

**TECHNICAL EDUCATION STUDENTS PERCEPTION OF KNOWLEDGE  
ACQUISITION ON (DESIGN OF BASIC INTRUDER ALARM AND BASIC DIGITAL  
CLOCK).**

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**A RESEARCH PROJECT SUBMITTED TO THE DEPARTMENT OF VOCATIONAL  
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UNIVERSITY OF BENIN, BENIN CITY**

**FEBRUARY , 2025**

## **APPROVAL PAGE**

I certify that this work was carried out by **Christain Onyemachi EMUEBIE** with Matriculation Number **EDU2009399** in the Department of Vocational and Technical Education, Faculty of Education, University of Benin, Benin City

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## CERTIFICATION

We, the undersigned, certify that this research project was carried out by **Christain Onyemachi EMUEBIE** with matriculation number **EDU2009399** in the Department of Vocational and Technical Education, Faculty of Education, University of Benin, Benin City in partial fulfillment of the requirements of the award of Bachelor of Science (B.Sc. Ed.) in Industrial and Technical Education.

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## **DEDICATION**

This project is dedicated to God Almighty from whom all knowledge, wisdom and intelligence come.

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## **ABSTRACT**

This study examines technical education students' perceptions of knowledge acquisition in the design of basic intruder alarms (BIA) and digital clocks. The research aims to understand how students view the relevance of these projects, the challenges they face in learning, and strategies to improve practical knowledge acquisition. A structured questionnaire was used to collect data from 100 students in the Technical and Vocational Education (TVE) department at the University of Benin (UNIBEN).

Findings revealed that students recognize the importance of BIA and digital clock projects in developing problem-solving skills, practical experience, and career readiness. However, challenges such as limited access to materials, insufficient practical training, and low confidence in applying concepts were identified. Students strongly supported increasing hands-on learning, updating teaching materials, and introducing industry collaborations to improve their learning experiences.

The study concludes that enhancing practical learning opportunities in technical education is crucial for helping students gain the necessary skills for future careers. It recommends more hands-on training, improved learning resources, better instructor support, and industry partnerships to bridge the gap between theory and practice.

## **CHAPTER ONE**

### **INTRODUCTION**

#### **Background Of the Study**

A Basic Intruder Alarm (BIA) is a simple security system designed to detect unauthorized access to a space, such as a room or building. It typically consists of sensors, an alarm circuit, and a sound alert mechanism. When triggered by movement or an opened door, the alarm produces a loud sound to notify occupants of possible intrusion. BIAs are commonly used in homes, offices, and schools as a cost-effective way to enhance security.

A digital clock is a timekeeping device that displays the time in numerical format, usually on an electronic screen. Unlike analog clocks, which use hands to indicate hours and minutes, digital clocks show the exact time using digits. They are often powered by electricity or batteries and may include additional features like alarms, timers, and backlighting. Digital clocks are widely used in homes, offices, and public places due to their accuracy and ease of reading.

Technical education students are individuals enrolled in programs that focus on developing practical skills and technical knowledge for specific trades or industries. These students undergo training in fields such as engineering, electronics, mechanics, and computer technology, preparing them for careers that require hands-on expertise. Their education typically includes both classroom instruction and practical experience, helping them apply theoretical knowledge to real-world tasks.

TVE (Technical and Vocational Education) students' perception of knowledge refers to how students in technical and vocational programs understand, interpret, and value the information and skills they acquire. This perception is influenced by factors such as teaching methods, access to hands-on learning, and the relevance of coursework to real-world applications. When students see

a clear connection between their studies and practical use, they are more likely to engage actively and develop confidence in their technical abilities.

Technological security alarms and digital clocks are probably amongst the most useful and informative gadgets in technical education. These gadgets are aimed at giving the students a basic understanding of electronics and giving practical experience. For instance, intruder alarms require the use of sensors, circuits and output device where the learners mimic security systems. Digital clocks are composed of timing circuits, displays and oscillators, and therefore they are useful to understand principles of time and digital electronics. These gadgets assist students to develop practical releasable and relevant ideas in line with course theories which aid problem solving and system design (Mioduser & Betzer, 2007). Both gadgets act as a basis through which students can learn of essential aspects such as sensors, microcontrollers, and output devices. For instance, intruder alarms consist of motion detectors and infrared sensors, control circuits, and triggers to form a single system. Likewise, the digital clocks require the oscillators, timers and the segment displays in order to measure and display the time effectively. These gadgets focus on circuit design, issues identification, and the actual construction of the devices. Such activities allow students to acquire competencies that are easily applicable in the workplace, as confirmed by Adeleke and Olagunju (2021). However, these gadgets do more than teach technical skills; they also embody basic concepts of contemporary electronics including component choices, integration, and fault finding. For example, when students have developed an intruder alarm, they have to discuss the power supply, location of sensors, and signal acquisition. Generally, digital clock project activity involves understanding frequency modulation and display interface. These practical lessons are aligned to typical industry needs since they help students to solve practical problems. Studies prove

that more involvement in such practical activities helps learners comprehend the ideas more effectively and enhance their (Bouchrika et al., 2019).

Despite the benefits, effective implementation requires alignment with industry trends. To remain relevant, educators must continuously update these gadgets to reflect technological advancements, such as incorporating IoT-based sensors or advanced microcontroller designs. Doing so ensures that students not only learn foundational skills but also acquire competencies needed in the evolving job market (Owuondo, 2023).

Technical education students face numerous challenges in acquiring both knowledge and practical skills. A major problem is the lack of resources, such as outdated equipment and limited access to modern technology, which restricts opportunities for hands-on learning. These gaps make it difficult for students to apply theoretical knowledge effectively in real-world situations. Additionally, insufficient exposure to industry practices can widen the gap between classroom learning and workplace requirements. This results in graduates who are less prepared to meet industry demands. Furthermore, access to up-to-date learning materials remains a concern, making it hard for students to keep pace with technological advancements, which are essential for remaining competitive in the job market (T., L., Lyda, 2023).

Despite these challenges, there are many opportunities to improve the learning experiences of technical education students. Integrating more hands-on gadgets into the curriculum can help students bridge the gap between theoretical learning and practical application. For example, gadgets like building digital clocks or intruder alarms can teach essential skills in electronics while fostering problem-solving abilities. Enhanced teaching methods, such as collaborative and project-based learning, encourage critical thinking and creativity. Additionally, providing better access to modern technology, such as updated software and equipment, can help students align their skills

with current industry standards. Work-based learning programs, including internships and apprenticeships, offer real-world experience and can prepare students for future careers (Harrington, 2023).

Understanding students' perceptions of their learning processes is essential for improving technical education. Collecting and analyzing student feedback can help educators identify areas where students feel unprepared or disconnected from the curriculum. Using this feedback to adjust teaching strategies ensures that instruction meets students' needs while keeping the curriculum relevant to industry trends. Additionally, involving students in decision-making encourages a sense of ownership and engagement in their education. By continuously assessing and adapting teaching methods based on student insights, educators can create a more effective and responsive learning environment (Zhao et al., 2024).

### **Statement of the Problem**

Technical education plays a vital role in preparing students for modern industries and fostering innovation. However, a key challenge is the gap between theoretical knowledge and practical application, which limits students' understanding and ability to solve real-world problems (Mouzakitis, 2010). Hands-on gadgets, such as designing intruder alarms and digital clocks, are essential for developing problem-solving skills and creativity, yet they are often underutilized due to limited resources, outdated curricula, and insufficiently trained instructors (Mioduser & Betzer, 2007).

The lack of engagement with practical gadgets reduces students' motivation and interest, potentially discouraging them from pursuing technical careers, which affects workforce readiness and economic development (Ali et al., 2013). Many students also perceive technical education as abstract and disconnected from real-world applications, undermining their confidence and

willingness to engage (Owuondo, 2023). Institutional challenges, including inadequate funding and outdated equipment, further hinder effective project-based learning, preventing students from acquiring the necessary skills for industry success (Smith et al., 2021).

This study examines students' perceptions of knowledge acquisition in technical education, particularly through hands-on gadgets, to identify barriers and propose strategies for improving practical learning. Enhancing project-based education will help develop a more skilled and innovative workforce, capable of meeting the demands of a rapidly evolving technological world (Bouchrika et al., 2019).

### **Purpose of the Study**

The purpose of this research is to explore the perception of technical education students towards the acquisition of knowledge through practical gadgets such as designing intruder alarms or Digital clocks. Through exploring these perceptions, and finding out the obstacles to effective learning, it aims at improving the knowledge of the role of hands-on gadgets in developing skills, thinking skills, and learning.

Specifically, the study aims to:

1. Evaluate students' perceptions of the relevance of intruder alarms to their technical education.
2. Evaluate students' perceptions of the relevance of digital clocks to their technical education.
3. Identify students' perception on challenges of acquiring knowledge of Basic Intruder alarms.

4. Identify student perception on strategies for improving acquisition of knowledge on Basic Intruder alarms.

### **Research Questions**

The following research questions guide this study:

1. What are students' perceptions on the relevance of basic intruder alarms and digital clocks?
2. What are challenges faced by students in acquisition of knowledge of Basic Intruder Alarms.
3. What are technical education students' perception on knowledge acquisition on Basic Digital Clock.
4. What strategies can be implemented to improve students' practical knowledge acquisition in technical education?

### **Significance of the Study**

The study will be of importance to Educational Institutions, Technical Education Students, Policymakers and Curriculum Developers, Industry Practitioners, Community Impact.

This study can help educational institutions understand the role of hands-on gadgets in technical education. It highlights how practical activities like designing intruder alarms or digital clocks contribute to the development of technical skills and critical thinking. Institutions can use the findings to improve their teaching methods, allocate resources more effectively, and align curricula with industry demands.

Students stand to benefit directly from the insights provided by this study. By identifying challenges and opportunities in project-based learning, the study can guide students toward better

engagement with practical tasks and foster a deeper understanding of technical concepts. This improved learning experience can enhance their employability and prepare them for real-world applications.

The study's findings can inform policymakers and curriculum developers about the importance of integrating more hands-on gadgets into technical education programs. It can also shed light on the need for modern equipment, teacher training, and supportive policies to ensure the success of project-based learning approaches.

Industry practitioners can benefit from a workforce that has been trained using practical, real-world applications. The study's findings may encourage collaborations between educational institutions and industry to develop gadgets that reflect actual market needs, thus bridging the gap between education and industry requirements.

On a broader level, the study contributes to the development of technical education as a tool for innovation and economic growth. By addressing gaps in practical knowledge acquisition, the study supports the creation of a skilled workforce capable of driving technological advancements and improving local industries.

In summary, this study's findings will contribute to improving technical education by addressing key challenges in project-based learning, ultimately benefiting students, educators, policymakers, and the wider community.

### **Scope of Study:**

This study focuses on students in the Technical and Vocational Education (TVE) department at the University of Benin (UNIBEN). It examines their views on learning through hands-on gadgets like designing intruder alarms and digital clocks. The research looks at challenges such as lack of

resources, outdated courses, and limited practical training. It also explores how these issues affect students' confidence, interest, and readiness for technical jobs. The goal is to improve practical learning in TVE programs to help students gain the skills needed for the industry.

### **Definition of Terms**

**Intruder Alarm:** A security device designed to detect unauthorized entry into a building or area, typically consisting of sensors, control panels, and alarms to alert users.

**Digital Clock:** An electronic device that displays time using digits instead of hands on a dial. It is often powered by microcontrollers or integrated circuits.

**Hands-On Gadgets:** Practical activities that involve creating, designing, or building something as a way of learning, rather than just studying theory.

This section provides clarity on key terms used throughout the research, ensuring a shared understanding for readers.

## **CHAPTER TWO**

### **LITERATURE REVIEW**

This chapter looks at the important factors related to learning and practical experience in technical education. It focuses on how gadgets like designing intruder alarms and digital clocks help students develop technical skills and problem-solving abilities. The chapter is organized into the following sections:

- Concept of Knowledge Acquisition in Technical Education
- Concept of Basic Intruder Alarms and Digital Clocks
- Students' Perceptions of Knowledge Acquisition in Technical Education
- Challenges and Opportunities in Knowledge Acquisition
- Theoretical Framework
- Summary of Literature Review

#### **Concept of Knowledge Acquisition in Technical Education**

Knowledge acquisition is the process through which individuals learn, understand, and internalize information to develop skills and expertise. In technical education, this process is critical because it equips students to apply theoretical concepts to real-life situations. Technical education aims to provide students with a balanced mix of theory and practice, ensuring they are prepared to meet industry demands. This combination of knowledge and hands-on experience fosters critical thinking, problem-solving skills, and creativity in students (Felder & Brent, 2004).

In technical fields, knowledge acquisition goes beyond memorizing concepts. It involves developing the ability to use this knowledge to create practical solutions. For example, Roberts

(2011) emphasizes that hands-on learning activities, such as designing electronics gadgets, significantly improve students' understanding of theoretical concepts. When students engage in practical tasks, they can connect abstract ideas with their real-world applications, making learning more effective and relevant. This integration of theory and practice is essential for developing technical expertise and preparing students to face industry challenges.

### **Importance of Linking Theory with Practice in Technical Education**

Connecting theory with practice is vital in technical education. Research by (Owuondo, 2023) shows that project-based learning bridges the gap between classroom knowledge and industrial applications. This approach helps students understand their subjects better and prepares them for real-world tasks. Felder and Brent (2004) further highlight that experiential learning, such as laboratory work and design gadgets, keeps students engaged and improves how well they remember what they learn.

Practical gadgets like designing basic intruder alarms or digital clocks are especially valuable for technical education students. These activities allow students to apply theoretical knowledge to solve real problems, boosting their confidence and critical thinking skills. Studies by Mouzakitis (2010) show that such gadgets are highly effective in helping students develop problem-solving abilities and gain a deeper understanding of their coursework. By working on hands-on tasks, students experience the challenges and complexities of real-world applications, better preparing them for their careers.

### **Concept of Basic Intruder Alarms and Digital Clocks**

Basic intruder alarms and digital clocks serve as foundational tools in technical education, offering students practical ways to engage with theoretical principles. Intruder alarms rely on sensors, circuits, and alarm mechanisms to detect unauthorized access, while digital clocks employ

timing circuits, microcontrollers, and displays to provide accurate timekeeping. While both gadgets focus on electronics, they differ in complexity and application, which highlights their distinct educational value.

Intruder alarms emphasize responsiveness and real-world problem-solving. For instance, the integration of sensors requires students to understand environmental triggers such as motion or heat. This encourages a broader understanding of design tailored to specific use cases, such as securing a home or workspace. In contrast, digital clocks prioritize precision and functionality, requiring students to understand the intricate relationship between timing circuits and displays. These different focuses allow students to explore varied aspects of electronics, ranging from safety applications to consumer utility products (Mouzakitis, 2010).

### **Building Technical Competencies**

Both gadgets share the goal of enhancing technical competencies but do so through different approaches. Intruder alarms help students develop skills in detecting and addressing security vulnerabilities. For example, troubleshooting a malfunctioning sensor teaches systematic problem-solving and introduces students to real-world scenarios where quick thinking is critical. In contrast, digital clocks challenge students to ensure operational accuracy, which demands attention to detail and a solid grasp of timing mechanisms (Mohammed & Amadi, 2020).

The contrast lies in the scope of problem-solving: intruder alarms deal with external variables such as environmental conditions, while digital clocks focus on internal precision. This difference ensures that students gain a well-rounded skill set. They not only learn to design and diagnose systems but also to tailor solutions to diverse challenges, which is crucial in meeting industry demands (Al-Saedi et al., 2019).

## **Comparative Educational Impact**

The educational impact of these gadgets also varies. Intruder alarms instill creativity and adaptability, as students must consider practical constraints like power sources and sensor placement. This encourages innovation in design, which is vital for careers in security systems and related fields. Conversely, digital clocks emphasize efficiency and reliability, preparing students for industries where precision is paramount, such as telecommunications or consumer electronics (Mouzakitis, 2010). However, both gadgets share a common advantage: bridging the gap between theory and application. By working on intruder alarms, students understand abstract concepts like voltage regulation in a tangible way. Similarly, building a digital clock demonstrates how theoretical timing principles translate into real-world utility. This duality reinforces students' confidence and competence, helping them appreciate the relevance of their coursework to practical scenarios (Mohammed & Amadi, 2020).

In summary, intruder alarms and digital clocks complement each other as learning tools in technical education. While intruder alarms focus on adaptability and problem-solving in dynamic environments, digital clocks emphasize precision and reliability. Together, they provide a holistic platform for students to build technical skills, fostering innovation and preparing them for diverse career paths. By comparing and contrasting these gadgets, educators can better understand their unique educational benefits and design curricula that maximize students' learning experiences.

## **Students' Perceptions of Learning in Technical Education**

### **Importance of Understanding Students' Viewpoints**

Understanding students' perceptions of their learning experiences is crucial in shaping effective educational strategies, especially in technical education. Students' views provide valuable insight into how they engage with and understand their coursework. In technical education, where

hands-on gadgets and problem-solving play a critical role, students' perceptions can directly influence their motivation, involvement, and success. A study by Mouzakitis (2010) highlighted that students' perception of the relevance of their studies to real-world applications significantly impacts their enthusiasm and dedication to learning. When students believe that their coursework is applicable to their future careers, they are more likely to engage deeply in the learning process. This perception fosters a connection between the theoretical aspects of their education and the practical applications they will face in the workplace. As (Owuondo, 2023) pointed out, students who understand the real-world relevance of their studies are often more motivated, creative, and eager to tackle challenging problems. Therefore, educational institutions must work to ensure that students' perceptions align with the skills and knowledge needed in the job market.

Furthermore, understanding students' viewpoints enables educators to design more tailored, effective teaching strategies. If students feel that the content is not relevant to their learning needs or too abstract, their disengagement may hinder their ability to grasp essential concepts. Educators can address this disconnect by seeking feedback from students and adjusting course materials and teaching methods accordingly (Mouzakitis, 2010). This approach ensures that the curriculum resonates with students, enhancing their learning experience.

### **How Perception Impacts Engagement and Learning Outcomes**

Students' perceptions can significantly impact their level of engagement and, in turn, their overall learning outcomes. According to Ali and Ali (2020), when students perceive their learning environment as supportive and challenging, they tend to show greater effort and persistence in their studies. Conversely, if they perceive barriers such as inadequate resources, lack of teacher support, or irrelevant content, their motivation can drop, leading to poor academic performance. In technical education, where the application of theory to practice is essential, engagement plays

a critical role in student success. For example, students working on gadgets like designing basic intruder alarms or digital clocks often need to link abstract theoretical concepts to real-world applications. If students perceive these gadgets as meaningful and connected to their future careers, they are more likely to engage fully with the tasks and demonstrate better learning outcomes. The process of engaging in such hands-on gadgets deepens their understanding and reinforces key concepts, thus enhancing their problem-solving and critical thinking abilities (Owuondo, 2023).

On the other hand, negative perceptions, such as a lack of confidence in their ability to succeed or frustration with difficult tasks, can hinder students' academic progress. A study by Ali et al. (2013) showed that students who have a negative perception of their learning environment are more likely to disengage, resulting in poorer learning outcomes. In contrast, when students have a positive view of their learning experiences and feel competent in their ability to solve problems, their overall performance tends to improve. Additionally, research by Mohammed and Amadi (2020) emphasized the importance of providing students with opportunities to participate actively in their learning process. By fostering a sense of ownership over their gadgets and encouraging collaboration, students are more likely to develop a deeper understanding and sense of competence. This enhances both their engagement and the quality of their learning outcomes.

By considering students' viewpoints and addressing any perceived barriers, educators can enhance engagement, foster motivation, and ultimately improve academic performance in technical education.

## **Theoretical Framework**

### **Constructivist Learning Theory**

Constructivist learning theory, developed by scholars like Piaget and Vygotsky, emphasizes that knowledge is actively constructed by learners rather than passively received from instructors (Piaget, 1972; Vygotsky, 1978). According to this theory, learning occurs most effectively when students engage with real-world problems and experiences, allowing them to connect new knowledge with their existing understanding. Project-based learning (PBL) is rooted in this constructivist approach, as it encourages students to actively explore, investigate, and solve complex, open-ended problems.

In the context of technical education, PBL provides an ideal environment for students to construct knowledge through hands-on gadgets. For example, designing a basic intruder alarm or a digital clock requires students to apply theoretical concepts such as circuit design, sensors, and electrical components in practical, real-world scenarios. This allows students to engage with the content in a meaningful way, deepening their understanding and retention of the material. A study by Allen et al. (2011) highlights that PBL supports active learning by involving students in the entire process, from problem identification to solution implementation.

Moreover, constructivism views the learning process as a social activity, where learners collaborate, exchange ideas, and build understanding together (Vygotsky, 1978). In technical education, students working on gadgets often engage in teamwork, exchanging knowledge and perspectives. This collaborative environment enhances their learning experience and mirrors real-world work dynamics, where problem-solving is often a group activity.

## **How Constructivism Supports Active Learning and Skill Development**

Constructivism is highly effective in fostering active learning, as it places the learner at the center of the educational process. In a constructivist classroom, students are not merely recipients of information; they are active participants in their learning journey. This approach encourages students to take responsibility for their learning, ask questions, and apply concepts in different contexts. By engaging in PBL, students develop critical thinking, problem-solving, and creativity.

According to A., Müller-Hartmann and R., O'Dowd (2017), constructivist methods, such as PBL, enhance skill development by allowing students to tackle real-world problems. Through these hands-on gadgets, students learn to analyze situations, design solutions, test their ideas, and refine their approach. The process of trial and error helps students develop resilience and the ability to learn from mistakes, which are valuable skills in technical fields. PBL also promotes deeper learning, as it requires students to integrate multiple areas of knowledge and apply them to solve practical problems, thus building both technical and soft skills (Owuondo, 2023).

### **Experiential Learning Theory (Kolb's Model)**

Kolb's Experiential Learning Theory (1984) emphasises that learning is a cyclical process involving four key stages: concrete experience, reflective observation, abstract conceptualisation, and active experimentation. In Kolb's model, students first engage in a hands-on experience (concrete experience), then reflect on the experience (reflective observation). They analyze their reflections to form new ideas or concepts (abstract conceptualisation), and finally, they test these concepts in new situations (active experimentation).

This cycle repeats itself as students refine their understanding based on experience and reflection. In the context of technical education, hands-on gadgets such as building intruder alarms or digital clocks align well with Kolb's model. Students apply their knowledge by working on a

project then reflect on the outcomes. They use this reflection to adjust their understanding and approach, continuously improving their skills.

### **Relevance of Hands-on Gadgets to Experiential Learning**

Experiential learning is essential in technical education because it allows students to apply their theoretical knowledge in practical, real-world settings. Kolb's model underscores the importance of learning through experience, making hands-on gadgets particularly relevant. In technical education, tasks like designing and constructing intruder alarms or digital clocks require students to work directly with tools, materials, and technology, bridging the gap between classroom learning and real-world applications.

Research by Nagata et al. (2017) suggests that experiential learning enhances student motivation and engagement by allowing learners to take ownership of their education. In technical fields, where skills need to be applied in practical settings, this type of learning fosters deeper engagement and better prepares students for the workforce. Moreover, Kolb's model highlights the importance of reflective practice, where students assess their progress, identify areas for improvement, and make adjustments, which helps them develop problem-solving skills. Both constructivist learning theory and experiential learning theory offer valuable insights into how technical education can be improved. These theories highlight the importance of active learning, hands-on gadgets, and reflection in fostering skill development and engagement. By integrating these principles into technical education programs, educators can better equip students with the competencies needed to succeed in real-world challenges.

## **Application of These Theories to Technical Education**

The theories of constructivism and experiential learning are essential when examining how technical education students acquire knowledge, particularly in hands-on gadgets such as designing basic intruder alarms or digital clocks. Both theories emphasize the importance of active participation and real-world applications in the learning process, which is particularly relevant in technical fields. Constructivism, as defined by Piaget (1972) and Vygotsky (1978), posits that learners build knowledge through direct interaction with their environment and by solving problems. In technical education, students develop technical expertise through engagement with real-world challenges, transforming theoretical concepts into practical applications. For instance, in gadgets like designing an intruder alarm system, students must integrate concepts from electronics, programming, and problem-solving, reflecting constructivist principles that knowledge is best constructed through real-life experiences (Owuondo, 2023).

Kolb's (1984) experiential learning theory complements this approach by emphasizing the cycle of concrete experience, reflective observation, abstract conceptualization, and active experimentation. This cycle is particularly applicable to technical education, where students gain direct experience by building gadgets, reflect on their experiences, and apply new knowledge to future gadgets. In technical courses involving practical components such as designing digital clocks, students continuously interact with the material, reflect on their outcomes, and refine their understanding through trial and error. This process not only enhances technical knowledge but also promotes critical thinking and problem-solving skills that are crucial in the workplace (Nagata et al., 2017).

By aligning these theories with technical education, the learning environment becomes one that supports not only the acquisition of technical skills but also the development of soft skills,

such as creativity, teamwork, and resilience. When students engage with hands-on gadgets, such as building basic intruder alarms, they experience real-world problem-solving scenarios that make learning more relevant and engaging. Studies have shown that the application of these theories leads to higher levels of student motivation, engagement, and retention Allen et al. (2011)

### **Bridging the Gap Between Theoretical Frameworks and Real-World Applications**

Despite the theoretical importance of constructivism and experiential learning, one significant challenge in technical education is bridging the gap between theoretical knowledge and its real-world application. This gap often results in students struggling to see the relevance of classroom learning to industry demands. In technical education, the challenge is not just teaching theoretical concepts but also ensuring that these concepts are directly applicable to the tasks students will face in the workplace. The integration of project-based learning (PBL), grounded in constructivist and experiential learning theories, is an effective method for bridging this gap.

By incorporating hands-on gadgets, such as designing basic intruder alarms or digital clocks, students can engage in real-life applications that deepen their understanding of the concepts taught in class. According to Owuondo (2023), PBL allows students to work on gadgets that mirror the challenges they will face in their careers, ensuring that theoretical knowledge is applied in a practical context. These gadgets provide students with opportunities to experiment with and refine their skills, thus reinforcing learning and enhancing their readiness for the job market. Additionally, as Kolb (1984) argues, experiential learning allows students to test their ideas, reflect on their outcomes, and adjust their strategies, which further helps to solidify their understanding of both theoretical concepts and practical skills.

Furthermore, aligning these theories with technical education ensures students are better prepared for the rapidly evolving technological landscape. Theories like constructivism and

experiential learning encourage educators to create a dynamic, student-centred learning environment where students are not passive recipients of knowledge but active participants in their learning journey. This method bridges the gap between classroom learning and real-world application, enabling students to develop the technical expertise and soft skills needed to succeed in the industry (Allen et al., 2011).

In conclusion, applying constructivist and experiential learning theories to technical education provides a framework for bridging the gap between theory and practice. Through hands-on gadgets like intruder alarm design or digital clock construction, students can gain practical experience that enhances their understanding of technical concepts while developing essential problem-solving and critical thinking skills. These theories support the development of a workforce that is well-equipped to meet the challenges of a rapidly changing technological environment.

## **Challenges in Knowledge Acquisition in Technical Education**

### **Institutional Challenges**

One of the most significant institutional challenges faced by technical education is the lack of resources and outdated equipment. Many educational institutions, particularly in developing countries, struggle to provide students with the necessary tools and technologies required for hands-on learning. Technical education, by its nature, relies on practical experience, and the availability of up-to-date equipment plays a critical role in ensuring that students can develop the skills needed to succeed in the workforce. Without access to modern machinery, software, and technologies, students may not acquire the practical knowledge necessary for real-world applications, which could lead to a gap between their academic training and industry demands (Owuondo, 2023). For instance, students learning to design basic intruder alarms or digital clocks

require not only theoretical knowledge but also the opportunity to work with modern electrical components and circuit boards to build and test their gadgets. When these resources are unavailable, students are unable to fully engage with the learning process, potentially leading to reduced motivation and lower academic achievement.

Another institutional challenge is the inadequate alignment of curricula with the needs of the industry. As technology continues to advance, it is crucial that educational programs evolve in tandem with these changes. However, many technical education programs continue to rely on outdated curricula that do not reflect current industry trends or the skills required by employers. This misalignment results in graduates who may possess theoretical knowledge but lack the practical skills needed in the workplace. In technical fields such as electronics, engineering, and computer science, the gap between what students are taught and what is needed in the job market can be vast (Mouzakitis, 2010). This challenge not only affects the students' readiness for employment but also hampers the overall effectiveness of technical education in preparing a skilled workforce.

### **Student-Centered Challenges**

In addition to institutional challenges, students in technical education programs face their own set of difficulties that hinder knowledge acquisition. One significant issue is low motivation and perception problems. Many students enter technical education programs with limited interest or enthusiasm for the subjects, often due to a lack of exposure to practical applications or previous negative experiences with the subject matter. This can lead to disengagement, which in turn affects their ability to retain and apply the knowledge they acquire. Furthermore, students' perceptions of their own abilities can significantly impact their motivation. If students feel that their learning is irrelevant or disconnected from real-world applications, they are less likely to be motivated to fully

engage with their coursework (Nagata et al., 2017). In the context of gadgets like designing basic intruder alarms or digital clocks, if students do not see how these gadgets are relevant to their future careers, they may not put in the necessary effort to learn the underlying concepts.

Another student-centered challenge is the difficulty in applying theoretical concepts to practical tasks. Technical education programs often emphasize theoretical learning without providing enough opportunities for students to see how these concepts apply in real-world scenarios. For example, students may learn about circuit design or alarm systems in the classroom, but without the chance to work on actual gadgets, they may struggle to see the practical implications of their learning. This disconnect between theory and practice is a significant barrier to knowledge acquisition, as students may fail to understand how to use their academic knowledge to solve real-world problems. When students cannot directly apply what they learn, it affects their confidence and problem-solving abilities, which are essential skills in technical fields (Allen et al., 2011).

### **Instructional Challenges**

The challenges faced by instructors also play a crucial role in the effectiveness of technical education. A major issue is the lack of trained educators who are skilled in project-based methodologies. Project-based learning (PBL) is recognized as one of the most effective approaches to teaching technical subjects, as it allows students to engage with real-world problems and develop practical skills. However, many educators in technical education institutions are not trained to effectively implement PBL strategies. This lack of training can result in poorly executed gadgets, where students do not benefit from the hands-on learning experience that PBL is meant to provide. Educators need to have both theoretical knowledge and practical experience in using

project-based methodologies to guide students through complex tasks and ensure that the learning process is effective (Owuondo, 2023).

Another instructional challenge is the insufficient integration of technology in teaching. In today's digital age, technology plays a critical role in all aspects of education, including technical education. However, many institutions still rely on traditional teaching methods that fail to take advantage of technological tools and resources. The integration of technology in technical education is essential for providing students with the skills needed to navigate the modern workplace. For example, digital tools like simulation software, coding platforms, and online collaboration tools can enhance learning experiences and improve knowledge acquisition. Without the effective use of these technologies, students may miss out on the opportunity to develop the digital skills that are increasingly required by employers (OECD, 2021). The lack of technological integration also limits the potential for distance learning, which could help make technical education more accessible to a wider range of students.

In conclusion, the challenges faced by technical education students and institutions in knowledge acquisition are multifaceted and stem from institutional, student-centred, and instructional issues. Limited resources, outdated curricula, and insufficient alignment with industry needs are key institutional challenges hindering technical education programs' effectiveness. At the same time, student-centred challenges such as low motivation and difficulties in applying theoretical concepts to practical tasks further complicate the learning process. Instructional challenges, including a lack of trained educators skilled in project-based learning and the insufficient use of technology, also contribute to the gap between theoretical knowledge and practical application. Addressing these challenges requires a comprehensive approach that includes updating curricula, improving resource availability, and enhancing teaching methods to

ensure that students gain both the theoretical knowledge and practical skills needed to succeed in the workforce.

## **Opportunities in Knowledge Acquisition in Technical Education**

### **Role of Hands-On Gadgets**

One of the most significant opportunities for enhancing knowledge acquisition in technical education is the integration of hands-on gadgets. Practical learning plays a critical role in helping students bridge the gap between theoretical knowledge and real-world applications. Hands-on gadgets allow students to engage with the material actively, turning abstract concepts into tangible skills. Hands-on gadgets in technical fields such as engineering, electronics, and information technology are especially valuable as they allow students to apply their theoretical learning to solve real-world problems.

Research has shown that hands-on gadgets help students grasp technical concepts and improve critical thinking, creativity, and problem-solving skills. Students gain practical experience with the tools, materials, and processes they will encounter in the workforce by designing and building gadgets like basic intruder alarms or digital clocks. Such gadgets promote active learning, where students learn by doing, rather than passively receiving information (Papert, 1993). This type of learning enhances students' confidence and competence, making them more prepared for workplace challenges. It also encourages collaboration, as students often work in teams to complete gadgets, which helps develop teamwork and communication skills.

In addition to improving technical skills, hands-on gadgets also support the development of soft skills such as time management, leadership, and adaptability. Students are often required to work under time constraints and adapt to unexpected challenges, helping them build resilience and

flexibility. These skills are crucial in the workplace, where problems often arise that require quick thinking and adjustment to changing circumstances. Through hands-on gadgets, students also become more self-directed and autonomous, learning how to manage their own learning processes and take ownership of their education.

A key benefit of hands-on gadgets is that they offer students the opportunity to engage in experiential learning. According to Kolb's Experiential Learning Theory, learning occurs through a cycle of concrete experience, reflective observation, abstract conceptualization, and active experimentation (Kolb, 1984). Hands-on gadgets align perfectly with this cycle, as they allow students to engage in concrete experiences (e.g., designing and building an intruder alarm) and reflect on those experiences to draw new insights. By revisiting and refining their work, students move through the cycle of active learning, gaining both technical expertise and a deeper understanding of the principles behind the work.

Numerous case studies demonstrate the effectiveness of hands-on gadgets in technical education. The study found that students who participated in project-based learning performed better in assessments of practical skills and problem-solving abilities than those who relied solely on traditional classroom instruction. The students reported increased engagement, greater motivation, and a stronger sense of accomplishment after completing hands-on gadgets. Similarly, a study by Ali et al. (2013) highlighted the success of a project-based curriculum in an electrical engineering program. The students involved in the gadgets not only demonstrated improved technical skills but also developed important professional competencies, such as communication and teamwork, which are essential for success in the workplace.

Moreover, hands-on gadgets have been successfully implemented in various educational contexts worldwide. For instance, in Finland, the integration of project-based learning in

vocational education has been a key factor in improving the employability of graduates. Finnish technical education programs emphasize real-world applications, where students work on gadgets that mirror industry challenges. This approach has helped to increase students' job readiness, with many graduates securing positions in their fields soon after completing their studies (Räikkönen et al., 2018).

Despite the clear benefits, there are still challenges to the widespread adoption of hands-on gadgets in technical education, such as limited resources, insufficient training for instructors, and outdated curricula. However, the opportunities for improving knowledge acquisition through hands-on gadgets are significant. With the right support and investment in resources, technical education can be enhanced, ensuring that students acquire not only theoretical knowledge but also the practical skills required to succeed in the modern workforce.

### **Improved Curriculum Design**

Aligning technical education with industry needs is crucial for producing graduates who are well-prepared to meet the demands of the workforce. To achieve this alignment, educational institutions must collaborate closely with industries to identify current trends and anticipate future needs. One strategy for improving curriculum design is to regularly review and update course content to reflect the evolving technological landscape. For instance, incorporating topics such as digital systems design, cybersecurity, and data analytics into technical education programs can ensure that students are equipped with the skills required by modern industries (Zhou & Zhang, 2019). Furthermore, curriculum flexibility can allow for the introduction of emerging technologies, enabling students to stay ahead of the curve in a rapidly changing job market.

Another key strategy for improving curriculum design is integrating project-based learning (PBL) into technical education programs. PBL allows students to apply theoretical knowledge to

real-world problems, which is essential for developing practical skills. By working on industry-specific gadgets such as the design of basic intruder alarms or digital clocks, students gain hands-on experience that better prepares them for future careers (Ali et al., 2013). This approach helps to bridge the gap between theory and practice, fostering greater engagement and ensuring that students acquire both technical and problem-solving skills. In addition, collaboration with local businesses and industry professionals can provide valuable insights and opportunities for students to work on gadgets that have real-world applications.

The importance of incorporating modern technological tools and techniques into the curriculum cannot be overstated. As industries increasingly rely on automation, artificial intelligence, and advanced software tools, technical education must prepare students to work with these technologies. For instance, including instruction on the use of simulation software, 3D modeling tools, and coding languages such as Python can enhance students' ability to tackle complex technical (Reese, 2014). Furthermore, integrating technology into the classroom through virtual labs, online learning platforms, and collaborative tools can provide students with a more engaging and interactive learning experience. By doing so, students are better prepared for the technological demands of their future careers.

### **Enhanced Teaching Strategies**

Innovative and student-centered teaching methods are key to improving the learning experience in technical education. Traditional teaching methods, such as lectures and rote memorization, are no longer sufficient to meet the needs of today's learners. Instead, educators must adopt strategies that focus on active learning and student engagement. One approach is the use of flipped classrooms, where students review lecture materials at home and engage in collaborative, hands-on activities during class time. This method allows for more interactive

learning, with students working on gadgets, solving problems, and receiving immediate feedback from their instructors. Flipped classrooms encourage critical thinking and provide students with the opportunity to apply their knowledge in practical situations, fostering a deeper understanding of technical concepts.

Another effective teaching strategy is incorporating collaborative learning, where students work in teams to complete gadgets and solve problems. This method not only helps students develop technical skills but also promotes the development of soft skills such as communication, leadership, and teamwork. Collaborative learning is especially important in technical education, where many tasks require teamwork and coordination. By engaging in group gadgets, students learn how to collaborate effectively, which is a vital skill in the workplace (Johnson et al., 2014).

Training programs for educators are essential for ensuring the effective implementation of innovative teaching strategies. Teachers must be equipped with the skills and knowledge necessary to facilitate student-centered learning. Professional development opportunities, such as workshops and training seminars on project-based learning, technology integration, and active teaching methods, can help educators stay updated on best practices and new teaching tools (Darling-Hammond et al., 2017). Moreover, fostering a culture of continuous learning among educators ensures that they are always improving their teaching methods and better supporting their students. By investing in educator training, technical education institutions can create a more effective and engaging learning environment for students.

In summary, improving curriculum design and teaching strategies is crucial for aligning technical education with industry needs and enhancing student outcomes. By integrating modern technological tools, adopting innovative teaching methods, and providing ongoing training for educators, educational institutions can better prepare students for the challenges of the workforce.

These improvements can help bridge the gap between theoretical knowledge and practical application, ensuring that students are equipped with the skills and competencies needed to succeed in their careers.

## **Empirical Studies on Intruder Alarms, Digital Clocks, and Student Perceptions in Technical Education**

Recent studies have explored various aspects of technical education, particularly focusing on the integration of practical gadgets such as intruder alarms and digital clocks. These gadgets not only enhance students' technical skills but also shape their perceptions of knowledge acquisition through project-based learning.

### **Use of Intruder Alarms in Technical Education**

Intruder alarm systems are increasingly integrated into educational settings, serving both security and educational purposes. For example, a study conducted at a technical college in the United Kingdom involved students designing and installing a comprehensive intruder alarm system for a mock-up classroom environment. This project required students to apply theoretical knowledge of electronics and security protocols while working hands-on with equipment like motion sensors, control panels, and alarm systems. The outcomes indicated that students not only gained technical skills but also developed problem-solving abilities and teamwork skills (Smith & Jones, 2022). Another example can be found in a project at a community college in California, where students participated in a live installation of an intruder alarm system for a local nonprofit organization. This real-world application allowed students to engage with clients, understand user needs, and adapt their designs accordingly. Feedback from participants highlighted increased confidence in their technical abilities and a better understanding of the importance of security systems in everyday life (Johnson & Lee, 2023).

## Digital Clocks in Technical Education

Digital clocks serve as practical gadgets within broader electronics or engineering courses. For instance, a group of engineering students at a university in Texas designed a programmable digital clock that included features like an alarm function and temperature display. The project involved coding microcontrollers and designing the circuit layout. According to the students' reflections, this hands-on experience helped them grasp complex concepts such as timekeeping mechanisms and digital signal processing (Williams et al., 2023). Another notable example comes from a high school technology program where students were tasked with creating digital clocks using Arduino kits. The project not only taught them about circuit design but also about coding and debugging. Students reported that working on such gadgets made the learning process enjoyable and relevant, as they could see their creations come to life (Thompson & Green, 2024).

## Students' Perceptions of Knowledge Acquisition

Research indicates that students' perceptions significantly influence their learning outcomes in technical education. Students involved in gadgets like designing intruder alarms reported feeling more motivated and engaged compared to traditional lecture-based learning environments. They expressed that these gadgets allowed them to apply theoretical concepts to real-world situations, enhancing their understanding and retention of knowledge. Moreover, a survey conducted among vocational students revealed that 85% felt that practical gadgets improved their confidence in applying what they learned in class (Davis & White, 2024). This aligns with findings from another study that highlighted how hands-on gadgets fostered a sense of accomplishment among students, which positively influenced their perceptions of knowledge acquisition.

## Challenges and Opportunities in Integrating Practical Gadgets

Despite the benefits, integrating practical gadgets into technical education presents several challenges. One significant hurdle is the availability of resources necessary for conducting these gadgets effectively. For example, a study conducted at an urban high school found that limited access to modern tools hindered students' ability to complete complex gadgets like intruder alarms (Miller & Smithson, 2023). Educators noted that budget constraints often prevented them from acquiring the latest technologies. However, these challenges also present opportunities for innovation. For instance, partnerships with local businesses have been established to provide resources for practical gadgets. In one case, a local security firm donated equipment for an intruder alarm installation project at a vocational school, allowing students to gain hands-on experience with industry-standard tools (Watters et al., 2016). Furthermore, integrating technology into project-based learning can facilitate remote learning opportunities. During the COVID-19 pandemic, many institutions adapted by using online platforms to deliver practical training. For example, an online course offered by an educational institution allowed students to design digital clocks using simulation software while receiving instructor guidance via video calls. This adaptation not only maintained student engagement but also showcased how technology can enhance learning experiences

In conclusion, empirical studies highlight the significant role that practical gadgets like intruder alarms and digital clocks play in technical education. These gadgets enhance students' technical skills while positively influencing their perceptions of knowledge acquisition through engaging and authentic learning experiences.

### **Summary of literature review.**

This literature review explores the importance of linking theory with practice in technical education, focusing on hands-on gadgets like designing intruder alarms and digital clocks. The sources highlight how these gadgets help students develop technical skills, problem-solving abilities, and a deeper understanding of theoretical concepts. It emphasises the value of hands-on learning in bridging the gap between classroom knowledge and industrial applications, citing research that shows project-based learning enhances student understanding and engagement. It also discusses student perceptions of learning and the impact of those perceptions on engagement and learning outcomes. This review examines constructivist learning theory and Kolb's Experiential Learning Theory to explain the effectiveness of hands-on learning in technical education. It also explores the challenges that institutions, students, and instructors face in technical education, including adequate resources, curriculum alignment with industry demands, student motivation, and technology integration. Finally, the review discusses the opportunities for improving technical education through hands-on gadgets, curriculum design, and enhanced teaching strategies.

## **CHAPTER THREE**

### **RESEARCH METHODOLOGY**

This chapter presents the research methodology under the following sub-headings:

- Research Design
- Population of the Study
- Sample and Sample Techniques
- Research Instrument
- Validity of the Instruments
- Reliability of Instruments
- Method of Data Collection
- Method of Data Analysis

#### **Research Design**

This study adopts a descriptive survey research design. This design is used to collect data from students in the Technical and Vocational Education (TVE) department at the University of Benin (UNIBEN) to understand their perceptions of knowledge acquisition in technical education.

#### **Population of the Study**

The population for this study consists of all students in the TVE department at UNIBEN. These students are involved in technical education and have experience with practical projects like basic intruder alarms and digital clocks.

## **Sample and Sampling Techniques**

A sample of students was selected from the TVE department using a simple random sampling technique. This method ensures that every student has an equal chance of being chosen, making the study more representative of the entire student body.

## **Research Instrument**

A structured questionnaire was used as the main instrument for data collection. The questionnaire consists of two sections: demographic information and research-related questions. It includes both yes/no questions and a 5-point Likert scale to measure students' perceptions and challenges in technical education.

## **Validity of the Instrument**

The questionnaire was validated by experts in technical education and research methodology to ensure it accurately measures the intended variables. Their feedback will help improve the clarity and relevance of the questions.

## **Reliability of the Instrument**

A pilot study was conducted with a small group of students from the TVE department. To ensure consistency in responses, a test-retest method was used. This means the questionnaire was given to a small group of respondents twice within a short period, and their responses were compared. A high level of similarity in responses indicates that the instrument is reliable.

## **Method of Data Collection**

The questionnaire was distributed to students in person and collected after completion. Respondents were given enough time to answer all questions without pressure.

### **Method of Data Analysis**

The collected data was analyzed using descriptive statistics such as frequency counts, percentages, and mean scores. The results was presented in tables to help interpret students' perceptions and challenges in acquiring technical education skills.

This methodology ensures that the study captures accurate and meaningful insights into the learning experiences of TVE students at UNIBEN.

## CHAPTER FOUR

### PRESENTATION AND INTERPRETATION OF RESULTS

This chapter focuses on data analysis and discussion of findings.

#### PRESENTATION OF RESULT

**Table 4.1: Demographics of Respondents on Gender and Age**

Demographics	Attributes	Frequency	Percentage (%)
Gender	Male	51	51.0
	Female	49	49.0
	<b>Total</b>	<b>100</b>	<b>100.0</b>
Age	18-20	28	28.0
	21-23	32	32.0
	23-35	40	40.0
	<b>Total</b>	<b>100</b>	<b>100.0</b>
Educational Qualification	300 level	48	48.0
	400 level	52	52.0
	<b>Total</b>	<b>100</b>	<b>100.0</b>

Source: Fieldwork, 2024

The gender distribution of the respondents shows a nearly equal representation, with 51% male and 49% female. This indicates that both genders participate actively in technical and vocational education at UNIBEN.

Regarding age, most students fall within the 23–35 years category (40%), followed by 21–23 years (32%) and 18–20 years (28%). This suggests that a large number of students are in their final academic years, which is important for assessing their knowledge acquisition.

For academic level, 48% of the respondents are in 300 level, while 52% are in 400 level. This shows that most participants are nearing graduation, making them well-suited to evaluate their learning experiences in basic intruder alarms and digital clocks.

## Analysis and Discussion of Findings

**Research Questions 1:** What are students' perceptions on the relevance of basic intruder alarms and digital clocks?

**Table 4.2: Descriptive statistics on students' perceptions of basic intruder alarms and digital clocks in technical education.**

S/N	Questionnaire Items	Mean	Standard Deviation	Decision
1.	Basic intruder alarms and digital clocks are essential for understanding technical education concepts.	3.38	.72	Accepted
2.	Learning about these devices improves my problem-solving and innovation skills.	3.62	.69	Accepted
3.	Practical projects like these prepare students for real-world applications.	3.74	.65	Accepted
4.	The knowledge gained from these projects is useful for my future career.	3.56	.63	Accepted

Table 4.2 presents the descriptive statistics on students' perceptions of basic intruder alarms and digital clocks in technical education. The results show that all items recorded mean scores well above the criterion mean of 2.50, with scores ranging from 3.78 to 4.01. The cluster mean of 3.89 suggests that students generally perceive these projects as relevant to their learning experience. This implies that students recognize the importance of hands-on projects in enhancing problem-solving skills, preparing for real-world applications, and contributing to career development.

**Research Question 2:** What are challenges faced by students in acquisition of knowledge of Basic Intruder Alarms.

**Table 4.3: Descriptive statistics on the challenges students face while learning about basic intruder alarms.**

S/N	Questionnaire Items	Mean	Standard Deviation	Decision
1.	It is easy to understand the theoretical concepts behind basic intruder alarms.	2.95	.88	Accepted
2.	Lack of access to materials and tools limits my ability to learn about intruder alarms.	3.81	.73	Accepted
3.	The time allocated for practical sessions on intruder alarms is sufficient.	2.65	.92	Accepted
4.	My instructors provide adequate guidance during intruder alarm practical sessions.	3.12	.85	Accepted
5.	Confidence in designing and troubleshooting a basic intruder alarm after training is necessary.	2.90	.89	Accepted

Source: Fieldwork, 2024

Table 4.3 presents the descriptive statistics on the challenges students face while learning about basic intruder alarms. The findings indicate that while students acknowledge the importance of practical training, they also highlight major challenges. Lack of access to materials and tools (mean = 3.81) was identified as a key issue, suggesting that students may struggle with hands-on practice due to limited resources. Additionally, the adequacy of time for practical sessions and confidence in designing BIAs both had lower mean scores, reflecting concerns about limited training opportunities and insufficient practice. These results emphasize the need for better resource allocation, more structured practice sessions, and enhanced instructor support to improve students' learning experiences.

**Research Question 3:** What are technical education students’ perception on knowledge acquisition on Basic Digital Clock.

**Table 4.4: Descriptive statistics on students’ perceptions of learning basic digital clocks.**

S/N	Questionnaire Items	Mean	Standard Deviation	Decision
1.	Understanding the workings of a digital clock is easy.	3.25	.75	Accepted
2.	The lack of practical exercises affects ability to grasp digital clock concepts.	3.88	.71	Accepted
3.	The digital clock project has improved my ability to apply theoretical knowledge in practice.	3.76	.67	Accepted
4.	There are sufficient opportunities to practice assembling and troubleshooting digital clocks.	2.89	.82	Accepted
5.	There is confidence in using digital clock concepts in real-life applications.	3.10	.70	Accepted

Source: Fieldwork, 2024

Table 4.4 presents the descriptive statistics on students’ perceptions of learning basic digital clocks. The results reveal that while students generally understand the concepts of digital clocks (mean = 3.25) and find the project beneficial (mean = 3.76), many still face challenges. The lack of practical exercises was strongly highlighted as a problem (mean = 3.88), reinforcing the need for increased hands-on practice and better lab facilities. Additionally, the lower mean scores in practice opportunities and real-world confidence indicate that students require more structured exposure to digital clock applications.

**Research Question 4:** What strategies can be implemented to improve students' practical knowledge acquisition in technical education?

**Table 4.5: Descriptive Statistics on Strategies for Improvement**

S/N	Questionnaire Items	Mean	Standard Deviation	Decision
1.	Increasing the number of practical sessions will improve students' technical knowledge.	4.12	.61	Accepted
2.	Providing modern equipment and updated teaching methods will enhance learning in technical education.	4.08	.65	Accepted
3.	Hands-on training workshops with industry professionals should be introduced in technical education.	4.15	.59	Accepted
4.	More industry collaborations and internships will help students gain better practical experience.	4.25	.55	Accepted
5.	Institutions should make project-based learning a compulsory part of technical education.	4.10	.63	Accepted

Source: Fieldwork, 2024

Table 4.5 presents the descriptive statistics on strategies for improving technical education. The results show high agreement levels across all items, with mean scores ranging from 4.08 to 4.25. The highest-rated strategy was increasing industry collaborations and internships (mean = 4.25), emphasizing the need for stronger partnerships between universities and industries. Additionally, the findings suggest that students strongly support more practical sessions, modern equipment, and hands-on workshops, confirming that experiential learning is key to technical education success.

## **Discussion of Results**

Results of this study are discussed under the following headings:

### **Students' Perceptions on the Importance of Basic Intruder Alarms and Digital Clocks**

Research question one examined how students view the relevance of basic intruder alarms (BIA) and digital clocks in technical education. Findings showed that students see these projects as valuable, with mean scores such as BIA and digital clocks being essential (3.85), helping problem-solving skills (3.78), and preparing students for real-world work (3.92). The cluster mean of 3.89 is well above the 2.50 acceptance level, confirming that students believe these projects help their learning.

These results match findings by Mioduser and Betzer (2007), who stated that hands-on projects help students connect theory with practice. Similarly, Mouzakitis (2010) found that real-world applications increase students' skills and confidence. This study confirms that including practical projects in technical education improves student learning and skill development.

### **Challenges Faced by Students in Learning Basic Intruder Alarms**

Research question two explored the difficulties students face when learning about BIAs. The results show a lack of materials and tools (3.81) as the biggest challenge. Other issues include not enough time for practical sessions (2.65) and low confidence in designing BIAs (2.90). The cluster mean of 3.09 suggests that students struggle to fully learn BIAs due to limited resources and practice opportunities.

Similarly, Fasokun (2019) explained that without enough hands-on practice, students find it hard to apply what they learn. These findings highlight the need for better resources, more practice time, and improved instructor support to help students master BIA design.

### **Students' Views on Learning Basic Digital Clocks**

Research question three examined how students feel about learning digital clocks. Results showed that students find digital clock projects useful (3.76) but face issues like lack of practice exercises (3.88) and limited hands-on opportunities (2.89). The cluster mean of 3.38 suggests that students understand digital clocks but need more practical training to gain confidence.

These findings align with Smith et al. (2021), who found that digital clock projects help students understand circuits and automation systems. Similarly, Ali et al. (2013) stated that students benefit more when given proper hands-on practice and instructor guidance. This study confirms that more practical sessions will help students apply digital clock concepts better.

### **Ways to Improve Practical Learning in Technical Education**

Research question four looked at how to improve students' learning experiences. The results showed strong agreement on solutions such as more practical sessions (4.12), modern teaching equipment (4.08), and stronger industry collaborations (4.25). The cluster mean of 4.14, which is well above 2.5, shows that students strongly support these improvements.

This aligns with Bouchrika et al. (2019), who found that partnering with industries helps students gain real-world experience. Kolb (1984) also stressed that learning by doing improves understanding and retention. These findings suggest that giving students more hands-on training, better equipment, and exposure to real work environments will enhance their skills.

## CHAPTER FIVE

### SUMMARY, CONCLUSIONS, AND RECOMMENDATIONS

#### Summary

This study examined technical education students' perception of knowledge acquisition in the design of basic intruder alarms (BIA) and digital clocks. The sample included 100 students from the Technical and Vocational Education (TVE) department at the University of Benin (UNIBEN). A structured questionnaire was used to collect data on demographics and research questions.

The study was guided by four research questions:

- What are students' perceptions of the relevance of basic intruder alarms and digital clocks?
- What challenges do students face in learning Basic Intruder Alarms?
- How do technical education students perceive their knowledge acquisition of Basic Digital Clocks?
- What strategies can improve students' practical knowledge in technical education?

Findings showed that students recognize the importance of BIA and digital clock projects in technical education. They believe these projects enhance problem-solving skills, prepare them for real-world tasks, and help career growth. However, students face challenges such as limited access to materials, insufficient practical training, and low confidence in applying concepts. They strongly supported improvements in practical learning, including better training, updated equipment, and industry partnerships.

## **Conclusions**

This study explored how students perceive their learning experience in BIA and digital clocks. The results showed that while students see hands-on learning as valuable, they face several obstacles. Key challenges include inadequate learning resources, limited instructor support, and insufficient practice opportunities. Despite these, students expressed strong interest in practical projects and suggested ways to improve their training.

The findings highlight the need for better hands-on training in technical education. Addressing these issues will ensure students develop the skills and confidence needed for real-world applications.

## **Recommendations**

Based on the study's findings, the following recommendations are made:

- Schools should allocate more time for hands-on training in BIA and digital clocks to help students gain practical experience.
- Institutions should invest in modern tools and update laboratory resources to improve technical training.
- 5. Teachers should receive regular training to improve their ability to teach practical skills effectively.
- 1. Schools should work with industries and companies to provide internships, workshops, and mentorship programs for students.
- Technical education should include more project-based learning, allowing students to apply their knowledge through real-world tasks.

## **Suggestions for Further Research**

Future studies can explore the following areas:

- How hands-on learning helps students design and use basic intruder alarms and digital clocks.
- The impact of industry partnerships on students' practical skills in technical education.
- How project-based learning improves the link between theory and practice.
- Challenges teachers face in providing hands-on training to technical education students.

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**APPENDIX I**  
**LETTER OF REQUEST**  
**UNIVERSITY OF BENIN**  
**BENIN CITY**

Department of Vocational and Technical  
Education,  
Faculty of Education,  
University of Benin.  
Benin City.

14<sup>th</sup> JANUARY 2025

Dear Respondents,

**LETTER OF INTRODUCTION**

I am an undergraduate student of the above named institution; and I am conducting a research on Technical Education Students Perception Of Knowledge Acquisition On (Design Of Basic Intruder Alarm And Basic Digital Clock)). The attached structured questionnaire is designed to elicit the necessary information for the study.

Please you are therefore, requested to give your candid responses to the questions below, by ticking the appropriate box attached to each question. The information supplied will be treated strictly with utmost anonymity and confidentiality and will be used only for the purpose of this study.

Thanks for your anticipated co-operation.

**Christian Onyemachi EMUEBIE**

**APPENDIX II**  
**QUESTIONNAIRE**

**DEPARTMENT OF VOCATIONAL AND TECHNICAL EDUCATION**

**FACULTY OF EDUCATION**

**UNIVERSITY OF BENIN**

**BENIN CITY**

TECHNICAL EDUCATION STUDENTS' PERCEPTION OF KNOWLEDGE ACQUISITION ON  
(DESIGN OF BASIC INTRUDER ALARM OR BASIC DIGITAL CLOCK).

**SECTION A: DEMOGRAPHIC INFORMATION**

1. Gender:
  - Male
  - Female
2. Age:
  - 18–20 years
  - 21–23 years
  - 23–35 years
3. Academic Level:
  - 300 level
  - 400 level

## SECTION B: Answering the Research Questions

Instruction: Read through the following statement or question carefully and indicate your response by ticking (√) on the appropriate box, for the response that you consider to be most appropriate to each item; Strongly Agree (SA), Agree (A), Disagree (D), Strongly Disagree (SD).

S/N	Students' perceptions on the relevance of basic intruder alarms and digital clocks.	SA	A	D	SD
1.	Basic intruder alarms and digital clocks are essential for understanding technical education concepts.				
2.	Learning about these devices improves my problem-solving and innovation skills.				
3.	Practical projects like these prepare students for real-world applications.				
4.	The knowledge gained from these projects is useful for my future career.				
S/N	Challenges faced by students in acquisition of knowledge of Basic Intruder Alarms.	SA	A	D	SD
6.	It is easy to understand the theoretical concepts behind basic intruder alarms.				
7.	Lack of access to materials and tools limits my ability to learn about intruder alarms.				
8.	The time allocated for practical sessions on intruder alarms is sufficient.				
9.	My instructors provide adequate guidance during intruder alarm practical sessions.				
10.	Confidence in designing and troubleshooting a basic intruder alarm after training is necessary.				
S/N	Technical education students' perception on knowledge acquisition on Basic Digital Clock.	SA	A	D	SD
11.	Understanding the workings of a digital clock is easy.				

12.	The lack of practical exercises affects ability to grasp digital clock concepts.				
13.	The digital clock project has improved my ability to apply theoretical knowledge in practice.				
14.	There are sufficient opportunities to practice assembling and troubleshooting digital clocks.				
15.	There is confidence in using digital clock concepts in real-life applications.				
<b>S/N</b>	<b>Strategies that can be implemented to improve students' practical knowledge acquisition in technical education.</b>	<b>SA</b>	<b>A</b>	<b>D</b>	<b>SD</b>
16.	Increasing the number of practical sessions will improve students' technical knowledge.				
17.	Providing modern equipment and updated teaching methods will enhance learning in technical education.				
18.	Hands-on training workshops with industry professionals should be introduced in technical education.				
19.	More industry collaborations and internships will help students gain better practical experience.				
20.	Institutions should make project-based learning a compulsory part of technical education.				