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RESILIENCY IN NURSING STUDENTS EXPERIENCING DEPRESSION: PHENOMENOLOGICAL EXPLORATION

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ABSTRACT

This qualitative phenomenological study explored the lived experiences and resilience of clinically diagnosed nursing students navigating depression at Baguio Central University during the first semester of the 2025–2026 academic year. Grounded in Norman Garmezy’s Resilience Theory, the investigation utilized in-depth semi-structured interviews and narrative sketches from five purposively selected participants. Data were systematically analyzed using Braun and Clarke’s six-phase thematic analysis framework.

The findings revealed four major emergent themes: Emotional Turmoil and Academic Pressure, Coping Strategies and Self-Regulation, Support Systems and Institutional Influence, and Resilience as a Motivational Force. Students faced severe academic overload and post-pandemic adjustments, yet mitigated distress through self-awareness, spirituality, journaling, and academic focus. While peer, family, and empathetic faculty

support were crucial protective factors, a significant gap was identified regarding the accessibility and visibility of institutional mental health services. Ultimately, resilience functioned as a transformative, motivational force, allowing students to reframe adversity and strengthen their professional identity. The study recommends integrating proactive mental health modules into the nursing curriculum, expanding accessible institutional counselling, and equipping faculty with training to recognize early psychological distress.

Keywords: Resilience, Nursing-students, Depression, Phenomenology, Coping, Baguio

Introduction

Depression is a global mental health issue that affects millions of people, including university students. It is a mood disorder characterized by a persistent feeling of sadness and loss of interest (Videbeck, 9th edition, 2022). Nursing students faces distinctive stressors such as demanding academic pressures, clinical learning experiences during hospital rotations, and the emotional demands of patient care, all of which contributes to higher rates of depression. This study aimed to explore the resilience of nursing students at Baguio Central University who had experienced depression by examining their coping mechanisms and support systems.

Depression has been identified as the major contributor of global disability, with hundreds of millions affected worldwide. “Research indicates that nursing students are disproportionately affected by depression compared to those in other academic fields. Global estimates suggest prevalence rates ranging roughly one-third to nearly two-thirds of students, with variations influenced by demographic and academic factors (A Risal et al.,2016)”

In the Philippines, the prevalence of depression among nursing students is worryingly high. During the COVID-19 pandemic, findings from the University of Bohol highlighted that more than half of nursing students reported experiencing severe psychological distress, including anxiety, depression, and stress. This highlighted the urgent need for mental health support and interventions tailored to the unique challenges faced by nursing students (Buenaventura et al., 2024).

In the Cordillera Administrative Region, where Baguio City is located, the prevalence of depression among nursing students mirrored the national trend. Factors such as academic workload, clinical responsibilities, and personal stressors contributed to high rates in the region. Understanding the regional context is crucial for developing effective mental health strategies.

In the local context of Baguio City, depression among nursing students has emerged as a pressing issue. The interplay of sociocultural conditions and the demanding nature of nursing education has intensified the challenges faced by learners (Ducas, 2025). Dr. Ricky Ducas appealed to landlords and landladies in the city to act as second parents to non-Baguio resident students in order to minimize suicide cases. The Sangguniang Kabataan, as well as City Councilor Levy Lloyd Orcales, raised alarms over the state of mental health following distress calls from suffering youths. A comprehensive mental health care and wellness system was announced in Baguio City as a response to the alarming cases of depression and suicides (Alangsab, 2021). Councilor Joel Alangsab stated that Mayor Benjamin Magalong was poised to sign a city council ordinance to establish mental health programs aimed at providing affordable, if not free, medicines and access for affected sectors. Dr. Khezy Colas, medical officer of the City Health Services Office (CHSO), disclosed that the top five mental health issues addressed included depression, anxiety disorders, schizophrenia, bipolar disorders, and personality disorders.

Methodology

This study employed a Qualitative Research Design, specifically utilizing a phenomenological approach. This method was chosen to provide a deep understanding of the resilience and lived experiences of clinically diagnosed nursing students who had faced depression. Through this approach, the researchers were able to generate meaningful insights into the coping strategies, support systems, and personal growth of these students, thereby offering valuable implications for nursing education and support programs within the academe.

Theoretical Framework/ Conceptual Model

This study utilized Resilience Theory by Norman Garmezy. The theory focused on the ability of individuals to bounce back from adversity and to maintain or regain mental health despite experiencing significant stress or trauma. It also emphasized the role of protective factors that enabled individuals to cope with stress and adversity.

By applying Resilience Theory, the researchers gained a deeper understanding of the complex interplay of factors that contributed to resilience among nursing students and developed effective strategies to support their mental health and well-being.

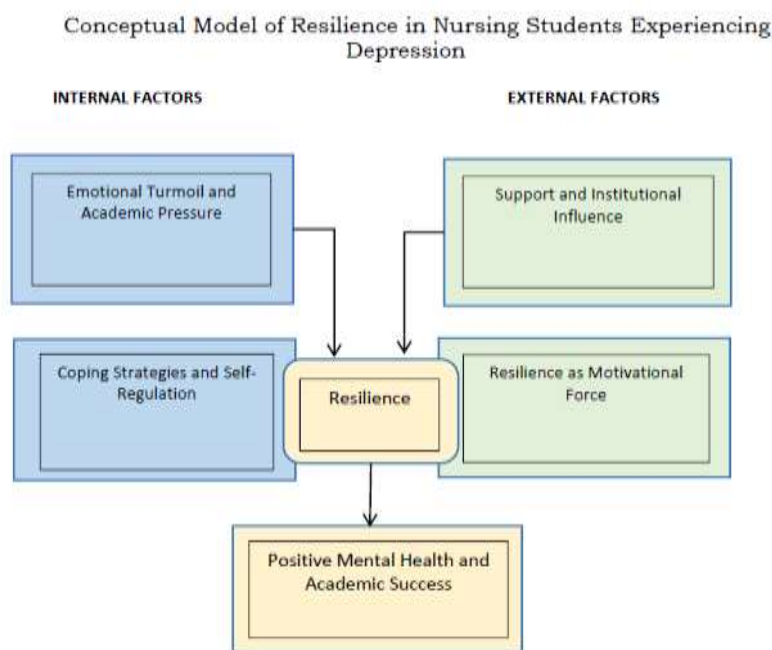


Figure 1. Conceptual Model of Resilience in Nursing Students Experiencing Depression

This model illustrates the dynamic interplay between internal factors, external supports, and the development of resilience among clinically diagnosed nursing students. Internal factors such as emotional turmoil and academic pressure, along with coping strategies and self-regulation, shaped students' personal responses to adversity. External supports including peer and family encouragement, faculty empathy, and institutional influence further reinforced resilience. The model also highlights how resilience evolved into a motivational force, guiding students toward positive mental health and academic success.

Statement of the Problem

This study aimed to investigate the resilience of nursing students at Baguio Central University who had experienced depression and the factors that influenced their ability to cope and recover. Specifically, the study sought to answer the following questions:

1. What strategies did nursing students use to maintain their mental well-being and balance academic and clinical responsibilities?
2. How did nursing students view their own ability to cope with challenging emotions?
3. What role did personal and environmental factors play in supporting their well-being?

Research Design and Methodology

This chapter discussed the research design, the locale and population of the study, the data-gathering tools, and the treatment of data. It outlined the methodological framework that guided the investigation, described the setting in which the study was conducted, and identified the participants involved.

Furthermore, it explained the instruments that were employed to collect the necessary data and the procedures that were applied in analyzing and interpreting the findings

Research Design

The study utilized a Qualitative Research Design with a phenomenological approach, which provided a deep understanding of the resilience and lived experiences of clinically diagnosed nursing students who had faced depression. This design allowed the researchers to capture the essence of the participants' perspectives and offered important insights for nursing education and support programs within the academe.

Locale and Population

The study was conducted at Baguio Central University particularly in the College of Nursing and the School of Midwifery in coordination with the Guidance Services Office and a licensed psychometrician in the first semester of school year 2025-26. The participants of the study consisted of approximately five stable, clinically diagnosed nursing students.

Data Gathering Tool

This study used in-depth, semi-structured interviews and narrative sketches. To gather data on everyday life experiences of participants. The researchers developed an interview guide consisting of open-ended questions that encouraged participants to share their experiences in detail. In coordination with the Guidance Counselor and a licensed psychometrician, the participants were also assessed using the Screening Test before the face to face interview.

Examples of interview questions included:

1. Can you describe a time when you felt depressed during your nursing studies?
2. How did you cope with your depression?

3. What factors or strategies helped you remain resilient?
4. How has your experience with depression and resilience affected your nursing education and practice?

Data Gathering Procedure

The data collection consisted of in-depth, semi-structured face to face interviews with audio recording to capture nursing students' detailed narratives of their experiences with depression and resilience.

Screening Test was also done prior to the Face-to-Face interview by the Guidance Counselor to ensure stability of the participants. Narrative sketches were also collected from participants as visual representations that depicted their journey through depression and resilience.

Prior to the conduct of the interviews', informed consent was obtained after participants were briefed about the study. The researchers established rapport and demonstrated flexibility and active listening throughout the sessions to ensure participants felt comfortable sharing their experiences. All interviews were recorded and transcribed verbatim to ensure the full capture of nuances in the participants' narratives.

Treatment of Data

In data preparation, the researchers compiled the transcripts and narrative sketches in a systematic manner, ensuring that each participant's data was clearly labeled and stored for easy retrieval. The researchers employed coding and thematic analysis to identify common themes and patterns within the data. They read through the transcripts and narrative sketches multiple times to become familiar with the content. Significant statements, phrases, and visual elements were identified to capture key aspects of the participants' experiences. Initial codes were generated for these significant elements, with each code being descriptive and reflective of the essence of the data. An example, A participant

mentioned finding support from peers, this was coded as “peer support.”

Axial coding was then applied to help the researchers identify patterns and relationships within the data. Emerging themes included “coping strategies,” “support systems,” “impact of depression,” and “resilience factors.” These themes provided a structured framework for interpreting the participants’ narratives and facilitated a deeper understanding of their lived experiences.

Data Analysis
Venn Diagram of Methodology

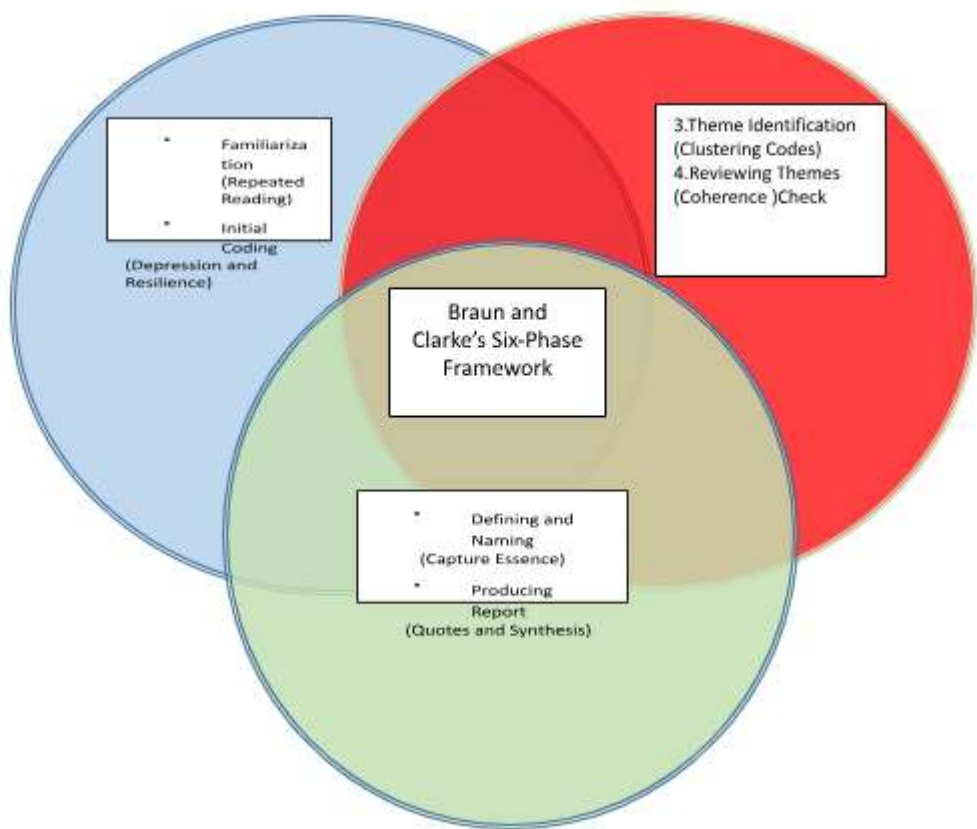


Figure 2. Venn Diagram of Methodology using Braun and Clarke’s Six Phase Framework.

The analysis for this study utilized the six-phase thematic analysis framework established by Braun and Clarke (2006), characterized by an iterative and recursive process of data interpretation. This systematic approach begins with a rigorous

Data Engagement phase (Blue Zone), involving the repeated reading of interview transcripts to ensure familiarization (Step 1) and the systematic application of initial codes to segments specifically relevant to depression and resilience (Step 2). As the analysis progresses into Theme Generation (Red Zone), these initial codes are clustered into broader patterns of meaning to identify potential themes (Step 3), which are then critically reviewed for internal coherence and external relevance to the data set (Step 4). The final stage of the methodology focuses on Synthesis and Reporting (Green Zone), where the identified themes are refined, defined, and named to capture the fundamental essence of the participants' experiences (Step 5). This culminates in the production of a comprehensive report that integrates illustrative quotes with thematic synthesis to provide a grounded interpretation of the phenomena (Step 6). Central to this framework is the constant refinement of data, codes, and themes, ensuring that the final analysis is not merely a description of the data but a theoretically sound interpretation of the interplay between depression and resilience.

Ethical Considerations

To address ethical considerations, the researchers ensured the safety, well-being, and rights of the participants. Informed consent, including voluntary participation, provision of detailed information, comprehension, and written consent, was obtained from each participant before they took part in the study.

Confidentiality and anonymity were maintained, and all data collected during the study were kept confidential and securely stored. Any personally identifiable information was excluded from any representations.

Participants had the right to withdraw from the study at any point without any negative repercussions respecting their right to withdraw. The researchers also obtained approval from the Director of Research before commencing the study. This approval

ensured that the study met ethical standards and protected participants' rights.

All participants were treated with dignity and respect throughout the study. Cultural sensitivity and respect for participants' backgrounds and experiences were consistently observed.

Findings and Result

This chapter present the findings of the study, “*Resilience in Nursing Students Experiencing Depression: A Phenomenological Exploration.*” Data were analyzed using Braun and Clarke’s six-phase framework for thematic analysis. Four major themes emerged from the narratives of nursing students: Emotional Turmoil and Academic Pressure, Coping Strategies and Self-Regulation, Support Systems and Institutional Influence, and Resilience as a Motivational Force. These themes captured the lived experiences of participants and illustrated how resilience was fostered amidst depression.

Emergent Themes

1. Emotional Turmoil and Academic Pressure

Participants consistently described emotional distress rooted in academic demands, personal challenges, and environmental stressors.

1. Academic overload: Pop quizzes, reporting, and clinical duties triggered breakdowns and sleep disturbances.
2. Post-pandemic adjustment: Transitioning from online to face-to-face learning intensified anxiety.
3. Family strain and isolation: Living away from family heightened feelings of loneliness.
4. Environmental triggers: Weather and external stressors influenced mood and motivation.

“...I felt really down na hindi na po ako nakakabangon...” – Participant 1

“...Ang hirap pong umattend ng classes...” – Participant 2

This theme highlighted the intersection of academic rigor and personal vulnerability, underscoring the need for balanced workloads and psycho social support.

2. Coping Strategies and Self-Regulation

Students employed diverse methods to manage their mental health and sustain resilience.

1. Self-awareness and acceptance: Recognizing emotional needs and practicing breathing exercises.

2. Faith and spirituality: Reconnecting with religious beliefs offered strength and clarity.

3. Journaling and reflection: Writing thoughts helped process emotions.

4. Academic focus as distraction: Immersing in studies diverted negative thoughts.

“...Nag fo-focus ako sa academics para ma-divert yung thoughts ko.” – Participant 3

“...Breathing exercises and acceptance.” – Participant 4

These strategies reflected the adaptive mechanisms students used to regulate emotions and maintain functionality despite depressive episodes.

5. Support Systems and Institutional Influence

Support from peers, family, and faculty was pivotal in fostering resilience.

1. Family encouragement: Emotional grounding from parents and grandparents.

2. Peer support: Companionship and early recognition of distress.

3. Faculty empathy: Instructors who listened and counseled students made lasting impacts.

4. Mental health advocacy: Participation in peer programs fostered community and awareness.

“...One of our instructors actually stepped up to help us...” – Participant 1

“...Mas nagiging aware ako... natutulungan ko din sarili ko.” – Participant 3

This theme emphasized the importance of institutional empathy and accessible mental health programs, while also revealing gaps in awareness and engagement with formal services.

4. Resilience as a Motivational Force

Resilience was framed not merely as survival, but as transformation and purpose.

1.Future orientation: Anchoring efforts in long-term goals and professional aspirations.

2.Re-framing adversity: Viewing challenges as stepping stones to becoming better caregivers.

3.Faith in transformation: Belief in divine support and personal growth.

“...God is greater than my fear, anxiety, and depression.” – Participant 3

“...This profession is going to be my future vision for myself.” – Participant 4

This theme illustrated how resilience became a motivational force, enabling students to transcend adversity and strengthen their professional identity.

Results

The results are the following:

1. Nursing students sustained their mental health and managed academic and clinical demands through a combination of internal strengths-such as self-awareness, spirituality, and academic engagement- and external supports, including encouragement

from family, peers, and empathetic faculty members. These findings echo broader discussions in the Philippine media that highlight the importance of psychosocial support in academic settings” as cited by articles on Philippines Daily Inquirer November 1, 2021.

2. To cope with challenging emotions the participants used: Journaling, Breathing Exercises, Faith and Academic Focus as cited by this journal author Natasha Lynn Albatroso in Nursejournal.org as of 2024

3. Support network- including family members, peers, faculty mentors, and institutional mental health initiatives- were consistently identified as crucial to student well-being. Local government reports have similarly underscored the role of community-based programs strengthening resilience among youth as cited by this article in the official website of the City of Baguio. (No date citation)

Conclusion

1. “The study revealed a notable gap: although peer and faculty support proved beneficial, institutional mental health services were often perceived as insufficient or difficult to access.”
2. “A disconnect was observed between existing mental health programs and student participation, underscoring the necessity for initiatives that are more visible, accessible, and tailored to student needs.”
3. “The findings further emphasized the importance of equipping faculty with training to recognize early signs of psychological distress and to respond effectively, thereby strengthening resilience among nursing students.”

Recommendations

For Educational Institutions

Integrate mental health components into nursing curricula: Include modules on self-awareness, coping strategies like journaling and breathing exercises, and the role of spirituality in well-being, aligned with evidence-based practices.

Strengthen faculty training. Provide professional development to help educators become more empathetic and equipped to recognize signs of distress and offer appropriate support.

Expand institutional mental health initiatives: Establish or enhance programs that connect students with counselors, support groups, and resources tailored to nursing students' unique demands.

For Families and Peer Groups

1. Foster open communication: Encourage family members and peers to regularly check in on nursing student well-being and offer consistent emotional encouragement.

2. Promote peer support networks: Facilitate the formation of student-led study and wellness groups where individuals can share experiences and coping strategies.

For Policy Makers and Local Governments

1. Support community-based mental health programs: Invest in and expand initiatives similar to those highlighted in local reports, ensuring they are accessible to nursing students and other youth in academic settings.

2. Establish partnerships: Collaborate with educational institutions to align community resources with student's needs, creating a cohesive support system.

For Nursing Students

1. Prioritize personal coping practices: Incorporate evidence-based strategies like journaling, breathing exercises, or faith-based activities into daily routines to manage stress.

2. Proactively seek support: Utilize available resources from family, peers, faculty, and institutional or community programs rather than addressing challenges in isolation.

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INFLUENCE OF LIBRARY SERVICES ON THE RESEARCH PRODUCTIVITY OF BAGUIO CENTRAL UNIVERSITY

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ABSTRACT

This study examines the influence of library services on the research productivity of faculty and students at Baguio Central University. It explores how access to services, availability of research support, and library facilities impact the quantity and quality of research outputs. Data were collected through surveys to assess user satisfaction and the correlation between library utilization and research performance. Results indicate that comprehensive library services significantly enhance research productivity by providing essential materials, and fostering information literacy. The study concludes that continuous improvement of library services is vital for supporting the university's academic and research goals.

Keywords: Library-services, Research-productivity, Academic-libraries, Higher-education, Information-seeking-behavior, Resource-utilization

Background of the Study

In the contemporary landscape of global higher education, research productivity has emerged as a quintessential indicator of a university's efficiency and academic standing. It is no longer a peripheral activity but an integral measure that determines institutional rankings, attracts talent, and secures funding. The pressure to enhance scholarly output is a global phenomenon, and national educational bodies are responding with clear directives. In the Philippines, for example, the Commission on Higher Education (CHED) has made it a core part of its development plan to enhance the research culture within higher education institutions (Orfan et.al., 2024).

Research plays an important role in facilitating the prosperity of a nation and the well-being of her people. Through research, Universities and other higher institutions of learning make important contributions to the growth and development of vital sectors of a nation, thereby promoting national and global development. Research is a process of careful, systematic, checking, verifiable, empirical, critical, analyzing and interpreting data to provide answers. It is an intentional effort to gather, check, and analyze information (Blessing, Ogbomo, & Ifejeh, 2018).

Research productivity is crucial for all institutions. It plays a significant role in academic success since it is one major requirement for academic promotion in many countries. It boosts professional development, prestige, and self-confidence and improves capacity to adapt to the demands of dynamic academic environments (Orfan et.al., 2024).

Moreover, research output raises an institution's standing and reputation, improves its national and worldwide ranking, and draws in more domestic and foreign students, all of which boost an institution's financial standing (Henry et al., 2020). One of the main reasons why higher education institutions (HEIs) have ever

appeared in any global university rankings is because of poor research output (Tahsildar et al., 2021).

A bibliometric study of research productivity in Arab and Middle Eastern nations over a 20-year span (2003–2022) was carried out by Dardas et al. (Citation2023). The results showed a steady rise in research production in the area, while academic output, impact, and quality varied significantly throughout nations. Iran dominated publication activity when population and GDP were taken into consideration, followed by Egypt and Turkey. Nonetheless, a smaller percentage of the region's research output was published in high-impact journals. Research productivity in the Organization of Islamic Cooperation (OIC) member nations was also examined by Haq and Tanveer (Citation 2020). In 2018, they looked at 3,946,933 academic publications worldwide. Only 8.29% of publications came from five OIC member nations, they discovered. In terms of academic publications, Iran and Turkey were the two OIC nations with the most.

The writers also came to the conclusion that OIC countries were steadily increasing their publications.

The role of the academic library has undergone a profound transformation. Historically, libraries were considered passive "storehouses" of preserved records, with their primary function being the acquisition and organization of books and journals. However, this curatorial function has expanded dramatically to encompass an active, facilitative role in the modern research ecosystem. Today's academic libraries are recognized as "vital hubs" that provide access to information, offer essential support, and foster collaborative environments. They are seen as pivotal in the creation, dissemination, and discovery of knowledge within academic communities (Tahsildar et al., 2021).

In academic research institutions, research is essential, and university libraries are vital for user's research assistance. In order to promote research, libraries must maintain essential

services and resources, which can be difficult given shrinking finances and conflicting requests to pay for databases, journal subscriptions, and other resources. In light of this, academic librarians must not only determine the demands of the users but also show the library's worth and influence on their research output (Mi Scoulas & De Groot, 2024).

Libraries not only give users access to vast collections of preserved archives, but it educates users through information literacy. Users are not only kept up to date on recorded information, but they are also encouraged to locate pertinent information at the appropriate moment. It teaches them the real ways to conduct research and use library resources. Library resources also assist students with their research and study needs. Together with resources for specialist databases and research materials, it offers areas for both solo and group study (Ajiboye, Bokoh, Bello & Idowu, 2023).

According to the Scimago Institutions Ranking as cited by Rogayan and Corpuz (2022), the Philippines ranked sixth among the 10 member states in the Association of Southeast Asian Nations (ASEAN) region based on the April 2020 Scopus data. The country has 38,024 documents in the Scopus database, and 34,839 of these are citable. The total number of citations reached 571,112, including 55,765 self-citations. On average, there were 15.02 citations per document, and the h-index was 246. Numerous studies have been carried out in the Philippines concerning research productivity. These investigations have concentrated on the research productivity of basic education institutions, the research productivity of SUC leaders along with their leadership styles, the research productivity of faculty members, the effects of research productivity within higher education institutions (HEIs), research productivity across specific disciplines, obstacles to research productivity, the government's role in enhancing the research productivity of HEIs, fostering a research culture and boosting scientific output, and evaluating the effectiveness of the Philippines' scientific enterprise system.

Baguio Central University (BCU) operates within a Philippine higher-education context where demands for research outputs are rising—driven by accreditation standards, graduate program development, and the need to contribute to local and national knowledge. Like many regional universities, BCU’s library faces pressures to modernize services, expand electronic access, and provide more specialized research support within constrained budgets. Anecdotal observations and institutional reports often point to bottlenecks (limited subscriptions to key databases, inadequate research training, or insufficient staff time for individualized research consultations) that could be suppressing research productivity among both students and faculty. However, locally specific, empirical evidence linking particular library services to measurable changes in research productivity at BCU is limited or absent.

This study therefore investigates the influence of library services on the research productivity at Baguio Central University. By identifying which services are most strongly associated with higher output (quantity and/or quality), and by exploring user perceptions and institutional constraints, the research aims to provide evidence for targeted improvements—such as prioritizing database subscriptions, expanding research-skills training, or upgrading technological infrastructure. The findings are intended to inform library planning and university policy so that resource allocation better supports the institution’s research goals.

Theoretical / Conceptual Framework

This study is anchored on several theories that explain how access to information and support services influence academic research productivity at Baguio Central University. Information Seeking Behavior Theory (Wilson, 1999). Wilson’s model of information-seeking behavior posits that individuals actively seek, use, and exchange information when faced with a research problem. Library services—such as reference

assistance, access to electronic resources, and research consultations—serve as facilitators in meeting these information needs. When library services are effective, students and faculty experience reduced barriers, enabling higher research productivity. According to the concept, information seeking behavior develops when an information user perceives a need and, in order to meet that need, places demand on formal or informal information sources or services. This behavior determines whether or not the user finds pertinent information. If successful, the person uses the knowledge they have found and may either completely or partially meet their perceived need. If they are unable to meet their need, they will need to start the search over.

Resource-Based View (Barney, 1991). The Resource-Based View (RBV) highlights that organizations gain competitive advantage when they utilize valuable, rare, and well-managed resources. Applied to libraries, services such as digital repositories, databases, and interlibrary loan systems act as institutional resources that enhance the research capabilities of students and faculty. The more accessible and effective these services are, the more they contribute to improved research output and productivity.

Penchansky and Thomas' Theory of Access (1981). This theory identifies five dimensions of access—availability, accessibility, affordability, acceptability, and adequacy. When applied to library services, these dimensions shape how researchers engage with resources. A well-designed library system that is accessible, user-friendly, and responsive to needs fosters greater utilization, which directly influences the research productivity of its users.

Expectancy-Value Theory (Vroom, 1964). Expectancy-Value Theory explains that individuals' motivation is influenced by their expectation of success and the value they place on the outcome. In the library context, when researchers expect that library services will significantly aid their work (expectancy) and

they value the quality of research output (value), they are more likely to maximize library resources. This motivation translates into greater research productivity.

Paradigm of the Study

The paradigm of the study outlines how the research input, process and output interact with each other as shown in Figure The input variables contents influence of library services on the research productivity of Baguio Central University.

The process indicates the descriptive research design, descriptive survey method, administration of questionnaire, statistical treatment of data, analysis and interpretation of data. The expected output is to propose a model or framework linking effective library services to higher research output.

INPUT	PROCESS	OUTPUT
Influence of Library Services on the Research Productivity of Baguio Central University	➤Quantitative Descriptive Research Design ➤Descriptive Survey Method ➤Administration of Questionnaire ➤Treatment of Data ➤Analysis of Data ➤Interpretation of Data	Propose a model or framework linking effective library services to higher research output

Statement Of the Problem

This study looked into the influence of library services on the research productivity of Baguio Central University. Specifically, the study seeks to answer to the following questions:

1. What is the level of agreement of library services on the research productivity of Baguio Central University in terms of:
 - a. Library Resources and Accessibility;
 - b. Library Services;
 - c. Facilities and Infrastructure; and
 - d. Research Productivity
2. What degree of challenges encountered in using library services for research productivity?

Research Design and Methodology

This chapter contains the research design, locale and population of the study, data gathering instrument, reliability and validity of the questionnaire, data gathering procedure, treatment of data and ethical considerations.

Research Design

This study employs the descriptive research design particularly on the influence of library services on the research productivity of Baguio Central University. This method was used because it allows the researcher to collect data from the respondents. The descriptive research design is well-suited because it provides a systematic and detailed description of the current state of skills, identifies patterns, and lays the foundation for further research and interventions (Heath, 2023).

Descriptive research design is a type of research methodology that aims to describe or document the characteristics, behaviors, attitudes, opinions, or perceptions of a group or population being studied (Hassan, 2024).

Descriptive survey method was used to collect information from the respondents about their opinion, behavior, or knowledge. The data aimed to know the extent to which different conditions can be obtained among the respondents.

Locale and Population of the Study

The respondents of this study are the enrolled students and currently working at Baguio Central University for the school year 2025 – 2026. The sample will be determine using Slovin's formula, $n = N / (1 + Ne^2)$, estimates the minimum sample size (n) needed for a survey or study, given the total population size (N) and an acceptable margin of error (e). The researchers chose these respondents since they are easier to reach and engage with. Factors like time constraints and willingness to participate will be taken into consideration.

Data Gathering Instrument

This study utilizes a structured survey questionnaire as the primary data collection instrument. The questionnaire are divided into two main sections to ensure a comprehensive evaluation of the research productivity at Baguio Central University. The items in Part 1 of the questionnaire deals with the level of agreement of library services that supports the research productivity of Baguio Central University in terms of (a) library resources and accessibility; (b) library service; (c) facilities and infrastructure; and (d) research productivity. The items in Part II of the questionnaire focuses on the level of challenges encountered in using library services for research productivity.

Reliability and Validity of Questionnaire

Reliability refers to the consistency and stability of the instrument in measuring what it intends to measure. To determine the reliability of the questionnaire on research productivity, a pilot test was conducted among a group of respondents similar to the target population. The results were analyzed using Cronbach's Alpha, a statistical measure of internal consistency. A Cronbach's Alpha coefficient of 0.70 and above was considered acceptable, indicating that the items in the

questionnaire were reliable in measuring the constructs related to research productivity

Data Gathering Procedure

The data gathering process for this study is conducted systematically to ensure accurate and reliable results. Prior to data collection, necessary permissions were obtained from the school administration, and informed consent is secured from all participating respondents. The study employ a structured survey questionnaire as the primary data collection instrument to assess the level of agreement and level of challenges of library services on the research productivity of Baguio Central University. The first phase involved the distribution of the survey questionnaire to the respondents and was given clear instructions on how to answer the questionnaire. In the second phase, responses are collected, reviewed, and analyzed. The data were processed using statistical tools.

Statistical Treatment of Data

The researchers measured the items in the questionnaire using a three (3) point scale to ensure that the respondents understand them. The data will be categorize in appropriate tables containing all the items of each problem, numerical values, statistical limits, descriptive equivalent, and symbols use.

Ethical Considerations

Before conducting the study, the researchers has undertook and observed the following procedures to ensure ethical considerations in the conduct of the research: The researchers secured first the written permission to administer the research instruments from the school authorities of the intended participants of the study; a letter accompanied the survey instrument was given to the respondents; the participants identify would not be divulged in the current study in compliance to the

provisions of the Data Privacy Law; all information and data from the respondents of the study would be held in strict confidentiality; when the respondents answered the questionnaire meant they would agree to participate in the study as respondents; the responses in the questionnaire would be presented in aggregate form and not as individual responses. That the researchers hereby declares that all information, materials and findings quoted from other sources which were included in this study were properly cited and acknowledged. The authors hereby declares that generative AI technologies, have been used in the writing and/or editing of this manuscript. The AI tools utilized for this purpose are Perplexity AI and Chat GPT AI. Details of AI usage: AI assistance was employed for structuring, refining, and enhancing clarity in the manuscript. The AI-generated content was reviewed, edited, and validated by the author(s) to ensure accuracy, coherence, and adherence to research standards. Input prompts provided to the AI primarily included requests for text refinement, paraphrasing, grammatical corrections, aggregation, and formatting suggestions. The researchers utilized both Perplexity AI and Chat GPT AI, taking advantage of each tool's strengths, to provide a well-rounded support system for the paper. The final manuscript remains the intellectual work of the authors, who take full responsibility for its content, accuracy, and interpretation.

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BENEFITS AND RISKS OF AI OVERDEPENDENCE ON THE COGNITIVE SKILLS OF NURSING STUDENTS IN RESEARCH

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ABSTRACT

This quantitative descriptive study examines the relationship between the perceived benefits and academic risks of Artificial Intelligence (AI) overdependence on the cognitive skills of nursing students at Baguio Central University during the 2025–2026 academic year. Driven by faculty observations of student reliance on AI during research tasks and title defenses, this study addresses a local literature gap within the Cordillera Administrative Region. The research is grounded in Cognitive Learning Theory, Bloom’s Taxonomy, Benner’s Novice to Expert Model, and Self-Determination Theory.

Data will be gathered from purposively selected student nurses using a four-part self-structured survey questionnaire assessing AI platform usage frequency, perceived benefits, academic risks, and cognitive skill levels across analysis, synthesis, evaluation, problem-solving, and information literacy. Statistical analysis will utilize descriptive statistics, including weighted mean, range, and Cronbach's alpha for instrument reliability. The study aims to uncover how technological

assistance coexists with cognitive offloading, diminished independent reasoning, and lower-order defense vulnerabilities. Ultimately, the findings will establish baseline empirical data to inform educational policies, helping curriculum planners design instructional strategies that integrate responsible AI utilization while safeguarding autonomous critical thinking and evidence-based competencies vital for future clinical nursing practice.

Keywords: Artificial-Intelligence, Overdependence, Cognitive-skills, Nursing-education, Research-competence, Academic-risk

Background of the Study

Artificial Intelligence (AI) is on the rise in educational institutions, which has brought its benefits and risks, particularly in nursing education and research. Research has been considered an important and vital component of requirement accomplishment and career formation.

In Baguio Central University, instructors have observed a trend where students are becoming overly dependent on AI platforms in research-related tasks. Online electronic technologies certainly offer instant and automatic support with results, but over usage raises concerns about the failure of essential cognitive skills in both instruction and clinical practice, such as analysis, synthesis, evaluation, and critical problem-solving, which are crucial and critically considered in nursing practice and education.

This situation placed into focus the need to conduct a research study to examine the benefits and the academic risks, as these factors are intertwined when it comes to AI usage and utilization. The overdependence of nursing students will undermine the evidence-based skills development that higher education institutions who had its primary goal. As some students had acknowledged their reliance on AI in research-related tasks and during title defense sessions where students

can't fully answer questions that will justify their created titles, this prompted the researchers to conduct this study.

In the global environment, the integration of frameworks of academic writing, efficiency, accessibility of resources, and especially research tasks. Across different countries in literature reviews, the improvement of writing quality, even increasing students' confidence in research undertakings, AI has consolidated all these (Castillo Martínez et al., 2024; Zhou et al., 2024). However, international scholars also warn of significant risks when students rely too heavily on AI platforms. Overdependence has been linked to diminished critical thinking, challenges in independent reasoning, and a tendency toward cognitive offloading, where technology substitutes essential intellectual engagement (Wang et al., 2024; Garzón et al., 2025).

In the Philippine context, AI adoption has grown rapidly among students in both secondary and tertiary institutions. National discourse highlights its role in supporting academic writing, reducing workload, and assisting students with research tasks. Yet, concerns about plagiarism, loss of originality, and reduced mastery of research competencies are increasingly reported by educators. While studies on AI in Philippine nursing education remain scarce, related research in allied health programs suggests that students benefit from AI tools but struggle to maintain independent critical inquiry and a deeper understanding when they become overly reliant on these platforms (Savellon, Baybayan, & Asiri, 2024; Labrague, 2023). Within the Cordillera Administrative Region (CAR), the challenge is magnified by the unique educational and cultural landscape, where many nursing students face difficulties in academic writing, literature synthesis, and research analysis. Educators in the region have noted that while AI use has made academic tasks faster and more accessible, students are at risk of bypassing the cognitive processes necessary for developing research competence. This raises questions about the long term

implications of AI overdependence on the readiness of future nurses to engage in evidence based practice, which is essential in regional health care delivery.

In Baguio City, where nursing education is highly competitive and research training is emphasized as part of professional preparation, the trend of AI overuse is particularly visible. At Baguio Central University, instructors have encountered students heavily reliant on AI for paraphrasing, summarizing, and even generating research outputs. Although these platforms are meant to support learning, their excessive use appears to undermine students' cognitive engagement, weakening their capacity to analyze, synthesize, and critically evaluate literature independently. This was a clear gap that is being reflected in Turnitin percentages when it comes to the research papers being submitted by nursing students. While research endeavors had constantly been focused on looking at global and national knowledge and perspectives, one aspect had been overlooked, where there was a scarce investigation that had been done in the Baguio area and the Cordillera region as a whole.

This study is significant in nursing education because it provides proof and a baseline on how AI overuse and overdependence will influence students' cognitive skills in analyzing, synthesizing, and critical evaluation. Findings will help educators design teaching strategies that will balance the development of independent learning and higher order thinking with the utilization of AI platforms. The results will help integrate responsible use of AI as it is incorporated into instructional design, as the active engagement of students is preserved and ensured by curriculum planners and instructors considering their cognitive processes, where they develop critical thinking skills, which are essential in research subjects and even in training.

The implications that this will carry in nursing practice will be shown in the results and findings. The ability to critically examine research is rooted in evidence-based practice as the findings are applied in clinical settings. Weakened decision making and analytical skills are rooted in overly depending on AI platforms, and they, at the same time, pose a risk as future nurses will enter the professional realm.

Identifying the risks and benefits of AI when it comes to overdependence, this study highlights the seriousness of training future nurses who are not only technologically knowledgeable but also have the competence in exercising independent judgment and critical thinking in patient care.

Finally, this study will contribute to nursing research by acknowledging current and uncharted issues where the academic impact of AI overdependence on the cognitive skills of nursing students. The results will draw a balance on AI utilization and informative guidelines on ethics when it comes to its usage. In this study, Baguio Central University serves as its local context. This will fill the gap when it comes to the absence of national literature in the Philippines and the regional setting, which is within the Cordillera, adding to the growing discourse on the intersection of AI along with student learning and research development.

Given these realities, this study aims to examine the relationship between the perceived benefits and academic risks of AI overdependence on nursing students' cognitive skills in research. This study seeks to explore the risks to independent learning and upper-level thinking, and the positive perceptions of AI usage, considering its benefits as they co-exist hand in hand.

Taking the context of inquiry within Baguio Central University, it will contribute to localized empirical evidence to the broader discourse on AI education as it addresses the scarcity of data in the Philippines and the Cordillera region, which

will provide insights that can inform nursing research, education, and practice.

Theoretical Framework/Conceptual Framework

This study is grounded on several theories that provide support in analyzing the consequences of AI overdependence on the cognitive skills of nursing students.

Applied in this study, **Cognitive Learning Theory** suggests that while AI platforms provide readily accessible information, excessive dependence on them may limit students' opportunities to process, analyze, and internalize knowledge deeply, thereby weakening cognitive development (Miller, 2021).

Second, Bloom's Taxonomy of Cognitive **Objectives** serves as a framework for evaluating student learning outcomes. While AI tools may enhance lower-order thinking skills such as remembering and understanding, there is growing concern that overreliance on these technologies could hinder the development of higher-order cognitive skills—particularly analysis, evaluation, and synthesis—which are essential in conducting nursing research (Anderson & Krathwohl, 2001).

Third, Benner's Novice to Expert Model explains how nursing students progress from novice learners to experts through experience and reflective decision-making. Overdependence on AI platforms may interrupt this natural progression by encouraging reliance on machine-generated outputs rather than experiential learning, thereby delaying the development of critical thinking, sound judgment, and independent problem-solving skills (Benner, 1984).

Lastly, Self-Determination Theory (SDT) underscores the significance of intrinsic motivation, autonomy, and competence in learning. Excessive dependence on AI may undermine students' intrinsic motivation to engage independently with

research tasks, diminishing their sense of autonomy and ownership of the learning process, and ultimately weakening self-regulated learning (Deci & Ryan, 2000).

perceived benefits coexist with academic risks. Such risks include diminished critical thinking, decreased knowledge retention, citation inaccuracies, and tendencies toward academic dishonesty. Both the benefits and risks are believed to directly influence the development of cognitive skills—specifically analysis, synthesis, evaluation, problem-solving, and information literacy.

Guided by Cognitive Learning Theory, Bloom’s Taxonomy, Benner’s Novice to Expert Model, **and** Self-Determination Theory, the framework assumes that cognitive skills are most effectively developed through active, autonomous, and critical engagement in research processes.

However, overdependence on AI tools may either facilitate or impede this development, depending on how students balance the perceived advantages and manage the associated academic risks.

Paradigm of the Study

The study focuses on the input, that is, the benefits and risks of AI overdependence on the cognitive skills of nursing students in research. The process is a quantitative research design, a self-structured questionnaire, statistical treatment, and interpretation and analysis of data, while the output will be the proposed strategies on how nursing students can optimize AI tools in research while avoiding the risks of overdependence.

Conceptual Framework

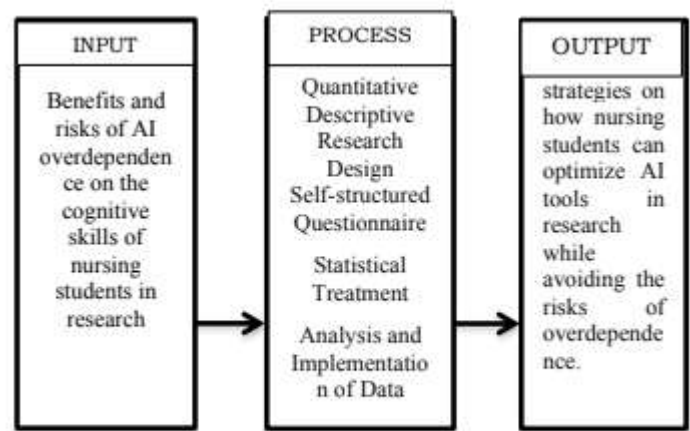


Figure 1. Paradigm of the Study

Statement of the Problem

This study aims to examine the overdependence of nursing students on AI platforms.

Specifically, it seeks to answer the following questions:

1. What is the demographic profile of the respondents?
2. What is the level of frequency of the use of Nursing students in the different AI platforms in accomplishing research-related tasks?
3. What are the perceived benefits of AI usage in research-related tasks among nursing students?
4. What academic risks do nursing students encounter in relation to AI overdependence?
5. What is the level of cognitive skills of nursing students in terms of analysis, synthesis, evaluation, problem-solving, and information literacy?
6. Is there a significant relationship between perceived benefits of AI use and the cognitive skills of nursing students?
7. Is there a significant relationship between perceived academic risks of Ai Overdependence and the Cognitive Skills of Nursing Students.

Methodology

This chapter presents the research design, the locale and respondents of the study, the data gathering tool, and the statistical treatment of data.

Research Design

The researchers will use quantitative research to explain phenomena by collecting numerical data that is analyzed using mathematically based methods. Quantitative descriptive research is a type of research design that aims to describe the characteristics of a population or phenomenon being studied. It focuses on quantifying data through various means (surveys, questionnaires, tests) and analyzing it to understand patterns, trends, and relationships (Creswell, J. W., 2014). It means that quantitative research methods deal with numbers and anything measurable in a systematic way of investigation of phenomena and their relationships.

Locale and Population

This study will be conducted at #28 Lower P. Burgos, Baguio City, where the Department of College of Nursing and School of Midwifery of Baguio Central University (BCU) is located. The university mentioned is chosen because it is the most accessible and convenient for the researchers since the respondents are currently enrolled in the university.

The respondents of the study are going to be student nurses of BCU who are currently enrolled and are overdependent on AI when doing their research.

Data Gathering Instrument

The researchers will use a structured questionnaire in the form of a checklist for the convenience of the respondents to answer the information needed. The content of the questionnaire will

be self-constructed and address the study on the benefits and risks of AI overdependence on the cognitive skills of nursing students in research.

The questionnaire is composed of three parts in such a way that it will examine the overdependence of nursing students on AI platforms. The first part will look into the frequency of the use of AI platforms, the second part will determine the perceived benefits of AI usage in research-related tasks among nursing students, and the third part will determine the perceived risks of AI usage. Lastly, part four will consist of the level of cognitive skills of nursing students in terms of analysis, synthesis, evaluation, problem solving, and information literacy.

Data Gathering Procedure

Upon the approval of the college dean, the questionnaires will be distributed to the respondents, and they will be informed of the purpose of the study and how to answer the questions. Anonymity and confidentiality will be assured among the BSN respondents who depend on the use of AI platforms. The direction of the accomplishments of questionnaire will be specified. The questionnaires will be collected after they are answered on the same day.

All the questionnaires will be collected, and the data will be treated statistically, followed by interpretation, generalization, and drawing a conclusion.

Treatment of Data

The data to be gathered will be edited, classified, tallied, and organized into tables. After which, they will be analyzed by the researchers to give a clearer and more comprehensive understanding. The researchers will utilize descriptive statistics, which include a weighted mean for the statistics.

1. Range

The range is the spread of data from the lowest to the highest value in the distribution. It is a commonly used measure of variability.

$$R = (H - L) / H$$

Where:

R = range

H = highest value

L = lowest value

2. Weighted Mean

This is a descriptive type of statistics that deals with statistical procedures and describes data. The weighted mean is a set of measurements where the sum of frequency scores is divided by the total number of cases.

$$\text{Where: } \bar{x} = (\sum f_i x_i) / (\sum f_i)$$

f_i = frequency or number of respondents

X_i = is the value of the variable X

3. Cronbach's alpha

Cronbach's Alpha is widely used in research and social sciences to assess the reliability or internal consistency of a set of items (usually survey questions or test items) that are intended to measure the same underlying construct or concept. Cronbach's alpha can be calculated using the following formula:

$$\alpha = \frac{N}{N - 1} \cdot \left(1 - \frac{\sum_{i=1}^N \sigma_i^2}{\sigma_T^2} \right)$$

Ethical Considerations

Ethical considerations are the principles that guide researchers and ensure their work is conducted with integrity. These principles help hold researchers accountable, ensuring that

funding is used appropriately and research misconduct is prevented. By adhering to ethical standards, researchers maintain public trust in their work.

Researchers will follow the required protocols for conducting the study, including obtaining consent forms, justifying the study's purpose, and securing necessary approvals.

Regarding the anonymity of the questionnaires, the respondents' preferences will be respected. They will be provided with enough information to fully understand the potential risks and benefits of the study, ensuring their voluntary participation. Furthermore, the data that will be collected will be kept confidential and will only be used as necessary for the research project.

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ETHICAL BEHAVIOR IN THE WORKPLACE: THE BCU SITUATIONER

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ABSTRACT

This study endeavored to establish the situationer on the ethical behavior in the workplace among the employees of Baguio Central University. Specifically, it answered the following queries: 1) Level of awareness of the employees on the ethical behavior in the workplace; 2) Level of agreement of the employees on the ethical behavior in the workplace; 3) Frequency of practice of the ethical behavior in the workplace; and, 4) Level of seriousness of the challenges or problems encountered relative to ethical behavior in the workplace. The study made use of the mixed methods employing the sequential explanatory design. The quantitative phase used a survey questionnaire to answer the problems purported in the study while the qualitative phase was through the interview of selected participants using the semi-structured guide questions. The participants involved 23 employees who submitted their responses via the Google form.

The data gathered for the quantitative phase were tallied and subjected to frequency count, weighted mean and average weighted mean; the qualitative data gathered during the interview underwent thematic analysis. The following were the findings of

the study: the level of awareness on the ethical behavior in the workplace is “Very Aware”; the level of agreement on the ethical behavior in the workplace is “Agree”; the frequency of practice of ethical behavior in the workplace is “Usually”; and, the level of seriousness of the challenges or problems encountered relative to ethical behavior in the workplace is “Serious.” Based on the findings of the study, the following conclusions are drawn: the level of awareness of the respondents on the ethical behavior in the work place is quite high which means that the respondents are highly cognizant of these ethical behavior; the respondents expressed their concurrence to the identified ethical behaviors in the workplace; the respondents consider that the practice of ethical behavior is just the normal, customary or a common day-to-day practice; and, the unethical behavior considered as serious may indicate that there is a perceived violations of professional standards in the workplace which may have a negative impact in the workplace.

Keywords: Ethical behavior, workplace, situationer, awareness, frequency of practice, challenges

Introduction

Background of the Study

This study focused on the situationer of the ethical behavior in the workplace through the eyes of the employees.

According to goong.com-New Dictionary (n.d.), “a situationer is a document that provides an analysis or overview of a specific situation. It is meant to inform decision-makers about a current state of affairs or circumstances. It is often used in professional and academic settings where comprehensive understanding of a situation is required. It further emphasized

“that it is responsible for identifying, assessing and analyzing various situations or circumstances. It involves gathering relevant information, conducting research and presenting an overview or summary of a current state or conditions.”

Ethical behavior refers to the actions that align with moral principles and values. It involves making decisions based on fairness, honesty and respect for others (Cornell, 2024). Indeed Editorial Team (2023) aptly described that “a person who displays ethical behavior often possesses a strong moral standard and consistent value system.”

Why is ethical behavior important in the workplace? What benefits can a company derive when employees observe ethical behavior?

It is important to understand that ethical behavior in the workplace can stimulate positive employees with respect to what is right and what is wrong in regard to conduct and decision-making (Mahan, 2021). The benefits of ethical conduct in the workplace are manifold. It fosters a positive culture, enhances the company’s image and leads to a greater employee satisfaction and retention. Conversely, unethical behavior can lead to legal issues, financial loss and damage to company’s reputation (bizadmin, 2023). It further emphasized that “Despite its importance, maintaining ethical standards can be challenging issues like conflict of interest, discrimination, harassment and data breaches pose significant ethical dilemma. While organization policies are critical, the responsibility also lies with each employee: being aware of ethical standards, reporting unethical behavior and making integrity a personal priority.”

But what impel unethical practices in the workplace? What drives the unethical behavior of employees? According to NeuroLaunch Editorial Team (2024), the identified drivers of

unethical behavior are: personal gains and self-interest, pressure from superior or peers, lack of ethical leadership, organizational culture and norms, insufficient training and awareness and rationalization and moral disengagement.

In the Philippines, the Filinnials (Filipino millenials) bring a unique blend of traditional Filipino values and modern global influence into their workplace. Their work attitude and ethical behavior reflect their upbringing in a culture deeply rooted in collectivism, respect for authority and family orientation combined their exposure to technology, globalization and individualistic ideals (Admin, 2025). The cited article further explained that “Filinnials bring a dynamic mix of cultural values and modern ideals into the workplace shaping their work attitude and ethical behavior.”

Generally, people tend to use the words ethics and values interchangeably. However, there is a fine line of difference between the two: Ethical behavior is a documented set of principles according to which people are expected to behave. Values are the inner conscience. Behavior based on values balances out any conflict in an organization (Beyondpsychub, 2022).

Core values are a small set of essential, enduring principles encapsulated as organizational culture. They represent the foundational commitments and beliefs that help a company navigate complex situations while maintaining its identity (empuls, 2024). BambooHR, (n.d.) defined that “Core values are the beliefs and principles that inform behavior in an organization and thus shape culture.”

Baguio Central University has core values that serve as the guiding values of the employees expressed in the acronym E.A.G.L.E. which means E for Excellence, A for Accountability,

G for Gratitude, L for Loyalty and E for Equity. They serve to fortify the ethical behavior of the employees in the workplace. These core values are enshrined in the employees' manuals of the University. One way to align these core values will be to integrate them in the day-to-day functions of the University employees. As pointed out by Obaidy, (2019) "Without core values, it's nearly impossible to create an ethical workplace culture."

As of this present study, there is an absence of an undertaking conducted relative to ethical behavior in the workplace in Baguio Central University. Thus, this prompted the researchers to venture into this project.

Statement of the Problem

This study endeavored to establish the situationer on the ethical behavior in the workplace among the employees of Baguio Central University. Specifically, it answered the following queries: 1) What is the level of awareness of the employees on the ethical behavior in the workplace?; 2) What is the level of agreement of the employees on the ethical behavior in the workplace?; 3) What is the level of frequency of practice of the ethical behavior in the workplace as perceived by the employees?; 4) What is the level of seriousness of the problems encountered relative to the ethical behavior in the workplace as perceived by the employees?

It was theorized in this study that the level of awareness on the ethical behavior in the workplace is "Aware"; the level of agreement on the ethical behavior in the workplace is "Agree"; the frequency of practice of the ethical behavior in the workplace is "Always"; and the degree of seriousness of the challenges or problems encountered relative to ethical behavior in the workplace is "Slightly Serious."

Theoretical Framework of the Study

This study was anchored on the following theories and concepts relative to ethical behavior in the workplace (BITGLINT, 2023):

Utilitarianism. It asserts that an action is morally right if it maximizes overall happiness or pleasure of the greatest number of people.

Deontology. It argues that there are moral values and principles that are inherently right or wrong, irrespective of its consequences.

Social Contract Theory. It suggests that morality is based on a hypothetical agreement individuals make to follow certain rules for the benefit of the society.

Behaviorism. It contends that what is morally right or wrong is dependent on cultural, societal and individual beliefs.

Egoism. This argues that individuals should act in their self-interest.

Consequentialism. It evaluates the morality of action based on their outcomes.

These above-cited theories on workplace ethics were confirmed by Corrigan (n.d.).

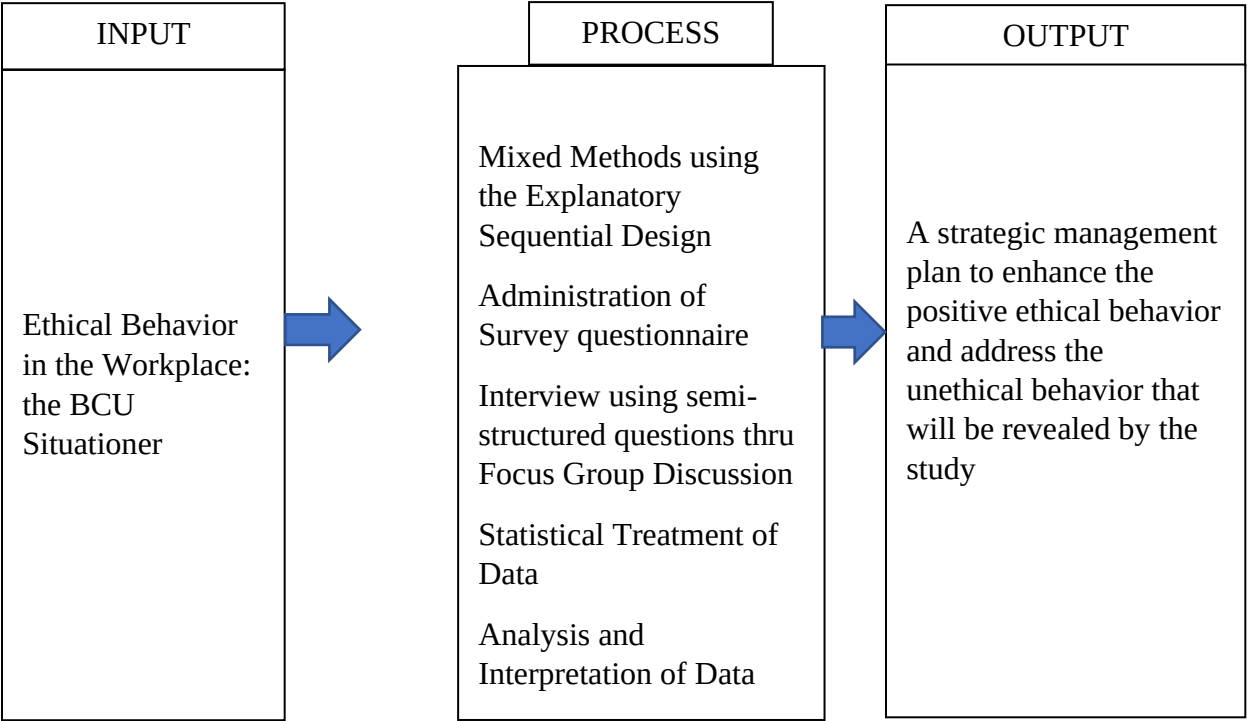
Social Cognitive Theory. A learning theory developed by Albert Bandura which provides a framework for understanding how people actively shape and are shaped actively by their environment. It views people as active agents who influence and are influenced by their environment (Vinney, 2024).

Paradigm of the Study

The paradigm of the study illustrates the interplay of the input-process-output schema. The Input was the Ethical Behavior in the Workplace: the BCU Situationer; the Process include the mixed methods of research using the Explanatory Sequential design, administration of the survey questionnaire, statistical treatment of data using the weighted mean and ranking, interpretation and analysis of data, conducting interview using semi-structured guide questions, the thematic analysis and focus group discussion (FGD). The Output is strategic plan of the management to enhance the positive ethical behavior and address the unethical behavior in the workplace that will be revealed in the study (see Figure 1)

Figure 1

Paradigm of the Study



Methodology

Research Design

This study used the descriptive-quantitative research method employing the survey design. The quantitative phase used a survey questionnaire to answer problems purported in the study.

Participants and Locale of the Study

This study involved the (rank-and-file) teaching and non-teaching employees of Baguio Central University as of Academic Year 2025-2026. The management officials were excluded from this study. The participants were chosen through stratified random sampling to determine of participants with an expected eighty (80%) per cent from both the teaching and non-teaching employees. The total population from each group were derived from the Human Resource and Development Office (HRDO) of the University to determine the sample size.

Data-Gathering Tool

There were two (2) data-gathering tools to be employed in this study. The quantitative data were derived from the responses of the participants in the survey questionnaire. The survey questionnaire is made up of four (4) parts: Part I- Level of Awareness on the Ethical Behavior in the Workplace; Part II- Level of Agreement on the Ethical Behavior in the Workplace; Part III- Frequency of Practice of Ethical Behavior in the Workplace; and, Part IV- Degree of Seriousness of the Challenges/Problems Encountered Relative to Ethical Behavior in the Workplace.

Data-Gathering Procedures

The researchers distributed the questionnaires to them through the Google form and the responses were returned through

the link provided.by the researchers. This procedure was done to gather the data for the quantitative phase of the study.

Treatment of the Data

The quantitative data were determined through frequency count, weighted mean and ranking using the Likert’s 4-point scale with the following arbitrary statistical limits and their respective descriptive equivalent:

3.26 – 4.00 (Very Much Aware/Strongly Agree/Always/Very Serious); 2.51 – 3.25 (Very Aware/Agree/Usually/Serious); 1.76 – 2.50 (Slightly Aware/Disagree/Seldom/Slightly Serious); and 1.00 – 1.75 (Not Aware/Strongly Disagree/Never/Not Serious).

Results and Discussion

Level of Awareness on the Ethical Behavior in the Workplace

Table 1 presents the level of awareness of the employees on the ethical behavior in the workplace. The average weighted mean of 2.94 is indicative of “Very Aware”. This means that the respondents have a high level of awareness on the ethical behavior in the workplace.

Table 1
Level of Awareness of the Employees on the Ethical Behavior
in the Workplace (n=23)

Indicators	Level of Awareness				TWP	WM	DE	R
	VMA	MA	SA	NA				
	4	3	2	1				
1 There is a code of conduct in your workplace	13	5	5	0	77	3.35	VMA	1
2 There exist a conflict of interest in your workplace	6	7	5	5	60	2.61	VA	6.5
3 Unethical practices occur outside of your workplace but are connected to your organization	4	6	5	8	52	2.26	SA	10
4 There are consequences for engaging in unethical behavior in your workplace	14	5	1	3	76	3.30	VMA	2

5 There are instances where your organization prioritized ethical consideration over profit	4	9	7	3	60	2.61	VA	6.5
6 There had been ethical issues/concerns your workplace experienced in the past	9	6	4	4	66	2.87	VA	4
7 There are instances where your workplace successfully addressed unethical behavior	5	7	4	7	56	2.43	SA	8.5
8 There are instances where your workplace made unethical decisions for financial gains	4	5	5	9	50	2.17	SA	11
9 There are instances where your workplace protects whistle blowers	2	5	8	8	47	2.04	SA	12
10 There are instances where your workplace provides true and correct information to its stakeholders	7	11	4	1	70	3.04	VA	3
11 There are ethics training or education provided by your workplace	6	6	3	8	56	2.43	SA	8.5
12 There are efforts by your workplace to promote ethical behavior in your workplace	6	8	8	1	65	2.83	VA	5
Average Weighted Mean						2.94	VA	

Legend:

Weight	Statistical Limit	Descriptive Equivalent	Symbol
4	3.26-4.00	Very Much Aware	VMA
3	2.51-3.25	Very Aware	VA
2	1.76-2.50	Slightly Aware	SA
1	1.00-1.75	Not Aware	NA

Of the 12 indicators of awareness, the respondents claim Rank 1 is “There is a code of conduct in your workplace” with the highest weighted mean of 3.35 described as “Very Much Aware” followed by Rank 2 is “There are consequences for engaging in unethical behavior in your workplace” with a weighted mean of 3.30 likewise described as “Very Much Aware.” However, the respondents expressed that they are “Slightly Aware” on the following indicators according to their weighted means: “There are instances where your workplace

protects whistleblowers” (2.04); “There are instances where your workplace made unethical decisions for financial gains” (2.17); and, “Unethical practices occur outside your workplace but are connected to your organization” (2.26). The rest of the indicators are perceived by the respondents to be “Very Aware”.

Indeed Editorial Team (2025) explained, “A code of conduct is essential in a workplace because it gives employees a definitive guide on how they should work and act while performing their job.” Khan (2024) emphasized, “Ethical behavior is the foundation of trust in any organization. It builds credibility among employees, clients and stakeholders creating a positive work environment where everyone feels valued and respected.”

The average weighted mean of 2.94 interpreted as “Very Aware” hereby rejects the hypothesis.

Level of Agreement on the Ethical Behavior in the Workplace

Table 2 presents the level of agreement of the respondents on the ethical behavior in the workplace. The average weighted mean of 2.86 is indicative of the level “Agree”. This could be interpreted that the respondents merely have satisfactory agreement as far as ethical behavior in the workplace is concerned.

Table 2

Level of Agreement of the Employees on the Ethical Behavior in the Workplace (n=23)

Indicators	Level of Agreement				TWP	WM	DE	R
	SA	A	D	SD				
	4	3	2	1				
1 Ethical behavior is important in your workplace	20	1	0	2	85	3.70	SA	1

2 You are comfortable in reporting unethical behavior to your superior/appropriate authority	5	12	2	4	64	2.78	A	8.5
3 The leadership i9n your workplace sets a good example when it comes to ethical behavior	4	13	3	3	64	2.78	A	8.5
4 The ethical consideration is taken into account in decision-making process	7	11	4	1	70	3.04	A	2
5 The ethical standards in your workplace align with your personal values	6	12	4	1	69	3.00	A	3
6 There are adequate channels/means of reporting unethical behavior	3	10	5	5	57	2.48	D	15
7 The ethical standards in your workplace are effectively disseminated to all employees	7	6	8	2	64	2.78	A	8.5
8 Your workplace has a strong ethical culture	7	8	4	4	64	2.78	A	8.5
9 Employees in your workplace are held accountable/liable for unethical behavior	7	7	5	4	63	2.74	A	12
10 The ethical behavior is rewarded/recognized within your workplace	6	9	4	4	63	2.74	A	12
11 Your workplace fosters an environment/atmosphere of trust and respect	6	11	5	1	68	2.96	A	4
12 The ethics policies of your workplace are effectively enforced	6	10	5	2	66	2.87	A	5.5
13 Your workplace encourages you to speak up when it comes to ethical concern	4	11	4	4	61	2.65	A	14
14 The ethics policies of your workplace are easily available and understandable	7	6	7	3	63	2.74	A	12
15 The commitment to ethical behavior in your workplace is shown in its public image	7	9	4	3	66	2.87	A	5.5
Average Weighted Mean						2.86	A	

Legend:

Weight	Statistical Limit	Descriptive Equivalent	Symbol
4	3.26-4.00	Strongly Agree	SA
3	2.51-3.26	Agree	A
2	1.76-2.50	Disagree	D
1	1.00-1.75	Strongly Disagree	SD

In the same Table, the respondents expressed they “Strongly Agree” that “Ethical behavior is important in the workplace” with the highest weighted mean of 3.70. Rank 2 among the other indicators is “The ethical consideration is taken into account in

decision-making process” registering a weighted mean of 3.04 (Agree) while Rank 3 is “The ethical standards in your workplace align with your personal values” with a weighted mean of 3.00 (Agree). The respondents likewise “Agree” with the most of the indicators; however, they “Disagree” along the indicator “There are adequate channels/means of reporting unethical behavior” with the lowest weighted mean of 2.48.

Rumage (2024) pointed out, “Workplace ethics are important to creating a culture built on trust which contributes to employee satisfaction, increased collaboration and stronger brand reputation. Additionally, an organization that acts ethically – and agrees on the shared set of values – is safeguarded from the problems that can result from unethical behavior.” Indeed Editorial Team (2025) supported, “Workplace ethics are incredibly important part of forming a successful organization with satisfied and loyal team members.”

Since the average weighted mean of 2.86 is considered in the level of “Agree”, the hypothesis is hereby accepted.

The Frequency of Practice of the Ethical Behavior in the Workplace

Table 3 shows the level of frequency of practice of the identified ethical behavior in the workplace. Based on the average weighted mean of 2.90, the respondents perceived that the ethical behaviors identified in the table are practiced “Usually”. This could mean that the practice of the ethical behaviors is “the usual thing that is done in a particular situation; that the practice is just customary, standard or done on a regular basis.”

Table 3
Level of Frequency of Practice of the Ethical Behavior in the Workplace (n=23)

Indicators	Level of Frequency				TWP	WM	DE	R
	AP	FP	RP	NP				
	4	3	2	1				
1 Honesty in communication	5	12	5	1	67	2.91	U	6
2 Respect for other’s opinion	5	13	4	1	68	2.96	U	3
3 Keeping one’s promises	5	9	8	1	64	2.78	U	9.5
4 Taking responsibility to one’s actions	7	10	5	1	69	3.00	U	1
5 Treating people fairly	6	10	6	1	67	2.91	U	6
6 Respecting privacy	8	8	4	3	67	2.91	U	6
7 Avoiding conflict of interest	7	10	4	2	68	2.96	U	3
8 Standing up against injustice	7	8	6	2	66	2.87	U	8
9 Practicing non-judgment	7	10	4	2	68	2.96	U	3
10 Giving credit where credit is due	7	5	10	1	64	2.78	U	9.5
Average Weighted Mean						2.90	U	

Legend:

Weight	Statistical Limit	Descriptive Equivalent	Symbol
4	3.26-4.00	Always	A
3	2.51-3.25	Usually	U
2	1.76-2.50	Seldom	S
1	1.00-1.76	Never	N

All the ethical behaviors in the said Table are rated as “Usually” practiced. “Taking responsibility to one’s actions” registered the highest weighted mean of 3.00; followed by “Respect of other’s opinion”, “Avoiding conflict of interest” and “Practicing non-judgment” with identical weighted means of 2.96. The lowest of the ethical behaviors are:

“Standing up for injustice” (2.87); while “Giving credit where credit is due” and “Keeping one’s promises” have equal weighted means of 2.78.

What does it mean to take responsibility to one's actions? Bennet (2021) responded, "Taking responsibility for your actions requires the realization that you play a part in every situation or experience and therefore, have some degree of responsibility over the outcomes or consequences" She further stressed, "Today's workplace is arguably more interconnected than ever. What you do may not only affect your productivity, performance and success, your co-workers, teammates, bosses, customers and so forth. For this reason, it is imperative that you take responsibility for your actions and maintain a high level personal accountability even in the face of failure."

Why is it important to respect the opinion of others? Ponio explained, "Respecting other's opinions does not necessarily mean you need to agree with them. You can disagree without disrespecting their opinions." She further enumerated three ways to show others that there is respect in their opinions: 1) Make others feel that their opinions are valid; 2) Acknowledge that everyone has their own truth; and, 3) Accept that you are not right all the time.

Ethical behavior if not practiced has the ability of reducing organization performance; it may cause disagreements, lawsuits, client dissatisfaction, poor service delivery, poor time management and corruption among others (Yatich & Musebe, 2017).

Since the average weighted mean of 2.90 is interpreted as "Usually", the hypothesis is hereby accepted.

3.4. Degree of Seriousness of the Challenges or Problems Encountered Relative to Ethical Behavior in the Workplace

Table 4 shows that in all the identified challenges or problems encountered relative to ethical behavior in the workplace, the respondents considered them "Serious". Based on their weighted means, the indicator with the highest weighted

mean is “Dishonesty” (3.22); followed by “Favoritism” (3.17); and “Taking Credit for Other’s Work” (3.09). Registering the lowest weighted mean is “Violence of Co-workers” (2.52)’ and “Harassment” and “Fraud” with identical weighted means of 2.65.

Table 4
Degree of Seriousness of the Challenges or Problems Encountered Relative to the Ethical Behavior in the Workplace (n=23)

Indicator	Degree of Seriousness				TWP	WM	DE	R
	VS	S	SS	NS				
	4	3	2	1				
1 Abusive Leadership	12	4	2	5	69	3.00	S	6
2 Discrimination	10	5	3	5	66	2.87	S	8.5
3 Harassment	9	4	3	7	61	2.65	S	11.5
4 Breach of Privacy	11	5	3	4	69	3.00	S	6
5 Exploitation of Employees by Superiors	13	2	4	4	70	3.04	S	4
6 Nepotism	12	3	4	4	69	3.00	S	6
7 Favoritism	13	3	5	2	73	3.17	S	2
8 Dishonesty	14	2	5	2	74	3.22	S	1
9 Whistleblower	9	5	6	3	66	2.87	S	8.5
10 Taking Credit for Other’s Work	13	3	3	4	71	3.09	S	3
11 Violence of Co-employees	9	3	2	9	58	2.52	S	13
12 Non-office Related Work	7	6	6	4	62	2.70	S	10
13 Fraud	9	3	5	6	61	2.65	S	11.5
Average Weighted Mean						2.91	S	

Legend:

Weight	Statistical Limit	Descriptive Equivalent	Symbol
4	3.26-4.00	Very Serious	VS
3	2.51-3.25	Serious	S
2	1.76-2.50	Slightly Serious	SS
1	1.00-1.75	Not Serious	NS

Why people lie in work? Kislik (2021 elaborated, “Some employees are afraid you or others will have a negative reaction to the truth. They feel personally involved and are fearful of creating a bad outcome for themselves or you. They want to make sure that you’re not disappointed in them or that you won’t have any need to discipline them.”

Favoritism is an unfair practice. It elevates one person over others for unmerited reasons . . . can also be form of discrimination. This takes place when employment decisions and actions result in employees with legally protected characteristics being treated differently than others (Boatman, n.d.)

Since the average weighted mean of 2.91 interpreted as “Serious”, the hypothesis that the challenges or problems encountered relative to ethical behavior is “Slightly Serious” is hereby rejected.

Conclusions and Recommendations

Conclusions

The conclusions are drawn based on the findings of this study: 1) The level of awareness of the respondents on the ethical behavior in the workplace is quite high which means that the respondents are highly cognizant of these ethical behaviors; 2) The respondents expressed their concurrence to the identified ethical behaviors in the workplace; 3) The respondents consider that the practice of ethical behavior is just on the level of a normal, customary or a common day-to-day practices; and 4) the unethical behavior labeled as “serious” would only indicate that there is a perceived violation of professional standards in the workplace which may have a negative impact in the workplace.

Recommendations

From the conclusions drawn, the following recommendation are hereby presented: 1) The management should conduct more intensive program for the employees to acquire a much higher level of awareness of ethical behaviors in the workplace; 2) The Administration should conduct an in-depth discussion with the employees in order for them to have a higher level of acceptance of ethical behaviors in the workplace; 3) The members of Administration and other leaders of the institution to endeavor to

constantly demonstrate the desired ethical behaviors in the workplace; 4) For administrators and other school leaders to avoid demonstrating unethical behaviors in the eyes of their constituents; 5) For future researchers to look into other areas not covered by the current study.

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A TRACER STUDY ON THE PROFESSIONAL JOURNEY OF THE BACHELOR OF SCIENCE IN CIVIL AND GEODETIC ENGINEERING GRADUATES SY 2018-2023

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ABSTRACT

This study aimed to trace and analyze the professional journey of the Bachelor of Science in Civil and Geodetic Engineering graduates SY 2018-2023 of Baguio Central University. The study was conducted to the graduates of civil and geodetic engineering graduates which involved one hundred sixty-two civil engineering and thirty-seven geodetic engineering graduates. The study used the descriptive design in determining the relevance of knowledge, and skills of the civil and geodetic engineering graduates. The questionnaire-checklist were used in gathering the data needed in the study. Based on the data gathered, the findings are the following: The profile of the respondents were in the male has a greater percentage than the female; as to employment status and job experience the greater percentage of the respondents are permanently employed; on the relevance of the knowledge and skills acquired in the course, on the civil engineering the respondents have found the technical and soft skills they acquired in the course very relevant and Geodetic engineering respondents found the technical and analytical skills,

field and practical skills and soft skills and knowledge they acquired in the course very relevant. The conclusions are as follows: the males are more inclined to take engineering courses; majority of the respondents gainfully and permanently employed. The employability of the respondents is quite high; the civil engineering respondents are very much satisfied with the very relevant technical skills, soft skills, knowledge and practical experiences they earned from their civil engineering course; and the respondent geodetic engineers are very much satisfied with their relevant technical and analytical skills, field and practical skills, knowledge and practical experiences they earned from their geodetic engineering course.

Keywords: technical skills, knowledge, experiences, analytical skills, field, practical skills

Introduction

Higher education institutions (HEIs) are essential factors in the promotion of lifelong learning (LLL). They have a unique capacity to develop skills and foster knowledge, and the potential to mobilize educational resources and provide learning opportunities for diverse populations. This implies a fundamental shift, from educating young students coming from secondary schools to encouraging learners from various backgrounds to enter higher education at different ages and stages of their personal and professional lives. Higher education institutions (HEIs) have a multi-faceted role in society, primarily serving to educate and train the workforce through instruction, fostering research and innovation that drives economic development, promoting entrepreneurship by providing knowledge and support, and contributing to community development through service and by building trusted, knowledgeable networks. They also foster personal growth and lifelong learning for individuals and play a crucial role in building

a nation's foundation by preparing future citizens and leaders (UNESCO, n.d.).

Higher education institutions are increasingly expected to engage in the challenges of the contemporary world. Policymakers have repeatedly asked for investment in personal skills as a route to building resilience and aiding recovery in the economic recession (OECD Employment Outlook 2012) because higher education institutions are the key contributors of societal progress and economic development. They play a crucial role in shaping the future of individuals and society, empowering learners to become responsible and contributing to members of their communities. notes that at the higher education level. They are looked up to as talent engines that foster innovation and competence development (Abelha et al., 2020) resulting in highly qualified graduates who can eventually compete in a local and global arena (Cuadra et al., 2019). Nations with well-developed higher education systems tend to have a more skilled and innovative workforce, contributing to overall prosperity and competitiveness in the global market (Lackwanna College News & Media, 2025), (Römgens et al., 2020).

According to Abramowitz and Gardner (2024) higher or tertiary institutions all over the globe exist for a range of purposes and missions such as to provide professional training, to teach and conduct research in an ever-expanding array of disciplines, to educate underserved populations, to focus explicitly on globalization, climate change, the arts, and/or to cultivate specific political viewpoints and orientations. Indeed, many of the institutions have different stated missions. Higher educational institutions (HEIs) strive to help students in improving skills for employability (Lees, 2002) to address the competitive requirements of the industry. For example, HEIs must develop skills considered necessary in the workplace, such as computing and research (Al-Mutairi, Naser & Saeid, 2014). Tomlinson (2012) stressed that graduate employability is influenced by the dynamic relationship between the higher education institution and

the industry. Dynamic changes in industry requirements affect the potential career of graduates.

Hence, the employability of an individual is often associated with their skills, theoretical foundations, and personal attributes, which together make them competitive in the workplace. HEIs are expected to equip graduates with the said features of employability (Kalufya & Mwakajinga, 2016). The effectiveness of HEIs is determined by the quality of graduates who are enabled to work in their respective fields (Celis, Fetijo, & Cueto, 2013). Indeed, the employability of graduates is one of the measures used to gauge the quality of education fostered by HEIs (Alusen, 2016) as cited by Saong, Javier & Moyaen (2022).

In the field of higher education, engineering supports the growth and development of a country's economy by shaping the local infrastructure, technology, and industrial landscape. With this responsibility, the Philippine Institute for Development Studies (PIDS) asserted that the country will need 1.8 million engineers by 2025 (Curran Daly Associates 2024). Local infrastructure development, globalization, and emerging technologies contribute to engineering's high demand in the future. To keep up with the world, Filipino stakeholders must address skill gaps, talent migration, and poor quality of STEM education. Despite driving the Philippine economy forward, the engineering sector is plagued by numerous problems the local infrastructure development, globalization, and emerging technologies contribute to engineering's high demand in the future, and to keep up with the world, higher education institutions and concerned Filipino stakeholders must address skill gaps, talent migration, and poor quality of STEM education.

In the Philippines, the Commission on Higher Education (CHED) is mandated to implement the national government's commitment to transformational leadership that puts education as the central strategy for investing in the Filipino people, reducing poverty, and building national competitiveness and pursuant to Republic Act 7722. CHED shall: 1) Promote relevant and quality

higher education (i.e. higher education institutions and programs are at par with international standards and graduates and professionals are highly competent and recognized in the international arena); 2) Ensure that quality higher education is accessible to all who seek it particularly those who may not be able to afford it; 3) Guarantee and protect academic freedom for continuing intellectual growth, advancement of learning and research, development of responsible and effective leadership, education of high level professionals, and enrichment of historical and cultural heritages; and 4) Commit to moral ascendancy that eradicates corrupt practices, institutionalizes transparency and accountability and encourages participatory governance in the Commission and the sub-sector. The CHED envisions the Philippine higher education system that is equitable and producing locally responsive, innovative, and globally competitive graduates and lifelong learners through its mission of promoting equitable access and ensure quality and relevance of higher education institutions and their programs. Likewise, the CHED is mandated to ensure the delivery of quality education is observed by schools of higher learning ultimately to attain the national development goals and improve the economic conditions in the country (Malolos & Tuliao Jr., 2018).

This is the main reason why many higher education institutions are constantly evaluating and re-aligning their curricula in order to equip their students with the 21st century knowledge, skills and attitudes to make them locally and globally competitive in the employment arena. Higher education institutions constantly evaluate, readjust and refine their curriculum to stay relevant in a globalized and technology-driven economy, making graduate outcomes a vital metric for assessing the effectiveness of business education programs (Naughton, 2021).

The existence of Higher Education Institution (HEI) contributes to the improvement of higher-level competencies and skills of graduates for long-term employability. Employers want graduates who can adapt to the workplace and participate in

innovative teamwork. The Commission of Higher Education (CHED) requires HEIs to submit a report on the employability of its graduates through a tracer study. The tracer study concept has been instrumental in gaining insights into alumni career paths. It follows a growing trend in higher education research. Eslit (2023) shares that the pursuit of meaningful employment is a central concern of the country. The dynamics of employment have been notably influenced by economic, social, and technological forces in recent years.

In Baguio City and North Luzon, Baguio Central University (BCU) is one of the established higher education institutions offering undergraduate and graduate courses. The BCU College of Engineering offers Bachelor of Science in Civil Engineering and Bachelor of Science in Geodetic Engineering. The vision of the College of Engineering is dedicated to educational excellence in its program of study and to provide the graduates with a common global standard in the field of Engineering and its mission is committed to train holistic and globally competitive graduates with the necessary technological knowledge, skills and values needed in the practice of Engineering. The goals of the College of Engineering are holistic formation and development, organizational stability, adaptability and responsiveness, moral recovery for the common good, excellence in education and continuing development towards global competitiveness. These goals are attained through the following objectives: 1) Apply knowledge of mathematics, physical science to solve complex civil engineering problems; 2) Design and conduct experiments, as well as to analyze and interpret data; 3) Design a system, component, or process to meet desired needs within realistic constraints, in accordance with standards; 4) Function in multidisciplinary and multi-cultural teams; 5) Identify, formulate, and solve complex civil engineering problems; 6) Understand professional and ethical responsibility; 7) Communicate effectively civil engineering activities with the engineering community and with society at large; 8) Understand the impact of civil engineering solutions in a global, economic, environmental, and societal context; 9) Recognize the need for and engage in life-

long learning; 10) Use techniques, skills, and modern engineering tools necessary for civil engineering practice; 11) Know and understand engineering and management principles as a member and a leader of a team, and to manage projects in multi-disciplinary environment; and 12) Understand at least one specialize field of civil engineering practice.

As a higher education institution, Baguio Central University aims to

produce competent and highly qualified engineering graduates that can be eventually competitive in the local and global arena (Cuadra et. al., 2019). In response to the outcomes-based curriculum requirement of CHED memorandum order no. 37 series of 2012, there is a need to examine its curriculum offering relative to the industry. There is a need to strengthen the competencies that could make the curricular offering more relevant to current jobs (Ramirez, 2014). Conducting tracer studies an important feedback mechanism of HEIs to track and assess graduates' post-graduation progress, providing data on employability, curriculum relevance, skills development, and program effectiveness to improve their future educational programs and services. These studies gather information from graduates about their employment status, career paths, and satisfaction with their academic preparation, enabling institutions to make data-driven decisions to enhance curriculum and meet labor market needs. Tracer studies are common research methods for education institutions to check on the employability of their graduates (De Ocampo, Bagano & Tan, 2012). Rogan & Reynolds (2016) also asserted that a Graduate Tracer Study (GTS) is useful for policy and equity implications in higher education.

The BCU College of Engineering aimed to provide a holistic understanding of the career paths of its alumni. This study looked into the post-graduation experiences, achievements as to their employability, job opportunities and accomplishments of the graduates between School Years 2018-2023. Specifically, the study gathered information on the graduates' employment status, job tenure, work location, and the relevance of the

knowledge, and skills acquired in their engineering course in their current work. The data gathered will serve as a useful baseline information in considering possible improvements, adjustments and enrichments of the two engineering curricula so that the future graduates will be better equipped with knowledge, skills and experiences, making them more equipped, prepared and competitive in the job market.

Theoretical and Conceptual Framework

This study was supported by the theories of Human Capital, Social Capital, and Career Construction, which explain how education and skills (Human Capital), social networks (Social Capital), and subjective experiences shape career paths and employability. These theories provide frameworks for understanding how alumni's investments in their education and their ability to leverage social connections influence their professional success and career trajectories after graduation.

The Human Capital Theory posits that human beings can increase their productive capacity through greater education and skills training. Human capital is a loose term that refers to the educational attainment, knowledge, experience, and skills of an employee (Ross, 2024). The core idea of this theory is that individual's investment in education, training, and skill development enhances their human capital, leading to increased productivity, earning potential, and career success. The application of this theory in tracer studies is that it helps researchers examine the relationship between alumni's acquired knowledge and skills and their employment outcomes, such as income levels and job performance (Eslit, 2023).

Social Capital Theory (SCT) proposes that social networks and the resources (like trust, norms, and shared knowledge) embedded within them provide value to individuals, groups, and societies, similar to how physical or human capital provides value. Thinkers like Pierre Bourdieu, James Coleman, and Robert Putnam have contributed to the theory, viewing social networks as a form of capital that can be leveraged

for social and economic benefits. It encompasses the quality and structure of relationships, leading to mutual benefits and improved societal functions. Social capital refers to the structure and quality of social relationships and constitutes a positive product of social interactions that can be a source of benefits for individuals, social groups and the society as a whole (Tsounis & Xanthopoulou, (2025). Social capital refers to the structure and quality of social relationships, from which individuals, social groups and society may benefit (Sarracino & Mikucka, 2017). Most scholars agree that social capital is a multidimensional resource that is generated through interpersonal interactions, and it includes both network ties and shared values, such as trust and reciprocity, that may facilitate cooperation and collective action (Agampodi et al., 2015; Tsounis et al., 2023). The key aspects of Social Capital Theory are: 1) Networks which indicate that social capital is built on durable networks of relationships that provide access to social resources; 2) Resources can include information, trust, obligations, shared norms, and mutual support that are made available through social ties; 3) Mutual benefits - the theory suggests that these resources can be used to achieve mutual benefits for individuals, groups, and society as a whole; and 4) Forms of capital - it is often viewed as a form of capital, alongside economic and cultural capital, that can contribute to social stratification and economic outcomes (Theory Hub, 2025). Social capital theory asserts that an individual's or group's social networks are valuable assets that can be leveraged to achieve goals (AI Google.com).

Career Construction Theory (CCT). Mark Savickas (2013) as cited by Wang & Li (2024) postulated that the Career Construction Theory was based on personal constructivism, social constructionism, and post-modernity. Career Construction Theory believes that the essence of individual career development is the dynamic construction process of pursuing mutual adaptation between the subjective self and the external objective world, and different people construct different stories. Career Construction Theory provides a dynamic perspective to give

personal meaning to memories, present experiences, and plans, constructing careers through a sense of meaning and clarifying future directions. This theory explains the interpretive and interpersonal processes by which individuals organize their behavioral dispositions, impose direction on their vocational behavior, and make meaning of their vocational development. The application of the Career Construction Theory is that it provides a framework for understanding how individuals actively construct their careers by making choices and adapting to new situations, reflecting on their experiences, and shaping their career narratives.

The Labor Market Theory also supports this tracer study. This theory is an economic framework explaining wage determination and worker allocation based on the principles of supply and demand, where labor is treated as a commodity. When supply increases, demand decreases and vice versa. In the labor market, the employers who offer jobs are the supply and the workers who want those jobs are the demand (Cook, 2023). According to AI Overview, the concept of the labor market is based on the theory of supply and demand. The key concepts of this theory are: 1) Labor Demand – it means that firms demand labor because it contributes to revenue, and a profit-maximizing employer will pay a worker up to the value of their marginal productivity, or the revenue they generate for the firm; 2) Labor Supply - workers supply labor in exchange for wages or other monetary compensation, though they may also consider factors beyond compensation; 3) Wage Compensation - Wages are determined by the interaction of labor demand and supply, with the equilibrium wage and employment level reached where the two curves intersect; and 4) Marginal Productivity - The value of the additional output generated by hiring one more worker, which sets the maximum wage a firm will pay for that worker.

Other frameworks for tracer studies support this study like the following: 1) Skills Matching (Horizontal And Vertical) - tracer studies are used to measure how well a graduate's field of study matches the tasks in their job (horizontal matching) and how appropriate their position is relative to their qualifications

(vertical matching); 2) Curriculum Evaluation means that by studying graduates' experiences, tracer studies provide feedback to institutions to improve curriculum efficiency and better meet the needs of the workforce; and 3) Quality Assurance – tracer studies serve as a tool for educational institutions to assess their performance, improve the quality of their programs, and ultimately enhance the quality of life and social mobility for their graduates (AI Overview, n.d.).

Relatively, this study focused on the concept as an investigative work used to track and gather information about the outcomes and experiences of the graduates of the concerned institution specifically Baguio Central University College of Engineering.

Statement of the Problem

The main purpose of this study was to profile graduates of Baguio Central University, College of Engineering (College of Civil and Geodetic Engineering) from SY 2018-2023.

Specifically, the study looked into the following: (1) Profile of the respondents; (2) Employment status and job experience; and 3) Relevance of the knowledge, skills and training experiences acquired in the course.

Methodology

Research Design

The descriptive research design was used as it served the nature and purpose of this study.

Descriptive research design is a powerful tool used by scientists and researchers to gather information about a particular group or phenomenon. This type of research provides a detailed and accurate picture of the characteristics and behaviors of a particular population or subject. By observing and collecting data on a given topic, descriptive research helps researchers gain a

deeper understanding of a specific issue and provides valuable insights that can inform future studies. Descriptive research design involves observing and collecting data on a given topic without attempting to infer cause-and-effect relationships. The goal of descriptive research is to provide a comprehensive and accurate picture of the population or phenomenon being studied and to describe the relationships, patterns, and trends that exist within the data Sirisilla (2023).

Population and Locale of the Study

The population of the study was composed of one hundred ninety-nine (199) graduates of the College of Engineering (Civil Engineering and Geodetic Engineering) of the SY 2018-2023, Baguio Central University. Moreover, purposive sampling was used for this study particularly in the graduates of Civil Engineering because it involves studying the whole population that possesses a specific set of traits (Laerd Dissertation, n.d.). While total enumeration in the graduates of Geodetic Engineering. The distribution of the respondents is shown in Table 1 below.

Table 1
Distribution of Respondents

School Year	Number of Graduates BSCE	Number of Respondents	Percentage
2018-2019	48	30	62.50
2019-2020	42	26	61.90
2020-2021	37	21	56.76
2021-2022	47	34	72.34
2022-2023	60	51	85
TOTAL	234	162	69.23
School Year	Number of Graduates BSGE	Number Respondents	Percentage
2018-2019	8	8	100
2019-2020	4	4	100
2020-2021	8	8	100

2021-2022	8	8	100
2022-2023	9	9	100
TOTAL	37	37	100%

Source: BCU Registrar’s Office (2025)

Table 1 shows the distribution of respondents and response rate by batch of the civil and geodetic engineering graduates. Out of 234 graduates of civil engineering for the five years from 2018-2023, 69.23% responded to our questionnaire, which was sent personally and through Facebook Messenger. According to Sataloff and Vontela (2021), the acceptable response rates in survey research are from 40% to 75% across different specialties. Therefore, the 69.23% response rate of this study is considered to be strong and acceptable.

Data Gathering Instrument

A questionnaire-checklist was used as the main data gathering instrument in this study. It was constructed to gather the data and information relevant to the study. The said instrument was based on similar tracer research studies published by research journals in the internet and other relevant graduate studies availed at the BCU Library.

The questionnaire-checklist gathered data on the following: Part I Personal Profile of the respondents as to: a) Bachelor’s degree, Sex, and Year graduated. Part II Employment status and job experience. Part III Relevance of knowledge, skills and training experiences acquired in the course.

The reliability and validity of the questionnaire was tested based on the BCU Graduate School Manual, and from the evaluation recommendation of the Research Committee Panel. Nonetheless, the researchers of the study were aware of the reliability test of a research instrument, like the *test-retest reliability* (administering the same instrument twice to the same group), *parallel-forms reliability* (using two equivalent instruments), *split-half reliability* (dividing a single instrument in

half), or internal consistency (using Cronbach's alpha to measure how well items within an instrument measure the same construct).

The corrections, recommendations and suggestions for the improvement of the instrument were made, and its corrected copy was re-submitted to the Research Committee Panel for further evaluation and approval.

Data Gathering Procedure

The researchers followed all the standard operating procedure, established practice, guidelines, and proper method of Baguio Central University in conducting tracer studies.

The necessary permission to conduct the study was secured from the President and Dean of the College of Engineering of this University. A letter addressed to the Registrar of BCU was made to request the names (address, contact numbers) of the graduates of the two engineering courses in the school years covered in the study. To those graduates and/or respondents residing in Baguio City and in adjacent localities, the researchers visited them to personally administer the questionnaires. The copies of the questionnaire were sent to the other graduates and/or respondents through Google Forms, FB Messenger and other means.

The collected responses were tabulated and summarized ready for statistical treatment.

Treatment of Data

The data gathered were treated using descriptive statistics such as frequency count, percentage, mean, and ranking.

Other descriptive statistics such the pie chart was also used. Pie charts are used in research for descriptive statistics to show the proportions and relative frequencies of qualitative (nominal) data. They visually represent how a whole is divided into segments, with each slice's area corresponding to the percentage of a specific category. This makes pie charts effective for

comparing the size of one category relative to the total, but they are not suitable for continuous data or for precise numerical comparisons when there are many categories (AI Overview, Google.com); JMP Statistical Discovery Portal (n.d.).

The statistically treated data were subjected to analysis and interpretation in order to understand their significance and implications.

Ethical Considerations

The researchers followed the ethical guidelines and regulations of Baguio Central University in conducting research. Additionally, the researchers have observed the 5 ethical principles when carrying out a research study. These are: 1) informed consent, where participants voluntarily agree to participate after understanding the study's details; 2) minimizing harm, ensuring participants are not subjected to physical, psychological, or social risks; 3) confidentiality and anonymity, protecting participants' identities and private information; 4) voluntary participation, allowing individuals to participate without coercion or pressure; 4) upholding the fundamental human rights of participants (AI Overview, Google) and 5) respect for dignity and rights, These principles are essential for maintaining scientific integrity, protecting participants, and ensuring the public trusts research.

Results and Discussion

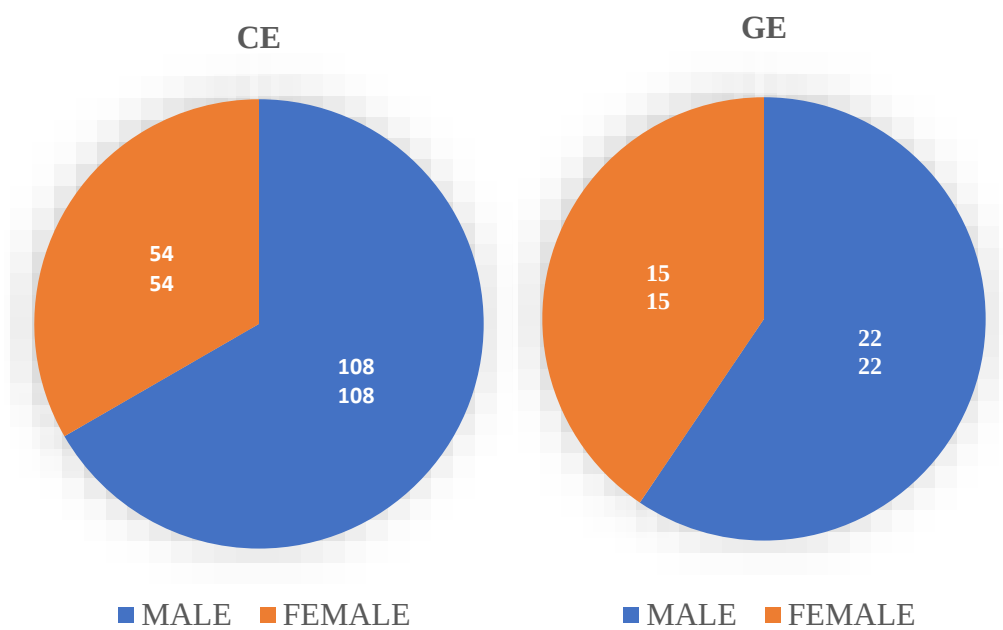
Profile of the Respondents

A.As to Sex

Figure 1 presents the profile of the respondents as to their sex. The collected data showed that there were 108 males or 66.67%, and 54 females or 33.33% for civil engineering graduates. While on Geodetic Engineering graduates there were 22 or 59.46% males and 15 or 40.54% females. This meant that

there were more males who were inclined to the engineering course as compared to the female sex.

Figure 1
Profile of Respondents as to Sex



B. As to Employment Status

Figure 2 presents the profile of the respondents as to their employment status. The data showed that 135 or 83.33% are employed, 24 or 14.81% are not employed, and 3 or 1.85% have never been employed in civil engineering graduates. For geodetic engineering graduates 33 or 89.19% are employed, 3 or 8.11% are not employed, and 1 or 2.70% have never been employed. This meant that majority of the graduates of both civil and geodetic engineering have found employment. This signifies the high employability and competitiveness of the civil and geodetic engineering graduates of Baguio Central University in the job market. The respondents have acquired the set of skills, knowledge and personal attributes that enabled them get employed and kept fulfilled in their chosen career.

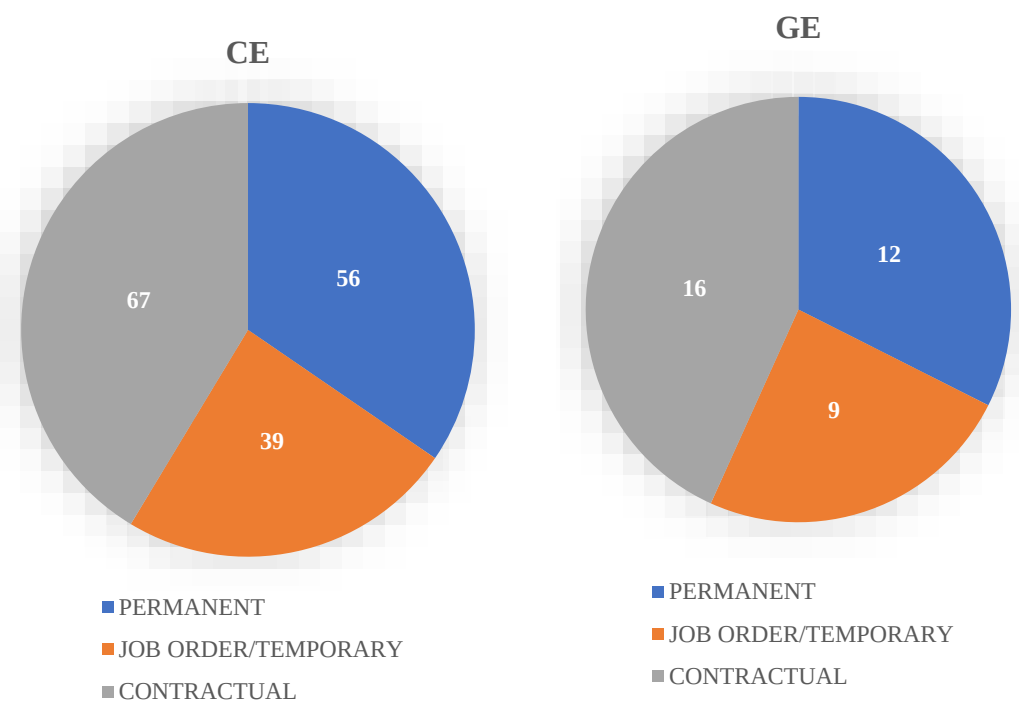
Figure 2
Profile of Respondents as to Their Employment Status



C. As to Employment Status/Tenure

Figure 3 presents the profile of the respondents as to their employment status or work tenure. The data gathered revealed that civil engineering graduates, 56 or 34.57% of the respondents have permanent status in their work; 39 or 24.07% have temporary status or job order, while 67 or 41.36% are working on a contractual basis while in geodetic engineering graduates 12 or 32.43% of the respondents have permanent status in their work; 9 or 24.32% have temporary status or job order, while 16 or 43.246% are working on a contractual basis. This meant that the respondents have found gainful employment in their respective fields. Although some of the respondents are temporary or contractual in their present employment, they still gain meaningful and relevant experiences which may help them land or find new and better job opportunities here and abroad. The engineering graduates of this University now have economic stability to support themselves and their families, and getting employment by the respondents is a fulfillment of their cherished dreams after finishing their engineering courses.

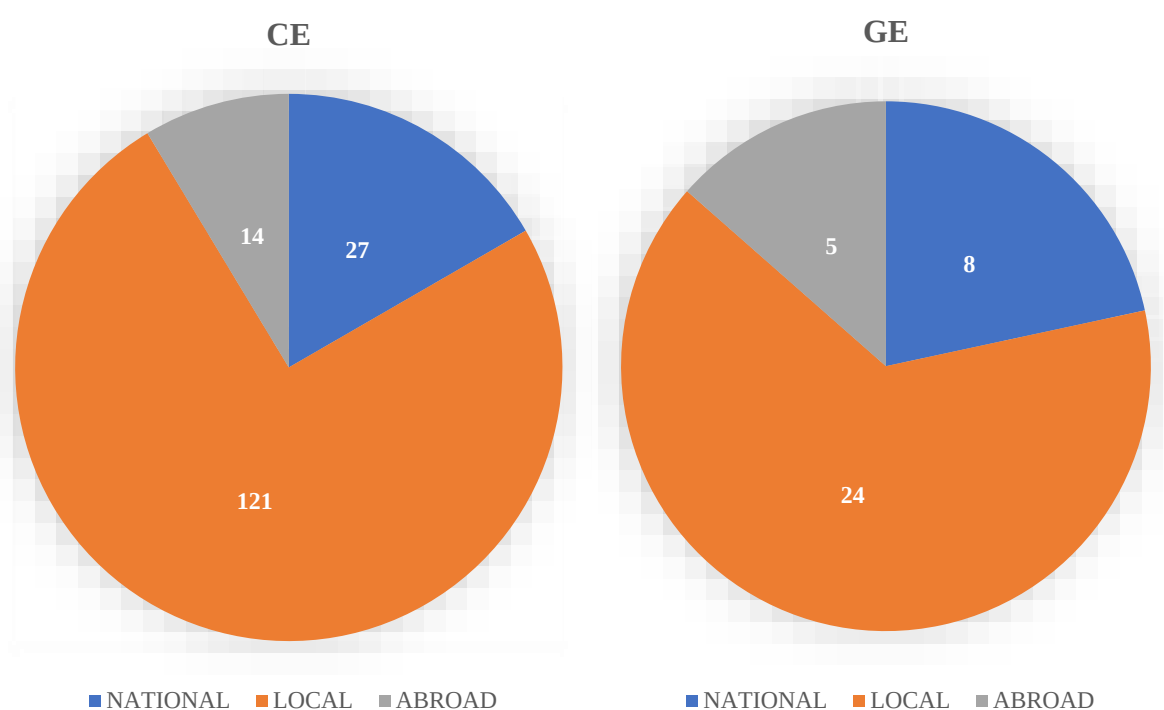
Figure 3
Profile of Respondents as to Their Employment Status/Tenure



D. Work Location

Figure 4 presents the profile of the respondents as to their work location. The data gathered showed that 121 or 74.69% have found work in their respective locality, 27 or 16.67% are working at the national level (public and private), and 14 or 8.64% have found work overseas for civil engineering graduates while on the geodetic engineering graduates there were 24 or 64.86% have found work in their respective locality, 8 or 21.62% are working at the national level (public and private), and 5 or 13.51% have found work overseas. These data indicate that the engineering graduates of Baguio Central University are highly competitive in the job market both in the national and local levels but also in foreign countries. Dotong et. al. (2016) noted that local industries and corporations are still dominating in the employment locale of the engineering graduates though some of them are still employable internationally or in different parts of the world.

Figure 4
Profile of Respondents as to Their Work Location



Relevance of Knowledge, and Skills of the Civil Engineering Graduates

Table 2 presents the degree of relevance of the knowledge and skills acquired by the respondent civil engineering graduates of Baguio Central University.

The data gathered revealed that the civil engineering graduates have rated the technical skills and soft skills they acquired in their civil engineering course very relevant as evidenced by the obtained overall average weighted mean of 2.61. The technical skills and soft skills got an average weighted mean of 2.50 and 2.72 respectively. These findings manifest the respondents’ strong agreement of the high relevance of their acquired or learned technical and soft skills in their civil engineering course in the practice of their engineering professions.

Table 2
Relevance of the Knowledge, and Skills of the Civil Engineering Graduates
N=162

Indicators	Degree of Relevance			TWP	WM	DE	R
	VR	SR	NR				
	3	2	1				
A. Technical Skills							
1. Advance Mathematics & Physics	69	84	9	384	2.37	VR	
2. Design & Modeling	91	60	11	404	2.49	VR	
3. Project Management	103	56	3	424	2.62	VR	
4. Engineering Principles	110	49	3	431	2.66	VR	
5. Technical Writing	62	93	7	379	2.34	VR	
Ave. Weighted Mean					2.50	VR	2
B. Soft Skills							
1. Problem Solving	116	42	4	436	2.69	VR	
2. Critical Thinking	119	38	5	438	2.70	VR	
3. Communication	121	38	3	442	2.73	VR	
4. Leadership	117	40	5	436	2.69	VR	
5. Teamwork and Collaboration	132	27	3	453	2.80	VR	
6. Adaptability & Coping Mechanisms	121	38	3	442	2.73	VR	
Ave. Weighted Mean					2.72	VR	1
Overall AWM					2.61	VR	

Legend:			
Scale	Statistical Limits	Descriptive Equivalents	Symbols
3	2.34-3.00	Very Relevant	VR
2	1.67-2.33	Somewhat Relevant	SR
1	1.00-1.66	Not Relevant	NR

As to technical skills, the respondents have rated Engineering Principles as the topmost very relevant technical skills garnering the highest weighted mean of 2.66 followed by project management, 2.62; design and modelling, 2.49; advance mathematics and physics, 2.37; and technical writing, 2.34.

These findings imply that Baguio Central University College of Engineering has adequately prepared and/or taught their civil engineering graduates the essential technical knowledge and skills which made them very competitive in the job market and in the advancement of their career growth. These positive and encouraging feedback from the graduates is essential for the continuous upgrading and enhancement of Civil Engineering

course offered by the University and also as a means of giving appreciation of the efforts and sacrifices of the members of its faculty in preparing their students to become productive and successful civil engineers.

Relatively, the Resources of Employers (2024) technical skills are specialized abilities needed to perform specific tasks in real-world situations. Technical skills are essential in the modern workplace to drive productivity, efficiency, and innovation by allowing employees to effectively utilize industry-specific tools and technologies. They are critical for accelerating company growth, improving customer satisfaction, solving complex problems, and increasing an employee's, as well as an organization's, competitiveness. It further mentioned that regardless of the industry, knowledge of certain technical skills is necessary to meet daily work performance requirements. According to Penn Commercial (2025) possessing technical skills enhances employability. Employers are actively seeking candidates who can effectively leverage technology to solve complex problems, improve productivity, and drive innovation. Technical skills can provide individuals with a competitive edge, opening up a broader range of job opportunities. Individuals possessing high technical skills are ensured of job security and growth potential as well as high earning potential. Additionally, technical skills offer avenues for continuous professional growth and career advancement. As a result, individuals with technical expertise often enjoy higher earning potential compared to their counterparts without such skills. Linked in (n.d.) the technical skills for engineers refer to the specialized knowledge and abilities required to design, build, and maintain complex systems and solve problems in fields like software, electronics, and infrastructure. Building a strong technical foundation is essential not only for day-to-day problem-solving, but also for long-term career growth and adaptability in a rapidly changing technology landscape.

The respondents also rated their soft skills as very relevant with an average weighted mean of 2.72. Teamwork and

collaboration topped among the six soft skills having attained the highest weighted mean of 2.80, followed by adaptability and coping mechanisms, and communication with 2.73 each; critical thinking, 2.70; and problem solving and leadership, 2.69 each. The results significantly affirmed the rich, relevant and comprehensive civil engineering curriculum offered by this University which prepared its graduates very well in seeking their own place in the professional and career world.

According to Vashisht (2024) soft skills in communication, teamwork, problem solving and adaptability truly make a difference in building a successful engineering career. She concluded that engineers who excel have a blend of strong technical skills and well-developed soft skills help the engineers in their long-term career success and better preparedness for leadership roles.

Overall analysis showed that Baguio Central University has provided its civil engineering graduates the essential technical skills, soft skills and training experiences that made them very much prepared and competent in their practice of their profession. The Baguio Central University is compliant to the CHED Memorandum Order No. 92 series of 2017 which provides the policies, standards and guidelines for the Bachelor of Science in Civil Engineering (BSCE) Program Effective Academic Year (AY) 201802019). This Order is in accordance with the pertinent provisions of Republic Act (RA) No. 7722, otherwise known as the Higher Education Act of 1994 in pursuance of an outcomes-based quality assurance system as advocated under CMO No. 46 series of 2012 (Policy Standard to Enhance Quality Assurance (QA) in Philippine Higher Education through an Outcomes-Based and Typology-Based Quality Assurance and as addendum to CMO No. 37, s. 2012, the Establishment of an Outcomes-Based Educational System in Higher Education Institutions offering Engineering Programs.

Relevance of the Knowledge and Skills of the Geodetic Engineering Graduates

Table 3 presents the degree of relevance of the knowledge and skills acquired by the respondent geodetic engineering graduates of Baguio Central University.

The data gathered indicated that the knowledge and skills of the geodetic engineering graduates were very relevant as proven by the overall average weighted mean of 2.68. The technical and analytical skills got the highest average weighted mean of 2.71, followed by field and practical skills, 2.68, and soft skills and knowledge, 2.66. These three main skills were all rated as very relevant because the respondents believed that they contributed in building up their competence and efficiency as geodetic engineers.

The Technical and Analytical Skills were all rated as very relevant based on their computed weighted means as follows in descending order: Surveying and Measurement, 2.81; Data Analysis and Interpretation, 2.73; Technical Understanding, 2.70; and Geospatial Software, 2.59. These skills have enabled the geodetic engineering graduates to process and interpret complex geographic information. These geodetic engineering technical skills also include surveying and instrumentation, geospatial technologies, data processing and mapping, remote sensing and photogrammetry, specialized surveys and engineering design and application while the analytical skills include geodetic computations and adjustments, spatial analysis and modeling, problem solving, mathematical aptitude and legal and regulatory knowledge (AI Overview, n.d.).

The Field and Practical Skills were equally rated as very relevant such as Mapping and Documentation, 2.70; Equipment Operations, 2.68; and Physical Endurance, 2.65. According to Radojčić et. al. (2025), (AI Overview, n.d.) Field and Practical Skills are essential for geodetic engineers because they directly impact the accuracy, legality, and safety of infrastructure projects

and land management. These skills enable engineers to bridge the gap between theoretical calculations and real-world, often challenging environments.

Lastly, the Soft Skills and Knowledge were very relevant too as follows: Problem Solving, and Communication and Collaboration, 2.73 each; Research Skills, 2.70; Ethical Skills, 2.68; Project management, 2.62 and Regulatory Knowledge, 2.51. ZipRecruiter (n.d.); AI Overview (n.d.) add the following essential soft skills of geodetic engineers namely: attention to detail and accuracy, communication and adaptability, and teamwork and leadership. According to LGA Engineering (n.d.) the soft skills of engineers is the secret behind success. Soft skills make the difference between a good engineer and an excellent one. In an engineering world where collaboration and communication are increasingly important, these skills are indispensable. Engineers who master their soft skills work more efficiently and grow faster in their careers. Technical knowledge alone is not enough. Communication, teamwork and problem-solving skills make you work better together, handle more complex challenges and make an impact.

With all these results, the respondent geodetic engineers admittedly affirmed that these three major skills (technical and analytical skills, field and practical skills and soft skills and knowledge) with their high ratings as very relevant.

Additionally, Ayyappan et. al. (2019) describe engineering as a discipline, has a direct and vital impact on economic development, all aspects of people's life, and the provision of services to society. Engineering curriculum design is based on sound educational principles for giving students necessary fitness to solve the real-world problems. An Engineering curriculum is a continuously improving framework where the assessment of outcomes set path for further modifications to achieve the ideal result. Engineering and Technological Education have been analyzed by the impact of Engineering Pedagogy and Outcome Base Education.

The implication of these findings is that the geodetic engineering graduates of Baguio Central University have thoroughly acquired, learned and experienced all the foundational knowledge, skills and practical on-hand experiences that molded each graduate into a well-rounded, well-prepared and well-equipped geodetic engineer. This is the very reason why the graduates of the College of Engineering of this University are now successfully practicing their careers not only here but also abroad.

Thus, Baguio Central University shall uphold its vision and mission to deliver quality education. It will continue to upgrade and enhance its engineering curriculum in order to produce globally competitive graduates.

Table 3
Relevance of the Knowledge and Skills of the Geodetic Engineering Graduates
N=37

Indicators	Degree of Relevance			TWP	WM	DE	R
	VR	SR	NR				
	3	2	1				
A. Technical and Analytical Skills							
1. Surveying & Measurement	30	7	0	104	2.81	VR	
2. Geospatial Software	23	13	1	96	2.59	VR	
3. Data Analysis & Interpretation	27	10	0	101	2.73	VR	
4. Technical Understanding	26	11	0	100	2.70	VR	
AWM					2.71	VR	1
B. Field and Practical Skills							
1. Equipment Operations	25	12	0	99	2.68	VR	
2. Physical Endurance	25	11	1	98	2.65	VR	
3. Mapping & Documentation	26	11	0	100	2.70	VR	
AWM					2.68	VR	2
C. Soft Skills and Knowledge							
1. Problem Solving	27	10	0	101	2.73	VR	
2. Communication & Collaboration	27	10	0	101	2.73	VR	
3. Project Management	23	14	0	97	2.62	VR	
4. Regulatory Knowledge	19	18	0	93	2.51	VR	
5. Research Skills	26	11	0	100	2.70	VR	
6. Ethical Skills	25	12	0	99	2.68	VR	
AWM					2.66	VR	3
Overall AWM					2.68	VR	

Legend:

Scale	Statistical Limits	Descriptive Equivalent	Symbol
3	2.34-3.00	Very Relevant	VR
2	1.67-2.33	Somewhat Relevant	SR
1	1.00-1.66	Not Relevant	NR

Findings

Based on the data gathered, the findings are the following:

1. Profile of the Respondents
 - 1.1 The greater percentage of the respondents are male.
 - 1.2 The greater percentage of the respondents are employed. A few are not employed and/or never been employed.
2. Employment Status and Job Experience
 - 2.1 A greater percentage of the respondents are permanently employed. The other respondents are employed on a contractual or job order basis.
 - 2.2 A greater percentage of the respondents are employed in their respective localities. The other respondents are employed in national offices and abroad.
3. Relevance of the knowledge and skills acquired in the course.
 - 3.1 Civil Engineering – The respondents have found the technical and soft skills they acquired in the course very relevant.
 - 3.2 Geodetic Engineering – The respondents have found the technical and analytical skills, field and practical skills and soft skills and knowledge the acquired in the course very relevant.

Conclusions

Based on the above findings, the conclusions are the following:

1. Males are more inclined to take engineering courses.

2. Majority of the respondents gainfully and permanently employed. The employability of the respondents is quite high.
3. The respondent civil engineers are very much satisfied with the very relevant technical skills, soft skills, knowledge and practical experiences they earned from their civil engineering course.
4. The respondent geodetic engineers are very much satisfied with their very relevant technical and analytical skills, field and practical skills, soft skills, knowledge and practical experiences they earned from their geodetic engineering course.

Recommendations

The recommendations are the following:

1. The faculty of the College of Engineering should encourage and fully support female engineering students finishing their engineering course in order to produce more female civil and geodetic engineers.
2. The curriculum of the College of Engineering should be regularly evaluated and upgraded (if needed) based on the current trends on engineering education and on the knowledge, skills and training needs of the engineering students.
3. The members of the faculty of the College of Engineering are encouraged to undergo relevant training/studies to enhance their teaching competence and human relations with students.
4. The Baguio Central University is encouraged to continue upgrading its engineering ICT facilities, equipment and other relevant needs.

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THE STATUS OF TECHNOLOGY INTEGRATION ON STUDENT ENGAGEMENT IN FORENSIC SCIENCE COURSES

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ABSTRACT

This study examines the relationship between technological accessibility, educator perceptions, and student engagement in forensic science courses within the College of Criminology and Justice Education at Baguio Central University during the 2025–2026 academic year. Driven by localized technology gaps and resource constraints within the Cordillera Administrative Region, the research addresses how digital infrastructure impacts practical criminal justice training. The study is anchored in the Unified Theory of Acceptance and Use of Technology (UTAUT) and the Community of Inquiry (CoI) framework.

Employing an explanatory sequential mixed-methods design, quantitative data will be gathered via stratified sampling from criminology students who have completed their forensic science courses, utilizing a validated 4-point Likert scale survey. Concurrently, qualitative data will be collected through purposive semi-structured interviews with forensic science faculty. Quantitative analysis will utilize weighted means and Pearson’s correlation (r), while qualitative data will undergo thematic analysis to contextualize statistical trends. The findings aim to expose how specific resource deficits or innovations (e.g., virtual ballistics simulators and digital fingerprint databases) shape pedagogical approaches and student participation. Ultimately,

this study provides empirical data to guide targeted institutional investments, curriculum modernization, and faculty development frameworks.

Keywords: Forensic-Science-Education, Technology-Integration, Student-Engagement, Criminology-Program, Mixed-Methods-Research, Higher-Education-Institution

Introduction

The integration of technology in education has been widely recognized as a critical factor in improving student engagement and learning outcomes, particularly in science-related courses. Sari (2024) investigated the relationship between digital literacy skills and student success in online science courses in Indonesia, finding a strong positive correlation. Proficient digital skills, including information literacy and online collaboration, were linked to higher academic achievement and increased engagement, emphasizing the importance of integrating digital literacy training into science curricula from early education to higher education levels. This study utilized the Technology Acceptance Model (TAM) and the Community of Inquiry Framework to anchor its theoretical approach, suggesting strong theoretical foundations for future studies on technology use in education.

Similarly, Suyono et al. (2024) explored the impact of interactive learning media on student achievement and engagement in science education through an experimental research design. Their findings demonstrated that students exposed to interactive technological tools experienced enhanced learning outcomes, deeper comprehension of scientific concepts, and increased motivation. Both educators and students provided positive feedback regarding the use of such media, highlighting the practical implications of teacher training and curriculum

integration aimed at maximizing the benefits of technology in science education.

In the context of forensic science education, Ness and Preece (2025) studied the status of popular forensic television programs on student motivations and expectations in a UK university setting. They observed that media portrayals, often referred to as the "CSI effect," significantly shape students' perceptions and decisions to pursue forensic science. However, a notable discrepancy exists between these media-statusd expectations and the academic realities of forensic science programs, particularly regarding the scientific rigor of the curriculum. This mismatch has implications for student satisfaction and engagement, underscoring the need for curriculum designs that incorporate media literacy and better prepare students for academic and professional demands.

Moreover, the advancement of forensic technology itself also plays an important role in education and practice. Studies on emerging technologies, such as nanotechnology and DNA forensic applications, reveal ongoing transformations in forensic investigations and education. For example, research on nanotechnology highlights its potential to provide detailed material evidence in criminal cases, which may necessitate corresponding updates in forensic science curricula to include such innovative tools and techniques (The role of nanotechnology in forensic investigation, 2024). Likewise, comprehensive handbooks on DNA forensic applications have underscored the importance of equipping students and professionals with knowledge of high-end forensic technologies, including AI and IoT applications for DNA data analysis, to enhance crime-solving capabilities (Handbook of DNA forensic applications and interpretation, 2022).

Hence, virtual reality (VR) has emerged as a promising educational technology in forensic science, offering immersive and cost-effective practical learning opportunities. Mayne and Green (2020) documented the successful implementation of a VR crime scene app that supported the acquisition of practical crime

scene investigation skills. The study showed high satisfaction levels among students and educators, highlighting VR's potential to complement traditional forensic science education with flexible, interactive experiences that may promote higher student engagement.

The foundational forensic science textbooks continue to update their content to reflect the integration of technological advancements within the discipline. Harris and Lee (2019) provided an extensive overview of forensic science concepts, evidence collection, and laboratory techniques, while emphasizing recent scientific developments including digital forensic evidence. Such comprehensive academic resources support student engagement by connecting theoretical knowledge with practical applications in contemporary forensic science.

In the Philippines, the transition to online and blended learning modalities, particularly in the wake of the pandemic, has profoundly affected criminology education in the Philippines, especially in hands-on forensic science courses. A review of recent literature suggests that the integration of technology and equipment has a dual status, presenting both challenges and opportunities that significantly impact student engagement, as explored in studies focusing on student experiences, faculty preparedness, and technological advancements.

The sudden shift away from traditional classrooms, primarily due to the pandemic, created significant barriers to engagement, particularly in practical, laboratory-based forensic subjects.

The study by Escalona (2022), investigating challenges in the Forensic Questioned Document Examination course, highlighted how the abrupt change impacted student engagement with core laboratory activities. Students faced issues with laboratory activities; in such cases, the practical examination of

documents, presentation of examined signatures, and submission of specimens were "greatly challenged" (Escalona, 2022).

Furthermore, specimen quality and reliability identified themes included problems with the development and reliability of specimens and the quality resolution of uploaded standard specimens for comparison (Escalona, 2022). Problems were also attributed to increased reliance on self-study (Escalona, 2022).

Moreover, Engagement was hampered by the use of multiple online platforms and frequent platform interruptions during assessments (Escalona, 2022). These reveal the positive impacts of digital literacy, interactive media, advanced forensic technologies, and immersive learning environments on student engagement and academic success. Accordingly, educational institutions must continue to adopt and adapt technological innovations in their curricula to better prepare forensic science students for the evolving demands of both academia and professional practice.

Hence, these findings collectively suggest that the difficulty in conducting accurate, hands-on, and verifiable laboratory work in a remote setting negatively impacts the deep, intellectual engagement required in forensic disciplines. The study's implication—the need for a system with specialized features intended for signature/handwriting comparison—directly points to a technology gap that, if filled, could improve engagement (Escalona, 2022).

Despite the challenges, the literature underscores a push toward integrating innovative technology and equipment to bridge the gap between theoretical knowledge and practical application, a factor shown to status student engagement.

The necessity for modern, standardized, and technologically advanced laboratory resources is repeatedly emphasized as a way to enhance the learning environment and, by extension, student engagement.

According to Benter et al. (2020), they noted that many school-based crime laboratories offering the BS Criminology program are outdated and lack sufficient equipment. The study advocated for the development of a School-Based Digital Fingerprint Laboratory equipment— including Hand and Fingerprint Digital Scanning and a Fingerprint database system — to improve laboratory experiences and meet standardization efforts. This move toward modern, digitized equipment directly supports a more engaging and up-to-date learning experience in courses like Personal Identification Techniques (Benter et al., 2020).

Hence, to counter the limitations of physical or online-only classes, innovative virtual tools have been developed. The Bullet Id: A Virtual Bullet Identification for Forensic Ballistics Students mobile application was proposed to serve as a promising educational tool to help both instructors and students in their learning activities in forensic ballistics (Roxas & Cawi, 2023). Being an offline-based mobile application, it offers flexibility and accessibility, which are crucial components for sustained academic engagement in a blended learning environment (Roxas & Cawi, 2023).

The effectiveness of technology integration in promoting student engagement is intrinsically linked to the preparedness of the faculty. The study by Amba & Jala (2024) examined the technological and pedagogical knowledge of criminology faculty. While faculty showed a high level of teaching proficiency, their level of technological knowledge was found to be average (Amba & Jala, 2024).

Crucially, the study found significant relationships between faculty technological knowledge and pedagogical approaches, such as the relationship between knowledge of multimedia and the use of course packages, and the link between integration, communication technology, and assessment with mastery of content and pedagogy (Amba & Jala, 2024). This suggests that

improving faculty technological knowledge is a prerequisite for effective technology-driven instruction, which in turn would enable more engaging and high-quality learning experiences in forensic science courses.

The role of instructional elements in driving overall student engagement is also pertinent. Abbott (2022) found that, in the context of face-to-face learning at Northwestern University, factors under academic identification (intellectual development and academic performance) often led criminology students to academic engagement. Furthermore, the best aspects of the institution that engaged students included the faculty, the LMS-Canvas, academic teaching strategy, and academic materials for teaching (Abbott, 2022). This highlights that technology platforms (LMSCanvas) and the quality of faculty-delivered instruction are vital, supporting the premise that the manner in which technology and equipment are integrated is key to fostering engagement.

The broader context of forensic science points toward an increasing reliance on technology, which mandates its integration into educational curricula to ensure future practitioners are competent and engaged with the subject matter. Chango et al. (2024) described the impact of technological advances—such as extended reality technologies for remote crime scene analysis, improvements in the accuracy and identification of biometric characteristics, and portable equipment—on professional forensic investigations.

The study is a systematic review outside the immediate educational context; it validates the need for criminology programs to adopt cutting-edge technology (like the virtual simulators proposed by Roxas & Cawi, 2023, and the digital labs by Benter et al., 2020). Aligning educational technology with industry practice ensures that students are learning relevant skills, thereby fostering a more meaningful and engaged learning experience.

The integration of technology and equipment has a direct, yet complex, status on student engagement in forensic science courses within criminology programs in the Philippines is essential to address the following: 1) Technology Deficits (e.g., lack of specialized systems, poor specimen resolution) negatively impact engagement in practical subjects like Questioned Document Examination; 2) Technological Innovations (e.g., digital fingerprint labs, virtual ballistics simulators) are highly encouraged as necessary tools to modernize instruction, improve laboratory experiences, and promote deeper engagement in subjects like Personal Identification and Forensic Ballistics; 3) The Preparedness of Faculty to leverage these technologies is a critical mediating factor in achieving effective technology integration and maximizing student engagement.

Purpose of the Study

The rapid advancement of technology has profoundly reshaped educational landscapes globally, particularly in fields requiring practical and intricate analysis, such as Forensic Science. This integration of technology, ranging from specialized laboratory equipment to digital simulation tools, holds significant potential to transform traditional instructional methods and, crucially, enhance student engagement (Arquero et al., 2022). This potential is especially pertinent in contexts like Baguio City, where educational institutions train future criminal justice and forensic professionals. The proposed research, *The Status of Technology Integration on Student Engagement in Forensic Science Courses*, seeks to systematically investigate the interconnected dynamics of technological accessibility, educator perception, and student engagement within this specialized academic setting.

Forensic Science education necessitates a strong foundation in both theoretical content and practical application, often involving complex techniques like DNA analysis and personal identification. However, challenges exist in bridging the gap between classroom theory and realworld forensic practice.

Locally, studies involving the Police Regional Office – Cordillera have highlighted significant resource limitations, including the "lack of reagents for testing" and "insufficient equipment and facilities in DNA laboratories," which directly impede effective analysis and practice (Domingo & Moyao-Donato, 2024; Tad-Awan et al., 2023). While these studies focus on professional settings, they underscore a broader issue of resource scarcity and the importance of functional equipment, which can inform the discussion on resources available to students in academic programs.

Furthermore, the effectiveness of technology integration relies heavily on the educators' competence and their knowledge of how to effectively weave technology into their pedagogy. Studies concerning criminal justice educators in Baguio City have addressed this crucial area. Research shows that faculty members generally possess high content knowledge (CK) and pedagogical content knowledge (PCK), but their overall Technological Pedagogical and Content Knowledge (TPACK) is often moderate, with factors like age and teaching experience influencing this level (Arquero & Pascual, 2023). These findings highlight a potential misalignment: a moderate understanding of how to best integrate technology despite a high necessity for it in a field like Forensic Science.

Existing local literature also provides evidence on the positive outcomes of faculty development and technology use. For instance, Faculty Development Programs (FDPs) have been shown to have a "transformative effect" on the professional development of criminal justice educators in Baguio City, leading to "enhancements in their confidence, creativity, and overall competence in the realm of teaching" (Moyao, 2023). This suggests that systematic investment in educator training could be a viable path toward overcoming deficits in TPACK.

Crucially, the direct impact of certain technologies on student performance has been demonstrated. The use of simulation technology for courses like Personal Identification.

Techniques proved significantly effective in improving students' performance in identifying and matching fingerprints, suggesting that technology can have a "powerful effect" on learning outcomes (Arquero et al., 2022). This study directly supports the premise that technology is a powerful tool for improving educational results in Forensic Science.

Despite these foundational findings, a comprehensive investigation connecting the three critical variables—technological accessibility for students, educator perception, and TPACK, and the outcome of student engagement—is missing in the local context of Forensic Science courses. The current body of work provides separate pieces of the puzzle: the need for resources (TadAwan et al., 2023; Domingo & Moyao-Donato, 2024), the state of educator knowledge and development (Moyao, 2023; Arquero & Pascual, 2023), and the effectiveness of technology on performance (Arquero et al., 2022).

Theoretical and Conceptual Framework

The integration of technology in forensic science education can be effectively analyzed through several established theoretical frameworks that not only guide the research design but also provide a foundation for interpreting the forthcoming results and discussion.

The Technology Acceptance Model (TAM) by Davis (1989) offers a strong basis for understanding how students and educators accept technology based on perceived usefulness and ease of use. In this study, TAM will be integral for analyzing how accessible technological equipment statuss student engagement and how educators perceive these tools in their instructional practice. Results interpreted through TAM can reveal whether positive perceptions about technology usability and benefits correlate with higher participation and learning outcomes in Forensic Science courses.

Complementing this, the Community of Inquiry (CoI) Framework proposed by Garrison, Anderson, and Archer (2000) draws attention to the dynamic interplay between social presence, cognitive presence, and teaching presence within technology-enhanced learning environments. This conceptual lens is particularly useful for exploring how technology fosters a collaborative and engaging learning community. Analysis of data with CoI will allow for an examination of how the educators' instructional strategies and technological integration collectively enhance students' cognitive engagement and social interactions during forensic science lessons.

Self-Determination Theory (SDT) by Deci and Ryan (1985) offers valuable insight into student motivation, emphasizing autonomy, competence, and relatedness as fundamental drivers of engagement. Investigating technology integration through the SDT framework can help discern whether technological tools empower students to take ownership of their learning and feel competent while maintaining social connections. Findings using this theory will frame engagement as not only behavioral but also inherently motivational, deepening the interpretation of survey or observational data on student participation.

Moreover, the Unified Theory of Acceptance and Use of Technology (UTAUT) by Venkatesh et al. (2003) extends TAM by incorporating social status and facilitating conditions alongside performance and effort expectancy. This comprehensive model will support analysis regarding how accessibility to technology, combined with educators' status and support structures, predicts students' adoption of technology and subsequent engagement. The use of UTAUT will be especially relevant in correlating educator perceptions with student usage patterns and engagement levels.

Constructivist Learning Theory, grounded in the foundational work of Piaget (1954) and Vygotsky (1978), emphasizes active, experiential learning through social interaction. Technology integration in forensic science education

can be seen as a mechanism enabling constructivist learning by promoting hands-on, inquiry-based activities. This framework will guide the interpretation of how technology facilitates knowledge construction and deeper cognitive engagement, evidenced through students' active participation and collaboration during forensic science tasks.

Finally, Engagement Theory (Kearsley & Shneiderman, 1998) highlights the critical role of meaningful, collaborative activities supported by technology in fostering learner engagement. This framework will be pivotal for evaluating the quality and depth of student engagement, helping to explain how technology-driven collaboration and relevance of learning tasks status student motivation and sustained participation in forensic science courses.

Together, these frameworks provide a multidimensional approach that will enrich the analysis and discussion of the study's findings. They collectively allow for comprehensive interpretations that link technology accessibility and educator perceptions with different facets of student engagement—ranging from behavioral to cognitive and motivational domains—thus informing future instructional design and policy development in forensic science education.

Schematic Illustration of the Study

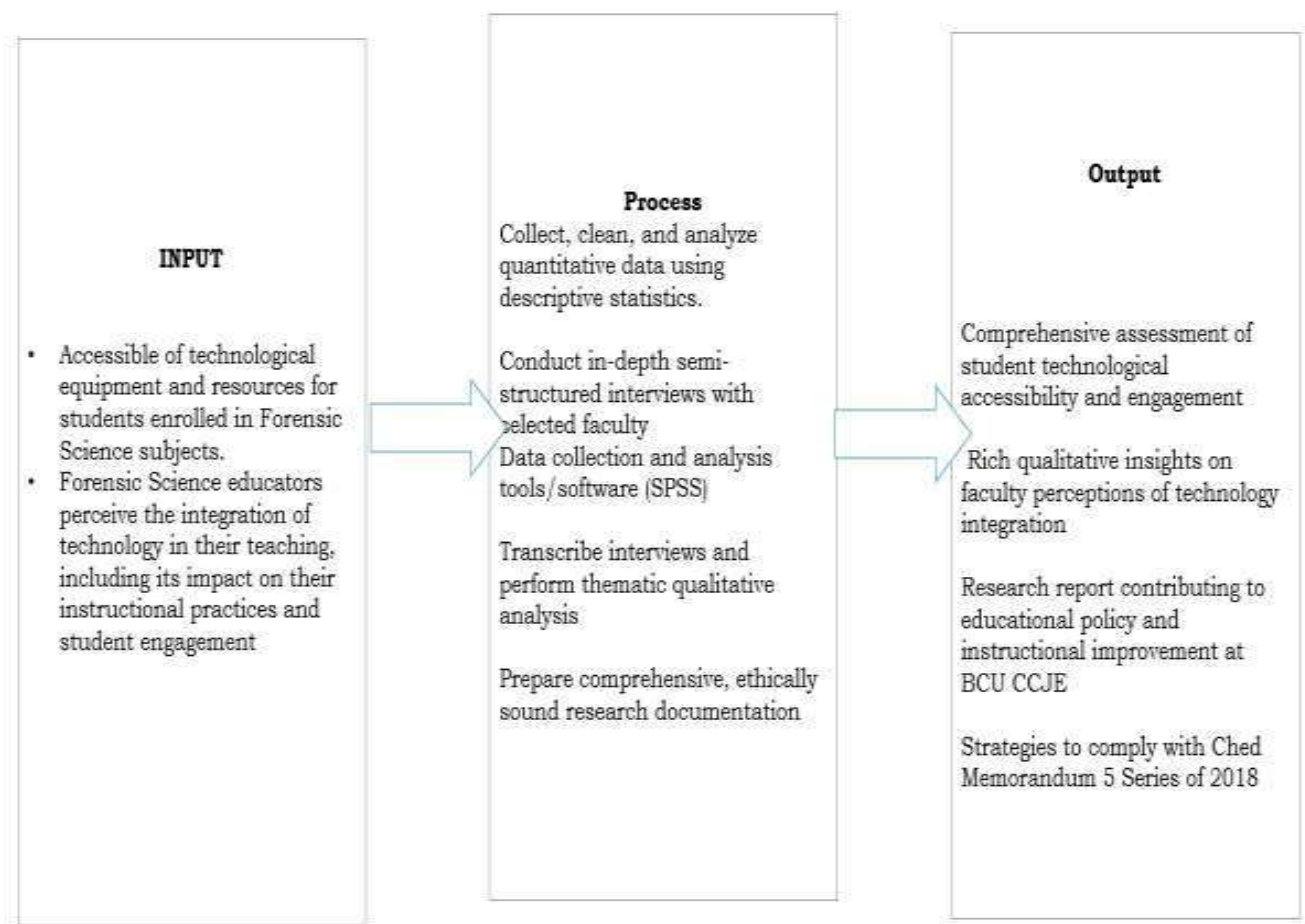
This study employs the Input-Process-Output (IPO) model to provide a clear framework for understanding how the research components interact to produce meaningful findings. The inputs include the research setting at Baguio Central University's College of Criminology and Justice Education (CCJE), the participants comprising forensic science students (selected by stratified sampling) and faculty (selected via purposive sampling), the research instruments, like quantitative surveys and qualitative interview guides, along with ethical approvals and necessary resources such as data collection and analysis software.

The processes involve preparation activities such as obtaining ethical clearances and coordinating with the administration, conducting the quantitative phase, followed by the qualitative phase. These steps culminate in the integration of both data strands into a comprehensive interpretation and the preparation of an ethically sound report.

The outputs represent the study’s outcomes, including detailed assessments of students’ technological accessibility, insightful educator perspectives on technology use, integrated findings supporting evidence-based recommendations for enhancing educational technology integration, and contributions to policy and instructional improvements at BCU CCJE.

Figure 1 systematically illustrates the flow from inputs through processes to outputs, enabling effective understanding and management of the study’s scope and objectives:

Figure 1
Schematic Illustration of the Study



Significance of the Study

The significance of this study rests on its capacity to provide comprehensive, empirical insights into the status of technology integration on student engagement in forensic science courses, with direct implications for multiple key stakeholders.

For the BCU Management, the study offers crucial evidence-based data that inform strategic planning and resource allocation, prioritizing investments in technologies that demonstrably enhance student engagement, retention, and instructional quality. Identifying technology-driven engagement strategies equips leadership to optimize fiscal responsibility and enhance institutional reputation by channeling funds into cyber infrastructure and facilities with proven educational impact. Furthermore, faculty-mentored undergraduate research, supported by robust technology integration, can increase the university's national visibility through outcomes such as publications and conference presentations that strengthen competitive positioning in securing prestigious grants like REU or R15 AREA. The availability of measurable data points contributes to continuous institutional improvement and accreditation adherence by confirming qualified staffing, quality-controlled facilities, and ongoing curriculum development.

Within the BCU CCJE Office, the study's findings are instrumental in maintaining academic rigor and relevance by providing objective evidence to guide curriculum development aligned with current industry standards and technological advancements, including AI-driven forensic applications. The quantification of technology resource efficacy aids precise budgeting decisions for software licenses, laboratory equipment, and IT support, supporting efficient management of limited resources. Additionally, by clarifying the "facilitating conditions" for technology adoption among faculty and leadership, the study fosters a supportive infrastructure that encourages pedagogical innovation and agile responsiveness to rapid forensic science developments that impact legal and scientific standards.

For BCU CCJE faculty, actionable findings reveal areas where targeted support and professional development in complex digital platforms—such as incident response tools or digital forensics examiner software—are needed to improve teaching practices. By highlighting correlations between high student engagement and pedagogical use of technology to capture active participation, faculty gain immediate practical feedback to refine lesson design and maximize instructional impact. Participation in technology-focused educational research additionally strengthens faculty scholarly profiles, as empirical data generated supports grant acquisition and publications while promoting effective translation of theory into hands-on learning experiences such as simulated crime scene reconstructions.

BCU CCJE students stand to benefit from an updated, career-relevant educational experience that fosters mastery of essential modern forensic tools, including AI-powered analytical platforms and extended reality systems. Increased engagement facilitates academic achievement and critical thinking skills essential for leadership in forensic science professions. The inclusion of virtual labs and online components addresses logistical challenges, broadening access while maintaining the quality of STEM education. Students are thereby prepared to meet the high scientific scrutiny of legal systems with confidence in the reliability of their forensic analyses, safeguarding both their career trajectories and the justice process.

For future researchers, the study offers a rigorous empirical foundation for investigating technology's role in specialized STEM education. By employing robust methodologies such as PLS-SEM and advocating for multi-modal measurement approaches beyond self-reporting, the research sets a methodological benchmark. Detailed definitions of technological components and student satisfaction constructs provide replicable frameworks for longitudinal and comparative educational studies, thereby advancing the academic discourse

and providing actionable insights relevant to forensic science education globally.

Aligned with the study's problem focus, the significance emphasizes exploration of three key facets: technological accessibility among forensic science students, educator perceptions of technology integration and its pedagogical impact, and the interplay between accessibility and these perceptions in influencing student engagement. Addressing these dimensions ensures that the research findings have tangible implications for improving instructional practices, resource management, and educational outcomes in forensic science programs, with ripple effects that extend across institutional, professional, and societal realms.

Statement of the Problem

The study aims to explore the status of technology integration on student engagement in Forensic Science courses. Specifically, it seeks to answer the following questions:

How accessible are the necessary technological equipment and resources for students enrolled in Forensic Science subjects?

How do Forensic Science educators perceive the integration of technology in their teaching, including its impact on their instructional practices and student engagement?

What strategies can be employed by Forensic Science educators and BCU Management to effectively integrate technology into the BCU students in ways that enhance instructional delivery and promote higher levels of student engagement?

Research Design and Methodology

This chapter outlined the design and methodology used in the research, covering aspects such as the research design, study population, data collection tools and procedures, data analysis methods, and ethical considerations.

Research Design

This study employed a descriptive mixed-methods research design, specifically utilizing the explanatory sequential design approach. In this design, quantitative data collection and analysis were conducted first to assess the accessibility of technological equipment and resources for students enrolled in Forensic Science subjects. This initial phase provided measurable data on technology availability and its direct relationship to student engagement.

Following the quantitative phase, qualitative data were gathered from Forensic Science educators to gain deeper insights into their perceptions of technology integration, including its impact on their instructional practices and on enhancing student engagement. This qualitative phase was designed to explain and elaborate on the quantitative results, providing a richer and more comprehensive understanding of the complexities involved in technology use within forensic science education.

The explanatory sequential mixed-methods design was particularly suitable for this study because it allowed for the integration of broad numerical trends with more nuanced, context-rich educator perspectives, thereby facilitating a robust exploration of the phenomenon.

By combining descriptive statistics with thematic qualitative analysis, this design ensured that both measurable factors and experiential insights informed the interpretation of findings in Chapter 3 and subsequent discussion, ultimately

supporting practical recommendations for educational policy and instructional improvement.

Population Locale of the Study

The study's population consisted of two main groups essential to examining the status of technology integration on student engagement in forensic science education: students who had finished all Forensic Science subjects and the faculty members who taught these courses at BCU's College of Criminology and Justice Education (CCJE). The student population included individuals across all academic year levels who had completed forensic science subjects, totaling 109. These students possessed diverse academic backgrounds and experiences, but uniformly interacted with forensic science instructional technologies, making them the pertinent group for assessing the accessibility of technological equipment and its impact on engagement. The educator population included faculty who actively taught forensic science courses and routinely integrated technology into their instructional practices. These educators offered valuable insights into the benefits, challenges, and impact of technology use on teaching effectiveness and student engagement.

The study was conducted at Baguio Central University (BCU), specifically within the CCJE, an ideal locale as it combined structured forensic science programs with available technological resources and policies relating to educational technology use. Sampling was conducted in two phases per the study's mixed-methods design to ensure representative and indepth data collection. For SOP 1, the student sample was drawn using stratified sampling, with strata defined by academic year level and, if relevant, program specialization. This approach guaranteed that subgroups within the forensic science student population were proportionally represented, allowing the findings on technological accessibility and engagement to be generalized appropriately across the diverse student body.

For SOP 2, purposive sampling for faculty participants was used to intentionally select educators who were knowledgeable and experienced in technology integration. These educators were required to be actively involved in teaching forensic science courses and to have documented or demonstrable use of technological tools in their pedagogy. This targeted sampling ensured the collection of rich, contextual insights into educator perceptions and instructional practices related to technology.

Together, these sampling procedures provided a robust framework for collecting comprehensive quantitative data reflecting technological accessibility across student groups and in-depth qualitative data elucidating educator perceptions and their effect on student engagement. This blended sampling strategy aligned with the explanatory sequential mixed-methods design, enabling the integration of broad trends with nuanced contextual understanding to effectively address the study's research objectives.

Data Gathering Tool

The data gathering tool consisted of two main instruments tailored to the explanatory sequential mixed-methods approach: a quantitative survey for students and a qualitative interview guide for faculty.

For Statement of the Problem 1, the survey was structured to quantitatively assess students' accessibility to technological equipment and resources related to their forensic science subjects. It included closed-ended questions with Likert-scale, multiple-choice, and yes/no formats covering areas such as availability of devices (computers, tablets, internet access), frequency of technology use in learning, and perceived impact of technology on their engagement. The questionnaire also collected demographic and academic information for stratified sampling validation (e.g., academic year, program specialization). Clear instructions and informed consent information accompanied the survey to ensure voluntary and confidential participation.

For Statement of the Problem 2, a semi-structured interview guide was developed to explore forensic science educators' perceptions of technology integration and its effects on instructional practices and student engagement. Open-ended questions encouraged detailed responses regarding benefits, challenges, and strategies in using technological tools. Topics included experiences with technology adoption, perceived status on teaching effectiveness, student interaction, and recommendations for enhancing technology use in forensic science education. Interview protocols emphasized confidentiality and voluntary participation, and allowed flexibility to probe emergent themes or clarify responses.

Additionally, participant information sheets detailing the study purpose and ethical considerations were incorporated to foster informed consent and data integrity. These tools together provided comprehensive quantitative and qualitative data essential for analyzing technology accessibility and its impact on engagement in forensic science education.

Data Gathering Procedure

The data gathering procedure for this study followed a systematic sequence aligned with the explanatory sequential mixed-methods design, ensuring thorough collection of both quantitative and qualitative data. The process began with preparation and coordination, which involved obtaining necessary approval and ethical clearance from Baguio Central University's research ethics board and relevant authorities. Coordination with the College of Criminology and Justice Education (CCJE) administration was essential to identify the population list of forensic science students who had completed all related subjects as well as faculty members actively teaching these courses. Data collection instruments, including a quantitative survey for students and an interview guide for faculty, were developed and pre-tested to ensure clarity, validity, and reliability.

In the quantitative phase (SOP 1), stratified sampling based on academic year level and program specialization was used to select student participants, ensuring proportional representation of the forensic science student population. The standardized survey questionnaire, which focused on students' access to technological equipment and resources relevant to forensic science subjects, was distributed either electronically or via printed copies, depending on accessibility. Clear instructions and informed consent forms were provided to explain the study's purpose, assure confidentiality, and clarify voluntary participation. Respondents were given approximately two weeks to complete the survey, with reminders sent to improve response rates. Completed surveys were collected, organized, and checked for completeness and accuracy.

Quantitative data analysis involved descriptive statistical techniques to assess levels of technological accessibility among students, and analysis was performed to explore relationships between accessibility and other relevant variables. Preliminary results from this phase were used to guide the subsequent qualitative phase. In the qualitative phase (SOP 2), purposive sampling was employed to select faculty members actively teaching forensic science courses and integrating technology in their instructional methods. In-depth, semi-structured interviews or focus group discussions were scheduled with these educators, using the interview guide to explore their perceptions of technology integration and its impact on teaching and student engagement. Interviews were recorded with participants' consent and detailed notes were taken to capture important verbal and non-verbal cues, while confidentiality and voluntary participation were strictly maintained.

For qualitative data processing, audio recordings were transcribed verbatim and organized systematically. Thematic analysis was applied to identify key patterns, themes, and insights related to educators' perceptions of technology use and its effects on student engagement. These qualitative findings were then integrated with the quantitative results to provide a

richer, more comprehensive interpretation of the data. Finally, both sets of data were synthesized to present a cohesive understanding of technology accessibility and its impact within forensic science education. The findings were documented transparently with attention to ethical considerations and procedural rigor, supporting valid and reliable conclusions that addressed the study's objectives effectively.

Treatment of Data

The treatment of data in this research followed systematic procedures aligned with the explanatory sequential mixed-methods design to ensure accurate and meaningful analysis of both quantitative and qualitative data.

For the quantitative data collected from the student survey, responses were first checked for completeness and consistency. Descriptive statistics that focused on weighted means were computed to summarize the level of accessibility to technological equipment and resources among forensic science students. To explore relationships between variables, specifically examining the association between technological accessibility and measures of student engagement. Data were processed and analyzed using statistical software, specifically SPSS, and all results were interpreted in the context of the research objectives.

Hence, for the first statement of the problem, “How accessible are the necessary technological equipment and resources for students enrolled in Forensic Science subjects?”, a 4-point Likert scale was used along with its description. The options were structured without a neutral middle point to encourage decisiveness in students' self-evaluation.

Table 1

4	FULLY ACCESSIBLE (FA)	All required technology and resources are consistently available, functional, and easy to use for every student without barriers. Students can rely on immediate access whenever needed.
3	HIGHLY ACCESSIBLE (HA)	Most technology and resources are readily available and functional, with only minor limitations (e.g., occasional scheduling conflicts or slight delays) that do not significantly hinder student learning
2	SLIGHTLY ACCESSIBLE (SA)	Some technology and resources are available, but access is inconsistent, limited, or requires extra effort. Students may struggle to fully meet course requirements.
1	NOT ACCESSIBLE (NA)	The necessary technology and resources are unavailable or unusable, preventing students from effectively engaging in forensic science subjects and completing required tasks.

Table 2

SCALE	RANGE	DESCRIPTIVE RATING
4	3.26-4.00	FULLY ACCESSIBLE (FA)
3	2.51-3.25	HIGHLY ACCESSIBLE (HA)
2	1.76-2.50	SLIGHTLY ACCESSIBLE (SA)
1	1.00-1.75	NOT ACCESSIBLE (NA)

Qualitative data from faculty interviews were transcribed verbatim to ensure accuracy. The transcripts were then organized and subjected to thematic analysis, a process that involved coding the data to identify key patterns, categories, and themes related to educators’ perceptions of technology integration and its impact

on teaching and engagement. This coding process was iterative and involved the use of qualitative data analysis software, such as SPSS, to enhance rigor and organization. Emerging themes were compared and contrasted to understand the complexities and contextual factors that statusd technology use in forensic science education.

Ethical Consideration

Ethical considerations in this study guided the design and conduct of the research to protect participants’ rights, ensure integrity, and maintain trustworthiness. Participants were free to join voluntarily, with the right to withdraw at any time without penalty, and informed consent was secured by explaining the study’s purpose, procedures, risks, benefits, and confidentiality measures. The researchers upheld non-maleficence and beneficence by minimizing risks and maximizing benefits, while anonymity and confidentiality were maintained through secure handling of data and avoidance of personally identifiable information. Fair selection and equitable treatment of participants were ensured, avoiding exploitation of vulnerable groups. Research integrity was observed through rigorous design, accurate reporting, avoidance of fabrication, falsification, and plagiarism, and transparency regarding funding and conflicts of interest.

Together, these principles ensured that the study was ethically sound, scientifically valid, and responsibly conducted.

Results and Discussion

Table 3 depicts on how accessible the necessary technology equipment and resources for students enrolled in forensic science subjects of Baguio Central University students. The table shows the weighted mean score and descriptive interpretation (DI) based on a Likert scale, which describe the accessibility of necessary technology equipment and resources in forensic

science subjects, specifically, on Forensic Photography, Personal Identification Techniques, Question Document Examination, Lie Detection, Forensic Ballistics And, Forensic Chemistry and Toxicology, including the overall accessibility.

Table 3

Item	Description (Tier)	Weighted Mean	Descriptive rating	Rank
Forensic 1- Forensic Photography				
1	Digital SLR/mirrorless w/ macro; 35mm manual SLR (Actual) Availability of this technology allows students to actively participate in hands on evidence imaging tasks.	1.89	SA	6
2	Lighting (ring/UV/IR) (Actual) This technology supports scene simulation participation and inquiry-based lighting experiments.	1.93	SA	4
3	Availability of this software enables active engagement in forensic photo analysis skills development.			5
4	Tripods/scales/markers (Actual) This equipment facilitates hands-on scale photo inquiry and precise evidence documentation practice.	1.94	SA	
5	Computers/high-res displays; dryers (Actual) High-res displays boost photo review motivation and collaborative lab discussions.	1.95	SA	

6	Darkroom: Enlarger/printer/tanks/bags (Actual) Darkroom tools promote hands-on lab processing practice and traditional technique mastery.	2.01	SA	
7	Chemicals (D-76/Fixer; B&W film) (Actual) Chemical processing availability sparks interest in authentic film development workflows.	1.87	SA	
Total Weighted Mean	1.93	SA		
Forensic 2- Personal Identification				

3	Availability of this software enables active engagement in forensic photo analysis skills development.			
4	Tripods/scales/markers (Actual) This equipment facilitates hands-on scale photo inquiry and precise evidence documentation practice.	1.94	SA	3
5	Computers/high-res displays; dryers (Actual) High-res displays boost photo review motivation and collaborative lab discussions.	1.95	SA	2
6	Darkroom: Enlarger/printer/tanks/bags (Actual) Darkroom tools promote hands-on lab processing practice and traditional technique mastery.	2.01	SA	1
7	Chemicals (D-76/Fixer; B&W film) (Actual) Chemical processing availability sparks interest in authentic film development workflows.	1.87	SA	7

Total Weighted Mean		1.93	SA	
Forensic 2- Personal Identification				
8	Fingerprint scanners/AFIS (Actual/Virtual) Availability of this technology allows students to actively participate in print matching tasks.	2.07	SA	2
9	Biometrics (facial/iris software/fingerprint) (Actual/Virtual) This technology supports hands-on ID simulation participation and biometric inquiry.	1.99	SA	5
10	Microscopes (compound/stereo) for latents (Actual) Microscopes enable active engagement in latent print examination understanding.	2.14	SA	1
11	Chem kits (ninhydrin/fuming chambers) (Actual) Availability supports hands-on development labs and chemical processing experiments.	2.04	SA	3
12	Matching databases/software (Actual/Virtual) Database tools boost motivation for forensic matching and analysis practice.	2.01	SA	4
Total weighted Mean		2.05		
Forensic 3- Question Document Examination				

13	VSC/document workstations (Actual) Availability of this technology allows students to actively participate in doc analysis hands-on tasks.	1.97	SA	5
14	UV/IR lights/stereo microscopes (Actual) This equipment supports ink/indentation participation and spectral inquiry experiments.	1.98	SA	4
15	ESDA for indented writing (Actual) ESDA enables hands-on writing detection skills and indentation recovery practice.	1.99	SA	3
16	Handwriting software (FISH) (Actual/Virtual) Software availability promotes active engagement in handwriting analysis inquiry.	2.02	SA	2
17	Scanners/printers (Actual) Scanners boost motivation for document replication and forensic comparison labs.	2.08	SA	1
Total Weighted Mean	2.01	SA		

Forensic 4- Lie Detection				
18	Polygraphs w/ interfaces (Actual) Availability of this technology allows students to actively participate in monitoring practice sessions.	2.06	SA	1

19	Voice stress (CVSA) (Actual/Virtual) This tool supports hands-on stress analysis participation and deception inquiry.	1.93	SA	3.5
20	Eye-tracking/pupil monitors (Actual/Virtual) Monitors enable active engagement in deception understanding through behavioral observation.	1.93	SA	3.5

21	EEG/fMRI simulators/biofeedback (Simulator) Simulators promote hands-on detection labs and neurofeedback experiments.	1.85	SA	5
22	Polygraph training software (Virtual) Software boosts motivation for polygraph administration and scenario practice.	1.99	SA	2
TOTAL Weighted Mean		1.95	SA	
Forensic 5- Forensic Ballistics				
23	Comparison microscopes (Actual) Availability of this technology allows students to actively participate in bullet/toolmark analysis tasks.	2.00	SA	2
24	Firing ranges/bullet traps (Actual/Shared) his facility supports hands-on test firing participation and ballistic experiments.	2.19	SA	1
25	IBIS/NIBIN simulators (Simulator) Simulators enable active engagement in ID system skills and database matching practice.	1.94	SA	4

26	3D scanners for firearms (Actual/Virtual) Scanners promote reconstruction inquiry and digital ballistics modeling.	1.96	SA	3
27	High-speed trajectory cameras (Actual) Cameras boost motivation for trajectory analysis and projectile path labs.	1.91	SA	5
	TOTAL WM	2.00		
Forensic 6- Forensic Chemistry and Toxicology				
28	Gas Chromatography-Mass Spectrometry (GC-MS) for drug/trace evidence ID (Actual/Shared) Availability of this technology allows students to actively participate in handson criminal substance analysis.	1.89	SA	2.5
29	Fourier Transform Infrared (FTIR) spectrometers for chemical/toxic ID in investigations (Actual) FTIR supports evidencematching participation and spectral identification inquiry.	1.85	SA	6
30	Fume hoods w/ toxicology kits (spot tests, colorimetry for drugs/poisons) (Actual) Kits enable hands-on screening lab understanding and presumptive testing practice.	1.90	SA	1

31	High-Performance Liquid Chromatography (HPLC) for Toxicological separation/quantitation (Actual/Shared) HPLC promotes active engagement in poison quantification tasks and separation experiments.	1.86	SA	5
32	Atomic Absorption Spectrometer (AAS) for heavy metals/poison detection in casework (Actual) AAS facilitates trace metal inquiry and quantitative poison detection labs.	1.88	SA	4
33	Chemical reagent kits/databases (Marquis/Mecke for drugs; NIST spectral matching) (Actual/Virtual)	1.85	SA	6
	Kits boost field-to-lab motivation and reagent-based drug identification practice.			
34	Microcrystalline/polybag kits for explosive/precursor identification (Actual) Kits support hands-on criminal chem exam practice and explosive precursor analysis.	1.89	SA	2.5
TOTAL Weighted Mean		1.87	SA	
			Mean	Rank
Forensic 1			1.93	5
Forensic 2			2.05	1
Forensic 3			2.01	2
Forensic 4			1.95	4

Forensic 5	2.00	3
Forensic 6	1.87	6
Total weighted mean	1.99	

The overall weighted mean of 1.99 which indicates Slightly Accessible indicates that Baguio Central University’s forensic science students have basic to intermediate access to required equipment but face recurring constraints—limited units, shared facilities, consumable shortages, and inconsistent availability—that restrict frequent, independent hands-on practice and deeper experiential learning. This accessibility profile reduces opportunities for iterative skill development that is essential in laboratory-intensive disciplines, and it creates scheduling and equity bottlenecks where some students receive substantially less practical exposure than others.

Limited physical access undermines the pedagogical gains associated with strong digital literacy: research shows that students with higher digital skills achieve better outcomes in science courses because they can leverage online tools, collaborate effectively, and engage with interactive content; when equipment and software access are inconsistent, those digital-skill advantages cannot be fully realized (Sari, 2024). In the present context, even if instructors integrate digital tasks or virtual assignments, students who lack reliable access to computers, licensed software, or stable lab time will be less able to translate digital literacy into measurable learning gains (Sari, 2024).

Similarly, the positive effects of interactive learning media on motivation and conceptual understanding depend on consistent, equitable access to the enabling technologies; experimental evidence indicates that interactive tools increase comprehension and engagement when students can use them regularly and receive teacher support (Suyono et al., 2024). The Slightly Accessible rating therefore suggests that while some

interactive activities may be possible, their impact will be uneven: classes or cohorts with better scheduling or privileged access will benefit more, while others will miss the deeper learning and motivation gains documented in controlled studies (Suyono et al., 2024).

Media-driven expectations also shape student attitudes and satisfaction: the “CSI effect” literature shows that popular forensic programs raise interest and expectations for high-tech, dramatic investigative work, yet academic programs often cannot match those portrayals in routine teaching (Ness & Preece, 2025). The SA result implies a potential mismatch between incoming students’ expectations—shaped by media—and the actual hands-on opportunities available, which can lead to disappointment, reduced engagement, or misaligned career perceptions unless curricula explicitly address media literacy and set realistic learning outcomes (Ness & Preece, 2025).

Advances in forensic instrumentation (e.g., nanotechnology applications, high-end DNA analytics, AI-assisted interpretation) are transforming professional practice, and the literature argues for curricular updates to reflect these tools; however, limited access to GC-MS, FTIR, HPLC, and other advanced instruments (noted as least accessible in chemistry/toxicology) means students may graduate with insufficient exposure to contemporary methods unless alternative strategies are used (The role of nanotechnology in forensic investigation, 2024; Handbook of DNA forensic applications and interpretation, 2022). Without targeted investments or partnerships that expand access to these high-impact instruments, graduates risk a skills gap relative to current professional expectations (Handbook of DNA forensic applications and interpretation, 2022; The role of nanotechnology in forensic investigation, 2024).

Virtual and simulated technologies offer a pragmatic mitigation: validated VR crime-scene simulations and other immersive tools can provide repeated, low-risk practice that approximates real-world tasks and has been shown to increase

student satisfaction and practical skill acquisition when well implemented (Mayne & Green, 2020). Given the SA rating, integrating VR and high-quality simulators—paired with digital literacy training and reliable computing access—can expand experiential learning affordably and reduce dependence on scarce physical instruments (Mayne & Green, 2020).

Interpreting these findings through the Technology Acceptance Model (TAM) clarifies the behavioral dynamics: sporadic availability reduces perceived usefulness (students cannot rely on tools to achieve learning goals) and increases perceived difficulty (scheduling, maintenance, and sharing create friction), which together lower the likelihood that students and faculty will adopt and integrate advanced technologies into regular practice (Davis, 1989). To convert the program's existing assets into sustained learning gains, interventions should therefore target both access (more units, consumables, shared-use agreements, extended lab hours) and perception/use (digital literacy training, instructor development, and TAM-informed monitoring of perceived usefulness and ease of use) so that technology is both available and meaningfully adopted (Davis, 1989; Sari, 2024).

The study's findings on accessibility in Personal Identification reveal that this subject area achieved the highest overall weighted mean of 2.05 (Rank 1) among all evaluated domains. This indicates relatively superior access to the specialized tools required for individualization compared to other forensic science areas. Despite this top ranking, the overall rating remains in the "Slightly Accessible" category, underscoring persistent constraints in consistent student usage even in the most favored area. This suggests that while institutional infrastructure prioritizes Personal Identification tools, systemic limitations—such as scheduling, equipment ratios, or maintenance—still hinder full student utilization.

A deeper breakdown of the indicators highlights specific strengths and disparities within the field. Microscopes

(compound/stereo) for latents emerged as the strongest indicator with a weighted mean of 2.14 (Rank 1). This reflects a significant institutional investment in optical hardware, which enables active engagement and a deeper understanding of latent print examination. Conversely, Biometrics scored the lowest with a weighted mean of 1.99 (Rank 5).

While this technology is intended to support hands-on ID simulation and biometric inquiry, its lower ranking suggests that digital and software-based resources lag behind traditional physical equipment in terms of availability.

These results align with the Unified Theory of Acceptance and Use of Technology (UTAUT), which posits that facilitating conditions—like equipment accessibility—alongside performance expectancy, effort expectancy, and social status predict technology adoption and engagement (Venkatesh et al., 2003). In this context, the "Slightly Accessible" rating implies suboptimal facilitating conditions that may dampen students' behavioral intention to engage with Personal Identification tools. The gap between high-access microscopes and lower-access biometric software suggests that students may feel more confident in traditional ridge analysis than in modern digital identification techniques due to these environmental constraints.

Echoing broader Philippine criminology education trends post-pandemic, these accessibility barriers exacerbate engagement hurdles in hands-on forensic courses. As noted by Escalona (2022), the shift to online or blended modalities often disrupted laboratory-based activities like specimen examination. The relatively lower accessibility of biometric software parallels these digital challenges, highlighting how limited access to virtual or specialized software platforms hampers practical proficiency and the development of modern identification skills.

To counter these challenges, institutions should leverage updated forensic resources that emphasize digital integration—such as Harris and Lee's (2019) coverage of technological

advancements—while adopting UTAUT-informed strategies like immersive digital simulations and sustained funding for both hardware and software. By prioritizing the accessibility of biometric tools alongside traditional microscopes, educators can bridge the gap between manual practice and automated identification, preparing students for the evolving professional demands of forensic science.

The study's results for Questioned Document Examination position it as the second most accessible area with a weighted mean of 2.01, Rank 2, with tools such as Video Spectral Comparator (VSC) workstations, Electrostatic Detection Apparatus (ESDA), and handwriting software available yet not fully accessible due to limited units or shared access, which diminishes efficiency in student-led document analysis.

This slightly accessibility enables basic engagement but underscores inefficiencies, as students must compete for resources, potentially fragmenting practical training in signature verification, ink analysis, and alteration detection. Within the area, scanners and printers stand out as the highest indicator with a weighted mean of 2.08, Rank 1, reflecting stronger access to foundational replication tools essential for digitizing and reproducing documents, while VSC and document workstations lag as the lowest with a weighted mean of 1.97, Rank 5, indicating underprovisioning of specialized, high-cost equipment critical for advanced forensic scrutiny.

Overall, the pattern favors basic over specialized tools, mirroring broader Philippine criminology lab deficiencies where outdated infrastructure hampers standardization; Benter et al. (2020) advocate digitized upgrades like fingerprint scanning systems to enhance experiential learning in related areas such as Personal Identification. These gaps align with constructivist learning principles, where active, hands-on interaction builds knowledge through inquiry; limited VSC access restricts such experiential construction in document examination, as students cannot fully engage in collaborative, real-world simulations without reliable tools (Piaget, 1954; Vygotsky, 1978). To

mitigate, innovative virtual alternatives prove viable, exemplified by the offline Bullet ID mobile app for forensic ballistics, which boosts flexibility and engagement in blended settings— a model adaptable to document examination via simulated VSC interfaces

(Roxas & Cawi, 2023).

Drawing from constructivist theory, technology integration fosters deeper cognitive engagement by enabling scaffolded, social activities; here, prioritizing scanners over VSCs limits this, as basic tools support replication but not the full inquiry cycle of forensic analysis (Piaget, 1954; Vygotsky, 1978). Institutional advocacy for modernization, per Benter et al. (2020), combined with virtual tools like those in Roxas and Cawi (2023), can elevate accessibility, transforming shared limitations into constructivist opportunities for sustained student collaboration and skill-building in Questioned Document Examination.

Forensic Ballistics ranks third in accessibility with a weighted mean of 2.00, Rank 3, with facilities like firing ranges and comparison microscopes present but only partially accessible, offering better hands-on opportunities than lower-ranked areas yet still constrained by sharing and availability. This partial access supports practical training in bullet matching and trajectory analysis but limits frequency and depth, as students navigate scheduling conflicts in shared spaces, potentially reducing skill mastery in real-time ballistic simulations.

The highest indicator, firing ranges and bullet traps with a weighted mean of 2.19, Rank 1, signals relatively strong institutional prioritization of core safety infrastructure for live-fire exercises, enabling safer, more frequent practice compared to other tools. In contrast, high-speed trajectory cameras score lowest with a weighted mean of 1.91, Rank 5, highlighting shortages in advanced imaging for precise motion capture, a gap that restricts detailed forensic reconstruction and underscores reliance on basic over cutting-edge resources. Faculty preparedness critically mediates these accessibility outcomes, as

average technological knowledge among criminology instructors hampers effective integration of ballistic tools into engaging lessons, despite high pedagogical proficiency (Amba & Jala, 2024). Targeted faculty development in tech proficiency—linking multimedia knowledge to course delivery and communication tools to assessments—could amplify hands-on ballistic engagement, transforming partial access into dynamic, technology-driven instruction (Amba & Jala, 2024).

Beyond equipment, instructional elements like faculty quality and LMS platforms drive engagement; in face-to-face criminology settings, academic identification factors, including Canvas LMS and teaching strategies, significantly boosted student involvement (Abbott, 2022). For Forensic Ballistics, optimizing firing range access via faculty-led LMS scheduling and enriched materials could mirror these successes, ensuring advanced tools like trajectory cameras complement basics for holistic academic performance and retention (Abbott, 2022). Lie Detection emerges as the fourth-ranked area in accessibility with a weighted mean of 1.95, Rank 4, where polygraphs and training software exist but face restrictions, while advanced tools like EEG/fMRI simulators prove even less accessible, curtailing students' exposure to contemporary neuroscientific deception detection methods.

The highest indicator, polygraphs with interfaces with a weighted mean of 2.06, Rank 1, indicates reasonable availability of traditional physiological monitoring devices, supporting foundational training in stress response analysis and interrogation simulations. Conversely, EEG/fMRI simulators rank lowest with a weighted mean of 1.85, Rank 5, revealing significant deficits in neuro-based tools that simulate brain imaging for lie detection, which limits hands-on familiarity with emerging, evidence-based techniques beyond legacy polygraphy.

This disparity—favoring traditional over advanced simulators—mirrors the broader forensic shift toward technology reliance, as Chango et al. (2024) detail in their systematic review

of innovations like extended reality for crime scenes, biometric accuracy enhancements, and portable gear, urging curricula to incorporate such tools (alongside virtual solutions from Roxas

& Cawi, 2023, and Benter et al., 2020) for industry-aligned competence. Under Engagement Theory, restricted access to modern simulators undermines meaningful, tech-supported collaboration essential for motivation; polygraph availability enables basic group activities, but neuro-tool gaps hinder deep, relevant tasks that sustain participation in Lie Detection courses (Kearsley & Shneiderman, 1998).

Forensic Chemistry and Toxicology rank lowest in accessibility with a weighted mean of 1.87, Rank 6, signaling profound challenges in accessing sophisticated instruments like gas chromatography-mass spectrometry (GC-MS), Fourier-transform infrared (FTIR) spectroscopy, and high-performance liquid chromatography (HPLC), forcing reliance on basic kits and shared labs that curtail thorough practical training in toxin identification and drug analysis. The highest indicator, fume hoods with toxicology kits with a weighted mean of 1.8981, Rank 1, offers marginal support for safe basic handling, yet falls short of enabling advanced experimentation.

FTIR spectrometers and chemical reagent kits tie for the lowest with a weighted mean of 1.85, Rank 6, exposing critical shortages in analytical hardware and consumables, which parallel professional constraints like reagent deficits and DNA lab inadequacies noted by Domingo and Moyao-Donato (2024) and Tad-Awan et al. (2023), and hinder academic bridging of theory to forensic practice. These limitations underscore technology's transformative potential in forensic education, as Arquero et al. (2022) affirm its role in elevating engagement via lab tools and simulations—especially vital in Baguio's criminology programs, where resource gaps impede training for criminal justice professionals.

Educator competence is pivotal for leveraging sparse resources; Arquero and Pascual (2023) reveal high content and

pedagogical knowledge among Baguio criminal justice faculty, but moderate Technological Pedagogical Content Knowledge (TPACK) status by age and experience, risking suboptimal integration of basic kits over advanced spectrometers. Through Self-Determination Theory (SDT), low accessibility undermines intrinsic motivation by eroding competence (via restricted practice) and autonomy (limited hands-on ownership), while faculty TPACK gaps may weaken relatedness in collaborative lab settings (Deci & Ryan, 1985), framing engagement as motivationally deficient rather than merely behavioral.

Across all forensic science subjects, the descriptive rating of Slightly Accessible (SA) highlights a systemic issue: while technology and resources exist, they are insufficient in quantity, outdated in some cases, or shared across multiple users, thereby limiting effective hands-on learning. For example, the study notes that “Digital SLR/mirrorless cameras and lighting equipment allow students to actively participate in evidence imaging tasks, but their availability remains limited”. Similarly, advanced forensic chemistry instruments are present but not readily accessible, which hinders mastery of toxicological analysis.

The results suggest that students are not fully empowered to practice and refine forensic techniques due to restricted access. This has implications for skill development, confidence in handling real-world forensic tasks, and preparedness for professional practice. Improving accessibility—through investment in additional units, modernized equipment, and dedicated laboratory time—would significantly enhance the quality of forensic science education.

Forensic Science educators perceive the integration of technology in their teaching, including its impact on their instructional practices and student engagement

The integration of technology in forensic science education has gained prominence amid rapid advancements in tools like AI-

driven analysis and virtual simulations, yet its effectiveness hinges on educators' perceptions of usability and pedagogical value. This study, rooted in frameworks such as TAM and CoI, reveals educators' views on how accessible equipment enhances teaching strategies while addressing gaps in student interaction during subjects like Personal Identification Techniques and Forensic Chemistry. These insights underscore technology's role in bridging theory and practice, informing targeted improvements for BCU CCJE.

Enhanced engagement

Enhanced engagement reveals a consistent pattern that working and interactive technologies. This highlighted recurring indicators such as increased student interest, active participation, improved clarity of instruction, and conditional depth of learning. Educators consistently associated functional technologies—such as DSLR/SLR cameras, LED TV presentations, and Canva outputs—with more dynamic and informative lesson delivery. As Respondent 3 explicitly stated, “Through these technologies, my lesson delivery became more informative and engaging. The students familiarize the contents of the lesson proper and the components of the camera used in photography.” This response underscores how visual and hands-on tools help concretize abstract theoretical discussions, particularly in skill-based modules like forensic photography.

Similarly, Respondent 4 emphasized the observable behavioral impact of technology integration, stating, “It heightens the interest of the students. Increases participation.” This reflects a strong link between functional technological tools and immediate engagement outcomes. Students appear more attentive and involved when instruction incorporates visual demonstrations and interactive platforms. However, the data also reveal an important qualification. R1 noted, “They show interest and actively participated in my discussion or activity, but the learning is limited.” This statement introduces a critical distinction between engagement and deep learning.

While technology stimulates participation and enthusiasm, it does not automatically ensure comprehensive understanding or higher-order cognitive processing.

The results therefore indicate a dual-layer outcome. On one level, technology clearly enhances observable engagement—students become more interested, participative, and responsive during instruction. On another level, the depth of learning depends heavily on instructional design and assessment alignment. Without structured, cognitively demanding tasks, engagement may remain surface-level.

These findings are supported by existing literature. Mayne and Green (2020) argue that Virtual and Augmented Reality crime scene applications promote higher student engagement through immersive and repeatable simulations that allow experiential learning. Similarly, Roxas and Cawi (2023) found that virtual ballistics simulators such as “Bullet Id” strengthen procedural knowledge by enabling safe, repeated practice. The effectiveness of these technologies lies not merely in their novelty, but in their structured interactivity, which supports skill acquisition. Furthermore, Sari (2024) highlights a positive correlation between digital literacy competencies and academic achievement, suggesting that students must actively produce, analyze, and evaluate digital outputs to achieve meaningful learning gains. Chango et al. (2024) also emphasize that integrating modern forensic technologies, including DNA applications and artificial intelligence, increases student motivation by aligning classroom experiences with evolving professional practices.

Overall, the discussion demonstrates that technology serves as a powerful catalyst for engagement and conceptual clarity in forensic education. The verbatim statements of the respondents confirm that interest and participation increase when lessons are visually supported and interactive. However, consistent with

both the empirical data and the literature, engagement must be strategically paired with higher-order tasks—such as capturing, annotating, interpreting, and critiquing forensic images—to translate enthusiasm into deeper learning and professional competence.

Limitations of Non-functional Technology and Equipment

Limitations of non-functional, unavailable, or inappropriate equipment significantly constrains authentic hands-on learning, responses were grouped under categories such as equipment unavailability, non-functional devices, restricted procedural practice, and theory heavy substitution. The respondents' statements consistently reflected frustration with the inability to deliver skill-based instruction due to broken or outdated laboratory tools.

Respondent 2 explicitly described the institutional limitation: "These machines are not currently available at the crime laboratory. Even the comparison microscope ... is not functional (as of the moment). Hence, the only tools ... are the magnifying glass ... and the ultraviolet lamp or light." This response illustrates a reduction in instructional fidelity. Instead of using specialized forensic instruments, instruction relies on basic substitutes that do not replicate professional procedures. Similarly, Respondent 1 emphasized the severity of non-functional equipment in lie detection instruction, stating, "Not functional polygraph machine ... None, since it is useless, using not functional machine for learning and application." The language used—particularly the term "useless"—highlights the total instructional breakdown caused by dysfunctional equipment. R3 reinforced this limitation in polygraph instruction: "The students familiarize the different parts of the polygraph but not the usage due to the fact that the polygraph is not functional." This indicates that learning is restricted to theoretical identification of components rather than procedural competence or skill execution.

The results demonstrate that non-functional equipment transforms practical forensic education into predominantly

theoretical instruction. In skill-based disciplines such as polygraph examination, questioned document analysis, and forensic microscopy, the absence of operational tools prevents students from developing hands-on competencies essential for professional readiness. Furthermore, when instructors resort to inappropriate consumer-grade substitutes—such as low-quality mobile phone cameras—learning fidelity decreases, potentially creating misconceptions and technical inaccuracies.

These findings align with the broader literature on the “technology gap” in forensic and laboratory-based education. Escalona (2022) described the problem of “remote rigor” in Questioned Document Examination, where low-resolution digital uploads of specimen signatures made accurate comparison nearly impossible. The inability to verify fine details mirrors R2’s concern about using magnifying glasses instead of functional comparison microscopes. In both cases, the precision required in forensic analysis is compromised by technological limitations.

Additionally, the reliance on unstable or non-specialized digital platforms contributes to what educators describe as platform fatigue, where repeated interruptions and system instability weaken intellectual engagement and assessment reliability. Without specialized forensic systems, course delivery fails to simulate authentic investigative environments, diminishing academic rigor. This concern is further supported by Benter et al. (2020), who noted that many school-based laboratories remain outdated and lack standardized equipment aligned with modern forensic curricula. Such infrastructural deficiencies widen the gap between textbook knowledge and laboratory practice, producing graduates who may understand theory but lack procedural proficiency.

Overall, the discussion underscores that technology in forensic education functions as a double-edged sword. When operational and properly implemented, it enhances engagement and skill development; however, when outdated, broken, or

unavailable, it becomes a structural barrier to meaningful learning.

Faculty Development Training and Opportunity

Faculty competence in operating and integrating technology is a decisive factor in determining the effectiveness of instructional tools. Through thematic coding, the responses of R1 and R4 were categorized under lack of training, absence of access, and limitations in instructional delivery. The data clearly indicate that the mere presence of technological equipment does not ensure pedagogical improvement. Instead, instructional value is directly mediated by faculty preparedness and professional development opportunities.

R1 explicitly stated, “No training with the use and how to operate the technologies No access at all.” This response highlights a fundamental barrier—not only the absence of structured training but also limited exposure to the equipment itself. Similarly, R4 emphasized the instructional consequence of this gap: “Training opportunity – it limits delivery of instructions.” These verbatim accounts suggest that even when technology is available within the institution, its pedagogical impact is constrained by inadequate faculty development. The lack of structured training reduces technology integration to superficial or minimal use, thereby limiting innovation in forensic instruction.

The results demonstrate that faculty development is not supplementary but foundational. Equipment without trained instructors results in underutilization, improper implementation, or complete non-use. In skill-based forensic disciplines, where precision, procedure, and analytical rigor are essential, insufficient faculty competence compromises both instructional quality and student outcomes. The findings therefore underscore those investments in hardware must be paralleled by investments in human capital.

These results are strongly supported by existing literature. Amba and Jala (2024) identified a significant pedagogical-technological gap, noting that while faculty members often demonstrate high pedagogical knowledge, their technological knowledge is frequently rated as only “average.”

This imbalance limits their ability to integrate advanced tools into complex forensic assessments. The findings from the present data reflect this same concern: instructors may possess strong content expertise, but without targeted technological training, they cannot fully operationalize digital or laboratory-based tools.

Professional development is therefore a prerequisite for meaningful modernization. Educators perceive a direct link between their own mastery of multimedia and ICT tools and their capacity to deliver engaging, high-quality instruction. Without structured and continuous training programs, the transition toward blended or digital forensic education remains superficial rather than transformative. This is particularly significant in light of the push for digitization in forensic science education. Benter et al. (2020) advocate for the establishment of School-Based Digital Fingerprint Laboratories equipped with digital scanning and database systems to standardize instruction across institutions. However, such modernization efforts will fail to achieve their intended outcomes if faculty are not adequately trained to operate and integrate these systems effectively.

The need for modernization is further intensified by what Ness and Preece (2025) describe as the “CSI Effect,” wherein students enter forensic programs with expectations shaped by media portrayals of advanced investigative technologies. Educators recognize that meeting these expectations requires not only access to high-end tools such as advanced DNA analysis and nanotechnology applications but also the capacity to teach students media literacy and scientific realism. Without faculty development, the gap between student expectations and

classroom realities widens, potentially diminishing academic credibility and engagement.

In resource-constrained contexts, faculty training also plays a crucial role in maximizing alternative solutions, such as offline-based mobile applications. These technologies offer accessible and flexible learning opportunities, particularly where high-speed internet access is inconsistent. However, their successful integration again depends on instructor competence and confidence.

Need for Modern Equipment and Tools

The data reveals a unanimous consensus among respondents regarding the urgent need for modernized equipment and tools within the forensic science program. This theme transcends simple hardware acquisition; it is framed as a foundational requirement for academic integrity and professional readiness. Respondents argue that the gap between classroom tools and field instruments directly affects the validity of student outcomes. For instance, Respondent 2 (Questioned Documents) emphasizes that technical precision is impossible without the proper apparatus, stating: “To have a sound conclusion ... the students must be using updated tools, such as VSC, ESDE, and others.”

This highlight on the Video Spectral Comparator (VSC) and Electrostatic Detection Apparatus (ESDA)—often referred to as ESDE by practitioners—indicates that "standard" magnifying tools are no longer sufficient for the complexities of modern forgery and document alteration. Without these, the "sound conclusions" required in a court of law cannot be replicated in a training environment, leaving students ill-prepared for the rigors of expert testimony.

Furthermore, the drive for modernization is fueled by the university's strategic ambition to maintain a competitive edge. Respondent 4 links the procurement of tools directly to the institution's identity and the global demands of the 21st century,

noting: “The university aims to be world class, so we need to equip the students with technological ideas or practices since we are now into the age of technology.” This statement implies that "world-class" status is not merely a title but a measurable standard of technological integration. In the current "age of technology," a forensic program that relies on legacy equipment risks obsolescence, potentially damaging its institutional reputation and the employability of its graduates.

The discussion of these findings suggests that procurement must be viewed as a strategic investment rather than a one-time expense. The implications are three-fold: curriculum relevance, graduate competitiveness, and institutional prestige. However, the mere presence of high-tech tools is not a panacea. The data suggests that for these acquisitions to be effective, they must be integrated into a broader ecosystem that includes faculty training, curriculum revision, and a robust maintenance plan. To ensure sustainability, the institution must look beyond traditional budgets and explore phased procurement, industry partnerships, and shared-service agreements with regional crime laboratories. By doing so, the university ensures that its students are not just studying history, but are actively practicing the future of forensics.

Strategies employed by Forensic Science educators and BCU Management for effective integration of technology and equipment into the BCU CCJE students to enhance instructional delivery and promote higher levels of student engagement

To effectively address the challenges and opportunities of technology integration in forensic science education at Baguio Central University (BCU), both educators and management must adopt coordinated strategies that balance instructional innovation with institutional support. These strategies aim to enhance the accessibility and utilization of technological resources, strengthen teaching practices, and foster higher levels of student engagement. By aligning classroom-level initiatives with organizational policies and infrastructure development, the

university can ensure that technology integration is not only sustainable but also transformative in advancing the quality of forensic science education.

Strategy	Technological Equipment / Resources	Target	Measurable Outcomes	Timeline
DSLR-Enhanced Imaging Stations	Purchase 2–3 entry-level DSLR cameras (e.g., Canon EOS 2000D at approximately ₱18,000–₱22,000 each) available at Henry's Camera Baguio or SM Cyberzone. Pair with free Adobe Lightroom Mobile for evidence annotation. Store cameras in a designated equipment cabinet with a manual borrowing logbook managed by the laboratory aide.	Educators	75% of students correctly produce scaled and labeled crime scene photographs by end of semester; borrowing logbook reflects at least 90% camera utilization per laboratory week.	January 2026: Purchase cameras and establish borrowing system; June 2026: Full use in all Forensic Photography classes.
Digital Comparison Microscope Stations	Procure 1–2 digital comparison microscopes with built-in or externally connected updated digital display screens (e.g., Radical Instruments RXL-4 Digital Comparison Microscope or equivalent models available through Instrument Systems Corporation Philippines or Labtron Philippines at approximately ₱85,000–₱150,000 per unit). These microscopes allow simultaneous side-by-side comparison of two specimens on a live digital screen, making them ideal for Personal Identification Techniques, Forensic Ballistics, and Questioned Documents Examination. The digital screen output can be projected via HDMI to a classroom monitor or television for whole-class demonstration.	Both Educators and Management	80% of students demonstrate accurate specimen comparison skills in practical examinations by end of semester; digital screen projection utilized in at least 90% of scheduled comparison microscopy laboratory sessions; equipment fault rate kept below 10% annually through preventive maintenance records.	Q1 2026: Budget proposal submitted to BCU Management; Q2 2026: Procurement through GPPB-compliant bidding process; Q3 2026: Units delivered, installed, and faculty trained on operation; Q4 2026: Full integration into Personal Identification Techniques, Forensic Ballistics, and Questioned Documents laboratory classes.
Spectrometer Data Digitization	Use existing laboratory spectrometers paired with any available departmental tablet or laptop and the free ImageJ software (downloadable at imagej.net) to photograph and digitize spectral outputs. Students upload digitized data to a free shared Google Drive folder organized by class section for group toxicological review and instructor feedback. No additional hardware purchase required at initial implementation.	Both Educators and Management	70% of toxicology laboratory reports submitted digitally through Google Drive by second semester of implementation; faculty report at least 25% reduction in time spent on manual data recording during laboratory sessions.	March 2026: Faculty orientation on ImageJ and Google Drive setup; August 2026: Routine use in Forensic Chemistry and Toxicology classes.
Microscope and Smartphone Integration	Procure universal smartphone microscope adapters (available on Shopee Philippines for approximately ₱300–₱800 each) to attach student smartphones to existing compound and stereo microscopes. Captured microscopic images are shared in a class group chat or Google Classroom for real-time discussion. Supplement with free Labster virtual modules accessed via school computers or personal devices during and after class hours.	Educators	80% of students submit at least one microscope-captured image per laboratory session; 25% improvement in trace evidence identification scores between first and second semester assessments.	February 2026: Adapters purchased and distributed; October 2026: Smartphone-microscope integration fully incorporated into Trace Evidence and Personal Identification laboratory sessions.

Scanner and OCR Document Workflows	Utilize the existing departmental flatbed scanner or any available photocopier with scan function to digitize handwriting specimens and questioned document samples. Process scanned files using the free Tesseract OCR application or Microsoft Office Lens, both available at no cost. Upload processed files to a shared Google Drive folder for collaborative peer annotation and comparative document analysis guided by faculty-provided markup protocols.	Both Educators and Management	80% of Questioned Documents students submit digitized laboratory outputs instead of handwritten reports by end of implementation period; peer annotation participation rate of at least 65% per laboratory session as recorded in Google Classroom activity logs.	April 2026: Faculty training on Tesseract OCR and Google Classroom setup; November 2026: Full integration into Questioned Documents Examination classes.
Rotational Equipment Access System	Designate two to three existing laboratory tables as shared equipment stations equipped with available institutional tools including tablets, DSLR cameras, UV lamps, and document scanners. Create a printed weekly rotation schedule posted in the laboratory so that all student groups access each station at least once per week. Assign a student equipment monitor each session to record usage and flag non-functional items for immediate reporting to the laboratory aide or faculty.	Management	100% of student groups complete at least one full equipment rotation cycle per week as confirmed by the faculty rotation log; at least 80% of equipment faults reported and acted upon within one week based on maintenance records.	Q2 2026: Rotation schedule designed and posted; Q3 2026: System fully operational with quarterly review by the CCJE Office.
Free Virtual Forensic Case Simulations	Integrate freely accessible platforms into weekly laboratory schedules. Autopsy Digital Forensics Platform (free at sleuthkit.org) for cyber forensics, PhET Interactive Simulations (free at phet.colorado.edu) for chemistry and biology procedures, and YouTube-based forensic procedure walkthroughs curated by faculty for subjects lacking physical equipment. Faculty design simple case scenarios using actual Philippine forensic case templates aligned with RA 10175. Students work in pairs and submit a one-page case analysis report.	Educators	75% of students complete assigned virtual simulation modules per semester as tracked through Google Classroom submission records; average case analysis report score of at least 80% based on faculty rubric assessment by end of each semester.	Q1 2026: Faculty curate and pilot virtual modules in two subjects; Q3 2026: Expanded to all forensic science subjects with limited physical equipment access.
Faculty Technology Upskilling Program	Enroll faculty in no-cost or low-cost training programs including TESDA Online Program courses at tesda.gov.ph, free Coursera audit-mode courses on digital forensics and instructional technology, and PRC CPD seminars for Criminologists. The CCJE Office to allocate at least one faculty development day per semester where faculty share technology integration strategies with colleagues through a simple in-house peer learning session conducted within the department.	Management	All forensic science faculty complete at least one technology-related training per academic year with certificate submitted to the CCJE Office; at least 70% of faculty demonstrate observable technology use in semestral classroom observations conducted by the Program Chair.	Q1 2026: Training needs assessment and enrollment in free online courses; Q2 2026 onward: Semestral in-house peer learning sessions institutionalized as part of the department calendar.

Conclusions and Recommendations

The study reveals that technological equipment for forensic science courses is generally "slightly accessible," with weighted means around 1.87–2.05, indicating inconsistent availability that hampers student practice and skill mastery. Personal Identification Techniques ranks highest in access, while Forensic Chemistry and Toxicology lags, underscoring systemic resource gaps that reduce experiential learning aligned with frameworks like TAM and UTAUT. Overall, enhanced accessibility, paired with faculty technological proficiency, is essential to bridge theory practice divides and elevate engagement in line with global forensic advancements.

From the findings and conclusions of the research study, the following are recommended by the researchers.

For BCU Management, allocate budget for laboratory upgrades, including additional comparison microscopes, cyanoacrylate fuming chambers, DSLR cameras, and UV lights. Record equipment usage to qualify for CHED and DOST grants. Conduct annual audits to meet accreditation requirements and partner with the PNP Crime Laboratory and NBI to boost research visibility.

For BCU CCJE Office, update the curriculum to include subject-appropriate equipment such as FTIR spectrometers and HPLC for Forensic Chemistry, ballistic microscopes for Forensic Ballistics, and VSC systems for Questioned Documents. Create a formal policy for adopting new technology and explore free or open-source software to reduce costs.

For BCU CCJE Faculty, attend technology training through CHED, TESDA, or PRC programs. Apply these skills by using available laboratory tools in actual classroom demonstrations. Publish research findings in local forensic science journals and

collaborate with the PNP Crime Laboratory or NBI for professional development.

For BCU CCJE Students, use free virtual laboratory platforms and offline apps to practice with equipment not available on campus. Join forensic science competitions and immersion programs offered by the PNP and NBI. Practice courtroom communication skills through moot court and crime scene simulation exercises.

For Future Researchers, replicate this study across multiple criminology schools in the Philippines using stronger research methods. Include newer forensic technologies as study variables. Apply for research funding through DOST and CHED, and publish findings in recognized local and international forensic science journals.

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KNOWLEDGE, ATTITUDE AND PRACTICES OF SMOKERS AMONG COLLEGE STUDENTS AT BAGUIO CENTRAL UNIVERSITY

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ABSTRACT

This study examined the knowledge, attitudes, and practices (KAP) regarding smoking among college students at Baguio Central University, highlighting demographic characteristics, smoking behaviors, and motivations. The cross-sectional survey of 48 student smokers, predominantly male and from the School of Hospitality Management, revealed a high prevalence of e-cigarette use, initiation mostly around 18 years old, and psychological stress and peer influence as primary reasons for smoking. Respondents showed strong awareness of smoking's health risks, particularly maternal and fetal harm, and supported public smoking bans and youth education. However, attitudes toward regulatory measures were mixed, and use of cessation aids like nicotine patches was low despite many expressing a desire to quit. The findings emphasize the need for localized anti-smoking policies that address vaping, stress management, accessible cessation support, and engagement of the student community to foster a healthier campus environment.

Key words: Smoking, College students, Knowledge, Attitudes and Practices

THE PROBLEM

Background of the Study

The tobacco epidemic is one of the biggest public health threats the world has ever faced, killing over 8 million people a year around the world. More than 7 million of those deaths are the result of direct tobacco use while around 1.3 million are the result of non-smokers being exposed to second-hand smoke (*Yang et.al,2019*)

All forms of tobacco use are harmful, and there is no safe level of exposure to tobacco. Cigarette smoking is the most common form of tobacco use worldwide. Other tobacco products include waterpipe tobacco, cigars, cigarillos, heated tobacco, roll-your-own tobacco, pipe tobacco, bidis and kreteks, and smokeless tobacco products.

According to the Philippine Statistics Authority, as of April, 2024, the top three causes of death in the country from January to November of 2022 were ischemic heart diseases, cerebrovascular diseases, and neoplasms. Majority of which is associated with Smoking (Larsson, S. C., & Burgess, S.,2022). There were an estimated 95,600 deaths attributable to tobacco use in 2019, accounting for nearly 15% of all mortality in the Philippines that year.(Murray, 2019)

In 2022, the population of the Philippines was 115.6 million (World Bank, 2022). According to the 2021 Global Adult Tobacco Survey (GATS), tobacco use prevalence amongst Filipino adults was 19.5%. Prevalence is much higher in males (nearly 35%) than females (over 40%) (WHO Global Report,2021). Amongst adolescence aged between 13 and 15. 12.5% were using some tobacco in 2019. Over 2% of Filipino adults reported current use of e-cigarettes (3.6% males; 0.5% females). However, use of e-cigarettes is considerably higher amongst youth. In the 2019 Global Youth Tobacco the corresponding figure was over 14%-higher than the conventional

cigarettes (10%). More than 20% of boys aged between 13 and 15 reported using e- cigarettes, compared to 7.5 % of girls. Smokeless tobacco use in the Philippines also appears to be greater amongst the youth; in 2019, 3% of young people reported smokeless tobacco use, compares to 1.5% of adults in 2021.

In Baguio City, a study was conducted across 16 barangays, revealing an increase in public awareness about the harmful effects of smoking and a decrease in tobacco use from 2014 to 2022. This change is attributed to government efforts to reduce smoking in the City (Hora, 2022). City Ordinance No. 34 Series of 2017 was created Prohibiting the use, sale, distribution, and advertisement of cigarettes and other tobacco products in certain places, imposing penalties for violations thereof and providing funds thereof, and for other purposes. This resulted to the creation of the Smoke-Free Baguio Task Force. Since then, Smoke-Free Baguio supports the Smoke-Free Baguio City Ordinance through Enforcement, monitoring and inspection in different barangays in Baguio City Conducting advocacy and enforcement training, seminars and workshops.

Researches on the knowledge, attitude, and practices (KAP) of smokers among college students has provided valuable insights into their perspectives and behaviors toward smoking. Surveys indicate that young adults aged 16-22, particularly college students, show a high inclination towards smoking, emphasizing the importance of implementing tobacco-free campus policies and promoting a smoke-free lifestyle among the youth (Sumit et. Al 2022)

A study involving medical students from Quaid-E-Azam Medical College highlighted a high level of awareness about the harmful effects of smoking, with 99% of students recognizing its detrimental impact and 94% acknowledging its addictive nature. The study also noted that 93% of the participants viewed passive smoking as harmful, and there was strong support for public smoking bans (Mustafa et al., 2023). Another study among Indonesian College students shows that they are aware of the

negative health effects of smoking but may still perceive benefits like stress reduction and increased morale (Setiyo, P., 2020). Additionally, findings suggest that smoking is sometimes viewed as a tool for social integration and communication among peers, with non-smokers associating smoking with fashion and social recognition more than smokers do (Lazurenko, N.V. ,2020).

In Dammam, Saudi Arabia, a survey at a medical science college found a prevalence of 19.84% for smoking tobacco among students, with female students demonstrating better knowledge of smoking's harmful effects compared to male students (Wasim Ahmad et al., 2021). While not directly focused on smoking, a study on health literacy among college students in China during the COVID-19 outbreak revealed differing levels of knowledge associated with factors such as gender and university type, hinting at general tendencies in health-related knowledge and practices that could align with smoking behaviors (Yuehui Jia et al., 2021).

Further research in Pakistan highlighted insufficient knowledge and utilization of alternative nicotine delivery systems among college student smokers. This underscores a gap in awareness and access to smoking cessation services, suggesting the need for targeted educational interventions (A. Hameed & Daud Malik, 2021).

Socio-cultural factors and psychological traits play a role in predicting tobacco use, with a strong association between smoking on campus and attempts to quit (Sachin, et. Al 2023). Additionally, college student smokers exhibit moderate levels of knowledge, positive attitudes, and intentions to quit smoking, highlighting the need for targeted smoking cessation programs focusing on attitude change (Hee-jung, J. and Sun-yeun, H.,2021).

The previous researches identify several research gaps.
1. There is a notable scarcity of studies specifically targeting the KAP of smokers among college students in the Southeast Asian

countries including the Philippines. Most of the literature reviewed originates outside Southeast Asia or does not focus exclusively on college students within this geographical context 2. There is a gap in knowledge regarding effective smoking cessation programs tailored for college students, including a lack of studies on the efficacy of different interventions within the Philippine context. Understanding what programs or strategies are most effective in encouraging cessation among young adults in this region 3. Longitudinal studies that track changes in smoking behaviors, attitudes, and knowledge over time among the same cohort of college students are needed to understand trends, identify causal relationships, and evaluate the long-term impact of interventions.

These gaps have prompted this study. By assessing the knowledge, attitudes, and practices of students at Baguio Central University, the school authorities can develop policies and guidelines for smoking cessation. A follow-up study can later evaluate the effectiveness of these policies.

Theoretical/Conceptual Framework

Conceptually, smoking can be understood as a form of addiction characterized by physical dependence (nicotine addiction) and psychological dependence (habitual behavior). Tobacco use results in true drug dependence (on nicotine) which is comparable to the dependence caused by heroin, speed, and cocaine (Fiore et. al., 2000). Nicotine affects essential brain structures associated with feelings of reward and arousal. The changes in the brain structure function persist long after the person stops using tobacco. The addictive power of nicotine may strengthen the learned behaviors that form tobacco-use patterns and make users more resistant to change.

Public Health Perspective framework views smoking as a public health issue, focusing on its epidemiology, prevention, and control. A public health perspective on smoking emphasizes a

comprehensive and multi-faceted approach to reducing smoking rates and improving health outcomes. By combining policy measures, health education, community interventions, and cessation support, public health efforts aim to create environments that discourage smoking and support individuals in quitting. This approach requires ongoing research, evaluation, and adaptation to address emerging challenges and disparities in tobacco use.

The Knowledge, Attitude, and Practices (KAP) model is a widely used framework for understanding and addressing various public health issues, including smoking. It helps in identifying what people know (Knowledge), how they feel (Attitude), and how they act (Practices) regarding a particular health behavior. Here's a detailed look at each component of the KAP model in the context of smoking:

Knowledge component assesses what individuals know about smoking, including its health effects, social implications, and legal aspects. These includes understanding the short-term and long-term health consequences of smoking, knowledge about nicotine addiction and the difficulty of quitting smoking, awareness of the risks associated with secondhand smoke for non-smokers, including children and pregnant women and information about the health benefits of quitting smoking and available cessation resources and support.

Attitude component examines individuals' beliefs, perceptions, and feelings towards smoking, including cultural and social influences. These includes 1. beliefs about the acceptability of smoking and its impact on personal health and well-being. 2. perceptions of smoking within peer groups, family, and society. 3. how individuals perceive the risks associated with smoking and their susceptibility to these risk 4. attitudes towards quitting smoking, including perceived barriers and benefits.

Practices component looks at the actual behaviors related to smoking, including initiation, continuation, and cessation. It also describes smoking habits like frequency, quantity, and context of

smoking (e.g., social situations, stress relief). It also includes questions on history of attempts to quit smoking, methods used, and outcomes. It also includes preventive actions like engagement in behaviors that reduce smoking risk, such as avoiding smoking areas and seeking help from cessation programs. Lastly, practices includes compliance with regulations like adherence to smoking bans and policies in public and private spaces.

By understanding and addressing the knowledge, attitudes, and practices related to smoking, public health professionals can develop more effective strategies to reduce smoking prevalence and improve overall health outcomes.

The Readiness to Change Model (Adopted from Prochaska et al, 1997; Di-Clemente et al, 1991; Prachaska & DiClemente, 1983) is a simple method used to identify a person's readiness to quit using tobacco. The model focuses on the decision-making of the individual (model of intentional change). It operates on the assumption that people do not change behaviors quickly and decisively, rather, through a cyclical process.

Sustainable Development Goal 3 (SDG 3) by the United Nations aims to ensure healthy lives and promote well-being for all ages. Specifically, it targets a reduction by one-third in premature mortality from non-communicable diseases (NCDs) through prevention and treatment by 2030, while also promoting mental health and well-being. Smoking is a major risk factor for many NCDs, including cardiovascular diseases, respiratory diseases, and various cancers. Reducing smoking rates can significantly lower the incidence of these diseases and improve overall health outcomes. Additionally, SDG 3 aims to strengthen the implementation of the World Health Organization Framework Convention on Tobacco Control (WHO FCTC) in all countries, as appropriate. The FCTC provides a comprehensive framework for implementing effective tobacco control measures, including smoking cessation initiatives. By adhering to the FCTC guidelines, countries can make substantial progress in reducing tobacco use and its associated health impacts.

Paradigm of the Study

The framework of this study is supported by the interplay of the input, process and output as shown in Figure 1.

Input	Process	Output
-determine the demographic characteristics of smokers among college students at BCU - determine the knowledge, Attitude and Practices of College students on smoking	-Questionnaire survey -statistical analysis	-suggest a Smoking cessation Plan for students in Baguio Central University

Figure 1. Schematic Illustration of the Study

Objectives of the Study

The study aimed to determine the Smoking characteristics among college students at Baguio Central University. Specifically, it aimed to

- a. Determine the demographical characteristics of smokers among college students based on
 - 1. Age
 - 2. Gender
 - 3. Course
 - 4. Type of smoke
 - 5. Reasons for smoking
 - 6. Length of smoking
 - 7. Age when smoking started
 - 8. Professional situation
- b. Determine the Knowledge, attitude and practices of smokers among College students

Research Design and Methodology

Research Design

This research utilized a Cross-Sectional Study design. It provided a survey of the knowledge, attitude and practices of

college student smokers including their demographic characteristic during the duration of the study.

Population and Locale of the Study

The researcher will utilized convenient sampling method. The questionnaire were administered to first to fourth year students of BCU College across all courses, enrolled this first semester of the 2024-2025 academic year who came to the Medical clinic. Eligible participants were either male or female, 18 years old or older and have been currently smoking for 6 months or more.

Data gathering tool

A self-made survey questionnaire was utilized for this study consisting of 2 parts. The first part included questions on demographic characteristics of the respondents. This was followed by a series of 10-point questions focusing on Knowledge, Attitude and Practices of college students regarding smoking. The questions were designed to be simple and clear ensuring ease of understanding. The questions were concise requiring only 10-15 minutes to complete. Reliability testing was conducted among Dentistry students at the University of Baguio. The questionnaire required to achieve a Cronbach alpha score of 0.70 or above to ensure acceptable reliability. Validity was done among 4 experts. In a validity test of a questionnaire with four validators, the ideal result is a Content Validity Index (CVI) of 1.00. This perfect score signifies unanimous agreement among all four experts that every item in the questionnaire is relevant. Any score below 1.00 indicates a need for revision or removal of certain items. Some questions were edited until CVI was satisfied.

Data Gathering procedure

The questionnaire were distributed to all students at Baguio Central University as they visit the university clinic for

consultation. Each participant read and signed the consent form before answering the questionnaire for this study. The researcher was present to address any questions and provide assistance as needed. The collected data was then subjected to statistical analysis and interpretation.

Treatment of Data

After gathering the questionnaires, the data were counted, categorized, and tabulated. Microsoft Excel was used to conduct statistical assessments. Statistical evaluations were performed to gain insights from the collected information. Descriptive data of the participants will be summarized using frequencies and percentages, providing an accurate representation of the characteristics evident in their responses.

Descriptive Statistics using Mean, percentages and frequency distribution were used to summarize the demographic characteristics of smokers among College students. Likert scales analysis will be used to measure Knowledgeable Attitude and Practices.

Here is the 4-point Likert Scale used for the analysis of Knowledge, attitude and Practices of smokers among College students at Baguio Central University. Interpretations and implications will be anchored on the following scale.

KNOWLEDGE

	Statistical limit	
4	3.26-4.00	Strongly Agree
3	2.51-3.25	Agree
2	1.76-2.50	Disagree
1	1.00-1.75	Strongly Disagree

ATTITUDE

	Statistical limit	
4	3.00-4.00	Strongly Agree
3	2.00-2.99	Agree
2	1.00-1.99	Disagree
1	0.99-1.00	Strongly Disagree

PRACTICES

Positive Practices	Statistical limit	
4	3.00-4.00	Always
3	2.00-2.99	Often
2	1.00-1.99	Rarely
1	0.99-1.00	Never

Ethical Considerations

The survey was used primarily to collect data to assess the knowledge, attitudes, and practices of College Students at Baguio Central University about smoking. All information provided were kept private and not be biased in any manner. The researcher will guarantee that the respondent personal information is protected by security by assigning a number. The operational requirements for this study will only be utilized exclusively for the intended purpose. This will be accomplished using informed consent and the inclusion of a confidentiality agreement or provision in data collection instruments such as the questionnaire. The research participants will be properly informed about the delicate procedures and risks involved in this study before agreeing to voluntarily participate. They will not be spending for this study. A participant can leave at any time if they feel uncomfortable and it will not be held against them. The researcher will be present to supervise the data collection process and entertain question as they arise.

The results of this study will serve as a baseline for the creation of Health policies to assist students in smoking cessation at Baguio Central University.

Results and Discussion

There were 48 respondents for this study. Mostly males from the School of Hospitality Management. (25%). The ages ranging from 18-25 years old, majority 19 years-old (40%). Most of the respondents are first and second years (31% each).

Multiple studies consistently show that male college students are more likely to be smokers than female students (Bin Abdulrahman,et.al, 2022). For example, one study found the smoking prevalence was 41.1% in men compared to 7.7% in women (Jarelnapeh, 2023).

Most college student smokers fall within the traditional college age range (18–25 years), with a mean age around 19–22 years (Jarelnapeh,2023). There is also a statistically significant relationship between academic year and smoking period, with older students tending to have smoked for longer durations (Jarelnapeh, 2023) Studies comparing college majors generally show that health-related fields (medicine, nursing, dentistry) have the lowest smoking prevalence, while humanities and sciences have higher rates. Business or sales-related courses are often grouped with non-health disciplines, which tend to have higher smoking rates than health fields. (Meza, et al, 2023) Broader smoking trend data indicate that occupations and industries linked with **sales and services** have notable tobacco exposure and smoking prevalence, which might reflect on students preparing for these fields (Barnett et al, 2025) This contrasts with education and healthcare sectors where smoking rates and exposure are lowest.

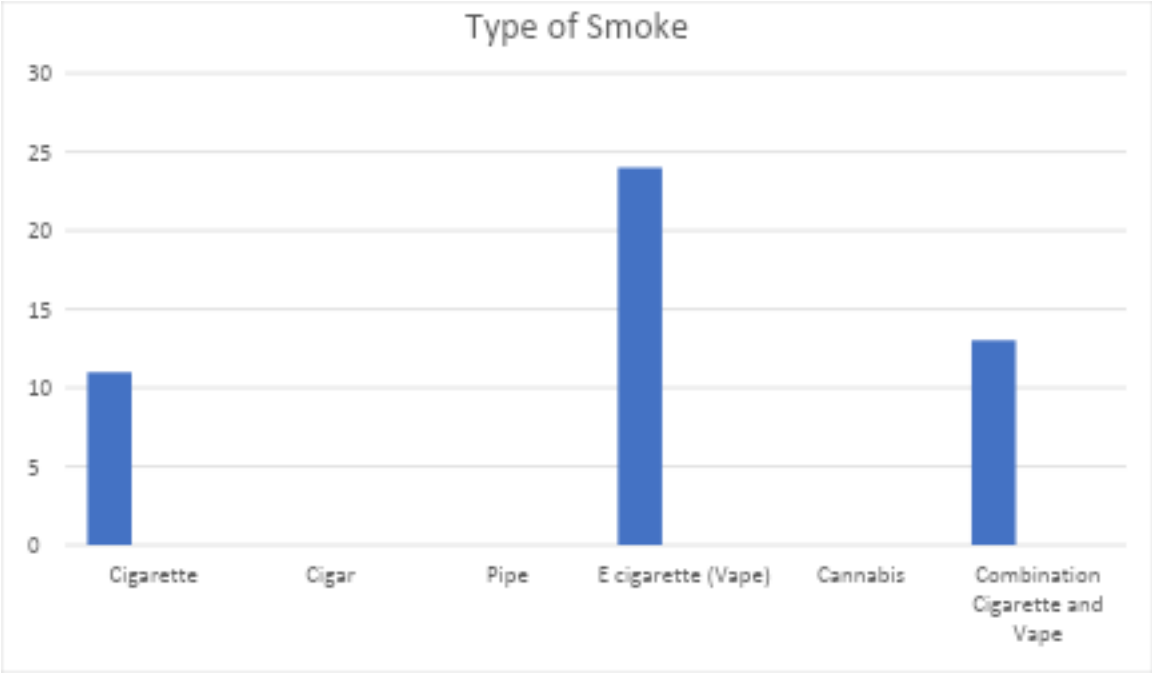


Figure 2. Type of Smoke

As to the type of smoke, E cigarette or vape is the most common. This is supported by several studies in America . A 2023 survey found that about 75% of college students who used tobacco products in the past three months reported using e-cigarettes or other vape products, making these the most used tobacco product among college students at that time. (Patrick, 2024). In a CDC report, E-cigarettes have been the most commonly used tobacco product among youth since 2014, with 7.8% of high school students and 3.5% of middle school students reporting use in the past 30 days in 2024, indicating a strong trend among younger populations that includes college-aged individuals.

In Southeast Asia, countries like Malaysia, Indonesia, the Philippines, Vietnam, Taiwan, and Hong Kong have growing e-cigarette markets, with Indonesia projected to become the largest market in the region by 2021. The prevalence of e-cigarette use among adolescents and young adults is rising sharply, driven in part by limited regulations in some countries such as Indonesia, which has no specific e-cigarette regulation and exhibits a relatively high prevalence of use around 9.4% to 11.8% among youth. (Ling et, al 2023)

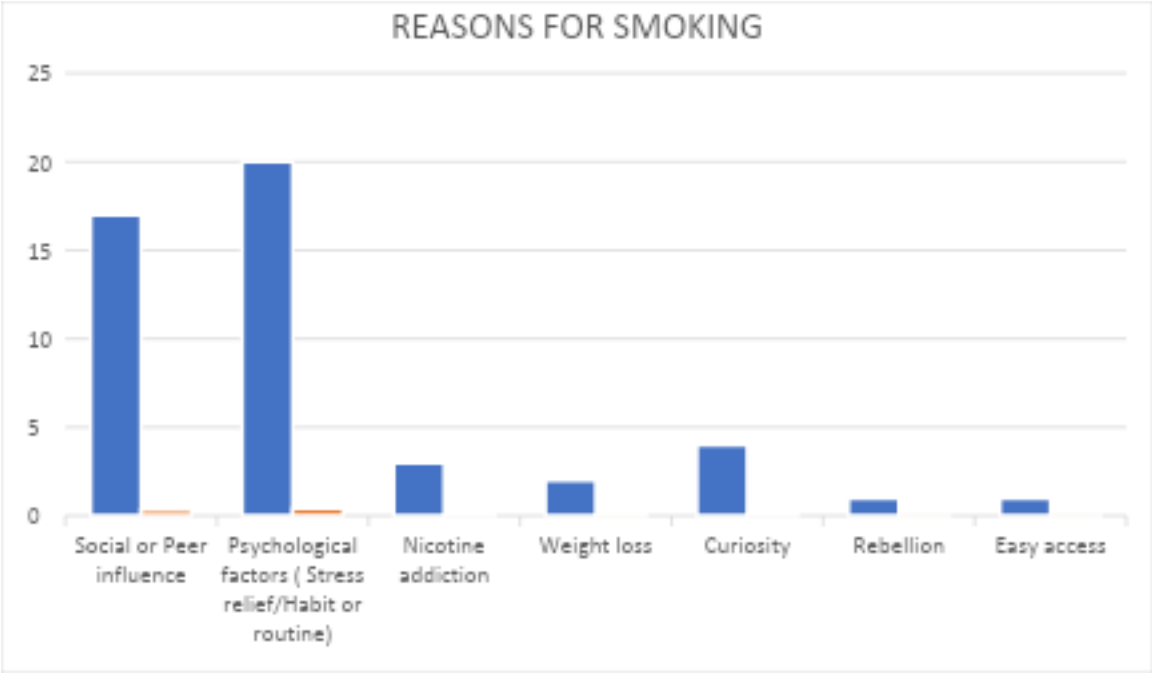


Figure 3. Reasons for Smoking

Table illustrates the primary motivations behind smoking among college students. The data highlights several key factors, with some reasons being significantly more prevalent than others. **Psychological factors** (such as stress relief, habit, or routine) are the most commonly cited reason for smoking, with the highest number of respondents indicating this motivation (42%). This findings were supported by similar studies where **Stress relief** is a common motivation, with many students reporting that they smoke to cope with academic pressures, anxiety, or negative emotions. (Alanazi, 2025), (Aldhahir et. Al, 2024). Next will be Social or peer influence (35%). **Peer pressure** is consistently cited as a major reason for smoking initiation and continuation among college students. Students with more friends who smoke are significantly more likely to become smokers themselves.(Ahmed et al, 2020), (Babaoğlu, Ü.T., İlter, H. (2025).

Age started smoking in years	Frequency	Percentage
12	1	2.08%
13	5	10.41%
15	6	12.50%
16	3	6.25%
17	4	8.33%
18	10	20.83%
19	7	14.58%
20	7	14.58%
21	2	4.17%
22	3	6.25%
	48	100 %

The data table shows the distribution of ages at which individuals started smoking, along with the frequency for each age. The most frequent age at which individuals began smoking is 18 years old, with a frequency of 10. This suggests that the transition to adulthood (often coinciding with leaving high school or starting college) is a critical period for smoking initiation. A small number of individuals started smoking at very young ages, such as 12 and 13 (5 people). This indicates that while early initiation is less common, it does occur. Ages 15 (6 people), 16 (3 people), and 17 (4 people) show moderate frequencies, indicating that mid-to-late adolescence is also a significant period for starting smoking.

Nearly 90% of adult daily smokers in the U.S. first tried smoking before age 18, but recent trends show a shift, with more young adults (ages 18–23) initiating smoking during college years according to (Barrington-Tremis, 2020). This is due to tobacco control efforts over the last several decades have produced some resounding successes in the US. In Asia, particularly in countries like China and those in South-East Asia, the average age of smoking initiation has declined over recent decades, with many starting between ages 12 and 16. (Xing et. Al, 2022).

Length of Smoking	Number of Individuals	Percentage (%)
1 year	19	39.6%
2 years	5	10.4%
3 years	9	18.8%
4 years	7	14.6%
5 years	7	14.6%
7 years	1	2.1%
Total	48	100%

Figure 8. Length of Smoking

Based on the findings, The largest group—**19 out of 48 individuals (40%)**—have been smoking for only **1 year**. This suggests a high rate of recent initiation, possibly indicating new smokers or those who started in the past year. Seven (**7 people**) have been smoking for **4 years**, and another seven (**7**) for **5 years**..These groups represent individuals who have maintained the habit through much of their college years or slightly longer.Only **1 person** reported smoking for **7 years**, indicating that long-term smoking is uncommon in this sample. This is corroborated by a study suggesting that many Asian college students who start smoking in their teens or early college

years continue for several years, with a significant proportion reporting regular smoking for at least five years (Alanazi, 2025).

Group	Number of Smokers	Percentage of Total Smokers (48)
Students only	29	60.4%
Working students	19	39.6%

Figure 9.

Based on the findings, majority of the smokers **60.4% (29/48)** are students who do not work. About 39.6% (19/48) are working students who juggle employment alongside their academic responsibilities. The presence of nearly 40% working students among smokers highlights that a significant portion of smokers manage both work and study. Working students often face additional stressors such as time management challenges, financial pressures, and fatigue, which may contribute to smoking as a coping mechanism. A meta-analysis of undergraduate students in Saudi Arabia found a pooled smoking prevalence of 24.5% among college students. Although this study did not explicitly separate working students, it highlighted that academic stress, feelings of independence, and peer influences contribute to smoking initiation and continuation in the college environment. The majority of smokers started within five years prior to the study, likely during their college years. Stress and family smoking history were significant correlates.(Alanazi, 2025) It is also suggested that Working students might have more disposable cigarettes, potentially increasing smoking frequency or intensity.

Age	Freq
18	4
19	11
20	2
21	9
22	9
23	4
24	6
25	3
BSCE-1	8
BSHM-2	12
BSN -3	6
CCJE 4	10
BSBA 5	2
stela 6	10
Males	40
Females	8

Knowledge

	Mean	SD	Interpretation
1. Smoking increases the risk of lung cancer.	3.40	0.75	Strongly Agree
2. Second hand smoke can be harmful to non-smokers.	3.42	0.65	Strongly Agree
3. Quitting smoking can improve overall health at any age.	3.29	0.92	Strongly Agree
4. Nicotine is the addictive substance cigarettes.	3.48	0.77	Strongly Agree
5. Smoking during pregnancy can harm the unborn baby.	3.63	0.67	Strongly Agree

6. Smoking is the leading cause of preventable death.	3.23	0.93	Agree
7. There are effective resources available to help out smoking.	3.33	0.78	Strongly Agree
8. Smoking can cause heart failure.	3.42	0.74	Strongly Agree
9. Electronic cigarettes (e-cigarettes) is not a completely safe alternative to traditional smoking.	3.38	0.73	Strongly Agree
10. Public smoking bans are effective in reducing rates.	3.17	0.83	Strongly Agree
Average Mean		3.38	Strongly Agree

Table 1 presents the knowledge levels regarding smoking and its health impacts. The overall average mean of 3.38 (Strongly Agree) suggests a high awareness among respondents about smoking-related risks. Standard deviation (SD) reflects the variability of responses. A higher SD suggests diverse opinions, while a lower SD indicates a more consistent agreement. Smoking during pregnancy harms the unborn baby scored the highest mean of (3.63, SD = 0.67, SA) – The highest-rated item, implying strong recognition of the severe risks to health of unborn baby, possibly due to warnings from healthcare providers. The low SD suggests strong consensus, likely due to medical warnings and public awareness campaigns. These findings were supported by recent study where Maternal tobacco smoking during pregnancy is linked to serious health issues for both mother and child, including preterm birth, low birth weight, stillbirth, and neonatal complications (Small, 2023) (Cagati 2024)

Public smoking bans reduce smoking rates had the lowest mean at (3.17, SD = 0.83, A). This indicated some hesitation about the effectiveness of bans. The relatively higher SD suggests mixed views, likely due to debates over the effectiveness of such bans in practice. Previous studies suggest that legislative smoking

bans were associated with a reduction in smoking rates among women compared to anti-tobacco media campaigns. The odds of achieving smoking reduction among women were significantly higher by 28% with legislative bans (Bird, 2020). Another research concluded that nationwide indoor smoking ban is associated with less smoking and improved lung function in the general population. Implementing an indoor smoking ban can improve lung function by influencing smoking behaviour and reducing secondhand smoke.

Attitudes

	Mean	SD	Interpretation
1. I believe that smoking should be banned in all public places.	3.40	0.76	Strongly Agree
2. I believe that people don't have the right to smoke wherever they choose.	2.88	0.91	Agree
3. I am not comfortable being around people who are smoking.	2.92	0.85	Agree
4. I believe that Smoking should be restricted by law.	3.13	6.10	Agree
5. I believe that Anti-smoking advertisement are effective in discouraging smoking.	2.98	6.43	Agree
6. I support higher taxes on cigarettes to reduce smoking rates.	3.17	0.81	Agree
7. I believe that Smoking is socially unacceptable.	2.90	0.93	Agree
8. I believe that it is important to educate children and teenagers about the dangers of smoking	3.52	0.65	Strongly Agree
9. I feel that smokers are treated fairly.	3.10	0.86	Agree

10. Seeing people smoke makes me want to smoke or makes me harder to quit smoking.	2.73	1.07	Agree
Average Mean		3.07	Agree

The findings indicate overall support for smoking restrictions, education, and policies that prevents smoking. However, mixed attitudes on personal rights and the effectiveness of certain interventions suggest areas where more awareness campaigns could be beneficial. The extremely high SD values for **legal restrictions (6.10)** and **anti-smoking advertisements (6.43)** suggest **polarized opinions**, possibly due to differing cultural, economic, and personal experiences with smoking. In contrast, **low SD values for banning smoking in public places (0.76)** and **educating children (0.65)** indicate **strong consensus**, highlighting areas where policies and education efforts are widely accepted.

For the Attitude, educating children about smoking dangers is important has the highest mean (3.52, SD = 0.65, SA) The strongest agreement emphasizes the belief in early prevention as a crucial intervention. The lowest SD in the table indicates strong consensus, showing universal agreement on the need for smoking education. The lowest mean is **seeing smokers influences my smoking (2.73, SD = 1.07, A)** – This implies that although being around smokers can provoke cravings, it is not a major influencing factor. The high SD suggests significant variability, with some strongly affected by exposure to smoking while others remain unaffected.

Table 3

Practices

	Mean	SD	Interpretation
1. I avoid smoking cigarettes.	3.06	0.98	Agree

2. I use alternative to smoking, such as nicotine patches or gum.	2.75	0.95	Agree
3. I avoid smoking in the presence of others.	3.33	0.69	Strongly Agree
4. I take steps to quit smoking.	3.33	0.63	Strongly Agree
5. I limit smoking to designated areas.	3.38	0.79	Strongly Agree
6. I seek information on quitting smoking.	3.08	0.79	Agree
7. I encourage others to avoid smoking.	3.10	0.90	Agree
8. I follow medical advice to reduce or quit smoking.	3.10	0.81	Agree
9. I refrain from smoking inside my house.	3.23	0.86	Agree
10. I choose smoke-free environment.	3.21	0.80	Agree
Average Mean		3.16	Agree

Analysis and Interpretation of Table 3

Table 3 examines smoking-related practices, with an overall mean of **3.16 (Agree)**. This suggests that respondents generally follow positive smoking-related behaviors, though some variation exists across specific practices. Standard deviation (SD) indicates the variability of responses. A **higher SD** suggests a wider range of opinions, while a **lower SD** implies more consistent responses.

The highest-rated practice **limiting smoking to designated areas (3.38, SD = 0.79, SA)** suggests compliance with regulations, reflecting the effectiveness of smoking restrictions in public spaces. The moderate SD suggests most respondents comply with smoking area restrictions, but a few may still smoke outside these areas.

The lower rating **using alternatives like nicotine patches or gum (2.75, SD = 0.95, A)** suggests that while some individuals attempt to use alternatives, they may not be widely preferred or accessible. The relatively high SD indicates that while some respondents use alternatives, others may not consider them effective or accessible.

Conclusions and Recommendations

This chapter presents the conclusions drawn from the findings of the study and offers recommendations.

Conclusions

Based on the research findings, a significant portion of the student population, particularly male students in the School of Hospitality Management, are at an elevated risk for smoking and vaping. The findings indicate that the college years, especially the first and second, represent a critical period for smoking initiation, with vaping being the most common form of tobacco use. Key motivating factors include psychological stress, peer pressure, and social influences. The study also reveals that working students, who make up a considerable portion of the smoking population, face additional stressors that may contribute to their habit. Furthermore, occupational influences within hospitality-related fields may normalize or increase exposure to tobacco. While many smokers are recent initiates, the presence of long-term smokers suggests that the habit can persist, becoming a lasting addiction. These local findings on vaping align with broader regional and international trends, highlighting the need for localized anti-smoking and anti-vaping campaigns that are sensitive to both international market dynamics and the specific stressors and influences affecting this student demographic.

Based on the Knowledge, Attitudes, and Practices (KAP) study, a clear understanding of the severe health consequences of smoking exists among respondents, especially regarding maternal

and fetal health. However, this high level of knowledge does not translate into universally accepted practices or attitudes towards anti-smoking policies, particularly regarding the trade-off between regulations and individual freedoms. While there is strong support for measures like public bans and youth education, with widespread compliance observed in practices such as smoking in designated areas, opinions diverge on the effectiveness of broader interventions like higher taxes and advertising campaigns. Importantly, many smokers in the sample express a desire to quit, yet there is a notable underutilization of professional cessation aids like nicotine patches or gum. This disconnect highlights that, while awareness of health risks is high and protective behaviors are generally observed, motivation to quit and access to effective cessation tools are key areas that require further focus.

Recommendations

To effectively address the issues of smoking and vaping among students, school authorities should adopt a multi-pronged strategy encompassing policy reinforcement, targeted education, enhanced cessation support, and a supportive campus environment. Firstly, existing smoke-free policies should be updated to explicitly include e-cigarettes and vaping, with a shift from punitive enforcement to a health-based, supportive approach that offers counseling for first-time offenders. Secondly, evidence-based prevention and education programs should be implemented early, particularly targeting high-risk groups like male students in the School of Hospitality Management, with a special focus on the dangers of vaping and developing healthy coping mechanisms for stress. Thirdly, access to and awareness of cessation resources, such as free or low-cost nicotine replacement therapy and counseling, must be significantly improved to support the many students who wish to quit. Finally, fostering a campus culture of wellness by engaging students in policy development, promoting positive social alternatives through peer mentoring, and involving parents and community

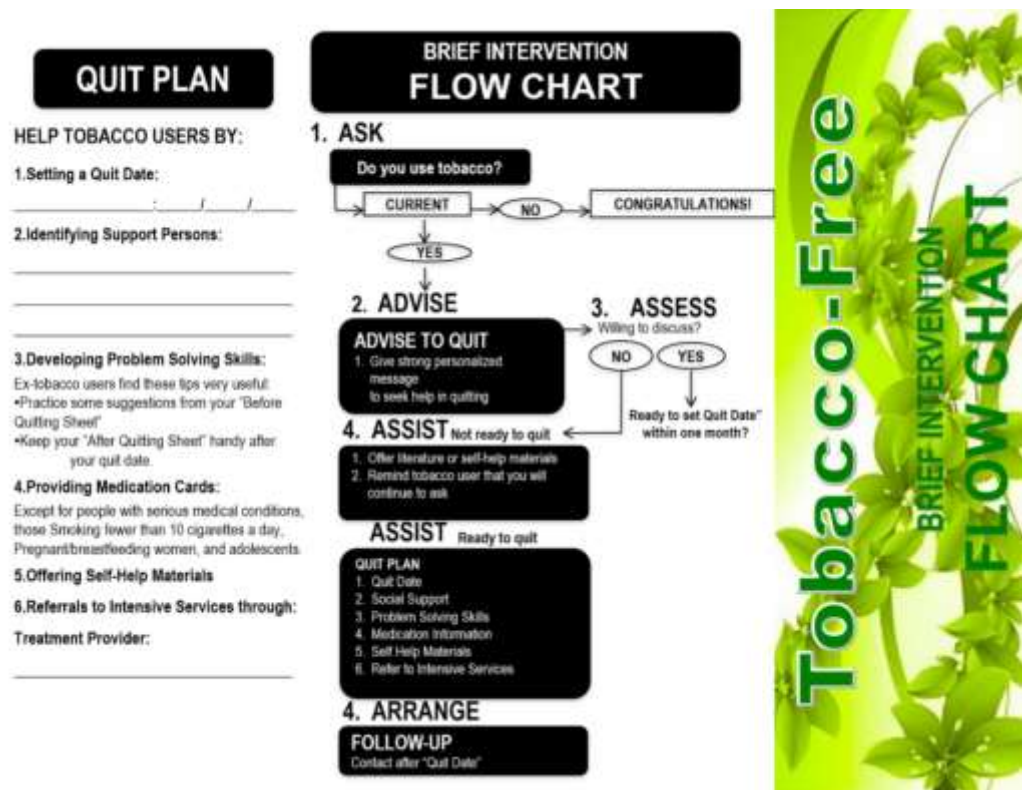
health partners will create a robust support system that moves beyond simple compliance toward genuine well-being.

The BCU clinic adopted an algorithm to assist students who are Smoking.

Figure 4. Algorithm for smokers



Figure 5. Quit Plan for Smokers



My QUIT PLAN Help tobacco users by: 1. Setting a Quit Date: Month Date Year 2. Identifying support persons: 3. Developing Problem Solving Skills: Ex-tobacco users find these tips very useful: - Practice some suggestions from your "Before Quitting Sheet" - Keep you "After Quitting Sheet" handy after your Quit Date 4. Offer Self-Help Materials 5. Referrals to Intensive Smoking Cessation Treatment provider:	My QUIT PLAN Help tobacco users by: 1. Setting a Quit Date: Month Date Year 2. Identifying support persons: 3. Developing Problem Solving Skills: Ex-tobacco users find these tips very useful: - Practice some suggestions from your "Before Quitting Sheet" - Keep you "After Quitting Sheet" handy after your Quit Date 4. Offer Self-Help Materials 5. Referrals to Intensive Smoking Cessation Treatment provider:	My QUIT PLAN Help tobacco users by: 1. Setting a Quit Date: Month Date Year 2. Identifying support persons: 3. Developing Problem Solving Skills: Ex-tobacco users find these tips very useful: - Practice some suggestions from your "Before Quitting Sheet" - Keep you "After Quitting Sheet" handy after your Quit Date 4. Offer Self-Help Materials 5. Referrals to Intensive Smoking Cessation Treatment provider:
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This algorithm is adopted that supports college smokers in quitting by guiding health professionals or counselors through a structured, empathetic process tailored to the smoker's readiness to quit. Initially, tobacco use is identified by routinely asking at every encounter, creating an opportunity to engage smokers without judgment. Smokers are then advised on the risks and benefits of quitting, considering their personal circumstances to make the advice relevant and impactful. The next step assesses each smoker’s willingness to set a quit date within a month. For those not yet ready or unwilling to discuss quitting, the focus shifts to gently encouraging contemplation of future quitting and offering self-help materials, ensuring ongoing support without pressure. For smokers ready to quit, the algorithm facilitates the creation of a personalized Quit Plan. This plan includes setting a firm quit date, identifying supportive people, developing problem-solving skills using practical tips, providing self-help materials, and referring to intensive smoking cessation programs if needed. Follow-up is integral for all smokers regardless of readiness, using reminders, calls, or visits to encourage progress and support relapse prevention. This comprehensive approach ensures that smokers receive continuous, individualized support that evolves as their readiness and needs change, fostering a

supportive environment conducive to lasting tobacco cessation among college students at Baguio Central University.

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