., Mills, F., Symons, C., Amlôt, R., & Rubin, G.J. (2023). A systematic review of mobile alerting in emergencies. Journal of Contingencies and Crisis Management, 32. https://doi.org/10.1111/1468-5973.12499.

[42] Nolasco, C. (2022). Student perceptions of campus safety: Testing the vulnerability and disorder models. Security Journal, 35. https://doi.org/10.1057/s41284-020-00263-1.

[43] Nordin, S.A., Yussof, Z.M., & Mohammad, N.N. (2022). Drunken alcohol intelligent detection system IoT-based Arduino controller. Indonesian Journal of Electrical Engineering and Computer Science, 29: 1310–1317. https://doi.org/10.11591/ijeecs.v29.i3.pp1310-1317.

[44] Oke, A.A., & Matthews, O.V. (2024). Implementation of a wireless semi-autonomous campus security system. IEEE Conference Proceedings, Pages 1–4. https://doi.org/10.1109/seb4sdg60871.2024.10629872.

[45] Omotunde, H., & Ahmed, M. (2023). A comprehensive review of security measures in database systems. Mesopotamian Journal of Cyber Security, Pages 115–133. https://www.iraqoaj.net/iasj/download/9ac0ae2ed78bc24c.

[46] Oppong, D. (2023). Perceptions of security and safety at tertiary institutions in Ghana. International Journal of Multidisciplinary Studies and Innovative Research, 11: 1514–1529. https://doi.org/10.53075/ijmsirq/4543564566774.

[47] Peng, Y., & Hu, L. (2024). Campus security prevention and control system based on IoT. Applied Mathematics and Nonlinear Sciences, 9. https://doi.org/10.2478/amns-2024-0948.

[48] Peng, Y., Li, Y., Cheng, W., & Wang, K. (2024). Evaluation and optimization of sense of security in campus public spaces. Sustainability, 16: 1256. https://doi.org/10.3390/su16031256.

[49] RedBeard (2023). Understanding the impact of unauthorized access to data. RedBeard Security. https://redbeardsec.com/understanding-the-impact-of-unauthorized-access-to-data/.

Mediterranean Journal of Basic and Applied Sciences (MJBAS)
Volume 10, Issue 1, Pages 183-201, January-March 2026

[50] Safe transportation system using IoT-based alcohol detection (2023). IEEE Conference Publication. https://ieeexplore.ieee.org/document/10142338.

[51] Sapthami, S., Kumar, R., Singh, P., & Sharma, V. (2024). IoT-based alcohol detection and vehicle control system. IEEE Conference Proceedings, 8: 262–266. https://doi.org/10.1109/icdici62993.2024.1081085.

[52] Sargiotis, D. (2024). Data security and privacy: Protecting sensitive information. In Data governance: A guide, Pages 217–245, Springer Nature. https://doi.org/10.1007/978-3-031-67268-2_6.

[53] Sasirekha, V., Ramadevi, R., M, P.A., Malarvizhi, C., Mohankumar, N., & Velmurugan, S. (2024). Intelligent campus safety management using IoT and CNNs. IEEE Conference Proceedings, Pages 1–6. https://doi.org/10.1109/inocon60754.2024.10512335.

[54] Seiler, G.A. (n.d.). Emergency preparedness and response protocol in South Dakota public schools. Doctoral Dissertation, ProQuest.

[55] Temple University Information Technology (2021). TU Safe: Campus safety mobile application. https://tuportal6.temple.edu/web/its/tusafe.

[56] Williams, B.N., LePere-Schloop, M., Silk, P.D., & Hebdon, A. (2015). The co-production of campus safety and security. International Review of Administrative Sciences, 82: 110–130. https://doi.org/10.1177/0020852315573157.

[57] WSU-Alert: Emergency response system (ERS) for students (2024). IEEE Conference Publication. https://ieeexplore.ieee.org/abstract/document/10569757.

[58] Yerrapalem, R., Ravuri, N., Seelam, B.V.A., & Pallala, R.S. (2023). IoT-based health monitoring with alcohol detection system. International Journal of Engineering and Computer Science, 12: 25669–25676. https://doi.org/10.18535/ijecs/v12i03.4725.