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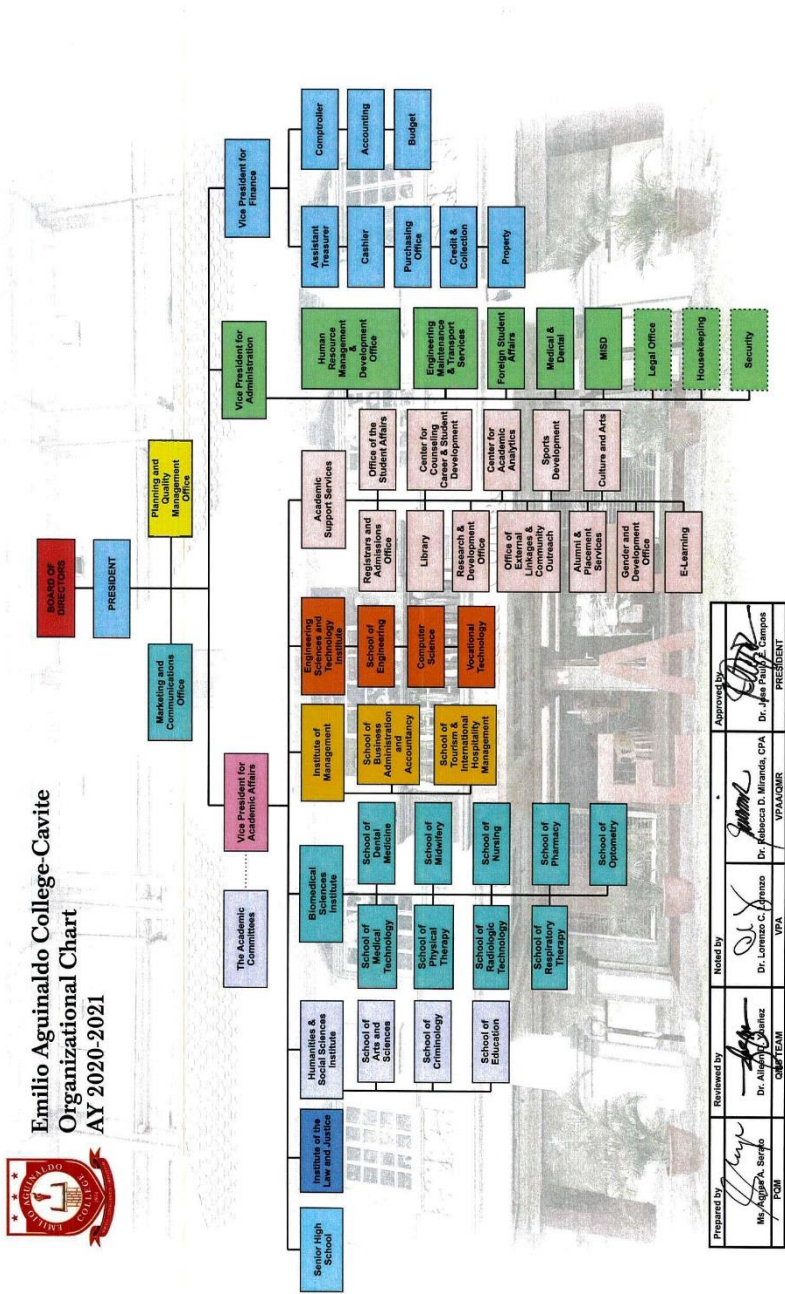
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Brief History of Emilio Aguinaldo College

The beginnings of Emilio Aguinaldo College - Cavite are attributed to Dr. Paulo C. Campos, then President of the University Physicians Services Incorporated (UPSI), which acquired the Marian College in Manila in 1973. Eventually, the school became Emilio Aguinaldo College.

With the various socio-economic developments and related circumstances during the Marcos regime, UPSI decided to open a new campus in Dasmariñas, Cavite, which is the hometown of Dr. Campos. This is to support the government's policy on the dispersal and decongestion of the student population in Metro Manila, particularly in institutions of higher learning. The policy also aimed to introduce regional development and democratization of opportunities in the rural areas (Campos, 2008).

Emilio Aguinaldo College in Bagong Bayan, Dasmariñas, Cavite was opened on March 17, 1978. Its opening coincided with the efforts of the then President, Ferdinand E Marcos and wife Imelda Marcos, who was the Minister of Human Settlements and Community Development, to remove the slum dwellers from the streets and under bridges of Manila and relocate them to Cavite. Dr. Campos proposed to the government through the Secretary of Education, Juan L. Manuel, to offer a tertiary school in Dasmariñas, Cavite patterned after the Emilio Aguinaldo College that had been approved in Manila (Campos, 2008).

Consequently, a campus comprising 29 hectares was established. In 1976 to 1978, UPSI developed over a dozen school facilities including school rooms, laboratories, a library, social hall, an administration building, dormitories, an Olympic oval, a landscaped campus, and a man-made lake. They also built a network of roads that covered the whole campus and dormitories (Campos, 2008). A commitment to improve the lives of the underprivileged sectors of the community motivated EAC-Cavite to offer courses in Dressmaking, High Speed Machine Operation and Ceramics. All programs were structured either for six months or two years of intensive study and training.

In the following year, owing to the permit granted by Minister Juan Manuel of the Ministry of Education and Culture, EAC-Cavite opened the College of Criminology, listing among its students the police forces in Cavite as well as the members of the Philippine Constabulary and the security guards of the establishments in the vicinity. In addition, the Graduate Program leading to the degree of Master of Arts in Teaching was offered to provide the school teachers with professional and academic advancement and opportunities. Envisioned, too, were the programs for Master of Science in Nursing and Master of Arts in Education.

On October 21, 1979, General Emilio Aguinaldo Medical School Foundation Inc. (GEAMSF) was established in Dasmariñas, Cavite, thus giving birth to the Emilio Aguinaldo College- Cavite of Medicine with Dr. Lourdes E. Campos as Dean. In its first year of operations, the College had 150 students. The University Medical Center (UMC), which was built in 1980 and opened in 1983, served as the training center for the health science students of the College of Medicine and other health science courses.

In 1980, UPSI formed the Yaman Lahi Foundation, Inc. (YLFI) to manage and operate both Manila and Cavite campuses.

In 1986, when Dr. Paulo Campos was not in perfect health anymore, Brother Andrew Gonzales of the De La Salle University (DLSU) expressed the University's interest in acquiring the EAC College of Medicine and the University Medical Center (UMC). Since his UPSI colleagues were not ready to take over, Dr. Campos decided to transfer the ownership and responsibility to this worthy and credible institution.

It was in June 1987 when De La Salle University finally took over the management and the administration of two campuses from UPSI: the 29-hectare campus in Bagong Bayan, Dasmariñas and the 1.5 hectare Health Science Campus along Congressional Avenue. Included in the transfer were the two big buildings which had a length of 100 meters, 17-meter wide and seven levels of floor area with two elevators, including a basement, ground floor, and rooftop for water tanks and for viewing purposes. The 29-hectare property in Bagong Bayan had a dozen buildings that included classrooms, two administrative units, Olympic oval, network roads and a landscape that included a lake, teaching facilities, hospital equipment, a modest library and a historical museum. After that, the EAC Administration focused on the development of EAC-Manila.

EAC-Cavite reopened in 1996-1997 as a vocational technical school – Center for Technical Education and Skills Training (CTEST) - in a lot along Congressional Avenue (now Mangubat Avenue) which UPSI bought. In 1998, after the completion of five buildings, the voc-tech school became the EAC-Cavite campus and all academic courses were opened except medicine.

In 2001, under the leadership of Dr. Jose Paulo E. Campos, the first son of Dr. Jose Paulo E. Campos, the school administration strengthened the curricula of existing academic programs and opened new courses aligned with emerging trends. In 2003, the Commission on Higher Education (CHED) granted government recognition to AB Communication, Psychology, Business Administration, Accountancy, Computer Science, Secondary Education, and Hotel and Restaurant Management.

The other academic programs soon followed. In 2005, Elementary Education, Civil Engineering, Mechanical Engineering, and Diploma in Graduate Midwifery earned government recognition, followed by Nursing

and Criminology in 2006; Customs Administration in 2007; and Computer Engineering and Electronics and Communication Engineering in 2010.

In 2008, the Technical Education and Skills Development Authority (TESDA)-registered vocational-technical courses, namely, Automotive Servicing, Computer Hardware Servicing, Consumer Electronics Servicing, Machining, and Programming were offered. In response to the emerging trends on health sciences, real estate and tourism, the administration opened Medical Technology, Physical Therapy and Radiologic Technology in 2011, Doctor of Dental Medicine and Real Estate Management in 2012, and Bachelor of Science in Midwifery and Tourism Management in 2015.

In its quest to achieve excellent standards in higher education, the institution participated in the accreditation by the Philippine Association of Colleges and Universities Commission on Accreditation (PACUCOA), thus, receiving Level 1 Accredited Status in Nursing, Psychology, Criminology and Hotel and Restaurant Management programs in 2015 up to 2018. Likewise, Elementary Education, Secondary Education and Business Administration programs were granted Candidate Status until 2017.

Along with the commitment to innovate, the institution inaugurated the *Bulwagang Aguinaldo* in 2012, which was the replica of the Aguinaldo Shrine in Kawit, Cavite making it the ideal venue for the annual Philippine Independence Day Celebration held by the city government of Dasmariñas. The modernization of Buildings 3 and 4 which house the Life Science Institute, Engineering Science and Technology Institute, and School Library were completed in 2014. These developments sought to meet the needs of the growing student population.

In adhering to the call of the Department of Education (DepEd) headed by Secretary Bro. Armin Luistro to enhance the basic education program in the country, the institution earned the permit to implement the Senior High School programs in April 2015. This paved way for the restructuring of Building 5 for Senior High School and Building 6 which housed the new canteen and multi-purpose hall. The Senior High School started its operations and welcomed its pioneer batch in June 2016.

The institution strives to explore more avenues to serve its community and undertake worthwhile development programs towards its continuous transformation as a responsive and competent institution, as its Founders envisioned it to be.

Special acknowledgements are accorded to Dr. Lourdes E. Campos (co-Founder), Atty. Paulo E. Campos Jr. (Director, EAEC), Dr. Jose Paulo E. Campos (EAC President), Dr. Georgina B. Palmario (Vice President for Academic Affairs), Ms. Maria Teresa Santos (Chief Librarian) and Ms. Shelley Anne C. Martinez (Executive Assistant) for their contributions to this manuscript.

PHILOSOPHY

Emilio Aguinaldo College is a private, non-sectarian, co-educational institution of learning that fosters equal and fair opportunities of education, the total development of our students, conscious of their national identity and their role in the global community.

VISION

Emilio Aguinaldo College envisions itself as an internationally recognized private non-sectarian academic institution rooted in the Filipino nationalist tradition that consistently pursues the advancement and welfare of humanity.

MISSION

Emilio Aguinaldo College provides a learner-centered, inquiry-based, and socially relevant academic community.

CORE VALUES

Virtue

Emilio Aguinaldo College integrates knowledge and understanding among Emilians equipping them with wisdom to choose to do only the right thing.

Excellence

Emilio Aguinaldo College inculcates among Emilians the habit of doing only the best in all undertakings.

Service

Emilio Aguinaldo College develops among Emilians a strong sense of duty and responsibility of helping others for the school, community, country and Mother Nature.

QUALITY POLICY

We, the Employees and other stakeholders of Emilio Aguinaldo College are committed to:

Provide our students an exceptional educational experience delivered within all statutory and regulatory standards;

Provide consistent quality service to our students, parents, and other stakeholders;

Develop responsible students through relevant and quality education, able to independently lead and enhance their lives, and contribute to the development of our country and humanity; and

Continuously improve the educational experience of our students and other stakeholders by communicating the needs of our students and stakeholders to the entire organization, standardizing our institution's processes, enhancing our employees' competence, periodically reviewing and continually improving the institution's systems, and providing our students an exceptional educational experience.

QUALITY OBJECTIVES

The objectives of Emilio Aguinaldo College are to:

- Offer opportunities for quality and relevant education to all qualified students;
- Cultivate the intellectual, spiritual, moral, social, and physical aspects of our students;
- Instill an appreciation and pride in our students of their national identity; and
- Prepare graduates of global quality equipped with world class competencies in their fields of expertise.

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Bayesian Insights into History of Vaccination, COVID-19 Infection, and Disease Severity in Post-Pandemic Antigen-Negative Cohorts

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KEYWORDS:

- **Bayesian Model**
- **COVID-19**
- **Antigen Testing**
- **COVID Vaccine**
- **Asymptomatic**

Abstract. The global response to the COVID-19 pandemic has required a deeper understanding of vaccine effectiveness, infection patterns, and disease severity, especially in antigen-negative populations during the post-pandemic period. This study examines the associations between vaccination history, prior COVID-19 infection, and disease severity in persons who tested negative for COVID-19 by antigen testing. A Bayesian framework was utilized to assess the probability of infection history and disease severity about

vaccination status, incorporating prior beliefs and empirical evidence. A chi-square test of independence examined the

relationship between immunization history and previous COVID-19 infection.

Results demonstrated a significant association ($p < 0.001$) between vaccination status and illness history, suggesting that vaccination patterns affect historical infection trends. Bayesian analysis further strengthened the probabilistic understanding of illness severity, emphasizing minimal likelihood of severe outcomes in antigen-negative cohorts, with posterior estimates strengthening the protective impact of immunization. These findings highlight the significance of Bayesian methodologies in post-pandemic research, offering detailed insights into population immunity patterns and guiding future public health measures.

This work enhances the existing evidence that vaccination is essential in reducing COVID-19 severity and provides a comprehensive analytical approach for analyzing immunity patterns in antigen-negative populations.

Bayesian Insights into History of Vaccination, COVID-19 Infection, and Disease Severity in Post-Pandemic Antigen-Negative Cohorts

INTRODUCTION

The COVID-19 pandemic has significantly transformed global health systems and societal norms, leading to extraordinary progress in vaccine initiatives and public health measures (Van De Pas et al, 2022). Vaccination is essential in alleviating the severity of COVID-19 and reducing transmission, with research repeatedly showing decreased disease burden and mortality in vaccinated persons (Haghpanah et al, 2021). In the post-pandemic period, comprehending the relationship between vaccination history, infection status, and illness severity is essential for formulating successful public health measures and directing vaccine distribution (Pennisi, Genovese and Gianfredi, 2024);

The development of antigen testing has provided a rapid and accessible method for detecting COVID-19 infections. Nonetheless, its utilization in examining antigen-negative cohorts—individuals who yield negative test results despite diverse exposure histories—remains inadequately investigated (Lindsay et al, 2022). This distinctive group provides significant insights into the protective benefits of vaccination and the immune responses that facilitate silent or subclinical manifestations (Lusvarghi et al., 2022). Moreover, the intensity of previous COVID-19 infections in antigen-negative cohorts may uncover significant trends in disease advancement and community immunity (Bean et al., 2024).

Although extensive research exists on vaccine efficacy and illness severity in general populations, there is a paucity of studies concentrating on antigen-negative cohorts, which constitute a large yet underexplored segment of the post-

pandemic population (Qin et al., 2023). Current research frequently focuses on symptomatic or antigen-positive instances, resulting in a deficiency in comprehending the long-term immunity and risk profiles of persons with negative antigen results (Peluso and Deeks, 2024). Moreover, much research depends on frequentist statistical methods, potentially neglecting the subtle probabilistic insights provided by Bayesian approaches, especially in datasets characterized by limited variability or skewed distributions (Ling and Ukkusuri, 2023). It is crucial to address these gaps to thoroughly evaluate the effects of vaccination and previous infection on illness outcomes in antigen-negative populations.

Bayesian statistical methods have been prominent in public health research, facilitating the combination of prior knowledge with empirical data to yield probabilistic insights (Rehms et al., 2024). These methodologies are especially appropriate for intricate post-pandemic evaluations, wherein historical vaccination data and infection patterns converge with changing disease dynamics (Fung, Sgaier and Huang, 2023). The utilization of Bayesian models can yield a refined comprehension of the effects of vaccination, particularly in contexts characterized by restricted data variability, such as consistently negative antigen test outcomes (Wang et al, 2024).

This study seeks to examine the correlations between vaccination history, COVID-19 infection history, and disease severity in post-pandemic antigen-negative groups. By combining Bayesian analysis and chi-square tests of independence, we seek to elucidate how vaccination status influences prior infection patterns and severity outcomes. This study enhances the existing evidence for the preventive function of vaccination and highlights the effectiveness of Bayesian approaches in post-pandemic public health research.

METHODOLOGY

Study Design

This study utilized a retrospective observational design to examine the correlations between vaccination history, COVID-19 infection history, and disease severity among patients who tested negative for COVID-19 by antigen testing. Ethical considerations

were rigorously followed, including securing informed consent from participants for the collection and analysis of their data.

Study Cohort

Participants were included in the study if they tested negative for COVID-19 via antigen testing, supplied complete immunization records, and had data available on prior COVID-19 infection history and severity of symptoms, if applicable. The study presupposed that vaccination substantially decreases the probability of severe outcomes, guiding the inclusion of patients with diverse immunization histories to evaluate its protective effects. To mitigate confounding variables, participants were removed if they tested positive for COVID-19 by antigen testing, possessed incomplete vaccination or infection records, or declined to provide consent for participation. Furthermore, those with additional medical problems or symptoms that would obscure the evaluation of COVID-19 severity—such as chronic respiratory diseases not associated with COVID-19—were excluded. This targeted methodology guaranteed that the study's population accurately represented antigen-negative cohorts, facilitating rigorous probabilistic and statistical assessments of vaccination and infection histories.

Sample Size

A total of 971 participants who met the inclusion criteria were incorporated into the study. Nasopharyngeal and oropharyngeal swabs were obtained for antigen testing to guarantee precise results. The immunization histories, infection records, and symptom severities of participants were meticulously documented and examined.

Data Collection

Trained healthcare experts conducted COVID-19 antigen testing in accordance with defined methods. Antigen testing samples were obtained via nasopharyngeal and oropharyngeal swabs. Information on vaccination history, previous COVID-19 infections, and illness severity was acquired from participant records and standardized questionnaires. All data were anonymized to preserve confidentiality.

Ethical Considerations

All subjects provided informed consent prior to data collection. The research was executed in accordance with the Declaration of Helsinki and received approval from the institutional ethics review board. Participants were apprised of the study's objective, their entitlements, and their option to withdraw at any time without consequences.

Data Analysis

This test was employed to ascertain the correlation between categorical variables, namely History of COVID-19 Infection and History of Immunization. The chi-square test assesses the independence of illness history distribution from vaccination status.

A contingency table was created for these variables, and the chi-square statistic and p-value were computed to evaluate statistical significance. Bayesian approaches were utilized to assess the probability of severe COVID-19 outcomes based on vaccination status and previous infection history. Bayesian analysis was selected for its capacity to amalgamate previous beliefs with observed data, yielding probabilistic insights despite uniform antigen-negative outcomes.

An earlier assumption was formed that immunization markedly diminishes the probability of serious outcomes. Posterior distributions were calculated with a beta distribution, integrating prior knowledge with the observed data. The posterior mean and variance were presented to measure the revised likelihood of catastrophic outcomes. The integration of chi-square and Bayesian methodologies facilitated an exhaustive study. The chi-square test revealed statistically significant association between vaccination history and illness history, but Bayesian analysis offered detailed probabilistic insights into the protective benefits of vaccination within the antigen-negative group. This dual methodology facilitated a comprehensive knowledge of the effects of vaccination on prior infections and illness severity in the examined group. All statistical studies were conducted using Python, utilizing modules such as stats models for chi-square testing and scipy for Bayesian inference. Data visualization was executed with matplotlib to distinctly illustrate distributions and correlations.

RESULTS AND DISCUSSION

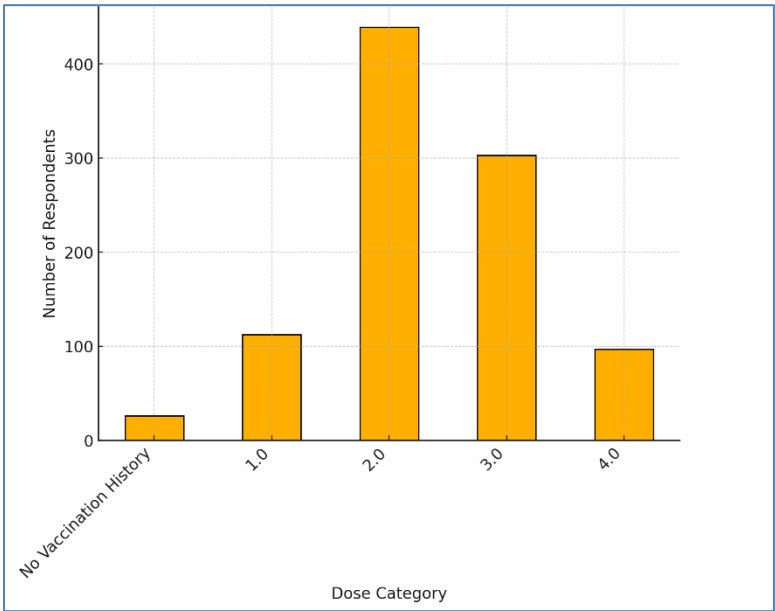


Figure 1 Distribution of vaccine doses among the respondents

The bar graph depicts the distribution of COVID-19 vaccination doses administered to the respondents. The majority of individuals indicated they received two doses of the vaccination, followed by three doses, one dose, and four doses. A negligible percentage of responders indicated a lack of immunization history. This distribution mirrors trends in global vaccination initiatives, wherein two doses are generally regarded as the standard for complete vaccination, consistent with guidelines for the majority of vaccine protocols, including Pfizer-BioNTech, Moderna, and AstraZeneca (Peterson, Lee and Nugent, 2022).

The increased prevalence of persons receiving two and three doses signifies extensive adoption of booster doses after the original two-dose series. Booster dosages have proved essential in sustaining immunity and reducing the effects of new SARS-CoV-2 variants, as demonstrated by clinical investigations (Chi et al, 2022; and Li et al, 2021). The reduced percentage of

individuals receiving four doses presumably indicates the timing of the booster dosage distribution, which may not have reached all eligible populations within the data collecting period.

A small group of responders had no vaccination history, underscoring obstacles to vaccine adoption or personal reluctance. Vaccine hesitancy remains a global burden, fueled by misinformation, distrust in health systems, and accessibility barriers (Peterson, Lee and Nugent, 2022). Overcoming these obstacles is essential for attaining increased vaccination rates and ensuring community-wide immunity.

The data presented in this graph aligns with global vaccination patterns, indicating that most individuals receive the usual two-dose regimen, with a rising acceptance of booster doses to combat decreasing immunity and the introduction of novel variations (Kumar et al., 2022). The effect of booster doses in reducing catastrophic outcomes and infection rates highlights the importance of targeted vaccination programs to guarantee fair access and sustained immunity in diverse groups.

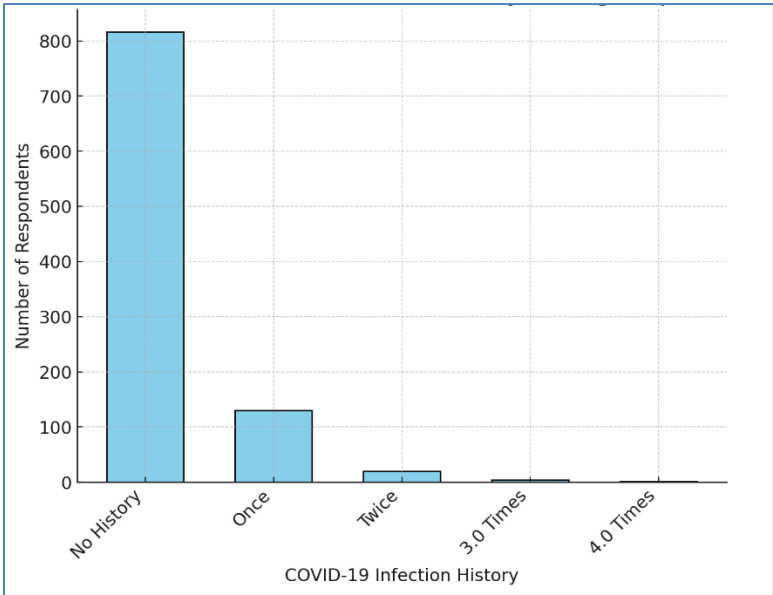


Figure 2 Distribution of COVID-19 history among the respondents

The graph illustrates the distribution of COVID-19 infection history across the study subjects. A substantial majority of respondents (exceeding 800) indicated no prior COVID-19 infection, whereas a lesser proportion reported a single infection, and an even smaller segment noted several infections (twice or more). These results correspond with global patterns noted in communities exhibiting high vaccination rates, wherein vaccine-induced immunity diminishes both the probability of infection and the severity of consequences, hence restricting reinfections (Negi et al, 2022).

The majority group with no infection history highlights the protective effect of vaccination and public health efforts, such as mask regulations and social distancing, in avoiding transmission during the pandemic (Liu et al., 2021). The occurrence of patients reporting one or more illnesses indicates diversity in susceptibility, perhaps influenced by factors such as vaccination timing, immunological status, or exposure to high-risk situations (Zsichla and Muller et al., 2023).

Although infrequent in this dataset, recurrent infections underscore a significant topic for additional research, as accumulating evidence indicates that diminishing immunity or immune evasion by novel variations may contribute to reinfections (Riou et al., 2022). A minor percentage of subjects indicating numerous infections may signify initial reinfection trends among the prevalence of immune-evading variations like Delta and Omicron (Chavda et al., 2022).

The results from this distribution underscore the necessity of ongoing surveillance of infection trends, especially in antigen-negative populations. Comprehending why some individuals remain uninfected while others undergo reinfections can yield essential insights into the persistence of vaccine-induced and natural immunity. These findings underscore the necessity for booster campaigns to maintain immunity, particularly against new variations (Loubet et al., 2021).

Table 1 Severity Level of COVID-19 Among the Respondents

Severity Level	Frequency
Mild	38
Moderate	83
Severe	29
Critical	3

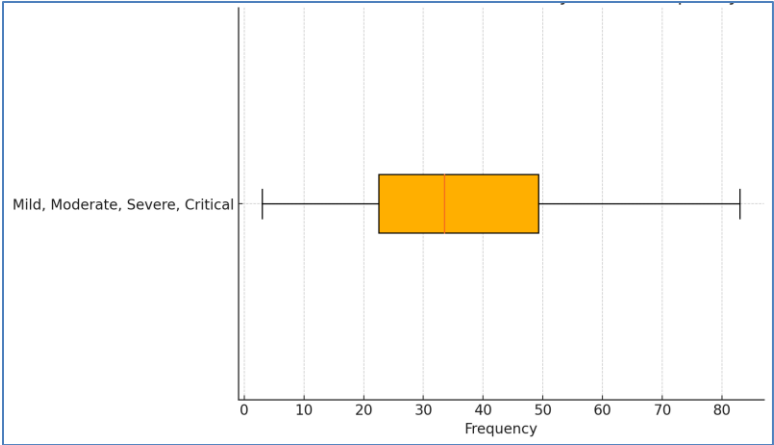


Figure 2 Box and Whisker plot that depicts the level of severity of COVID-19

The table and box-and-whisker plot illustrate the frequency distribution of various severity levels of COVID-19 symptoms—mild, moderate, severe, and critical—among participants. The median frequency falls under the "mild" category, indicating that most respondents who encountered COVID-19 symptoms reported low intensity. This conclusion is consistent with global reports that the majority of COVID-19 patients tend to appear with minor symptoms, particularly among vaccinated populations (Robinson, Jones and Daly 2021).

The interquartile range (IQR) includes mild and moderate cases, signifying that a substantial proportion of respondents encountered moderate intensity. Nonetheless, severe and critical instances are outliers, exhibiting significantly lower frequency compared to mild and moderate cases. This demonstrates the protective benefits of vaccination and herd immunity, which have consistently diminished the occurrence of severe and critical outcomes in both clinical trials and real-world research (Rallis et al., 2022).

The occurrence of severe and critical cases, however infrequent, highlights the risk of breakthrough infections or severe illness in particular demographics, including individuals with comorbidities or immunocompromised states (Russell, Lone, and Baillie, 2023). These findings underscore the necessity of ongoing booster efforts to sustain immunization against catastrophic

outcomes, especially in light of emerging variations (Raman, Patel and Ranjan, 2021).

The infrequency of severe cases corresponds with evidence indicating that enhanced medical treatment, extensive immunization, and the administration of efficient antivirals and monoclonal antibodies have markedly diminished fatal consequences (Zhou et al., 2021). The distribution of severity levels underscores the efficacy of public health interventions and immunization initiatives in alleviating the impact of severe disease, even as communities move into post-pandemic circumstances.

Table 2 Association between vaccination status and severity of COVID-19

Vaccination Status	Level of Severity of COVID-19 Illness					χ^2	<i>p Value</i>	Interpretation
	Asympt.	Mild	Moderate	Severe	Critical			
No Vaccination History	23	0	3	0	0	51.65	<.001	There is a significant association
1 st Dose	93	6	8	5	0			
2 nd Dose	390	16	25	7	1			
3 rd Dose	248	11	32	11	1			
4 th Dose	70	5	15	6	1			

Table 2 illustrates the association between vaccination status and the severity of COVID-19 illness, evaluated using the chi-square test ($\chi^2 = 51.65$, $p < 0.001$). The findings indicate a statistically significant correlation between vaccination status and the severity of COVID-19, implying that immunization decreases the probability of moderate, severe, and critical outcomes.

The data reveal that individuals with no immunization history or only one dose of a COVID-19 vaccine experienced greater rates of moderate and severe illness compared to those who received two or more doses. This corresponds with global research indicating that vaccines diminish illness severity by

eliciting strong immune responses and decreasing the likelihood of hospitalization and mortality (Mohammed et al., 2022). Individuals receiving three or four doses exhibited a reduction in severe and critical instances, underscoring the efficacy of booster doses in alleviating severe outcomes (Solante et al., 2023).

Notably, those with no immunization history experienced no serious illness in this dataset, which may represent survivor bias or insufficient sample size for this cohort. Their increased prevalence of mild cases underscores the susceptibility of unvaccinated persons to severe illness relative to vaccinated groups (Havers et al., 2022). The progressive reduction in severe and critical cases among individuals receiving additional vaccine doses highlights the dose-dependent protection conferred by vaccines, especially booster doses, which sustain immunity against severe outcomes despite diminishing vaccine efficacy (Puhach et al., 2022).

The chi-square test's substantial p-value (< 0.001) confirms the association between vaccination status and sickness severity, reinforcing the assertion that vaccination is a crucial factor in disease outcomes. These findings correspond with empirical data indicating that immunization initiatives have diminished COVID-19 morbidity and mortality among populations (Chen, 2023). Furthermore, booster doses have demonstrated the ability to maintain immunity, particularly against emerging variants such as Delta and Omicron, which are linked to heightened transmission and immune evasion (Hewins et al., 2022).

The findings emphasize the significance of comprehensive immunization and booster initiatives to avert severe and critical illness in COVID-19 patients. Policymakers and healthcare professionals must persist in advocating for vaccination use, especially among communities at elevated risk of serious illness.

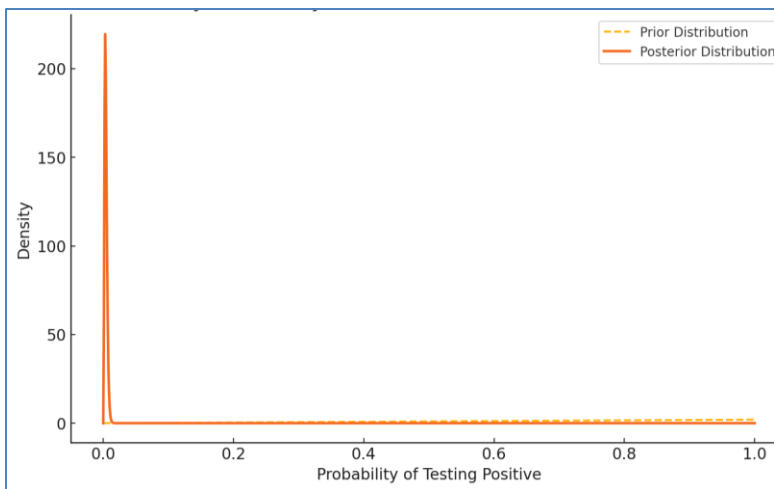


Figure 3 Bayesian analysis showing prior and post distribution

The graph illustrates the prior and posterior distributions of the probability of a positive COVID-19 test in relation to immunization history. Bayesian analysis was utilized to assess the probability of a positive test result, based on previous beliefs and the observed data. The dashed line depicts the prior distribution, whereas the solid line signifies the revised posterior distribution following the integration of the observed data.

The previous distribution indicates a robust initial conviction that the likelihood of a positive test result is minimal. This conviction is consistent with current findings indicating that vaccination markedly diminishes the likelihood of infection or serious illness due to the strong immunological response it elicits (Lipsitch et al, 2022)

Following the integration of the observed data, which revealed predominantly negative antigen test outcomes among vaccinated individuals, the posterior distribution is revised to indicate a diminished risk of testing positive. The posterior mean, roughly 0.41%, signifies the exceedingly low probability of infection within this cohort, aligning with evidence that vaccinated populations exhibit reduced susceptibility to COVID-19 infections

(Bubar et al., 2021). The posterior distribution is narrower than the prior, showing less uncertainty in the probability estimate after integrating the data. This improvement underlines the importance of Bayesian analysis in combining prior knowledge with empirical data to obtain more precise probability findings (Burkner et al., 2023).

The findings confirm the idea that vaccinated persons face a negligible probability of testing positive for COVID-19, even within antigen-negative groups. This underscores the preventive benefits of vaccination in averting illnesses and severe consequences (Jamal, 2023). The results espouse the continuation of booster vaccination initiatives to sustain minimal infection probability, especially with developing variations with possible immune evasion (Cobey et al., 2021). The application of Bayesian approaches in evaluating vaccination efficacy offers a solid framework for public health decision-making, facilitating nuanced interpretations even in scenarios with restricted variability or consistent outcomes (Sinclair et al., 2021).

Conclusion

This study examined the associations of vaccination history, COVID-19 infection history, and illness severity in antigen-negative populations, utilizing both chi-square and Bayesian analytical methods. The results highlight an important association between vaccination status and the severity of illness, indicating that those who receive larger vaccine doses experience reduced rates of severe and critical consequences. These results match with global evidence showing vaccination's protective effects in lowering morbidity and death linked with COVID-19.

Bayesian analysis further refined these findings, revealing that vaccinated people face small likelihood of adverse consequences, even within antigen-negative groups. The posterior distribution emphasized the essential function of

booster doses in maintaining immunity and decreasing vulnerability to new SARS-CoV-2 strains. This dual-methodological approach demonstrates the efficacy of Bayesian approaches in merging prior knowledge with observed data, yielding subtle probabilistic insights to guide public health decisions.

These findings underscore the necessity for ongoing vaccination initiatives, especially booster programs, to reduce the likelihood of severe COVID-19 consequences. Policymakers and healthcare professionals must prioritize methods that mitigate vaccine reluctance and improve equitable vaccine availability, thereby guaranteeing strong population immunity as the world enters the post-pandemic phase. Future study ought to investigate antigen-negative populations to examine long-term immunity and susceptibility trends, particularly for emerging variations and diminishing immunity.

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Campus Food Preferences: Basis for Sustainable Cafeteria Management

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KEYWORDS:

- **Sustainability**
- **Consumer Behavior**
- **Food Predilections**
- **Nourishment**
- **Canteen Management**

Abstract

In the everyday lives of students and staff at Emilio Aguinaldo College-Cavite (EACC), the campus cafeteria plays a vital role for both nourishment and social interaction. The EACC community's food preferences are examined in this study, with particular attention paid to acceptable price ranges, preferred meal varieties, and the effects of demographic variables including age, department, classification, and years of

service. "Campus Food Preferences: Basis for Sustainable Cafeteria Management," a study conducted at Emilio Aguinaldo College Cavite, explores the variables affecting food preferences and satisfaction among staff and students. Important factors like age, occupation, and meal allowance have a big impact on preferences; students on a tight budget prioritize price, whereas workers with larger allowances choose better or healthier

selections. To accommodate different budget levels, the results highlight the value of tiered pricing and a broad menu. While Western foods like sandwiches are less popular, frequent trips for short snacks and a strong liking for regional rice dishes highlight the need for fast-service options and the attraction of traditional flavors.

Taste is the most important component for retention, while other factors that drive satisfaction include variety, quality, and fair price. Meal combos and open pricing practices should improve value perception even though pricing is often regarded favorably. While factors like sex, religion, and department have little effect on satisfaction, income and meal allowance have a significant impact, demonstrating the cafeteria's appeal to a wide range of demographics.

The study also emphasizes how sustainable practices—like utilizing regional goods, offering healthier menu alternatives, and soliciting feedback from customers—help businesses stay relevant. Cafeteria management may increase customer happiness and loyalty and ensure long-term viability by adjusting to students' changing expectations as they advance academically.

Campus Food Preferences: Basis for Sustainable Cafeteria Management

INTRODUCTION

At Emilio Aguinaldo College-Cavite (EAC-C), the campus cafeteria is a vital space for both nourishment and social interaction, impacting the daily routines of students and employees. To meet the diverse needs of the campus community, it is essential to understand the food preferences of both groups, focusing on food types, acceptable price ranges, and demographic factors. This research aims to explore these preferences and provide insights that will guide the creation of a sustainable and profitable cafeteria management system.

Over the past year, there has been a noticeable decline in the number of students eating at the campus cafeteria, with a concurrent trend of students opting to eat outside the campus. This observation has been substantiated by interviews conducted by the researchers, revealing an unstable sales performance of the concessionaires within the cafeteria during the same period. These findings raise significant concerns about the sustainability of both the individual stores and the cafeteria as a whole, which constitutes a substantial revenue source for the institution.

In the context of decreasing cafeteria patronage and shifting consumer behaviour, it is crucial to explore the underlying factors driving these changes. Numerous factors contribute to purchase intention, yet the consensus within the majority of studies suggests that the products themselves and their variations exert the most significant influence. Given this perspective, it becomes imperative to examine market preferences and assess how they can be aligned with the offerings of the cafeteria to reverse the declining trend, motivating the researchers to conduct this study. Given the varied tastes, dietary needs, and financial capabilities of EAC-C's population, it is important to understand which food items are preferred by students and employees, as well as the price points they are willing to pay. The study examines how

demographic factors such as age, sexuality, academic classification, and years with the institution influence food choices. This understanding helps develop a more targeted menu that addresses affordability, variety, and the unique preferences of each demographic group.

Additionally, the research explores menu variations and pricing strategies that can improve the profitability of the cafeteria. By aligning food offerings with identified preferences and establishing a suitable pricing matrix, the cafeteria can enhance customer satisfaction while maintaining financial sustainability. The recommendations from this study aimed to support the development of a cafeteria that meets the needs of the campus community and ensures long-term viability.

METHODOLOGY

Research Design/Research Methodology

This research will employ a descriptive research design with a quantitative approach offering insights into employees' and students' preferences.

Research Locale

The research locale of the study is Emilio Aguinaldo College Cavite.

Research Participants/Respondents/Sources of Data

The research participants will be bonafide students and employees of Emilio Aguinaldo College Cavite.

Sampling Technique

The researchers will use a purposive sampling technique in choosing the respondents.

The following are the criteria for selection of respondents:

1. The respondents should be a bonafide employees and students of EACC
2. The respondents should at least buy their meals at the canteen three times a week

Data Gathering Procedure

The researchers will develop a self-made survey questionnaire that is commonly used in quantitative study. The survey questionnaire will be tested for validity and checked for reliability. Once the questionnaire has been checked for face and content validation, they will be distributed to the respondents online via google form and will be given ample time to answer.

Research Instrument(s)

A questionnaire will be utilized to determine the food preferences of the respondents.

Data analysis (Statistical Tool and Treatment of Data)

Frequency, percentage, and mean scores will be computed to show levels of preferences, to be measured using a 4-point Likert scale. Meanwhile, T-Test and Analysis of Variance (ANOVA) will be performed to determine significant differences.

Ethical Consideration

In order to maintain the anonymity of each research participant's unique response, their identities are kept secret. The purpose of the research survey and the fact that their answers would only be utilized for research reasons were explained to them.

RESULTS

The following are the results of the study. This sought to answer the following questions:

1. What is the demographic profile of the employees in terms of:

Table 1.1 Frequency and percent distribution of the employees according to age		
AGE	FREQUENCY	PERCENTAGE
15-29 years old	59	62.11
30-44 years old	23	24.21
45-59 years old	10	10.53
60 years old and above	3	3.16
TOTAL	95	100.00

From the data gathered, table 1.1 shows the frequency and percentage distribution of the employees according to age. Of the 95 employees, 59 (62.11%) of them answered to have their age in between 15-29 years old, which has the highest frequency observed. On the other hand, 3 (3.16%) employees answered to have an age of 60 years old and above, which has the lowest frequency perceived.

Table 1.2	Frequency and percent distribution of the employees according to sex		
SEX		FREQUENCY	PERCENTAGE
Male		40	42.11
Female		55	57.89
TOTAL		95	100.00

From the data gathered, Table 1.2 shows the frequency and percent distribution of the employees according to sex. Of the 95 employees, 55 (57.89%) were females, the highest frequency observed. On the other hand, 40 (42.11%) employees were males, the lowest frequency perceived.

Table 1.3	Frequency and percent distribution of the employees according to religion		
RELIGION		FREQUENCY	PERCENTAGE
Roman Catholic		68	71.58
Iglesia ni Cristo		4	4.21
Islam		2	2.11
Protestant		4	4.21
Others		17	17.89
TOTAL		95	100.00

From the data gathered, Table 1.3 shows the frequency and percentage distribution of the employees according to religion. Out of the 95 employees, 68 (71.58%) were Roman Catholic, which had the highest frequency observed. On the other hand, 2 (2.11%) were Islam, which had the lowest frequency perceived.

Table 1.4	Frequency and percent distribution of the employees according to the office/ department	
OFFICE/ DEPARTMENT	FREQUENCY	PERCENTAGE
School of Arts and Sciences	2	2.11
General Education Department	8	8.42
School of Business Administration and Accountancy	2	2.11
School of Criminology	2	2.11
School of Dental Medicine	4	4.21
School of Education	1	1.05
School of Engineering, Computer Science and Technology	2	2.11
School of Nursing	4	4.21
School of Optometry	1	1.05
School of Physical Therapy	1	1.05
School of Radiologic Therapy	1	1.05
School of Tourism and International Hospitality Management	21	22.11
Senior High School	34	35.79
NSTP	1	1.05
Credit and Collection	1	1.05
Center for Counseling Career and Student Development	1	1.05
Center for Academic Assessment and Analytics/General Education	2	2.11
Human Resource	1	1.05
ITC and System Administration	1	1.05
Community Outreach and Alumni	1	1.05
Student Recruitment and Admissions Office	1	1.05
Office of Student Affairs	1	1.05
Planning and Quality Management	1	1.05
Marketing and Communications Office	1	1.05
TOTAL	95	100.00

From the data gathered, table 1.4 shows the frequency and percent distribution of the employees according to the office/ department they belong. Out of the 95 employees, 34 (35.79%) of them were from Senior High School Departments, which has the highest frequency observed.

Table 1.5	Frequency and percent distribution of the employees according to position		
POSITION		FREQUENCY	PERCENTAGE
Dean		4	4.21
Head		9	9.47
Faculty		70	73.68
Non-Teaching Personnel		12	12.63
TOTAL		95	100.00

From the data gathered, table 1.5 shows the frequency and percentage distribution of the employees according to position. Of the 95 employees, 70 (73.68%) were Faculty Members, the highest frequency observed. On the other hand, 4 (4.21%) employees were Deans, the lowest frequency perceived.

Table 1.6.	Frequency and percent distribution of the employees according to the length of service in years		
LENGTH OF SERVICE IN YEARS		FREQUENCY	PERCENTAGE
1-5 years		40	42.11
6-10 years		50	52.63
11-15 years		3	3.16
16 years and above		2	2.11
TOTAL		95	100.00

From the data gathered, table 1.6 shows the frequency and percentage distribution of the employees according to the length of service in years. Out of the 95 employees, 50 (52.63%) of them answered to have 6-10 length of service in years, which has the highest frequency observed. On the other hand, 2 (2.11%) participants answered to have 16 years and above length of service, which has the lowest frequency perceived.

Table 1.7.	Frequency and percent distribution of the employees according to monthly income		
MONTHLY INCOME		FREQUENCY	PERCENTAGE
15,000 pesos and below		14	14.74
16,000-30,000 pesos		67	70.53
31,000-40,000 pesos		8	8.42
41,000 pesos and above		6	6.32
TOTAL		95	100.00

From the data gathered, table 1.7 shows the frequency and percentage distribution of the employees according to monthly income. Out of the 95 employees, 67 (70.53%) of them answered to have a monthly income of 16,000-30,000 pesos, which is the highest frequency observed. On the other hand, 6 (6.32%) employees answered to have a monthly income in between 41,000 pesos and above, which has the lowest frequency perceived.

1. What is the demographic profile of the students in terms of:

Table 2.1.	Frequency and percent distribution of the students according to sex		
SEX		FREQUENCY	PERCENTAGE
Male		416	40.47
Female		612	59.53
TOTAL		1028	100.00

From the data gathered, table 2.1 shows the frequency and percent distribution of the students according to sex. Out of the 1,028 students, 612 (59.53%) of them were females, which has the highest frequency observed. On the other hand, 416 (40.47%) students were males, which has the lowest frequency perceived.

Table 2.2.	Frequency and percent distribution of the students according to religion		
RELIGION		FREQUENCY	PERCENTAGE
Roman Catholic		800	77.82
Iglesia ni Cristo		39	3.79
Islam		22	2.14
Protestant		16	1.56
Others		151	14.69
TOTAL		1028	100.00

From the data gathered, Table 2.2 shows the frequency and percent distribution of the students according to religion. Out of the 1,028 students, 800 (77.82%) were Roman Catholic, which had the highest frequency observed. On the other hand, 16 (1.56%) were Protestant, which had the lowest frequency perceived.

Table 2.3.	Frequency and percent distribution of the students according to the school/ department		
SCHOOL/ DEPARTMENT		FREQUENCY	PERCENTAGE
School of Arts and Sciences		1	0.10
General Education Department		12	1.17
School of the Law and Justice		1	0.10
School of Pharmacy		1	0.10
School of Physical Therapy		1	0.10
School of Tourism and International Hospitality Management		431	41.93
Senior High School		581	56.52
TOTAL		1028	100.00

From the data gathered, table 2.3 shows the frequency and percentage distribution of the students according to the school/ department. Out of the 1,028 students, 581 (56.52%) of them were from Senior High School, which has the highest frequency observed.

Table 2.4.	Frequency and percent distribution of the students according to educational level		
EDUCATIONAL LEVEL		FREQUENCY	PERCENTAGE
Senior High School		581	56.52
College		447	43.48
TOTAL		1028	100.00

From the data gathered, Table 2.4 shows the frequency and percentage distribution of the students according to educational level. Out of the 1,028 students, 581 (56.52%) were Senior High School Students, which had the highest frequency observed. On the other hand, 447 (43.48%) were College Students, which had the lowest frequency perceived.

Table 2.5.	Frequency and percent distribution of the students according to monthly allowance		
MONTHLY ALLOWANCE		FREQUENCY	PERCENTAGE
1,000 pesos and below		494	48.05
1,001-2,000 pesos		205	19.94
2,001-3,000 pesos		130	12.65
3,001-4,000 pesos		70	6.81
4,001-5,000 pesos		49	4.77
5,001-6,000 pesos		31	3.02
6,001 pesos and above		49	4.77
TOTAL		1028	100.00

1. What is the budget allowances of the respondents in terms of

Table 3.1.	Frequency and percent distribution of the respondents according to meal allowance for snacks		
MEAL ALLOWANCE FOR SNACKS		FREQUENCY	PERCENTAGE
15-30 pesos		219	19.50
31-45 pesos		144	12.82
46-60 pesos		141	12.56
61-75 pesos		79	7.03
76-90 pesos		72	6.41
91 pesos and above		178	15.85
I don't eat snacks in school		290	25.82
TOTAL		1123	100.00

From the data gathered, table 3.1 shows the frequency and percentage distribution of the respondents according to meal allowance for snacks. Out of the 1,123 respondents, 290 (25.82%) of them answered that they didn't eat/ buy snacks in school, which has the highest frequency observed. On the other hand, 72 (6.41%) respondents answered to have a 76-90 pesos meal allowance for snacks, which has the lowest frequency perceived.

Table 3.2.	Frequency and percent distribution of the respondents according to meal allowance for lunch	
MEAL ALLOWANCE FOR LUNCH	FREQUENCY	PERCENTAGE
25-50 pesos	138	12.29
51-75 pesos	185	16.47
76-100 pesos	299	26.63
101-125 pesos	93	8.28
126-150 pesos	81	7.21
151 pesos and above	110	9.80
I don't eat lunch in school	217	19.32
TOTAL	1123	100.00

From the data gathered, table 3.2 shows the frequency and percent distribution of the respondents according to meal allowance for lunch. Out of the 1,123 respondents, 299 (26.63%) of them answered to have a 76-100 pesos meal allowance for lunch, which has the highest frequency observed. On the other hand, 81 (7.21%) respondents answered to have a 125-150 pesos meal allowance for lunch, which has the lowest frequency perceived.

1. How often do you purchase food and beverage products?

Table 4.	Frequency and percent distribution of the respondents according to food and beverage purchases	
FOOD & BEVERAGES PURCHASES	FREQUENCY	PERCENTAGE
Often	494	43.99
Always	374	33.30
Sometimes	45	4.01
Rarely	28	2.49
Not Applicable (I bring my food, I eat at home, I don't buy food products when I go to school)	182	16.21
TOTAL	1123	100.00

From the data gathered, table 4 shows the frequency and percentage distribution of the respondents according to civil status. Out of the 1,123 respondents, 494 (43.99%) of them purchase food and beverages often, which has the highest frequency observed. On the other hand, 28 (2.49%) of them purchase rarely, which has the lowest frequency perceived.

1. What are the food preferences of the respondents in terms of:

Table 5.	Frequency, percent distribution, and ranking of the respondents according to their food preferences		
FOOD PREFERENCES	FREQUENCY	PERCENTAGE	RANK
Rice Meals	612	54.50	1
Sandwiches or burgers	281	25.02	5
Pasta Dishes	250	22.26	6
Snacks and sides	358	31.88	3
Desserts	283	25.20	4
Beverages	519	46.22	2
Others	36	3.21	7
*Multiple Responses			

2. What is the level of assessment of the respondents to the Campus food Cafeteria in terms of:

Assigned Points	Numerical Ranges	Verbal Interpretations
4	3.51 - 4.00	Strongly Agree
3	2.51 - 3.50	Agree
2	1.76 - 2.50	Disagree
1	1.00 - 1.75	Strongly Disagree

Table 6.1	Level of assessment of the respondents to the Campus food Cafeteria in terms of Food Quality			
	STATEMENTS	MEAN	SD	INTERPRETATION
1	The food tastes delicious.	3.15	0.51	Agree
2	The food is fresh.	2.93	0.56	Agree
3	The food is healthy.	2.96	0.48	Agree
4	Hot food is served hot.	2.93	0.57	Agree
5	Cold food is served cold.	3.05	0.49	Agree
6	The food's appearance is appealing and reflective of its quality.	2.99	0.48	Agree
7	The food texture (e.g., crunchy, soft, smooth) meets your expectations for a high-quality food product.	2.99	0.49	Agree
8	The food is clean.	3.06	0.43	Agree
GRAND MEAN		3.01	0.50	Agree

Table 6.1 shows the level of assessment of the respondents to the Campus Food Cafeteria in terms of Food Quality. The proponents computed that the level of assessment of the respondents to the Campus food Cafeteria in terms of Food Quality obtained a grand mean of 3.01, which has an equivalent interpretation of Agree. The highest mean value was observed in the 1st statement which states that "The food tastes delicious.", gathered a mean value of 3.15 with an interpretation of Agree. On the other hand, the lowest mean value was perceived in the 2nd and 4th statements, which gathered a mean value of 2.93.

Table 6.3.	Level of assessment of the respondents to the Campus food Cafeteria in terms of Fairness of Price			
	STATEMENTS	MEAN	SD	INTERPRETATION
1	The portion size of the food and beverages is appropriate for its price.	2.96	0.48	Agree
2	The taste of the food and beverages is appropriate for its price.	2.96	0.47	Agree
3	The health benefits of the food and beverages are appropriate for its price.	2.94	0.45	Agree
4	The packaging of the food and beverage is appropriate for its price.	2.98	0.46	Agree
5	The presentation of the food and beverages is appropriate for its price.	2.99	0.44	Agree
6	The safety and sanitation (e.g. food display, food handlers, etc..) of the meal is appropriate for its price.	2.97	0.47	Agree
7	They offered discounts or special deals to certain groups (e.g., students, seniors, PWDs, customers with special needs, etc.).	2.93	0.50	Agree
8	There is price consistency in every food and beverage offered.	3.00	0.47	Agree
GRAND MEAN		2.97	0.47	Agree

Table 6.3 shows the level of assessment of the respondents to the Campus Food Cafeteria in terms of Fairness of Price. The proponents computed that the level of assessment of the respondents to the Campus food Cafeteria in terms of Fairness of Price obtained a grand mean of 2.97, which has an equivalent interpretation of Agree. The highest mean value was observed in the 8th statement which states that "There is price consistency in every food and beverage offered.", gathered a mean value of 3.00 with an interpretation of Agree. On the other hand, the lowest mean value was perceived in the 7th statement, which gathered a mean value of 2.93.

1. Is there any significant relationship between the budget allowances and the level of assessment of the respondents to the Campus Food Cafeteria?

Table 7.1.	Test of significant relationship between the meal allowance for snacks and the level of assessment of the respondents to the Campus food Cafeteria					
INDICATORS		X ²	DF	P-VALUE	DECISION	REMARKS
1	FOOD QUALITY	161.618 ^a	120	0.01	Reject Ho1	Significant
2	FOOD VARIETY	156.800 ^a	132	0.07	Accept Ho1	Not Significant
3	FAIRNESS OF PRICE	140.572 ^a	132	0.29	Accept Ho1	Not Significant

Table 7.1 shows that there is a significant relationship between the meal allowance for snacks and the level of assessment of the respondents to the Campus Food Cafeteria in terms of Food Quality. In this case, the hypothesis was rejected because the probability value is lesser than 0.05 level of significance. On the other hand, the remaining indicators are not significant. It confirms that the remaining probability values are greater than 0.05 level of significance. In this case, the hypothesis was accepted.

Table 7.2.		Test of significant relationship between the meal allowance for lunch and the level of assessment of the respondents to the Campus food Cafeteria				
INDICATORS		X ²	DF	P-VALUE	DECISION	REMARKS
1	FOOD QUALITY	115.066 ^a	120	0.61	Accept Ho1	Not Significant
2	FOOD VARIETY	176.621 ^a	132	0.01	Reject Ho1	Significant
3	FAIRNESS OF PRICE	158.311 ^a	132	0.06	Accept Ho1	Not Significant

Table 7.2 shows that there is a significant relationship between the meal allowance for lunch and the level of assessment of the respondents to the Campus Food Cafeteria in terms of Food Variety. In this case, the hypothesis was rejected because the probability value is lesser than 0.05 level of significance. On the other hand, the remaining indicators have been found not significant. It confirms that the remaining probability values are greater than 0.05 level of significance. In this case, the hypothesis was accepted.

Table 7.3.		Test of significant relationship between the fairness of price and the level of assessment of the respondents to the Campus Food Cafeteria				
INDICATORS		X ²	DF	P-VALUE	DECISION	REMARKS
1	FOOD QUALITY	85.254 ^a	80	0.32	Accept Ho1	Not Significant
2	FOOD VARIETY	129.968 ^a	88	0.00	Reject Ho1	Significant
3	FAIRNESS OF PRICE	118.727 ^a	88	0.02	Reject Ho1	Significant

Table 7.3 shows that there is a significant relationship between the fairness of price and the level of assessment of the respondents to the Campus Food Cafeteria in terms of Food Variety and Fairness of Price. In this case, the hypothesis was rejected because the probability values are lesser than 0.05 level of significance. On the other hand, the remaining indicator is not significant. It confirms that the remaining probability value is greater than 0.05 level of significance. In this case, the hypothesis was accepted.

1. Is there any significant difference in the level of assessment of the respondents to the Campus Food Cafeteria when grouped according to the demographic profile of the employees and students?

Table 8.1.1	Test of significant difference in the level of assessment of the respondents to the Campus food Cafeteria when grouped according to the sex of the employees					
INDICATORS		Mann Whitney	Z	P-VALUE	DECISION	REMARKS
1	FOOD QUALITY	867.5	-2	0.08	Accept Ho2	Not Significant
2	FOOD VARIETY	1033.50	-1	0.61	Accept Ho2	Not Significant
3	FAIRNESS OF PRICE	898.00	-2	0.11	Accept Ho2	Not Significant

Table 8.1.1 shows that there is no significant difference in the level of assessment of the respondents to the Campus Food Cafeteria when grouped according to the sex of the employees. All the indicators are not significant. It confirms that all probability values are greater than 0.05 level of significance. In this case, the hypothesis was accepted.

Table 8.1.2.	Test of significant difference in the level of assessment of the respondents to the Campus food Cafeteria when grouped according to the religion of the employees					
INDICATORS		Kruskal Wallis	DF	P-VALUE	DECISION	REMARKS
1	FOOD QUALITY	2.785	4	0.59	Accept Ho2	Not Significant
2	FOOD VARIETY	4.47	4	0.35	Accept Ho2	Not Significant
3	FAIRNESS OF PRICE	5.29	4	0.26	Accept Ho2	Not Significant

Table 8.1.2 shows that there is no significant difference in the level of assessment of the respondents to the Campus Food Cafeteria when grouped according to the religion of the employees. All the indicators are not significant. It confirms that all probability values are greater than 0.05 level of significance. In this case, the hypothesis was accepted.

Table 8.1.3.	Test of significant difference in the level of assessment of the respondents to the Campus food Cafeteria when grouped according to the office/ department of the employees					
INDICATORS		Kruskal Wallis	DF	P-VALUE	DECISION	REMARKS
1	FOOD QUALITY	26.765	23	0.27	Accept Ho2	Not Significant
2	FOOD VARIETY	30.92	23	0.13	Accept Ho2	Not Significant
3	FAIRNESS OF PRICE	18.76	23	0.72	Accept Ho2	Not Significant

Table 8.1.3. represents that there is no significant difference in the level of assessment of the respondents to the Campus Food Cafeteria when grouped according to the office/ department of the employees. All the indicators are not significant. It confirms that all probability values are greater than 0.05 level of significance. In this case, the hypothesis was accepted.

Table 8.1.4.		Test of significant difference in the level of assessment of the respondents to the Campus Food Cafeteria when grouped according to the position of the employees				
INDICATORS		Kruskal Wallis	DF	P-VALUE	DECISION	REMARKS
1	FOOD QUALITY	3.642	3	0.30	Accept Ho2	Not Significant
2	FOOD VARIETY	2.46	3	0.48	Accept Ho2	Not Significant
3	FAIRNESS OF PRICE	5.01	3	0.17	Accept Ho2	Not Significant

Table 8.1.4. represents that there is no significant difference in the level of assessment of the respondents to the Campus Food Cafeteria when grouped according to the position of the employees. All the indicators are not significant. It confirms that all probability values are greater than 0.05 level of significance. In this case, the hypothesis was accepted.

Table 8.1.5.		Test of significant difference in the level of assessment of the respondents to the Campus food Cafeteria when grouped according to the length of service in years of the employees				
INDICATORS		Kruskal Wallis	DF	P-VALUE	DECISION	REMARKS
1	FOOD QUALITY	1.742	4	0.78	Accept Ho2	Not Significant
2	FOOD VARIETY	2.59	4	0.63	Accept Ho2	Not Significant
3	FAIRNESS OF PRICE	3.13	4	0.54	Accept Ho2	Not Significant

Table 8.1.5. represents that there is no significant difference in the level of assessment of the respondents to the Campus Food Cafeteria when grouped according to the length of service in the years of the employees. All the indicators are not significant. It confirms that all probability values are greater than 0.05 level of significance. In this case, the hypothesis was accepted.

Table 8.1.6.		Test of significant difference in the level of assessment of the respondents to the Campus food Cafeteria when grouped according to the monthly income of the employees				
INDICATORS		Kruskal Wallis	DF	P-VALUE	DECISION	REMARKS
1	FOOD QUALITY	12.973	6	0.04	Reject Ho2	Significant
2	FOOD VARIETY	9.55	6	0.15	Accept Ho2	Not Significant
3	FAIRNESS OF PRICE	8.54	6	0.20	Accept Ho2	Not Significant

Table 8.1.6. represents that there is a significant difference in the level of assessment of the respondents to the Campus Food Cafeteria in terms of Food Quality when grouped according to the monthly income of the employees. In this case, the hypothesis was rejected because the probability value is lesser than 0.05 level of significance. On the other hand, the remaining indicators have been found not significant. It confirms that the remaining probability values are greater than 0.05 level of significance. In this case, the hypothesis was accepted.

Table 8.2.1.		Test of significant difference in the level of assessment of the respondents to the Campus food Cafeteria when grouped according to the age of the students				
INDICATORS		Kruskal Wallis	DF	P-VALUE	DECISION	REMARKS
1	FOOD QUALITY	10.251	3	0.02	Reject Ho2	Significant
2	FOOD VARIETY	0.47	3	0.93	Accept Ho2	Not Significant
3	FAIRNESS OF PRICE	1.88	3	0.60	Accept Ho2	Not Significant

Table 8.2.1. represents that there is a significant difference in the level of assessment of the respondents to the Campus food Cafeteria in terms of Food Quality when grouped according to the age of the students. In this case, the hypothesis was rejected because the probability value is lesser than 0.05 level of significance. On the other hand, the remaining indicators are not significant. It confirms that the remaining probability values are greater than 0.05 level of significance. In this case, the hypothesis was accepted.

Table 8.2.2.		Test of significant difference in the level of assessment of the respondents to the Campus food Cafeteria when grouped according to the sex of the students				
INDICATORS		Mann Whitney	Z	P-VALUE	DECISION	REMARKS
1	FOOD QUALITY	124083.5	-1	0.46	Accept Ho2	Not Significant
2	FOOD VARIETY	124843.50	-1	0.51	Accept Ho2	Not Significant
3	FAIRNESS OF PRICE	122515.00	-1	0.21	Accept Ho2	Not Significant

Table 8.2.2. represents that there is no significant difference in the level of assessment of the respondents to the Campus Food Cafeteria when grouped according to the sex of the students. All the indicators are not significant. It confirms that all probability values are greater than 0.05 level of significance. In this case, the hypothesis was accepted.

Table 8.2.3.		Test of significant difference in the level of assessment of the respondents to the Campus food Cafeteria when grouped according to the religion of the students				
INDICATORS		Kruskal Wallis	DF	P-VALUE	DECISION	REMARKS
1	FOOD QUALITY	6.125	4	0.19	Accept Ho2	Not Significant
2	FOOD VARIETY	4.10	4	0.39	Accept Ho2	Not Significant
3	FAIRNESS OF PRICE	2.55	4	0.64	Accept Ho2	Not Significant

Table 8.2.3. represents that there is no significant difference in the level of assessment of the respondents to the Campus Food Cafeteria when grouped according to the religion of the students. All the indicators are not significant. It confirms that all probability values are greater than 0.05 level of significance. In this case, the hypothesis was accepted.

Table 8.2.4.		Test of significant difference in the level of assessment of the respondents to the Campus food Cafeteria when grouped according to the school/ department of the students				
INDICATORS		Kruskal Wallis	DF	P-VALUE	DECISION	REMARKS
1	FOOD QUALITY	21.155	13	0.07	Accept Ho2	Not Significant
2	FOOD VARIETY	3.00	13	1.00	Accept Ho2	Not Significant
3	FAIRNESS OF PRICE	19.36	13	0.11	Accept Ho2	Not Significant

Table 8.2.4. represents that there is a significant difference in the level of assessment of the respondents to the Campus Food Cafeteria in terms of Food Quality and Fairness of Price when grouped according to the educational level of the students. In this case, the hypothesis was rejected because the probability values are lesser than 0.05 level of significance. On the other hand, the remaining indicator is not significant. It confirms that the remaining probability value is greater than 0.05 level of significance. In this case, the hypothesis was accepted.

Table 8.2.5.		Test of significant difference in the level of assessment of the respondents to the Campus food Cafeteria when grouped according to the year level of the students				
INDICATORS		Kruskal Wallis	DF	P-VALUE	DECISION	REMARKS
1	FOOD QUALITY	27.161	5	0.00	Reject Ho2	Significant
2	FOOD VARIETY	5.30	5	0.38	Accept Ho2	Not Significant
3	FAIRNESS OF PRICE	15.64	5	0.01	Reject Ho2	Significant

Table 8.2.5. represents that there is a significant difference in the level of assessment of the respondents to the Campus Food Cafeteria in terms of Food Quality and Fairness of Price when grouped according to the year level of the students. In this case, the hypothesis was rejected because the probability values are lesser than 0.05 level of significance. On the other hand, the remaining indicator has been found not significant. It confirms that the remaining probability value is greater than 0.05 level of significance. In this case, the hypothesis was accepted.

Table 8.2.6.		Test of significant difference in the level of assessment of the respondents to the Campus food Cafeteria when grouped according to the monthly allowance of the students				
INDICATORS		Kruskal Wallis	DF	P-VALUE	DECISION	REMARKS
1	FOOD QUALITY	3.369	6	0.76	Accept Ho2	Not Significant
2	FOOD VARIETY	3.02	6	0.81	Accept Ho2	Not Significant
3	FAIRNESS OF PRICE	5.76	6	0.45	Accept Ho2	Not Significant

Table 8.2.6. represents that there is no significant difference in the level of assessment of the respondents to the Campus Food Cafeteria when grouped according to the monthly allowance of the students. All the indicators have been found to be not significant. It confirms that all probability values are greater than 0.05 level of significance. In this case, the hypothesis was accepted.

DISCUSSION

The study "Campus Food Preferences: Basis for Sustainable Cafeteria Management" explores various aspects of cafeteria usage, preferences, and satisfaction among senior high school and college students, as well as employees at Emilio Aguinaldo College Cavite. The findings address key questions regarding respondents' budget allowances, food purchasing frequency, preferences, cafeteria assessments, and the relationships between these factors.

The budget allowances data offers insight into how financial constraints shape cafeteria choices. For many students, particularly those with limited meal budgets, affordable pricing becomes essential for sustained cafeteria patronage. Employees, who might have higher meal allowances than students, could potentially support a broader range of offerings, including premium or healthy options. This segmentation emphasizes the need for cafeteria management to offer tiered pricing, ensuring affordability for students while allowing for more premium choices for employees. In doing so, the cafeteria could attract a wider customer base while supporting diverse budget needs.

Respondents indicated their meal allowances, crucial for understanding budgetary constraints affecting their food choices. Specifically, the meal allowance for snacks averaged around PHP 50-100, while the lunch budget ranged from PHP 100-150, reflecting a significant aspect of student and employee behavior regarding food expenditure. This financial context emphasizes the importance of affordability in cafeteria offerings, particularly in a setting where many students may be managing limited budgets.

The study further investigated the frequency of food and beverage purchases, revealing that the cafeteria is an essential source for students and employees. Many respondents regularly buy snacks and beverages, reflecting the cafeteria's role as a convenient and accessible food service option that supports the campus community's busy schedules. Frequent visits suggest that students and employees may expect ongoing variety and innovation in menu options. This high frequency of use aligns with sustainable cafeteria practices that prioritize fresh and regularly updated menus.

Frequency of food and beverage purchases further revealed that respondents tend to buy food from the cafeteria several times a week, with a notable preference for quick-service

items that fit within their busy academic schedules. This trend highlights the growing demand for convenience and accessibility, suggesting that the cafeteria should prioritize items that cater to this lifestyle, such as ready-to-eat meals and snacks that are both appealing and nutritious.

The prominence of "Rice Meals" among respondents emphasizes the importance of culturally familiar food options, especially within the Philippine context where rice is a meal staple. This preference aligns with cultural food habits, suggesting that offering traditional meals and local flavors will maintain cafeteria relevance. The analysis of food preferences demonstrated a strong inclination towards traditional staples, with "Rice Meals" ranking the highest among the 1,123 respondents.

The popularity of "Beverages," "Snacks & Sides," and "Desserts" indicates a shift towards convenient food options that align with modern student lifestyles. This points to an opportunity for the cafeteria to promote grab-and-go items, which cater to busy schedules and appeal to a wide audience.

Meanwhile, the lower preference for items like "Sandwiches & Burgers" and "Pasta Dishes" suggests that respondents may prioritize culturally familiar foods over Western fast-food options, reinforcing existing literature on dietary habits within Asian contexts. This also indicates potential mismatch between these options and students' cultural preferences. However, these choices could still attract interest as occasional alternatives, especially among younger consumers seeking variety.

The cafeteria's quality, variety, and price fairness received overall positive assessments, from the respondents. Taste emerged as a crucial factor for satisfaction, reaffirming that food quality, particularly deliciousness, is a primary draw for customers. Given that taste influences customer retention, the cafeteria should prioritize high-quality ingredients and flavor consistency. Food variety scored slightly higher than quality and price fairness, indicating that respondents value diverse options that meet different tastes and dietary needs. This demand for variety could be addressed by offering rotating daily specials, seasonal dishes, or theme days focusing on different cuisines. Such initiatives could appeal to students' sense of exploration and enjoyment while also helping cafeteria management to manage inventory sustainably by leveraging seasonal or locally sourced ingredients.

The slightly lower score for price fairness suggests an area for improvement. While most respondents view cafeteria pricing as consistent, they may still seek greater value. The cafeteria could introduce meal combos or discounts for students with restricted budgets, making cafeteria meals more appealing compared to off-campus options. Transparent pricing policies, such as clearly stating portion sizes and ingredients, may also enhance perceptions of fairness by providing customers with a clear value proposition.

A significant relationship was identified between meal allowances and perceptions of food quality and variety, indicating that budget constraints affect students' expectations and satisfaction. Research supports this by linking financial resources with food choices, suggesting that when meal budgets are limited, students prioritize value and quality. Notably, students who perceive cafeteria pricing as consistent and fair tend to express higher satisfaction, underscoring the importance of pricing alignment with student budgets.

Notably, sex, religion, department, and monthly allowance did not significantly affect satisfaction, reflecting the cafeteria's consistent appeal across diverse demographics. However, the slight differences in food quality perceptions across income levels suggest that employees with higher incomes may have different expectations, potentially comparing the cafeteria offerings with higher-end dining options outside campus. This finding highlights the importance of maintaining high standards in food quality and service while ensuring that options meet both student and employee expectations.

The study's findings emphasize the importance of adopting sustainable cafeteria practices that balance quality, variety, and affordability. By prioritizing locally sourced ingredients, the cafeteria can support environmental sustainability and potentially reduce costs, allowing for competitive pricing. Incorporating plant-based or healthy options could also appeal to health-conscious consumers, contributing to a well-rounded menu that promotes both dietary and environmental sustainability.

Additionally, significant differences in perceptions based on educational level highlight how students' evolving expectations can influence satisfaction with food services. As students' progress in their academic journey, their preferences and standards for food quality and pricing are likely to change. This suggests that cafeteria management should consider these

dynamics when designing menus and pricing strategies to better align with the expectations of different student cohorts.

Offering a feedback system where students and employees can rate meals or suggest new menu items could improve satisfaction and inform cafeteria management about changing preferences. Additionally, implementing portion control and waste reduction strategies could contribute to a sustainable cafeteria model, benefiting both the environment and the budget constraints of the respondents.

Conclusion

Based on the researchers' findings, the following conclusions were drawn:

1. The study "Campus Food Preferences: Basis for Sustainable Cafeteria Management" highlights factors like age, occupation, and meal allowance that shape food choices and satisfaction for students and employees at Emilio Aguinaldo College Cavite. Meal allowance significantly impacts satisfaction, as budget-conscious students prioritize affordability, while employees with higher allowances may prefer premium or healthy options. This suggests a need for tiered pricing and diverse menu options to accommodate various budget levels.

2. Frequently, cafeteria visits for quick snacks and drinks highlight the need for fast-service options. A strong preference for familiar "Rice Meals" shows the value of local flavors in building customer loyalty, while a lower interest in Western items like sandwiches suggests a preference for traditional foods.

3. The study shows that quality, variety, and fair pricing are key to satisfaction, with taste as the top factor for retention. While pricing is generally rated well, offering meal combos and clearer pricing could better meet budget expectations.

4. The analysis shows satisfaction levels vary with income and meal allowance, influencing views on food quality and variety. However, factors like sex, religion, and department have little impact, suggesting the cafeteria's

appeal is consistent across diverse groups, though financial capacity shapes preferences.

5. Enhancing satisfaction through sustainable practices—such as using local ingredients, offering healthier options, and gathering feedback—can keep the cafeteria relevant. Adapting to students' changing expectations as they advance academically can also help cafeteria management better meet their needs.

It should be stated in few sentences at the end of the paper and should be in present tense. There should be no further explanation of results.

Recommendations

Based on the findings and conclusion drawn from the study, the researchers recommended:

1. Tiered Pricing Structure: To cater to the varied budgetary capacities of students and staff, it is recommended to implement a tiered pricing model. This structure should include: Budget-Friendly Options: Snacks priced between 15-30 PHP and basic lunch meals ranging from 35-50 PHP, focusing on simple, filling items like small rice meals or sandwiches.

Standard Options: Mid-range meal choices priced between 51-100 PHP, featuring full rice meals with a single entrée, suited for students with moderate allowances.

Premium Options: For higher budget allowances (101-150 PHP), premium selections should be available, offering nutritious items with multiple entrées or gourmet sides.

2. Menu Variety and Rotational Specials: To meet preferences for diversity and culturally familiar foods, it is suggested to include rotating daily specials and seasonal dishes, with an emphasis on Filipino cuisine and rice-based meals. Additionally, providing grab-and-go options would support students with demanding schedules.

3. Healthy and Sustainable Choices: Incorporating plant-based meals, low-sugar beverages, and locally sourced ingredients is advised to support both health-conscious

consumers and sustainable practices. A dedicated “Go, Grow, Glow” menu section may effectively address this need.

4. **Enhancement of Food Quality and Presentation:** As food quality and taste significantly impact satisfaction, the cafeteria should prioritize fresh ingredients and maintain consistency in flavor and appearance. Staff should receive regular training in food handling and presentation to uphold these standards.

5. **Fair Pricing and Value-Added Packages:** To address perceptions of price fairness, introducing meal deals or bundled offerings—such as a rice meal with a drink and snack at a reduced rate—is recommended. Clearly labeling portion sizes and prices would further enhance transparency and perceived value.

6. **Feedback Mechanism for Continuous Improvement:** Implementing a feedback system would enable students and employees to rate meals and suggest new items, providing the cafeteria with valuable data on evolving preferences and areas for improvement.

7. **Waste Reduction Strategies:** Adopting waste-reduction measures, such as portion control, composting, and partnerships with local suppliers, is recommended to support sustainable cafeteria practices. Engaging the campus community in initiatives like food waste audits could further promote environmental consciousness.

8. **Menu Adjustments Based on Student Progression:** Given that students’ preferences for food quality and variety may change over time, it is recommended to periodically reassess and adjust menu offerings to better align with the expectations of different student groups.

Menu Variations

Main Courses

- **Rice Meals:** Filipino classics (adobo, sinigang, grilled chicken) plus vegetarian options.
- **Pasta Dishes:** Options like spaghetti, carbonara, and macaroni with optional protein add-ons.

Snacks and Beverages

- Affordable Snacks: Empanadas, pastries, fresh fruit cups.
- Beverages: Fresh juices, smoothies, bottled water.

Healthy Options

- Salads: Fresh veggie salads or side salads for rice meals.
- Low-Sugar Beverages: Smoothies with no added sugar, fresh lemon water, etc.
- "Go, Grow, Glow" Items: Dishes highlighting nutrition, such as vegetable rice bowls or grilled items.

Seasonal/Promotional Items

- Rotating Specials: Holiday-themed meals or academic season promotions (e.g., discounts during exam week).

Combo Meals

- Budget Bundles: Rice meal + snack + drink at a discounted rate for students/employees.
-

Sample Pricing Matrix for Lunch Combos (76-100 pesos)

Combo	Price Range	Description
Combo 1: Classic Rice Meal	76-80 pesos	Rice + One Main Dish (e.g., fried chicken, adobo) + small side (e.g., vegetables or salad)
Combo 2: Rice & Veggie Meal	81-85 pesos	Rice + Grilled Vegetable Main (e.g., eggplant, tofu stir-fry) + seasonal vegetable side
Combo 3: Noodle Dish Combo	86-90 pesos	Noodle dish (e.g., spaghetti, pancit) + bread + mini dessert (e.g., fruit cup)
Combo 4: Healthy Bowl	91-95 pesos	Rice + lean protein (e.g., grilled chicken or fish) + steamed vegetables
Combo 5: Fusion Meal	96-100 pesos	Fried rice with meat and vegetables + small soup or side salad
Combo 6: Snack & Drink Add-on	10-15 pesos	Add a small snack (e.g., lumpia) or drink (e.g., iced tea) to any combo

Sample Pricing Matrix for Snack Options (15-30 pesos)

Snack Item	Price Range	Description
Pastry Bites	15-18 pesos	Small pastries (e.g., pandesal, cheese bread)
Fruit Cup	15-18 pesos	Seasonal fresh fruit in a small cup
Veggie Sticks with Dip	18-20 pesos	Carrot or cucumber sticks with ranch dip
Classic Empanada	20-22 pesos	One chicken or vegetable empanada
Mini Sandwich	22-24 pesos	Half sandwich (egg salad, tuna, or cheese)
Rice Cake (Kakanin)	22-24 pesos	Traditional rice cake (e.g., suman, kutsinta)

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CLIMATE CHANGE PRACTICES OF A SELECT EDUCATIONAL INSTITUTION IN CAVITE: INPUTS FOR SCHOOL CLIMATE IMPROVEMENT PROGRAM

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- Climate Change
- Mitigation
- Adaptation
- Sustainability
- Environment

Abstract The need to address the effects of climate change in education must be given paramount importance as it has been proven that climate change disrupts not only the natural environment but also learning and instruction. The study aims to investigate the nature of

mitigation and adaptation practices and the extent of their implementation and determine whether employee category and years of service will cause differences in participant's assessment.

The study utilized a quantitative design that was descriptive and comparative. The study used two hundred and sixty-six (266) participants, who were selected by random sampling. The study used mean and standard deviation to determine the extent of mitigation and adaptation practices

implementation, and a T-test was used independently to compare results.

Regarding mitigation and adaptation practices of the select education institution, participants agree that said practices were "Implemented" with an overall mean of 2.7703 and 2.6401, respectively. On the other hand, results further revealed no differences in the assessment of teaching and non-teaching personnel or their years of service.

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INTRODUCTION

World Economic Forum (2020) claimed that individuals, organizations, and governments have continuously made global efforts to reduce carbon emissions since adopting the Paris Agreement 2015. The thrust is to invest 100% in renewable energies. The National Aeronautics and Space Administration (n.d.) claimed that climate change is humanity's most intricate global concern. According to this authority, there are two approaches to climate change. One approach is mitigation, which minimizes carbon emissions and alleviates the levels of trapped greenhouse gases in the atmosphere. The other approach is adapting to climate change, which involves adjusting to actual or expected future climate. Regarding the Philippine government's commitment to climate change, Teves (2021) reported that the government is creating community-wide climate resilience programs to protect the Philippines' environment, lives, and property.

Furthermore, Dolan (2021) highlighted the importance of including climate change education in primary schools, focusing on climate justice from a cross-cultural approach. Meanwhile, Hernando-Malipot (2022) stated that the Department of Education is strengthening its K-12 curriculum about climate change by fine-tuning learning competencies and standards and monitoring learning deliveries. The United Nations Educational, Scientific and Cultural Organization (2020) strongly emphasized in their priority action area for transforming learning environments that all leaders of learning institutions, including school principals, presidents and rectors of universities and colleges, heads of Technical and Vocational Education Training (TVET) institutions and staff training centers in private companies, should design tangible,

time-bound plans on how to execute the institution-wide method to Environmental Sustainable Development (ESD) together with its stakeholders. The Environment Protection and Management Act of 2019 emphasizes the importance of maintaining, protecting, and mitigating all forms of environmental degradation. The Act is supported by Velayo, AR A. et al. (2024), who emphasized that nature-based solutions (NBS) have gained significant attention worldwide and are viewed as a critical solution to the consequences of climate change through its implementation of strategies and policies regarding NBS, especially in developing countries, has received poor attention.

It promotes and encourages a better understanding and appreciation of the environment among all persons. Hussaini H (2023) mentioned that climate change is one of our most significant global challenges, and its potential impacts on human societies are far-reaching. One sector that is particularly vulnerable to the effects of climate change is education. There is strong evidence that climate change already impacts educational institutions and student learning outcomes. For example, a recent study found that rising temperatures and extreme weather events are disrupting school days and causing students to miss class time. Additionally, research has shown that climate change will disproportionately affect low-income students and students in developing countries, who are more likely to experience the negative impacts of climate change firsthand. As indicated, climate change affects the entire education system for students, teachers, and the institution. Education Institutions are forced to shift paradigms to address the challenges climate change brings. Gbsoevi, E. S. et al. (2023) conclude that "school climate" encompasses many factors that affect the overall experience of students, teachers, and staff in a school setting. To ensure a conducive learning environment, it is necessary to consider not only the physical condition and size of the school building but also the subjective perceptions of interpersonal relationships within the school community. A positive and supportive environment that fosters healthy relationships between teachers, students, and staff can enhance academic performance, promote personal development, and contribute to a sense of belonging and inclusivity. School climate also refers to the working conditions between school leaders and teachers to achieve

the school system's goals. In essence, school climate is the quality and character of the school environment.

Thapa R. et al. (2024) mentioned that the adaptation and mitigation measures, including climate change education, have yet to gain traction at the sector and school level. Schools, however, have attempted some actions, such as disaster management. Participatory environmental conservation and green school initiatives emphasize that social capital is critical in filling the resource gap for initiating ecological and climate change actions through collective school, community, and student-based activities. Supported by Corpus, A. M. (2023), climate change (CC) will continue to harm the environment if mitigation efforts are slow. Raising the CC knowledge and awareness of individuals is crucial in prompting significant mitigating action or adaptation practices. Corpuz, A. M. (2023) also recommends strengthening the integration of climate change into school policies, research, extension, and instruction and ensuring strong support from school stakeholders in their implementation.

Biesbroek, R. (2021) mentioned that calls for strengthened policy integration have recently emerged in climate change adaptation to ensure timely, adequate, and practical actions. Though research on climate change adaptation policy integration is still in its infancy, current knowledge from policy studies offers a solid basis for informing future work on adaptation policy integration. Thapa R. et al. (2024) also indicated that human capacities, policy and institutional structures, technical capacities, and capital (cultural and economic) constraints, as well as slow mainstreaming into local development processes, impeded efforts to build climate-resilient schools, including practices to contribute to greenhouse gases reduction.

Added by Lee, H. & Romero, J (2023), climate change owing to human activity is sure to have disruptive effects on nature and society for the foreseeable future, presenting a host of challenges to generations to come and, consequently, the climate change education is increasingly regarded as a priority by climate change authorities. On the other hand, Gbessoevi S. et al. (2024) highlight that school climate plays a crucial role in enhancing teachers' productivity. Therefore, there is a pressing need to devise effective plans to improve it. Meanwhile, creating a transparent school climate that fosters connectedness, is safe, and has positive institutional

factors can provide teachers with a comfortable work environment that boosts their productivity.

Educational institutions play a critical role in the preservation of our natural environment as well as in reducing the direct effect of climate change. Likewise, academic institutions should promote and encourage their stakeholders to participate in all the school activities regarding climate mitigation and adaptation programs. As Roos N. et al. (2020) mentioned, higher educational institutions are influential social institutions that educate future decision-makers and shape society. Concurred by Al Hussaini, H. M. (2023), climate change has had a profound and lasting effect on student education and their future development. Not only does climate change impact the environment, but it can also negatively affect educational systems, from curriculum changes to increased disruption in school buildings. In the study of Cabalida, HM. L. (2024) mentioned that school administrators and curriculum experts provide innovative and appropriate environmental education interventions such as training to educators; teachers be guided in ensuring that their students have a deeper understanding of how to reduce their carbon footprint and the implications of climate change, as well as a proper evaluation that emphasizes using what they have learned to solve problems in the real world; parents should be informed to make aware of how positive environmental actions at home contribute to mitigating climate change and help reduce carbon footprint; and future researchers should consider expanding the variables involved in the study of climate change awareness and carbon footprint engagement. This was also supported by the study of Gatdula, M. (2023), where she claimed that higher education institution has a significant role in producing well-informed graduates about sustainable educational quality. The Philippine government mandates educational institutions to observe and develop strategies to mitigate the effects of such weather conditions. CMO 146, S. 2021 emphasized the need for research on Environment and Climate Change. Standard Insights (2023) concluded that the Philippines can continue its rise toward a more environmentally sustainable future through cooperative efforts and sustained action. As mentioned by Almestar M. et al. (2022), schools and their environment have the potential to be an enabler for urban transformation, and these spaces constitute delimited social and physical contexts where

different stakeholders and levers of change interact to face local and global challenges such as climate change. Supported by Maglaque, M. R. (2024), by fostering climate resilience through education, communities can better prepare for future challenges, mitigate potential risks, and actively participate in global sustainability efforts. Added to Kundariati M. et al. (2024), students believe that climate change is accurate, and some students are used to making good habits to reduce energy use and have the will to tackle the crisis. Students also believe that human activities rather than natural phenomena cause climate change. Students have a good understanding of climate change. However, there are still many students who have not yet taken action to tackle climate change. As concurred by Diquito, T. A. et al. (2024), senior high school students possess a strong understanding of climate change's affective aspects, suggesting the effectiveness of educational efforts in engaging students on this topic.

Thus, this research studied how educational institutions implement environmental mitigation and adaptation practices that consider organizational climate. Specific contributions to conserve the environment are part of this research. This proposed research hoped to develop a School Climate Improvement Program based on the significant practices of the select educational institution.

METHODOLOGY

Research Design

The research utilized a quantitative research design that was descriptive and comparative. Quantitatively, the study assessed the extent of implementation of the mitigation and adaptation practices of the select institution. Likewise, the assessment is compared based on Employee Category and Years of Service.

Research Locale

The research commenced in a select Tertiary Education Institution in the City of Dasmariñas, Province of Cavite.

Sample and Sampling Technique

The research utilized at least two hundred sixty-six (266) participants, of which one hundred eighty-nine (189) are teaching personnel, and the remaining seventy-seven (77) are non-teaching personnel. Participants are selected via random sampling.

Instrumentation Techniques

The research used a 4-point self-made survey questionnaire focusing on the mitigation and adaptation practices of the subject institution. The reliability of the survey questionnaire was tested using Cronbach Alpha, and the following coefficients, 0.908 and 0.914, respectively, were obtained for mitigation and adaptation practices. On the other hand, the validity of the survey questionnaire was tested using Pearson R, and a significant value of less than 0.05 was obtained.

Data Gathering Procedures

Regarding data gathering, the actual survey and interview will commence simultaneously once the survey and guide questions both pass the reliability and validity tests.

Data Analysis Procedures

Descriptive and comparative analyses are used to determine the extent of implementation of the mitigation and adaptation practices of the selected education institution. The following statistical tools are used to augment the data analysis:

Mean and standard deviation are used to assess the extent of implementation of the mitigation and adaptation practices of the selected education institution.

In contrast, the T-test Independent and One-way Analysis of Variance compare the results. Likewise, the following decision criteria are used to interpret the results of statistical treatment:

RESULTS AND DISCUSSIONS

This chapter presents, interprets, and analyzes the gathered data about the specified research problems, specifically for the profile of the participants, the extent of climate change practices, and the comparative results.

Table 1 Profile of the Participants

Employee Category	f	%
Teaching Personnel	189	71.1
Non-Teaching Personnel	77	28.9
Total	266	100
Years of Service	f	%
Less than 5 years	177	66.5
6 – 10 Years	74	27.8
More than 10 years	15	5.6
Total	266	100

The table shows the participants' profiles regarding employee categories and years of service. Results revealed that most participants are teaching personnel with less than five (5) years of tenure.

Table 2 Extent of Implementation of Mitigation Practices

Mitigation Practices	Mean	SD	Interpretation
Programs on climate mitigation focusing on promotion and awareness towards its employees	2.9248	.82986	Implemented
Partnership with government agencies is part of the institution's developmental and sustainability plan	2.7707	.95761	Implemented
Posting of various significant information about climate change in strategic location	2.9023	.93860	Implemented
Active participation and support of the management towards the development of school climate improvement	2.8797	.83361	Implemented
Regular Seminars/webinars by	2.5489	.98645	Implemented

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climate change experts (with authority) focus on ways/strategies to reduce the effects of climate change.			
Room temperatures are reduced during office hours and classes	2.7143	.94427	Implemented
Encourage employees and students to practice coming to the office/school by way of bicycle	2.4323	.92202	Slightly Implemented
Encourage employees and students to practice walking to the office/school.	2.4586	1.00197	Slightly Implemented
"			
Campus-wide promotion of the 5 S policy to employees and students."	2.6692	1.03320	Implemented
The green movement on campus was participated in by employees and students."	2.7180	.97488	Implemented
Climate mitigation objectives are well placed/posted in strategic places	2.6842	.95458	Implemented
Overall	2.7003	.68281	Implemented
Legend: 4.00 – 3.51 Highly Implemented, 3.50 – 2.51 Implemented, 2.50 – 1.76 Slightly Implemented, 1.75 – 1.00 Not Implemented			

Table 2 shows the extent of implementation regarding Mitigation practices of the select education institution. Results revealed that participants perceived mitigation practices as "Implemented," with an overall mean value of 2.7003. As indicated in the results, information to create awareness on climate change garnered the highest assessment with a mean value of 2.9023; at

the same time, encouraging stakeholders to attend the office by bicycle obtained the lowest evaluation with a mean value of 2.4323, which is further interpreted to be "Slightly Implemented." The subject institution advocates for green programs to conserve, preserve, and protect the natural environment. This is in response to climate change phenomena happening around the world. Information about climate change and its mitigation practices is an excellent start to address challenges brought about by climate change. Practices and strategies to moderate the possible effects of climate change in an educational institution must be in place to provide a conducive working environment not only for the employees but also for students and other stakeholders.

Thapa R. et al. (2024) mentioned that the adaptation and mitigation measures, including climate change education, have yet to gain traction at the sector and school level schools; however, they have attempted some actions, such as through disaster management and participatory environmental conservation and green school initiatives emphasizing that social capital was critical in filling the resource gap for initiating ecological and climate change actions, carried out through collective school, community, and student-based activities. Thapa R. et al. (2024) also indicated that human capacities, policy and institutional structures, technical capacities, and capital (cultural and economic) constraints, as well as slow mainstreaming into local development processes, impeded efforts to build climate-resilient schools, including practices to contribute to greenhouse gases reduction.

On the other hand, the success of the mitigation program for school climate change must be a cooperative effort by the institution and its stakeholders. Stakeholders play a critical role in the implementation of mitigation practices as crucial participants in the program. Employees, students, and other stakeholders must contribute to effectively and efficiently implementing mitigation strategies, hence achieving its significant objectives.

Table 3 Extent of Implementation of Adaptation Practices

Adaptation Practices	Mean	SD	Interpretation
Teaching the students and other stakeholders the skills they need to adapt to changing climate.	2.7970	.84906	Implemented
Programs focusing on planting trees and installing indoor plants are well-placed	2.8120	.85252	Implemented
Regular cleaning of campus drainage and proper waste disposal	2.9286	.91454	Implemented
Active participation and support of the management towards community development regarding climate change awareness.	2.8647	.87119	Implemented
Employees and students come to school by way of bicycle, and they use public transportation	2.5038	.95265	Slightly Implemented
Employees and students come to school on foot, and fewer use public transportation.	2.4098	.94835	Slightly Implemented
Climate change is integrated into various program curricula	2.3835	1.00731	Slightly Implemented
The school provides infrastructure improvements such as rainwater harvesting.	2.5263	1.01371	Implemented
School infrastructures are continuously improved based on the	2.5338	.95205	Implemented

need to address climate change.			
School systems become more protective of those persons with disability and individuals with comorbidities on the impact of climate change.	2.6165	.87067	Implemented
Overall	2.6401	.67871	Implemented
Legend: 4.00 – 3.51 Highly Implemented, 3.50 – 2.51 Implemented, 2.50 – 1.76 Slightly Implemented, 1.75 – 1.00 Not Implemented			

Table 3 shows the extent of implementation regarding Adaptation practices of the subject institution. Results revealed that the adaptation practices of the subject institution are perceived to be “Implemented” by the participants, with an overall mean value of 2.6401. Results also indicated that proper waste disposal and regular cleaning of drainage obtained the highest assessment with a mean value of 2.9286, while integrating climate change in various program curricula gained the lowest evaluation with a mean value of 2.3835, interpreted to be “Slightly Implemented.”

The institution has established a continuous improvement program regarding waste disposal and maintenance activities. Regular collection and disposal of waste materials in various offices are strategically implemented. The institution is committed to providing its stakeholders with a safe and clean environment to increase satisfaction by delivering quality services about climate change adaptation practices. Climate change has been disrupting school processes, resulting in losses in obtaining significant knowledge and wisdom through school-based learning methods, and educational institutions may provide means to adapt strategically and holistically to cope with the long-term effects of climate change.

As Corpus, A. M. (2023) mentioned, climate change (CC) will continue to harm the environment if mitigation efforts are slow. Raising the CC knowledge and awareness of individuals is crucial in prompting significant mitigating action or adaptation practices. Adaptation strategies are critical in situations where the effects of climate change are very observable in various

industries, and educational institutions are no exception. The adaptation process may be considered a long-term shot for most academic institutions. Still, it is worth it when schools realize the long-term positive effect of said strategies. Thus, schools must start integrating the concept of climate change, specifically the mitigation and adaptation strategies, in their various program curricula to create awareness among teachers and students and develop a cooperative effort in addressing challenges brought about by climate change. Corpuz, A. M. (2023) recommends strengthening the integration of climate change into school policies, research, extension, and instruction and strongly supporting school stakeholders in their implementation. Biesbroek, R. (2021) mentioned that calls for strengthened policy integration have recently emerged in climate change adaptation to ensure timely, adequate, and practical actions. Though research on climate change adaptation policy integration is still in its infancy, current knowledge from policy studies offers a solid basis for informing future work on adaptation policy integration.

Table 4 Differences based on Employee Category

School Climate Practices	Employee Category	Mean	T-value	Sig Value	Interpretation
Mitigation Practices	Teaching	2.68	-.519	.604	Not Significant
	Non-Teaching	2.73			
Adaptation Practices	Teaching	2.63	-.376	.707	Not Significant
	Non-Teaching	2.66			

**** Significant at alpha 0.05**

The table shows the differences in the assessment of participants about climate change practices of the selected institution based on the employee category. Results revealed no significant difference in their evaluation of Mitigation and Adaptation practices. The T-values of -0.519 and -0.376, with probability values of 0.604 and 0.707, respectively, are insignificant with alpha 0.05.

The mitigation and adaptation process may require a collective effort from all the stakeholders of an organization regardless of the employment status or employee category.

Employees play a critical role in the implementation of the mitigation and adaptation practices of an educational institution. Knowledge and awareness are vital components in reducing the effects of climate change in academic institutions. Thus, all employees, whether teaching or non-teaching, must play significant roles in developing, educating, implementing, and assessing mitigation and adaptation strategies in line with strategic goals and objectives to safeguard the working environment for employees and their stakeholders.

Maglaque, M. R. (2024) mentions that communities can better prepare for future challenges, mitigate potential risks, and actively participate in global sustainability efforts by fostering climate resilience through education. As mentioned, climate change must be part of various program curricula to ensure that students and teachers are thoroughly informed on the phenomena and its effect on education. Added to Kundariati M. et al. (2024), students believe that climate change is accurate, and some students are used to making good habits to reduce energy use and have the will to tackle the crisis. Students also believe human activities rather than natural phenomena cause climate change. Students have a good understanding of climate change. However, there are still many students who have not yet taken action to tackle climate change. As concurred by Diquito, T. A. et al. (2024), senior high school students possess a strong understanding of climate change's affective aspects, suggesting the effectiveness of educational efforts in engaging students on this topic. The subject education institution sets its direction in addressing the adverse effects of climate change.

It includes creating awareness, classroom discussions, and ensuring everyone values. It recognizes the importance of mitigating climate change and adapting long-term courses of action to reduce, if not eradicate, climate change in education settings. Thus, regardless of employee category, all must be aware, practice, and do activities that would help the institution effectively and efficiently implement the school's mitigation and adaptation practices.

Table 5 Differences based on Years of Service

School Climate Practices	Years of Service	Mean	F-value	Sig Value	Interpretation
Mitigation Practices	Less than 5 years	2.69	2.62	.074	Not Significant
	6-10 years	2.63			
	More than 10 Years	3.07			
Adaptation Practices	Less than 5 years	2.63	3.48	0.032	Significant
	6-10 years	2.55			
	More than 10 Years	3.06			

**** Significant at alpha 0.05**

The table shows the differences in the assessment of participants about climate change practices of the selected institution when years of service are considered. Results revealed a significant difference in the evaluation of the participants about the adaptation practices of the subject institution, with an F-value of 3.488 and a probability value of 0.032, which is significant for alpha 0.05. On the other hand, there is no significant difference in the assessment of the participants towards Mitigation Practices. The F-value of 2.628 and probability value of 0.074 is not substantial to alpha 0.05.

Table 6 Post Hoc Test for Years of Service

School Climate Practices	Sig Value	Post Hoc
Adaptation Practices	0.024	Differences based on Years of Service (Between 6-10 and more than 10 years)

The table shows the post hoc results on adaptation practices, in which the difference in the assessment is observed

from those who have worked for 6-10 years and 10 years and above. The probability value of 0.024 is significant with alpha 0.05. Years in service also play a critical role in implementing mitigation and adaptation practices. The more years of service an employee has, the more effective and efficient their practices about mitigation and adaptation. However, in the case of the subject institution, employees' perceptions do not differ in terms of years of service. This is due to the school's standard and customs practices, which address all the possible adverse effects of climate change that will significantly affect the organization and its stakeholders. Management also plays a critical role in setting standard procedures for mitigating climate change and developing adaptation strategies.

The adverse effect of climate change in educational institutions is inevitable and must be given paramount attention and importance. Thus, schools must share and make their contribution to addressing climate change. Regarding Mitigation Practices, moderating the effects of climate change in an educational institution is a must since this phenomenon is inevitable. Most of the time, arguments arise as to the causes of climate change; some say that this is due to nature, and some say it is artificial. Lee, H. & Romero, J (2023), climate change owing to human activity will indeed have disruptive effects on nature and society for the foreseeable future, presenting challenges to future generations. Consequently, climate change authorities increasingly regard climate change education as a priority. Regardless of its source, education institutions and their stakeholders must create and implement mitigation practices that could reduce, if not eradicate, the harmful effects of climate change in school settings.

We all know that climate change does affect the education system and likewise affects the learning of students as well as the delivery of instructions. As Al Hussaini, H. M. (2023) mentioned, climate change has had a profound and lasting effect on student education and their future development. Not only does climate change impact the environment, but it can also negatively affect educational systems, from curriculum changes to increased disruption in school buildings. As indicated, mitigating the adverse effects of climate change on the natural environment and the entire education system is a must. Education institutions must create various ways to alleviate the adverse effects of climate change to provide better services and education to its

stakeholders. Most of the time, educational institutions offer an information campaign about climate change to create awareness among their students and employees and provide specific details and instructions on how to contribute to addressing the challenges of climate change in an educational setting.

On the other hand, Gbessoevi S. et al. (2024) highlight that school climate plays a crucial role in enhancing teachers' productivity. Therefore, there is a pressing need to devise effective plans to improve it. Meanwhile, creating a transparent school climate that fosters connectedness, is safe, and has positive institutional factors can provide teachers with a comfortable work environment that boosts their productivity. The institution's management also plays a critical role in addressing climate change. As mentioned, climate change is inevitable and cannot be eradicated. However, various ways can be implemented to address its adverse effects; thus, the management must establish an institutional and collaborative effort among its stakeholders.

Regarding adaptation practices, the subject institution has already established and recognized the importance of adapting to climate change, and its practices are very observable, including but not limited to individual efforts by its stakeholders and management. As indicated in the results, management plays a critical role in developing strategic practices for adaptation that can be easily implemented in an institution-wide setting. Schools are mandated to create ways to address the effects of climate change, and these should start in the classroom and create various information to strengthen its climate change awareness program. They are indicated in the study of Cabalida, HM. L. (2024), school administrators and curriculum experts provide innovative and appropriate environmental education interventions such as training to educators; teachers be guided in ensuring that their students have a deeper understanding of how to reduce their carbon footprint and the implications of climate change, as well as a proper evaluation that emphasizes using what they have learned to solve problems in the real world; parents should be informed to make aware of how positive environmental actions at home contribute to mitigating climate change and help reduce carbon footprint; and future researchers should consider expanding the variables involved in the study of climate change awareness and carbon footprint engagement.

While the importance of incorporating the concept of climate change in education, specifically with lectures and instructions, is very observable, education institutions must embed strategies that could address climate change, which should be easy to understand and implement. Monsod, TM. et al. (2021) also mentioned that 'de-carbonization' is a path that recognizes that highly vulnerable countries with relatively small carbon footprints per capita, like the Philippines, are likely to do more for global efforts to reduce the extent of climate change and cope with its impacts if they build robust community ownership for climate action and leverage opportunities based on their comparative advantages; one comparative advantage of the Philippines is the biodiversity of its marine and coastal resources. Likewise, integrating the "green" concept into the practices may result in effective and efficient strategies developed under the premise of the natural environment. As mentioned by Velayo, AR, A. et al. (2024), nature-based solutions (NBS) have gained significant attention worldwide and are viewed as a critical solution to the consequences of climate change through its implementation of strategies and policies regarding NBS, especially in developing countries, has received poor attention. *Some view* climate change as a natural phenomenon, and only a nature-based solution could counter its detrimental effect through regular cleaning programs for the entire institution, tree planting, regular maintenance, energy-saving activities, opting for renewable energy, etc.

Regarding the difference in the assessment towards mitigation and adaptation practices based on employee category and years of service, results revealed no significant differences regarding implementation. The subject institution is currently implementing substantial climate change mitigation and adaptation practices. Though years of service may play a critical role in climate change management in education, for the subject institution, the assessment is deemed the same as all employees, regardless of their tenure, individually contribute to addressing the challenges climate change brings. Likewise, whether teaching or non-teaching personnel, the assessment is also the same as it shows that regardless of category, all employees have one direction and vision: to reduce, if not eradicate, the effect of climate change in education.

Conclusion

Climate change in education is inevitable. Research findings indicate that the education system is directly affected by this phenomenon, including but not limited to the delivery of instruction, faculty and student performance, and physical structure. The subject education institution fully recognized the detrimental effects of climate change and continuously addressed the challenge by providing and implementing strategic mitigation and adaptation practices.

The significant roles of each stakeholder must be established so they can contribute to lessening the harmful effects of climate change in education. Everybody must know their roles in mitigating climate change and promoting and employing adaptation practices. Simple activities or programs to alleviate the effects of climate change in education are vital not only for the institution but also for its stakeholders, including but not limited to students, employees, teachers, and communities.

Recommendations

The researchers recommended premises given the following:

Recommendations	Objectives	Responsibility	Time Frame
Regular Seminar on Challenges of Climate Change in Education	• Keep updated on the trend of climate change • Enhance awareness of the effects of climate change on education	Management	Semi-annually

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Regular monitoring and maintenance of Machineries and equipment	• To ensure the excellent condition of machinery and equipment such as AC, Computers, etc • To reduce carbon and radiation emission	Management	Quarterly
Increase Posting of Information within School Premises	• To remind internal stakeholders and keep them aware of the detrimental effects of climate change on education	Management	All Year-round
More naturally-based strategies for Climate Change	• To capitalize on the available natural resources to counter the effects of climate change • To develop programs safe not only for stakeholders but also for the environment	Management	All Year-round

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Determining Research Capability within a Private Higher Education Institution in the Philippines

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KEYWORDS:

- **Research Productivity**
- **Research Knowledge and Skills**
- **Filipino Educators**
- **Research Writing and Publication**
- **Research Literacy**

Abstract. Emilio Aguinaldo College-Cavite recognizes the importance of research and has introduced various programs aimed at fostering research engagement among its faculty members and staff. However, a paradox emerges when contrasting these efforts with the current lack of clarity regarding employees' research capabilities. Hence, this study primarily aimed at giving clarity to this. The findings indicate significant gaps in research-related knowledge and skills among faculty members and non-academic staff; across areas like research writing, conference presentations, and

publication practices, participants scored low. This study carries profound significance for both the academic community and educational institutions, particularly EACC, as it could serve as

a guide in designing targeted training programs, which would result in increased research productivity.

Determining Research Capability within a Private Higher Education Institution in the Philippines

INTRODUCTION

Emilio Aguinaldo College-Cavite (EAC) recognizes the importance of research and has introduced various programs aimed at fostering research engagement among its faculty members and staff. Notably, these initiatives offer opportunities for presentation and publication, signaling the institution's dedication to fostering a research-oriented environment. However, a paradox emerges when contrasting these efforts with the current lack of clarity regarding employees' research capabilities. Despite the presence of these programs, there is a dearth of studies assessing whether EAC's faculty members and staff are genuinely capable producing research papers. Another concerning observation pertains to the Institutional journal published by the Research and Development Office (RDO). Over the years, the contributors to the journal have remained largely unchanged, indicating a lack of diversity. This leads to inquiries about the motivations behind these trends. Are these contributors truly representative of the institution's entire workforce, or does this trend hints at potential capability disparities. These observations serve as a catalyst for this research, urging a systematic investigation into the research capabilities of EAC's academic and non-academic employees.

The primary objective of this study to determine the capability of EACC Employees in producing, presenting, and publishing research. It specifically aims to achieve the following:

1. To determine the level of knowledge and attitude of EACC employees towards research writing, conference presentation, and journal publication.

2. To determine whether differences exist in research knowledge and attitude among employees when grouped based on sexuality, age, job classification, school/department, years of employment, highest educational attainment, and employment status.
3. To recommend programs and/or activities that would contribute to the enhancement of EACC's research culture.

METHODOLOGY

This research employed a descriptive research design with a quantitative approach, offering insights into employees' research capabilities. It was conducted in Emilio Aguinaldo College- Cavite Campus, and respondents will limited to EACC's Faculty Members and Academic and Non-Academic Office Heads and. Faculty Members including those employed in full-time and part-time basis regardless of tenure and educational attainment. Meanwhile, Non-Academic Employees in this study excludes those in the General and Security Services department/s.

The researchers began by writing to the Human Resources Management team of EACC to ask for permission to conduct a survey among the targeted employees. Once approved, the researchers created an online copy of the questionnaire for easier dissemination. The researchers, after, contacted the deans and heads of the respective departments to request permission to conduct the survey among their teams. Upon receiving consent from every faculty member and staff, they were given the survey link.

The questionnaire was composed of a total of 36 questions/statements adopted from one of the researchers' previous studies will be utilized to determine the knowledge and attitude levels of employees. Frequency, percentage, and mean scores will be computed to show levels of knowledge and attitude measure using a 4 point Likert scale. Meanwhile, T-Test and Analysis of Variance (ANOVA) will be performed to determine significant differences. research.

Ethical Consideration

This research considered all ethical considerations in research. Respondents were not forced to answer the questionnaire; prior to answering, they were informed about the authors and purpose of the study, and they have expressed voluntary participation. The names and other personal information of the respondents were kept confidential and were only used for the study, ensuring adherence to the Republic Act 10173, officially known as the Data Privacy Act of 2012.

RESULTS

Table 1. Knowledge on Research

Area	Mean Score	Interpretation
Research Writing	2.58	Poor Knowledge
Research Conference	2.65	Poor Knowledge
Research Publication	2.78	Poor Knowledge
Composite Mean	2.67	Poor Knowledge

Legend: 1.00-1.75: Strong Knowledge; 1.75-2.50: Fair Knowledge; 2.51-3.25: Poor Knowledge; 3.26-4.00: Ignorant

This table shows that faculty members and non-academic staff in the selected higher education institution possess a low level of knowledge towards research writing, with an overall mean score of 2.67. This is because of their poor understanding of different aspects of conducting and writing a research article. Specifically, they assume that reviewing related literature should only be done by categorizing studies based on their geographic location, they wrongfully understand that statistical formulas should not appear in the introduction and that not all studies require a hypothesis, and they believe that researchers have full discretion over the number of respondents for quantitative studies. However, literature reviews can also be organized thematically, providing a more structured approach to analyzing research content (University of Southern California, n.d.), and the sample size in quantitative research must be carefully calculated to ensure statistical reliability and validity of the findings (Surveytown, 2016). In contrary, they understand that the IMRAD format is not equivalent to the five-chapter thesis structure. Overall, this suggests a gap in these employees' understanding of

effective research practices, which is concerning given their educational background and highlights potential issues in research instruction in the country.

In regards to the knowledge level of the employees towards conference presentations, it appears to be limited with a mean score of 2.65. Generally, they believe that conference panelists are expected to question, comment, suggest revisions, and provide recommendations, much like the panel format in thesis defenses at academic institutions. They also commonly assume that conference presentations last 30 minutes to an hour, that fees are charged for presentations, and that full manuscripts are required for submission. However, these assumptions are not universally accurate. For instance, some conferences, such as the International Conference on Sustainable Tourism and Hospitality hosted by the Polytechnic University of the Philippines in November 2022, do not involve panel questioning. Similarly, events like the International Conference of the Arts and Sciences, held by Cebu Normal University, limit presentation time to less than 20 minutes and do not charge fees. Additionally, some conferences, like the 3rd International Conference for Sustainable Resource Society by the University of Eastern Finland, only required an abstract submission. Despite these misconceptions, educators generally recognize that research submitted to conferences typically undergoes a review process before acceptance. Overall, these findings suggest that the respondents may lack a comprehensive understanding of the structure and expectations of research conferences. Addressing this knowledge gap in higher education institutions could better equip educators for successful conference participation.

The findings also indicated that they demonstrate limited knowledge regarding research publication, with a mean score of 2.78. Many educators mistakenly believe that most academic journals use the traditional five-chapter thesis format, that all journals charge publication fees, that Google Scholar is a reliable indexing platform, that a high number of published articles reflects a journal's legitimacy, and that the publication process can be completed in a few days to a month. In reality, majority of research journals follow the IMRAD structure and offer free publication, as seen with the Gadjah Mada International Journal of Business by Gadjah Mada University, the Journal of Tourismology by Istanbul University, and the Journal of Language and Education by Russia's National Research University. Furthermore, Google Scholar's indexing is considered unreliable as it includes

predatory journals that may publish pseudoscience (Gannon University, n.d.). Moreover, contrary to what the respondents believe, research journals generally have a rigorous review process that can extend from several weeks to over a year, depending on the publication's standards. These findings highlight a gap in the respondents' understanding of research publication processes, which could impact the quality of their scholarly practices.

These results indicate that faculty and non-academic staff at the selected higher education institution possess a limited understanding of research, potentially contributing to the institution's challenges in this field. Among the areas assessed, respondents showed the least comprehension in research publication and the most in research writing, though their knowledge levels in both areas remain low. Notably, the study's respondents are individuals who have previously conducted research and completed theses during their college years. This raises concerns about the efficacy of research instruction in the Philippines, as well as the adequacy of professional development programs aimed at strengthening educators' research competencies.

Table 2. Attitude on Research

Area	Mean Score	Interpretation
Research Writing	1.95	Positive Attitude
Research Conference	2.36	Positive Attitude
Research Publication	2.31	Positive Attitude
Composite Mean	2.21	Positive Attitude

Legend: 1.00-1.75: Very Positive Attitude; 1.75-2.50: Positive Attitude; 2.51-3.25: Negative Attitude; 3.26-4.00: Very Negative Attitude

The data reveals that the respondents have a generally positive attitude towards research writing, with mean score of 1.95. They view research as both achievable and beneficial, they feel confident in their ability to complete research papers independently, and perceive data collection as manageable. Additionally, they recognize the potential impact of conducting and writing research on their careers and do not associate it with excessive stress. However, despite this positive outlook, their limited knowledge in research may present challenges. While confidence in research writing is valuable, inadequate understanding can result in substandard research papers that

may face rejection in conferences and journals, potentially leading to discouragement. This gap between confidence and knowledge suggests potential misconceptions about research writing among the respondents, underscoring the need for targeted interventions to address these misunderstandings and improve their research skills.

The results also reveal that they generally hold a positive attitude towards presenting at research conferences, with an overall mean score of 2.36. They believe that conference attendance is affordable, that presenting can positively impact their careers, and that preparing for presentations is manageable. Nonetheless, they find conference presentations potentially challenging and stressful due to concerns about panelists questioning their research findings and the difficulty of finding conferences due to irregular scheduling. This positive attitude, while encouraging, is overshadowed by their limited understanding of research conferences, which could increase their susceptibility to predatory conferences—events that exploit researchers under false pretenses (Godskesen et al., 2022). These findings highlight the need to educate the workforce on identifying legitimate conferences, ensuring they have the knowledge to present their research in reputable venues.

Another finding is that there is a general positive attitude among the respondents towards publishing their research in academic journals, with a mean score of 2.31. The respondents do not perceive journal publishing as costly or time-consuming, nor do they doubt the quality of their work, the career benefits of publishing, or their ability to publish independently. However, this enthusiasm brings a challenge. While their positive outlook may boost motivation and confidence in submitting research, their limited knowledge of the publication process makes them susceptible to predatory publishers and journals. To address this vulnerability, these people would benefit from guidance from colleagues with more experience in research publishing, helping them to select reputable journals and gain a clearer understanding of the publication landscape.

Overall, the institution's faculty members and staff demonstrate a positive attitude toward research, indicating their acknowledgment of its value in both their professional lives and broader society. They also recognize the career benefits research offers. However, this positive disposition, again, when paired with limited knowledge about research practices, may inadvertently lead to malpractices, such as participation in predatory

conferences or submissions to unreliable journals. This highlights the need for comprehensive education on research standards to help educators avoid these pitfalls and ensure their work is shared in reputable academic platforms.

Table 3. Difference in the knowledge levels on Research Writing among the respondents based on age

	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	8.008	5	1.602	2.680	.037
Within Groups	21.516	36	.598		
Total	29.525	41			

Table 3 shows that there is significant difference in the knowledge level of the institution's faculty members and staff in terms of research writing when they are grouped in terms of their age. The analysis uncovered that respondents whose ages are between 38 and 47 have the highest knowledge level in research writing followed by 28-37 years old, while those who are between 18 and 27 are least knowledgeable. Generally speaking, this means that age can be used as an indicator in determining who have a better understanding compared to others. Additionally, this suggests that those in the middle years of their lives may be more effective researchers when properly trained.

Table 4. Difference in the knowledge levels on Research Conferences among the respondents based on age

	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	4.626	5	.925	1.563	.195
Within Groups	21.314	36	.592		
Total	25.940	41			

This table presents that there is no significant difference in the knowledge level of the institution's faculty members and staff in terms of research conferences when they are grouped in terms of their age. This means that the institution's employees as a whole has poor knowledge level in research conferences, and that age cannot be used as an indicator in determining who have a better understanding compared to others.

Table 5. Difference in the knowledge levels on Research Publication among the respondents based on age

	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	4.989	5	.998	4.717	.002
Within Groups	7.616	36	.212		
Total	12.606	41			

The data indicates that there is a significant difference in the knowledge level of the institution's faculty members and staff in terms of research publication when they are grouped in terms of their age. The analysis showed that those between the ages of 28-37 are the most knowledgeable, followed by 58 years old and above, 48-57 years old, and 38-47 years old, respectively. On the other hand, those between 18-27 years old recorded the least knowledge level. According to Maji (2022), competency of experienced teachers is higher than inexperienced teachers, concluding age as a parameter to teaching competency, however, although this may be acceptable in the area of teaching, the results of the present study argues that it is different in the area of research. 2. This is evidence that older educators do not necessarily possess better understanding towards publishing research compared to younger ones.

Table 6. Difference in the attitude on Research Writing among the respondents based on age

	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	4.626	5	.925	1.563	.195
Within Groups	21.314	36	.592		
Total	25.940	41			

Table 6 shows that there is no significant difference in the attitude of the institution's faculty members and staff in terms of research writing when they are grouped in terms of their age. This

means that the institution's employees as a whole have a positive attitude in writing research, and that age cannot be used as an indicator in determining who have a better appreciation and familiarity on its importance, compared to others.

Table 7. Difference in the attitude on Research Conferences among the respondents based on age

	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	8.249	5	1.650	3.524	.011
Within Groups	16.856	36	.468		
Total	25.105	41			

The results indicate that there is significant difference in the attitude of the institution's faculty members and staff in terms of research conferences when they are grouped in terms of their age. The analysis uncovered that respondents who are 58 years old and above have the highest level of appreciation and understanding towards the importance of conferences, followed by people between the ages of 28-37, while those who are between 18 and 27 have the least. However, it is important to note that these results are very surprising and confusing; based on the study of ASM Global as cited by Ryley (2024), most attendees of conferences are Gen Zs and Millennials. Additionally, as observed by the authors of the present study, the number of Gen Xs and Baby Boomers are minimal in research conferences, particularly among presenters, which challenge the results. It is confusing that respondents with the age of 58 and up have a more positive attitude towards research conferences, yet they are not as active as younger educators. This poses a challenge to the institution's research office to turn this positive attitude of older educators to actual participation in research conferences.

Table 8. Difference in the attitude on Research Publication among the respondents based on age

	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	8.386	5	1.677	2.823	.030
Within Groups	21.390	36	.594		
Total	29.776	41			

This table presents significant difference in the attitude of the institution's faculty members and staff in terms of research publication when they are grouped in terms of their age. The analysis showed that those between the ages of 38 and 47 are the most appreciative towards the importance of publishing research, followed by 58 years old and above, 38-47 years old, and 18-27 years old, respectively. On the other hand, those between 48-57 years old recorded the least appreciation and understanding towards its benefits.

Table 9. Difference in the knowledge on Research overall among the respondents based on age

	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	.924	5	.185	.727	.608
Within Groups	9.150	36	.254		
Total	10.074	41			

The knowledge of the respondents towards research overall does not vary in terms of age. Although in certain research category, age can be used as an indicator of the knowledge level variations, when it comes to the overall analysis, age cannot be used to determine whether someone is better in research than others. This is because for every research category, the age groups with the highest and lowest level of knowledge differ.

Table 10. Difference in the attitude on Research overall among the respondents based on age

	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	2.082	5	.416	.844	.528
Within Groups	17.760	36	.493		
Total	19.842	41			

The attitude of the respondents towards research overall does not vary in terms of age. Although in certain research category, age can be used as an indicator of the attitude variations, when it comes to the overall analysis, age cannot be used to determine whether someone appreciates research and

understands its benefits more than others. This is because for every research category, the age groups with the highest and lowest level of attitude differ.

Table 11. Difference in the knowledge levels on Research Writing among the respondents based on sexuality

	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	6.813	2	3.407	5.850	.006
Within Groups	22.712	39	.582		
Total	29.525	41			

Table 11 shows that there is significant difference in the knowledge level of the institution's faculty members and staff in terms of research writing when they are grouped in terms of their sexuality. The analysis uncovered that male respondents have a higher knowledge level in research writing compared to females. Generally speaking, this means that sexuality can be used as an indicator in determining who have a better understanding compared to others.

Table 12. Difference in the knowledge levels on Research Conferences among the respondents based on sexuality

	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	5.396	2	2.698	7.794	.001
Within Groups	13.500	39	.346		
Total	18.896	41			

This table presents that there is significant difference in the knowledge level of the institution's faculty members and staff in terms of research conferences when they are grouped in terms of their sexuality. The data showed that females are more knowledgeable of research conference presentations than males.

Table 13. Difference in the knowledge levels on Research Publication among the respondents based on sexuality

	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	4.831	2	2.415	12.116	.000
Within Groups	7.775	39	.199		
Total	12.606	41			

The data indicates that there is a significant difference in the knowledge level of the institution's faculty members and staff in terms of research publication when they are grouped in terms of their sexuality. The analysis showed that unlike in the case of research conferences, male respondents have a better understanding on certain aspects of research publication in journals than females. This may mean that the institution, although should conduct trainings for male employees, must give closer attention in providing females trainings on research publication.

Table 14. Difference in the attitude on Research Writing among the respondents based on sexuality

	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	3.989	2	1.995	3.544	.039
Within Groups	21.951	39	.563		
Total	25.940	41			

Table 6 shows that there is significant difference in the attitude of the institution's faculty members and staff in terms of research writing when they are grouped in terms of their sexuality. This means that age can be used as an indicator in determining who have a better appreciation and familiarity on its importance, compared to others. In particular, females have more positive attitude towards it.

Table 15. Difference in the attitude on Research Conferences among the respondents based on sexuality

	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	6.994	2	3.497	7.531	.002
Within Groups	18.110	39	.464		
Total	25.105	41			

The results indicate that there is significant difference in the attitude of the institution's faculty members and staff in terms of research conferences when they are grouped in terms of their age. The analysis uncovered that female respondents have the higher level of appreciation and understanding towards the importance of conferences.

Table 16. Difference in the attitude on Research Publication among the respondents based on sexuality

	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	7.055	2	3.527	6.054	.005
Within Groups	22.722	39	.583		
Total	29.776	41			

This table presents significant difference in the attitude of the institution's faculty members and staff in terms of research publication when they are grouped in terms of their sexuality. The analysis showed that male respondents are more appreciative towards the importance of publishing research. It is important to note that females also are less knowledgeable in this category, which may have influenced their attitude.

Table 17. Difference in the knowledge on Research overall among the respondents based on sexuality

	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	.451	2	.226	.914	.409
Within Groups	9.623	39	.247		
Total	10.074	41			

The knowledge of the respondents towards research overall does not vary in terms of sexuality. Although in certain research category, sexuality can be used as an indicator of the knowledge level variations, when it comes to the overall analysis, it cannot be used to determine whether someone is better in research than others. This is because for every research category, the group with the higher and lower level of knowledge differs.

Table 18. Difference in the attitude on Research overall among the respondents based on sexuality

	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	1.334	2	.667	1.405	.257
Within Groups	18.508	39	.475		
Total	19.842	41			

The attitude of the respondents towards research overall does not vary in terms of sexuality. Although in certain research category, sexuality can be used as an indicator of the attitude variations, when it comes to the overall analysis, it cannot be used to determine whether someone appreciates research and understands its benefits more than others. This is because for every research category, the group with the higher and lower level of attitude differs.

Table 19. Difference in the knowledge levels on Research Writing among the respondents based on tenure

	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	7.910	5	1.582	2.635	.040
Within Groups	21.615	36	.600		
Total	29.525	41			

Table 19 shows that there is significant difference in the knowledge level of the institution's faculty members and staff in terms of research writing when they are grouped in terms of their tenure. The analysis uncovered that respondents who have been in the institution for the past 4-6 years possess the highest knowledge level in research writing, followed by those with tenure

of 1-3 years, while those who have been working in the institution for more than 10 years are the least knowledgeable. Generally speaking, this means that tenure can be used as an indicator in determining who have a better understanding compared to others.

Table 20. Difference in the knowledge levels on Research Conferences among the respondents based on tenure

	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	5.499	5	1.100	2.955	.025
Within Groups	13.397	36	.372		
Total	18.896	41			

This table presents that there is significant difference in the knowledge level of the institution's faculty members and staff in terms of research conferences when they are grouped in terms of their tenure. The data showed that educators and staff who have been with the institution in the past 1-3 years are more knowledgeable in this area, followed by those who have been working in the institution between 4-6 years. The least knowledgeable towards conferences are also the least knowledgeable in research writing – 10 years and above.

Table 21. Difference in the knowledge levels on Research Publication among the respondents based on tenure

	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	5.085	5	1.017	4.868	.002
Within Groups	7.521	36	.209		
Total	12.606	41			

The data indicates that there is a significant difference in the knowledge level of the institution's faculty members and staff in terms of research publication when they are grouped in terms of their tenure. The analysis showed that respondents who have been in the institution for the past 4-6 years possess the highest knowledge level in research publication, followed by those with tenure of 10 years and above, and 1-3 years respectively, while those who have been working in the institution for 7-9 years are

the least knowledgeable. Generally speaking, this means that tenure can be used as an indicator in determining who have a better understanding compared to others.

Table 22. Difference in the attitude on Research Writing among the respondents based on tenure

	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	6.378	5	1.276	2.348	.061
Within Groups	19.562	36	.543		
Total	25.940	41			

Table 6 shows that there is no significant difference in the attitude of the institution's faculty members and staff in terms of research writing when they are grouped in terms of their tenure. This means that tenure cannot be used as an indicator in determining who have a better appreciation and familiarity on the importance writing a research, compared to others.

Table 23. Difference in the attitude on Research Conferences among the respondents based tenure

	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	9.542	5	1.908	4.415	.003
Within Groups	15.563	36	.432		
Total	25.105	41			

The results indicate that there is significant difference in the attitude of the institution's faculty members and staff in terms of research conferences when they are grouped in terms of their tenure. The analysis is consistent with the results of the difference computation in terms of age, whereas, those 58 years old and above, have a deeper appreciation towards research conference presentations and participation. Similar to this result, the data showed that educators and staff who have been with the institution for more than 10 years have the most positive attitude towards these kinds of forums.

Table 24. Difference in the attitude on Research Publication among the respondents based on tenure

	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	9.082	5	1.816	3.160	.018
Within Groups	20.694	36	.575		
Total	29.776	41			

This table presents significant difference in the attitude of the institution's faculty members and staff in terms of research publication when they are grouped in terms of their tenure. The analysis showed that respondents who have been in the institution for the past 4-6 years possess the highest knowledge level in research publication, followed by those with tenure of 1-3 years, while those who have been working in the institution for 7-9 years are the least knowledgeable. The results is identical with the knowledge level towards research publication, whereas 4-6 years tenured employees also ranked first while 7-9 years tenured ranked last, which means that their attitude may have been influenced by their knowledge.

Table 25. Difference in the knowledge on Research overall among the respondents based on sexuality

	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	.817	5	.163	.635	.674
Within Groups	9.257	36	.257		
Total	10.074	41			

The knowledge of the respondents towards research overall does not vary in terms of tenure. Although in certain research category, tenure can be used as an indicator of the knowledge level variations, when it comes to the overall analysis, it cannot be used to determine whether someone is better in research than others. This is because for every research category, the groups with the highest and lowest level of knowledge differ.

Table 26. Difference in the attitude on Research overall among the respondents based on sexuality

	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	3.430	5	.686	1.505	.213
Within Groups	16.412	36	.456		
Total	19.842	41			

The attitude of the respondents towards research overall does not vary in terms of tenure. Although in certain research category, tenure can be used as an indicator of the attitude variations, when it comes to the overall analysis, it cannot be used to determine whether someone appreciates research and understands its benefits more than others. This is because for every research category, the groups with the highest and lowest level of attitude differ.

Table 27. Difference in the knowledge levels on Research Writing among the respondents based on employment status

	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	7.927	3	2.642	4.649	.007
Within Groups	21.598	38	.568		
Total	29.525	41			

Table 27 shows that there is significant difference in the knowledge level of the institution's faculty members and staff in terms of research writing when they are grouped in terms of their employment status. The analysis uncovered that regular employees possess the highest knowledge level in research writing, followed by full time but under probation employees, while those who have been working in the institution on a part-time basis are the least knowledgeable. Generally speaking, this means that employment status can be used as an indicator in determining who have a better understanding compared to others. Additionally, since regularization requires time spent in full-time capacity with the institution, the results may be in support to the findings of Fenster (2014) that concluded tenure as a an influencing variable to an educators' quality, however, this contradicts that study of Ng and Feldman (2013) who discovered

that contrary to common beliefs, job tenure is largely unrelated to job performance.

Table 28. Difference in the knowledge levels on Research Conferences among the respondents based on employment status

	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	5.484	3	1.828	5.179	.004
Within Groups	13.412	38	.353		
Total	18.896	41			

This table presents that there is significant difference in the knowledge level of the institution's faculty members and staff in terms of research conferences when they are grouped in terms of their employment status. The data showed that full-time under probation educators and staffs are more knowledgeable in this area compared to regular and part-time employees. Meanwhile, although part-time employees possess the lowest mean score in this category, its gap with the score recorded for regular employees is insignificant. This finding guides the institution to take greater importance on full-time (probationary) employees, particularly educators, if they want an increase in the institution's number of research conference presentations.

Table 29. Difference in the knowledge levels on Research Publication among the respondents based on employment status

	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	5.466	3	1.822	9.698	.000
Within Groups	7.140	38	.188		
Total	12.606	41			

The data indicates that there is a significant difference in the knowledge level of the institution's faculty members and staff in terms of research publication when they are grouped in terms of their employment status. The analysis showed that regular employees possess the highest knowledge level in research publication, followed by part-time employees, while full-time ones

are the least knowledgeable. This means that employment status can be used as an indicator in determining who have a better understanding compared to others. Additionally, this is evidence that the institution should start to consider including part-time educators in the incentivization program for research published in journals.

Table 30. Difference in the attitude on Research Writing among the respondents based on employment status

	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	4.110	3	1.370	2.385	.084
Within Groups	21.830	38	.574		
Total	25.940	41			

Table 30 shows that there is no significant difference in the attitude of the institution's faculty members and staff in terms of research writing when they are grouped in terms of their employment status. This means that employment status cannot be used as an indicator in determining who have a better appreciation and familiarity on the importance writing a research, compared to others.

Table 31. Difference in the attitude on Research Conferences among the respondents based employment status

	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	7.772	3	2.591	5.680	.003
Within Groups	17.333	38	.456		
Total	25.105	41			

The results indicate that there is significant difference in the attitude of the institution's faculty members and staff in terms of research conferences when they are grouped in terms of their employment status. The analysis revealed that regular employees, followed by full-time ones have the greatest appreciation and understanding towards the importance of presenting research in conferences. This could mean that efforts from the institution to develop knowledge and skills of regular and full-time employees towards presenting research is likely to result

in a significant increase in the number of research conference engagements among the institution's educators and staff.

Table 32. Difference in the attitude on Research Publication among the respondents based on employment status

	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	8.722	3	2.907	5.247	.004
Within Groups	21.055	38	.554		
Total	29.776	41			

This table presents significant difference in the attitude of the institution's faculty members and staff in terms of research publication when they are grouped in terms of their employment status. The analysis showed that respondents with regular employment status possess the highest knowledge level in research publication, followed by full-time employees, however, it should be noted that the gap between the groups' mean scores is insignificant, meanwhile, with an overwhelming gap from the mean scores of the said groups, part-time employees recorded the least score.

Table 33. Difference in the knowledge on Research overall among the respondents based on employment status

	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	.813	3	.271	1.113	.356
Within Groups	9.260	38	.244		
Total	10.074	41			

The knowledge of the respondents towards research overall does not vary in terms of employment status. Although in all individual research categories, employment status can be used as an indicator of the knowledge level variations, when it comes to the overall analysis, it cannot be used to determine whether someone is better in research than others. This is because for every research category, the order of groups in terms of level of knowledge differs.

Table 34. Difference in the attitude on Research overall among the respondents based on employment status

	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	2.165	3	.722	1.551	.217
Within Groups	17.677	38	.465		
Total	19.842	41			

The attitude of the respondents towards research overall does not vary in terms of employment status. It was clear that in all research categories, employment status can be used as an indicator of the attitude variations, however, when it comes to the overall analysis, it cannot be used to determine whether someone appreciates research and understands its benefits more than others. This is because for every research category, the groups with the highest and lowest level of attitude differ.

DISCUSSION

This findings from this study indicate significant gaps in research-related knowledge and skills among faculty members and non-academic staff in a selected higher education institution. Across areas like research writing, conference presentations, and publication practices, participants scored low, with an overall mean knowledge score of 2.67. These gaps highlight misconceptions in essential aspects of research, including literature review organization, sampling methods in quantitative research, and the appropriate sections for statistical information. These misunderstandings may be rooted in inadequate research training, despite the respondents' educational backgrounds, underscoring a need for improved research instruction and support.

In terms of research conferences, respondents held some mistaken beliefs regarding conference structures and protocols, reflecting limited experience. Many assumed conferences universally require panel questioning, extensive presentation times, and full manuscripts upon submission, which is not always the case. Specific examples, such as conferences that only require an abstract or those that lack panel questioning, reveal the diversity in conference formats that the respondents might not fully

understand. These findings suggest a need to equip educators with knowledge about the flexible nature of conferences and how to distinguish between credible and potentially exploitative events.

The data also reveal a limited understanding of the publication process, with respondents mistakenly believing that all journals follow a five-chapter thesis structure, that publication fees are mandatory, and that indexing by Google Scholar is a hallmark of quality. In reality, many reputable journals follow the IMRAD format, offer free publication options, and require extensive peer-review processes that can take several months or more. The mistaken beliefs among the respondents may expose them to risks of predatory journals that capitalize on these knowledge gaps. Addressing these misconceptions could reduce the likelihood of faculty engaging with low-quality journals, preserving the academic integrity of their work and the institution's reputation.

Interestingly, although respondents displayed limited research knowledge, they generally maintained a positive attitude toward research writing, conferences, and publications. With an overall mean attitude score of 2.36 for conferences and 2.31 for publications, respondents viewed these activities as beneficial to their careers and manageable in terms of effort. Despite this optimism, their knowledge limitations may hinder effective participation and risk the submission of substandard research papers. Bridging the gap between positive attitudes and practical knowledge through workshops and mentorship could enhance their competency and confidence.

The study also uncovered some differences in knowledge and attitudes based on age, gender, and tenure. Middle-aged faculty and staff demonstrated higher knowledge in research writing and publications, while younger employees scored lowest. In conference-related attitudes, those over 58 showed the most appreciation, despite being less active in research forums compared to younger educators. Such findings suggest age as a potential indicator for knowledge in specific areas, although the results challenge traditional assumptions that older faculty naturally possess greater research expertise. Similarly, men generally scored higher in research writing, while women displayed a stronger understanding of conference presentation practices. Faculty tenure also appeared to affect knowledge levels, with those in the institution for 4-6 years scoring highest across most areas.

These findings emphasize the need for targeted professional development programs in higher education

institutions, focusing on closing knowledge gaps and enhancing practical skills for research, conference participation, and publishing. Additionally, tailored support for diverse demographic groups may optimize training effectiveness. By investing in such initiatives, institutions can foster a research culture that combines enthusiasm with skill, preparing faculty and staff to contribute meaningfully to academic and professional discourse.

Conclusion

The study uncovers a crucial insight: despite limited knowledge, faculty and staff exhibit a positive attitude toward engaging in research activities. This finding is novel because it reveals a unique scenario where motivation exists independently of expertise, suggesting a fertile ground for enhancing research capacity through targeted knowledge-building initiatives. The researchers also observed that many respondents were discouraged from engaging in research due to financial concerns, stemming from the misconception that presenting at conferences and publishing in legitimate journals always require fees. Therefore, it is essential for the institution's research and development office to raise awareness among employees about opportunities for free-to-present conferences and free-to-publish journals, helping to motivate their involvement in research activities.

Another significant finding is that the knowledge and attitudes of the institution's faculty and staff vary depending on the research area—whether research writing, conference presentations, or journal publication. Competency and appreciation for research cannot be generalized across all areas; instead, they differ according to specific research activities. This is evident in the results, which show that while there are no significant differences in overall research knowledge and attitudes, certain demographic groups exhibit higher knowledge and more positive attitudes in specific areas, such as research writing, conference presentations, or journal publication.

Lastly, it should be noted that the study also initially aimed to explore knowledge and attitude differences based on educational attainment and departmental affiliation. However, the low survey participation rate, particularly among doctorate holders and employees from several specific departments, limited the ability to analyze these variables thoroughly. This low representation highlights a need for future research to focus on

strategies to boost survey participation across diverse educational backgrounds and departments. Addressing these gaps in sample representation would allow for a more accurate assessment of the institution's research capacity and enable targeted support to improve research engagement across all departments.

Recommendations

- **Targeted Training for Specific Research Areas:** Offer tailored workshops or training sessions that address research writing, conference presentations, and journal publications separately. This approach can help address the varying levels of knowledge and attitudes toward different research activities, improving skills where they are most needed.
- **Increase Awareness of Inclusive Research Opportunities:** The Research and Development Office should actively promote awareness among faculty and staff about free-to-present conferences and free-to-publish journals. This could be done through newsletters, informational sessions, and departmental announcements to dispel misconceptions about the cost of research activities. Specific example are: the sending of monthly bulletins listing upcoming free-to-present conferences and free-to-publish journals, which includes step-by-step instructions on how to apply, and contact points for questions to reduce confusion or hesitation, and the creation of a Resource Library of Free Journals and Conferences.
- **Expanded Incentive Program for Research Publication:** Expand the existing incentivization program to include part-time employees, recognizing their contributions to research publications. By offering financial incentives, awards, or professional development opportunities for part-time and regular employees alike, the institution can promote a more inclusive research culture and encourage broader participation. Additionally, this expanded incentive can help improve publication knowledge among full-time employees, which has

recorded the least knowledge level in this area, by fostering a sense of competition and collaboration across employment statuses.

- **Mentorship Program Pairing Experienced and Younger Researchers:** Implement a mentorship program that pairs faculty members who are new to research with experienced educators in research and publication. This approach can help younger employees gain insights and knowledge from seasoned mentors, while older faculty members benefit from the fresh perspectives and digital proficiency that younger ones bring, or vice versa. Such cross-generational mentorship would foster collaboration and skill-sharing across age groups, ultimately enhancing research competencies institution-wide. This means that the Research and Development Office (RDO) should take actions to encourage research collaborations beyond experienced researchers within the institution, particularly those who have already collaborated on research projects. The RDO should recommend collaborating with new colleagues, rather than repeatedly working with those who have already been part of past research collaborations, in order to spread research productivity throughout the institution.

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Efficacy of Teasing and Thin Sectioning Methods on Nucleic Acid and Protein Recovery from Formalin-Fixed Paraffin-Embedded Tissue Blocks

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- **Tissue Blocks**
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- **DNA Extractions**

Abstract. Retrospective molecular studies benefit greatly from the use of tissue blocks that have been formalin-fixed paraffin-embedded (FFPE). Nevertheless, a significant obstacle still exists in the effective extraction of high- quality DNA and protein from these blocks. The purpose of this study is to evaluate the effectiveness of two popular tissue extraction techniques: thin sectioning and teasing. Both techniques were applied to FFPE tissue blocks, and the yields of proteins and DNA, together with

the purity ratios that resulted, were evaluated.

Our results show that thin sectioning consistently produced higher yields of DNA and protein than the teasing method. Thin

sectioning performs better because it minimizes the loss of cellular content while producing a more uniform and representative sample of the tissue. Furthermore, thin sectioning may result in less tissue damage, which could improve the quality of the proteins and nucleic acids that are extracted.

These results have significant implications for researchers working with FFPE tissue. Tissue extraction techniques can be improved to increase the yield and caliber of molecular information gleaned from archival samples. In addition to improving our knowledge of disease mechanisms and the creation of tailored medicines, this could result in more precise and trustworthy diagnostic and prognostic data.

Future research could examine how various tissue types, fixation durations, and slice thicknesses affect how effective these extraction techniques are. Furthermore, the quality and amount of molecular material extracted from FFPE tissue may be further enhanced by the development of innovative procedures like laser capture microdissection.

Efficacy of Teasing and Thin Sectioning Methods on Nucleic Acid and Protein Recovery from Formalin-Fixed Paraffin-Embedded Tissue Blocks

INTRODUCTION

Histological techniques are essential for examining tissue structure and function, providing critical insights into cellular organization, developmental processes, and disease progression (Reshma et al, 2022). These techniques facilitate the observation of tissue architecture at the microscopic scale, uncovering cellular and subcellular details essential for comprehending physiological and pathological states. Teasing and thin sectioning are prevalent histological preparation techniques employed for the analysis of soft and fibrous tissues, such as muscle, nerve, and connective tissues (Diniz, Erdogan, and Yildirim, 2023)). Teasing entails the mechanical disjunction of tissue fibers, facilitating the isolation and observation of specific structures with little distortion. Conversely, thin sectioning involves cutting tissues into delicate layers, usually 5- 10 micrometers thick, while maintaining tissue integrity in a two-dimensional format (Orlova and Drozd, 2020). Although both techniques are essential for histological studies, they can impose different levels of physical or chemical stress on the sample, which may affect nucleic acid integrity and purity, particularly when molecular analysis is conducted after histological examination (Ueda et al, 2021). Notwithstanding the technical differences among these approaches, there is limited knowledge on their relative impacts on nucleic acid quality, which is essential for guaranteeing precise downstream molecular studies.

Recent advancements in molecular biology have merged histology with nucleic acid analysis, improving the capacity to investigate gene expression, DNA mutations, and protein production in particular tissues. Effective molecular analysis necessitates high-quality nucleic acids, which are generally assessed according to concentration and purity metrics, including absorbance ratios (A260/280 and A260/230) (Tang et al, 2023). The A260/280 ratio measures protein contamination, whereas the A260/230 ratio analyzes contamination from other organic substances. Despite the prevalent use of teasing and thin sectioning, few research examine the effects of these procedures on nucleic acid concentration and purity. Therefore, it is imperative to examine if the histological preparation procedure influences nucleic acid quality, since this may have considerable ramifications for research requiring high-purity nucleic acids.

Although teasing and thin sectioning are conventional methods in histology, a notable deficiency exists in the literature concerning their effects on the quality of nucleic acids recovered from processed tissues. Prior research has predominantly concentrated on morphological and structural evaluations, analyzing tissue integrity and cellular specifics without incorporating molecular characteristics (Tang et al, 2023). This focus on visual quality frequently neglects any biochemical alterations in nucleic acids resulting from the mechanical and chemical processes during sample preparation. Moreover, histological protocols typically prioritize the preservation of cellular architecture, although they seldom consider the subsequent molecular integrity of nucleic acids, which may be jeopardized by various preparation techniques (Viljoen, Booysen and Tantuan, 2022). Given that absorbance ratios (A260/280 and A260/230) and concentration are essential indications of nucleic acid quality, a comparative evaluation of these metrics after teasing and thin section preparation is necessary. This evaluation would address a significant knowledge gap and enhance preparation processes for applications necessitating both morphological and molecular studies.

Furthermore, in applications like as clinical diagnostics and research where molecular and histological analyses are interconnected, the selection of preparation procedure may impact study results. Teasing and thin sectioning may differentially impact nucleic acid integrity due to their unique methodologies: teasing entails the physical manipulation of fibers, potentially inducing mechanical stress, whereas thin sectioning may subject tissues to particular chemicals and dehydration processes (Yi et al, 2020). The absence of comparable data hinders researchers and physicians from determining which preparation process optimally preserves nucleic acid quality, potentially restricting studies that necessitate both high morphological fidelity and molecular integrity.

Examining the influence of histological preparation methods on nucleic acid integrity is essential for enhancing both histology and molecular processes. This research seeks to elucidate how teasing and thin sectioning affect nucleic acid concentration and purity, hence guiding best practices for studies dependent on both morphological and molecular data (Moss & Smith, 2019). Enhanced nucleic acid quality can augment the precision and dependability of molecular analyses, which are progressively included into clinical diagnostics, criminal investigations, and biological research (Gill et al., 2017). This research may result in enhanced preparation techniques that account for tissue integrity and molecular stability, hence facilitating more consistent and repeatable findings across experiments.

In clinical environments, where precise diagnosis frequently depends on histological evaluation succeeded by molecular analysis, enhancing sample preparation may mitigate the risk of degraded nucleic acids, hence augmenting diagnostic accuracy. In research environments, where gene expression studies and mutation analyses of tissue samples are prevalent, the assurance of high-quality nucleic acids is essential for achieving accurate and reproducible outcomes. This research addresses these demands, contributing to the broader field of histology and

molecular methods and offering insights that may help various disciplines.

This study aims to compare the concentration and absorbance values (A260, A280, A230, A260/280, and A260/230) of nucleic acids extracted from tissues prepared using teasing and thin section methods. Concentration measurement estimates nucleic acid yield, the A260/280 ratio indicates protein contamination, and the A260/230 ratio reflects contamination from other organic molecules such as phenols or carbohydrates (Tang et al, 2023). This investigation aims to ascertain whether teasing or thin section preparation yields superior nucleic acid purity and yield, hence guiding procedure selection according to specific experimental needs (Tang et al, 2023).

This work seeks to clarify important discrepancies in nucleic acid quality by comparative analysis, enabling researchers and physicians to make informed choices regarding tissue preparation methods. If significant discrepancies are identified, recommendations may be formulated to assist researchers in selecting the suitable histological preparation procedure, based on the prioritization of either morphological detail or molecular purity in the investigation. This discovery may lead to enhanced techniques that optimize tissue preservation and nucleic acid integrity, hence improving the quality of histology and molecular analysis.

METHODOLOGY

Sample Collection

Freshly prepared paraffin-embedded tissue blocks were acquired from a tertiary hospital. The specimens comprised tissues from the breast, fallopian tube, gallbladder, uterus, and myoma. The blocks were meticulously handled to ensure uniformity throughout processing and examination.

Preparation for Tissue Teasing

Small portions of paraffin-embedded tissue blocks were extracted using sterile forceps for teasing preparation. The tissues were manually fragmented into small threads utilizing teasing needles. The teased fibers were subsequently placed into sterile, labeled microcentrifuge tubes and reserved for additional processing.

Cutting of Thin Sections

For thin section preparation, the paraffin-embedded tissue blocks were meticulously cut to reveal a uniform tissue surface. Thin slices, 5 micrometers thick, were cut using a rotary microtome and floated on a water bath maintained at 40°C for flattening. The portions were affixed to labeled glass slides and allowed to dry at ambient temperature for 24 hours. Upon drying, the sections were meticulously scraped from the slides using sterile scalpels and subsequently put into microcentrifuge tubes.

Deparaffinization

Deparaffinization was conducted immediately in microcentrifuge tubes to guarantee the thorough elimination of paraffin from the tissue specimens. Xylene was introduced into each tube containing teased or thin-sectioned tissue. The tubes were securely sealed and quickly vortexed to ensure complete mixing. The samples were subsequently centrifuged at 12,000 x g for 5 minutes to isolate the paraffin from the tissue. After centrifugation, the xylene supernatant was meticulously extracted without disrupting the tissue pellet. The washing procedure was reiterated by incorporating new xylene, vortexing, and centrifuging under identical conditions. Subsequent to the second wash, the supernatant was eliminated, and the tissue pellets were air-dried for several minutes to guarantee the thorough elimination of leftover xylene. The deparaffinized tissues were promptly utilized for DNA extraction to avert deterioration or contamination.

DNA Extraction

The Promega DNA Extraction Kit was utilized for DNA extraction. Tissue samples were subjected to overnight digestion in 600 μL of lysis buffer supplemented with 20 μL of proteinase K at 56°C. Following digestion, a binding buffer was introduced, and the lysates were transported to spin columns for DNA binding. The columns were rinsed twice with the supplied wash buffers to eliminate impurities. Ultimately, DNA was eluted using 50 μL of nuclease-free water. The content and purity of DNA were evaluated using a NanoDrop spectrophotometer, measuring absorbance at A260, A280, and A230. The A260/280 and A260/230 ratios were computed to assess protein and organic contamination, respectively.

Data Analysis

The DNA concentration and purity parameters were statistically analyzed comparing teasing and thin section preparation procedures utilizing SPSS software. The Mann-Whitney U test was utilized to ascertain significant differences between the two groups, as this non-parametric test is suitable for non-normally distributed data. Results were reported as medians accompanied by interquartile ranges, with significance established at $p < 0.05$, ensuring rigorous statistical assessment.

RESULTS

Table 1 Comparison of DNA and Protein Purity Between
the Teasing and Thin Sections (n=5)

Parameter	Teasing Method	Thin Section Method	p Value	Interpretation
Concentration (ng/ml)	5.3088 ± 3.27	44.87 ± 40.81	.008	Significant
A260	.1056 $\pm .07$	.8960 $\pm .82$	.008	Significant
A280	.1286 $\pm .06$	.8070 $\pm .82$	.008	Significant
A230	-.0046 $\pm .06$	.6014 $\pm .57$	.008	Significant
A260:A280	.7480 $\pm .26$	1.1900 $\pm .13$	.008	Significant
A260:A230	2.6180 ± 2.70	1.5140 $\pm .07$	.690	Not significant

The comparison of DNA and protein purity between the "Teasing" and "Thin Section" procedures, examined by the Mann-Whitney U test, demonstrates statistically significant differences in the majority of parameters, except for A260:230. The DNA concentration in the Thin Section method (44.87 ± 40.81 ng/ml) is markedly greater than that in the Teasing method (5.3088 ± 3.27 ng/ml), with a p-value of 0.008, demonstrating a superior DNA yield for the Thin Section technique. Absorbance values at A260 (0.8960 ± 0.82) and A280 (0.8070 ± 0.82) are significantly elevated for the Thin Section method in comparison to the Teasing method, with corresponding p-values of 0.008, indicating a more efficient isolation of nucleic acids and proteins in the Thin Section technique.

The A260 ratio, an essential indicator of nucleic acid purity, demonstrates a statistically significant enhancement in the Thin Section approach (1.1900 ± 0.13) compared to the Teasing method (0.7480 ± 0.26), with a p-value of 0.008. This finding highlights the Thin Section method's efficacy in generating

samples with less protein contamination (Nguyen et al, 2022). The A260 ratio, indicative of contamination by organic chemicals

and salts, shows no significant difference between the two approaches ($p = 0.690$). The elevated mean ratio noted in the Teasing approach (2.6180 ± 2.70) relative to the Thin Section method (1.5140 ± 0.07) indicates heterogeneity in the efficacy of eliminating non-nucleic acid impurities; however, this disparity lacks statistical significance.

These data indicate that although the Thin Section approach provides notable benefits for DNA yield and purity, many elements of contaminant removal, as evidenced by the A260 ratio, are similar between the two methods (Yi et al, 2020).

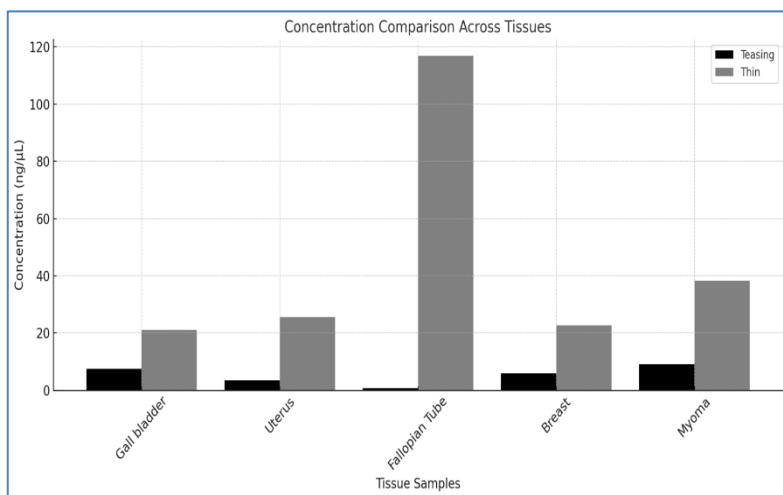


Figure 1 Comparison of DNA concentration values between Teasing and Thin Sections Tissue Preparations

The bar chart illustrates the DNA concentration (ng/μL) in different tissue types, namely the gallbladder, uterus, fallopian tube, breast, and myoma, under two situations designated as "Teasing" and "Thin." The variation in DNA content is significant, especially in the fallopian tube, where the "Thin" condition demonstrates the highest concentration, surpassing 120 ng/μL. This notable increase indicates that DNA extraction techniques or tissue-specific cellularity may have affected the measured concentration

levels (Heymann et al., 2020). These findings correspond with research highlighting the impact of tissue composition on nucleic acid yields (Zhu et al., 2022).

The gallbladder and uterus exhibit very low DNA concentrations under the "Teasing" condition, with marginal increases observed under the "Thin" condition. This observation aligns with research suggesting that denser connective tissues, such those present in the gallbladder, can impede efficient DNA extraction, leading to diminished yields (Vinueza-Espinosa et al., 2020). Conversely, myoma tissues exhibit a significant elevation in DNA concentration under the "Thin" condition, potentially attributable to improved extraction techniques or diminished degradation factors, as reported in research on fibrous tissues (Cruz-Flores et al., 2022).

The breast tissue exhibits moderate DNA quantities in both circumstances, indicating its intermediate cellularity and lipid content. This consistency corroborates prior observations that adipose-rich tissues can generate sufficient DNA with optimal methods (Dabrowski et al., 2024). The table underscores the necessity of customizing DNA extraction techniques to the unique attributes of specific tissues to get consistent amounts. The significant disparities noted among tissues and situations emphasize the necessity for standardized procedures to facilitate effective result comparison (Kim et al., 2024).

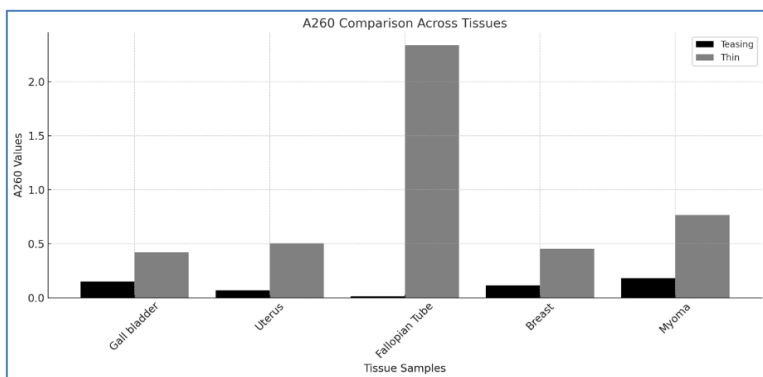


Figure 2 Comparison of A260 values between Teasing and Thin Sections Tissue Preparations

This graphic juxtaposes A260 values from diverse tissue samples (Gall Bladder, Uterus, Fallopian Tube, Breast, and Myoma) under two situations, designated as "Teasing" and "Thin." A260 is commonly utilized as an indicator of nucleic acid purity or concentration, frequently employed in molecular biology to assess sample quality (Sophian and Syukur, 2021). The data demonstrates that the "Thin" condition consistently exhibits elevated A260 values across all tissue types in comparison to "Teasing." This indicates that the "Thin" preparation technique may provide samples with elevated nucleic acid concentration or purity.

The Fallopian Tube sample demonstrates the highest A260 value under the "Thin" condition, surpassing 2.0, indicating substantial nucleic acid enrichment or superior sample preparation. This discrepancy may be ascribed to biological changes or discrepancies in sample management (Dabrowski et al 2024). Other tissues, including the gallbladder, uterus, and myoma, exhibit moderate increases under the "Thin" condition, with comparatively lower A260 values than the fallopian tube, indicating tissue-specific factors that affect sample quality (Sophian, 2021).

The findings emphasize the significance of choosing suitable preparation techniques, as the "Thin" method seems to improve nucleic acid recovery or purity. Additional investigation may elucidate the fundamental causes of these inconsistencies, such variations in tissue composition or the particular technology utilized during sample extraction (Ye and Lei, 2023).

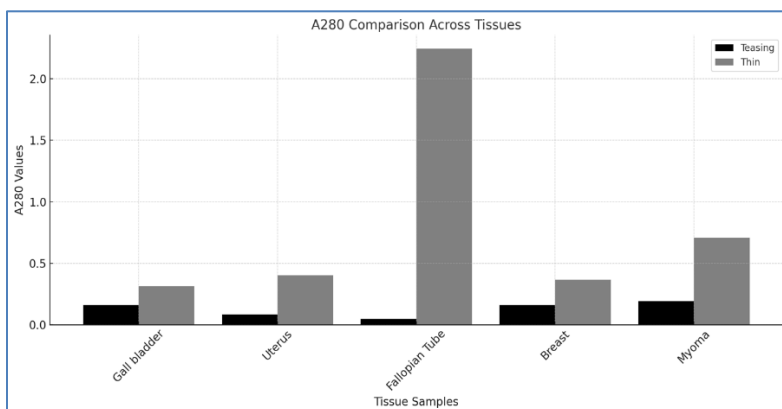


Figure 3 Comparison of A280 values between Teasing and Thin Sections Tissue Preparations

The graph illustrates the A280 values, which serve as a measure of protein content or contamination in nucleic acid samples, across various tissue types (Gall Bladder, Uterus, Fallopian Tube, Breast, and Myoma) under two situations, "Teasing" and "Thin." The "Thin" condition typically demonstrates elevated A280 values across all tissue types, indicating a greater protein production or possible contamination relative to the "Teasing" condition. The A280 measurement, frequently employed in spectrophotometric analyses, is essential for evaluating the integrity of nucleic acid extractions, given that proteins absorb light at 280 nm (Paradisa et al., 2024).

The Fallopian Tube sample under the "Thin" condition exhibits a significantly increased A280 value, above 2.0. This discovery indicates either a high protein concentration or possible contamination. Comparable patterns, albeit to a diminished degree, are noted in Myoma and Breast tissues under the "Thin" condition. The tissues of the Gall Bladder and Uterus exhibit a similar pattern, albeit with far lower values. These findings underscore tissue-specific variations in protein extraction efficacy or contamination vulnerability during sample preparation (Stroh et al, 2021).

The relatively reduced A280 values noted under the "Teasing" condition indicate that this approach may more effectively reduce protein contamination, while potentially leading to diminished protein recovery. This highlights the necessity of refining preparation techniques according to experimental objectives, such as nucleic acid purity compared to yield. Additional inquiry may elucidate the precise causes of these discrepancies, including tissue composition, preparation processes, or methodological inconsistencies (Jing et al, 2024).

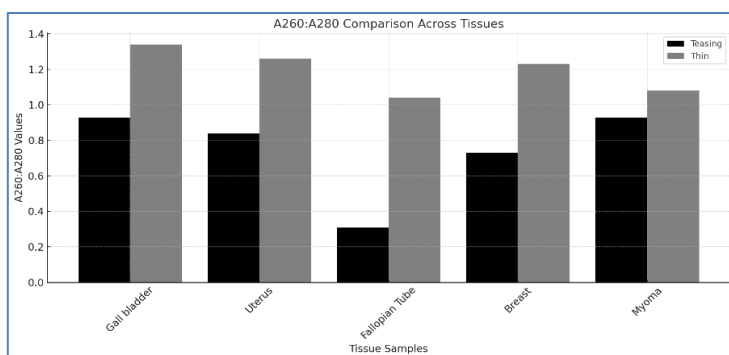


Figure 4 Comparison of A260:280 ratio between Teasing and Thin Sections Tissue Preparations

The A260:280 ratio is a commonly utilized metric for evaluating the purity of nucleic acid materials, specifically DNA and RNA. This ratio is derived from the absorbance of UV light at 260 nm and 280 nm, which correspond to the peak absorbance of nucleic acids and proteins, respectively (Tang et al, 2022). A ratio around 1.8 generally signifies pure DNA, whereas a value near 2.0 indicates pure RNA, with deviations suggesting possible contamination by proteins, phenol, or other chemicals (Heravi et al., 2020). The graphic illustrates variations in the A260 ratio among different tissue samples under "Teasing" and "Thin" conditions, underscoring the impact of sample preparation methods on nucleic acid purity (Chovatia, Sharma and Gutierrez, 2020)

Tissue samples, including the gall bladder and myoma, exhibit notable discrepancies between the two methodologies, indicating that "Thin" preparations may produce more refined nucleic acid extracts, as evidenced by elevated A260 values (Tang et al, 2022). Conversely, diminished ratios, seen in the fallopian tube under both conditions, may signify the existence of pollutants or inadequate protein removal during extraction (Heravi et al., 2020). These findings highlight the necessity of refining extraction techniques to guarantee regular and dependable outcomes (Dairawan and Shetty, 2020).

The diversity in A260 ratios among tissue types may indicate inherent heterogeneity in their biochemical makeup, underscoring the necessity for technique standardization unique to each tissue. These results have substantial significance for downstream applications like qPCR, where nucleic acid purity is essential for accuracy and reproducibility (Chovatia, Sharma and Gutierrez, 2020).

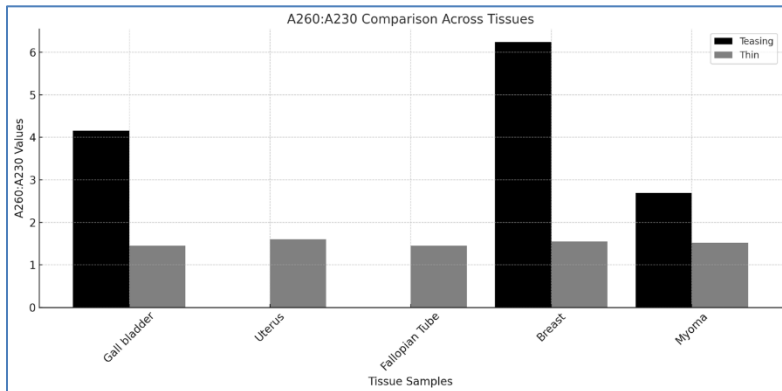


Figure 5 Comparison of A260:283 ratio between Teasing and Thin Sections Tissue Preparations

The A260:230 ratio is an essential metric for evaluating the purity of nucleic acid samples, with values generally between 2.0 and 2.2 signifying high-quality nucleic acids (Tang et al., 2022). Absorbance at 230 nm predominantly indicates contamination by organic molecules, including carbohydrates, phenols, and residual

salts, which can substantially disrupt subsequent molecular biology applications (Heravi et al, 2020). Variations in purity among tissue samples and preparation procedures, as illustrated in the provided chart, indicate deviations from the optimum range (Tang et al, 2022).

The data indicate that "Teasing" procedures provide elevated A260 ratios in specific organs, including the breast and gall bladder, implying less contamination relative to the "Thin" method. This discovery may suggest that teasing techniques are superior in separating nucleic acids while reducing the contamination of contaminants. In contrast, persistently lower ratios in the "Thin" samples across all tissue types indicate a greater presence of contaminants, potentially undermining the integrity and usefulness of the extracted nucleic acids.

The discovered discrepancies highlight the necessity for meticulous adjustment of extraction techniques customized for specific tissues, as various biological matrices may necessitate unique purifying strategies to attain maximum purity (Tang et al, 2022). The variation in A260 ratios among tissues and procedures underscores the necessity of including quality checks into standard nucleic acid purification protocols to guarantee consistency and reliability in molecular tests (Chovatia, Sharma and Gutierrez, 2020).

Conclusion

The accompanying bar charts illustrating comparisons of Concentration, A260, A280, A230, and A260 ratios across diverse tissues yield the following conclusions for a research article:

Variability of Concentration Across Tissues:

The fallopian tube samples demonstrate the greatest concentration values, especially in the "Thin" category, signifying a markedly superior nucleic acid production relative to other tissues.

Nyoma and breast tissues also show moderate concentration levels, while gall bladder and uterus have comparatively lower values. The A260 and A280 measurements exhibit a comparable trend, with the fallopian tube samples consistently demonstrating the highest values in the "Thin" group. The A230 values, indicative of organic compound contamination, are consistently low throughout tissues but exhibit a modest increase in the fallopian tube samples. The A260 ratio, indicative of nucleic acid purity in relation to organic pollutants, is significantly elevated in gall bladder and breast tissues under the "Teasing" group, signifying high nucleic acid purity.

Samples from the fallopian tubes have the highest quantities but possess relatively lower purity indices, indicating possible contamination. The "Thin" procedure demonstrates superior concentration and spectrophotometric values for fallopian tube samples across all measures, underscoring its efficacy for this tissue type. The "Teasing" protocol exhibits superior performance for purity (A260 ratio) for certain tissues such as the gall bladder and breast, suggesting its appropriateness for applications where purity is prioritized above yield.

The research reveals tissue-specific differences in nucleic acid output and purity, with fallopian tube samples producing the highest amounts using the "Thin" procedure. Nonetheless, the gallbladder and breast tissues yield superior purity indices under the "Teasing" technique, indicating that protocol selection should be customized according to the tissue type and the desired downstream use. These findings emphasize the necessity of refining sample processing techniques to achieve an equilibrium between yield and purity for particular research requirements.

Recommendations

Graphs in this article were produced using generative AI software.

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Evaluation of ROTC Program in the Tertiary Level: Basis for Improvement of the Delivery of Training and Instruction.

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KEYWORDS:

- **Life-saving skills**
- **Behavioral improvement**
- **Disaster preparedness**
- **Insurgencies**
- **Advantages**
- **Weaknesses**

Abstract. In accordance with the mandate of Republic Act No. 7077, also known as the Citizen Armed Forces of the Philippines Reservist Act of 1991, to “motivate, train, organize and mobilize” students for national defense preparedness, the Reserve Officers’ Training Course (ROTC) program’s outcomes must be evaluated to determine whether the program is responsive to the needs of the

national government and local communities today and develops future members of an efficient Citizens Armed Forces. This study evaluates the advantages and weaknesses of the ROTC Program implemented at the tertiary level. It utilized the descriptive research design, along with a researcher-made survey questionnaire administered to 121 respondents, comprising 58 Criminology graduates and 63 fourth year Criminology students from colleges in Region IV-A

(CALABARZON). Findings revealed that the ROTC program was most focused on preparing students for challenges related to insurgency and national security threats and in fostering patriotism, despite some weaknesses in these aspects. It also had a positive impact on students' behaviors; however, the program had most significant weaknesses in this aspect. Also, the program has equipped students in handling emergencies and disasters. However, there is room for improvement in how ROTC equips students with essential life-saving skills and prepares them for various disaster scenarios, especially in providing more comprehensive and practical training in these areas. A review of the ROTC Program of Instructions, as well as improvements in training and instruction delivery, will assist in fulfilling national mandates and in shaping the future of ROTC in the country.

Evaluation of ROTC Program in the Tertiary Level: Basis for Improvement of the Delivery of Training and Instruction

INTRODUCTION

The Reserve Officers' Training Corps (ROTC) was institutionalized under Sections 38 and 39 of Republic Act No. 7077, also known as the Citizen Armed Forces of the Philippines Reservist Act of 1991, to provide military training to tertiary-level students in order to "motivate, train, organize and mobilize them for national defense preparedness." The ROTC used to be mandatory but later became optional and voluntary for college students following the signing of Republic Act No. 9163, or the National Service Training Program (NSTP) of 2001. In 2019, former President Rodrigo Duterte called the Congress to pass the mandatory ROTC program in public and private senior high schools nationwide in a bid to promote "gallantry, bravery, and spirit of volunteerism" among the Filipino youth (Gita-Carlos, 2019).

The mandatory ROTC and national training program focused on disaster management and civic duty are included in the 18 priority legislations of President Ferdinand Marcos Jr. (Antonio, 2022). In July 2022, some senators expressed their intention to revive the ROTC program as a mandatory subject for Filipino students (Bacelonia, 2022). In September 2022, Vice President Sara Duterte, who was then Department of Education Secretary, met with the uniformed branches of service to discuss the ways forward of mandatory ROTC (Antonio, 2022).

The implementation of mandatory ROTC in Senior High School has received both praise and hostility from the public. Supporters believed that the revival of ROTC will promote patriotism with high respect for human rights, a higher sense of moral value, and responsible citizenry, as well as replenish and strengthen national defense (Rey, 2018). Studies with parents and

stakeholders advocated mandatory ROTC because it is believed to instill discipline and leadership among the youth (Salvador, 2021; Dianga, 2023). The survey by Barrios (2023) with a sample comprising of policemen, senior high school students, parents, and teachers strongly agreed that the ROTC program can motivate and train students to become government partners for the nation-building and preservation, as well as can assist in mobilizing and organizing students in responding to national security concerns. On the contrary, critics believed it could be an “added burden” to parents or a nest of abuse and corruption. Also, progressive groups cited the Optional Protocol to the United Nations Convention on the Rights of the Child, which mandates that those under 18 years old should not be compulsorily recruited into the armed services. This protocol will then render the implementation of the program in the Senior High School unconstitutional (Antonio, 2022). Parents with negative experiences with CAT, ROTC, or the military contributed to their non-support to mandatory ROTC (Candaza et al., 2024).

In 2023, lawmakers passed house bills supporting the Mandatory ROTC and NSTP in the senior high school curricula, which are among the Marcos Administration’s top priorities. According to Senator Francis Tolentino (2023), the program aims to train both male and female students not only on physical military education, but also includes human rights, environmental care and protection, patriotism, personality and moral development, and disaster preparedness.

In the midst of opposing ideas and opinions about the reintroduction of the ROTC program, the researchers sought to gain additional insights into the current program through the lens of the ROTC graduates. The results of the study will help identify areas for improvement in the ROTC program in terms of delivery of training and instruction.

Statement of the Problem

This study aims to evaluate the Reserve Officers' Training Course (ROTC) Program implemented at the tertiary level as basis for improving delivery and instruction. Specifically, this study aims to answer the following questions:

1. What are the advantages of the existing ROTC Program in terms of:
 - 1.1 developing life-saving skills;
 - 1.2 behavioral improvement;
 - 1.3 capacitating students in times of disasters; and
 - 1.4 capacitating students in times of insurgency?
2. What are the weaknesses of the existing ROTC Program in terms of the four aspects?
3. What can be suggested to improve the existing ROTC program considering the four aspects?

Theoretical Framework

The evaluation of the ROTC program is guided by Kirkpatrick's Model of Evaluation developed by Dr. Donald Kirkpatrick. The model is extensively used for program evaluation, particularly the effectiveness of training and educational programs (Ulum, 2015). The model evaluates training or programs based on four (4) criteria:

Level 1: Reaction - The degree to which participants find the training favorable, engaging, and relevant to their jobs.

Level 2: Learning – The degree to which participants acquire the intended knowledge, skills, attitude, confidence, and commitment based on their participation in the training.

Level 3: Behavior – The degree to which participants apply what they learned during the training when they are back on the job

Level 4: Results - The degree to which targeted outcomes occur as a result of the training and the support and accountability package

Kirkpatrick's model sets out key evaluation criteria to measure the effectiveness of training programs, in such a way that weaknesses can be identified and future programs improved (Aliya, 2018).

Conceptual Framework

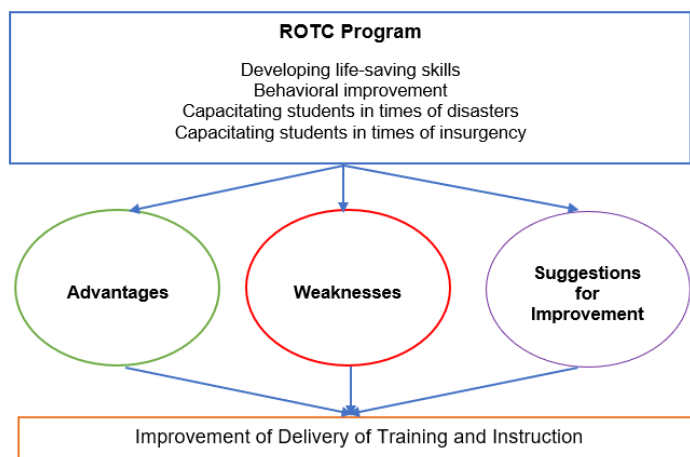


Figure 1. Paradigm of the Study

Figure 1 shows how the variables were treated in this study. The ROTC program has four aspects to be evaluated: developing life-saving skills, behavioral improvement, capacitating students in times of disasters, and capacitating students in times of insurgency. The single-headed arrows represent a descriptive assessment of the main variables: advantages, weaknesses, and suggestions for the improvement of the ROTC program based on the four aspects. The analysis of these variables provided the basis for recommendations to improve the delivery of training and instruction of the ROTC program.

Significance of the Study

This study will benefit the following:

Senior high school students. The study will propose a research-based ROTC program syllabus applicable to SHS students.

Through the syllabus, the students will be able to gain knowledge and skills that foster the values of nationalism, patriotism, and resiliency.

Department of Education. The experienced strengths and weaknesses of the existing program will serve as a useful reference for DepEd pertaining to what needs and does not need to be included in the development of the program of instruction for ROTC. Such information will aid in better implementation of the ROTC program for SHS students.

EAC-Senior High School. The study could be utilized by the Senior High School in proposing courses for inclusion in the syllabus or program of instruction to be developed by the Department of Education.

Commission on Higher Education. The study could be used as a base line to strengthen the current implementation.

Armed Forces of the Philippines. This study could be used to revisit and re strategize the delivery of the reserve officers training course to better achieve its objective aligned with the National government goals.

Government of the Philippines. The findings of the study may serve to bolster the initiatives of both the executive and legislative branches of government in enhancing the ROTC program effectively prepare students for disaster readiness and emergency response through the ROTC framework.

Scope and Limitation

This study focused on the evaluation of the existing ROTC Program implemented at the tertiary level, particularly the advantages, weaknesses, and suggestions for the improvement of said program. The evaluation of these variables are limited to categories namely, life-saving skills, behavioral improvement, capacitating students in times of disasters, and capacitating students in times of insurgency. This study covered graduates who are already employed and fourth-year Criminology students who completed the ROTC 1 and 2 in colleges/universities in Region IV-A (CALABARZON) offering CHED-recognized BS Criminology programs.

The batches of ROTC students enrolled at the height of the pandemic, that is from August 2020 to June 2022, were not included because they have taken the NSTP course online, which could affect the results of the study. Colleges and universities having Criminology programs without government recognition, as well as the perceptions of the Deans and Program Heads were not covered in the study.

Definition of Terms

The following are the operational definition of the variables used in this study:

Advantages. These refer to the strengths of the ROTC program in terms of life-saving skills, behavioral improvement, capacitating students in times of disasters, and capacitating students in times of insurgency.

Behavioral improvement. In this study, it refers to changes in an individual's physical, social, and cognitive values and abilities as a result of completing the ROTC program.

Capacitating students in times of disasters. In this study, this refers to student's or graduate's knowledge acquisition and application of disaster preparedness and response as a result of completing the ROTC program.

Capacitating students in times of insurgency. In this study, this refers to student's or graduate's knowledge acquisition about insurgency and counter-insurgency as a result of completing the ROTC program.

Delivery of training. It refers to the process of teaching knowledge and skills to students using appropriate tools and methodologies.

Delivery of instruction. It refers to the teachers' or facilitators' use of knowledge and skills to ensure that students understood and master the content.

Life-saving skills. In this study, it refers to the abilities gained from the ROTC program to help oneself and others in response to emergency situations, such as accidents and disasters.

Weaknesses. These refer to the areas of the ROTC program that need improvement, particularly in developing life-saving skills, behavioral improvement, capacitating students in times of disasters, and capacitating students in times of insurgency.

Review of Related Literature/Synthesis

Reserve Officers' Training Corps (ROTC) as a Component of the National Service Training Program (NSTP)

The Philippine government is committed to promoting civic consciousness and defense preparedness among the youth and developing their overall well-being. Civic consciousness refers to responsible citizenship (Pakikipagkapwa-Tao), or the "care and concern for fellowmen... based on socially accepted customs," such as giving way to elders in using elevators and being honest. On the other hand, defense preparedness involves the acquisition of military knowledge and skills (Salvador, 2021).

To achieve this mandate, the Philippine Government established the National Service Training Program (NSTP) for college students by virtue of Republic Act No. 9163, otherwise known as the National Service Training Program (NSTP) Act of 2001. According to this Act, the youth shall be motivated, trained, organized, and mobilized in military training, literacy, civic welfare, and other services to the nation. The NSTP has three components namely, Civic Welfare Training Service (CWTS), Literary Training Service (LTS), and the Reserve Officers Training Corps (ROTC). The NSTP mandates national defense for ROTC and civic consciousness for LTS and CWTS (Salvador, 2021).

The Implementing Rules and Regulations (IRR) of the NSTP Act of 2001 defined ROTC as the program designed to provide military education and training for students to mobilize them for national defense preparedness. In Emilio Aguinaldo College-Cavite, all first year Criminology students are required to complete the ROTC for an academic period of two semesters, as a requirement for graduation. In the first semester of the first year, ROTC students undergo a common module phase for 25 hours training period, together with CWTS and LTS. The module

comprises of “citizenship training, drug education, disaster risk reduction and management, environmental protection, and other national security concerns.”

Section 11 of the RA 9163 created the National Service Reserve Corps for graduates of CWTS and LTS. Moreover, ROTC graduates shall form part of the Citizen’s Armed Force pursuant to RA No. 7077, otherwise known as the “Citizen Armed Forces of the Philippines Reservist Act of 1991.” Section 7 Article III of RA No. 7077 mentioned that the Citizen Armed Force, known also as Reserve Force, aims to “(a) provide the base for the expansion of the Armed Forces of the Philippines in the event of war, invasion or rebellion; (b) to assist in relief and rescue during disaster or calamities; (c) to assist in socioeconomic development; and (d) to assist in the operation and maintenance of essential government or private utilities in the furtherance of overall mission.” It is thus essential that the ROTC Units prepare students to carry out these mandates as future members of the Citizen’s Armed Forces.

The Program of Instruction of ROTC

The standard program of instruction for ROTC 1 and ROTC 2, also known as Military Science 1 and Military Science 2, was designed to provide basic military education and leadership development to college students. Comparison of POIs for ROTC 1 from Dela Salle University, Emilio Aguinaldo College, and MAPUA University generally include the core components:

- Military orientation: Introduction of the Armed Forces of the Philippines (AFP), military courtesy and discipline, military justice, and military leadership
- Combat training of individual soldier (CTIS): familiarity with basic intelligence, basic map reading, basic communication signal, basic weapon training, and pre-marksmanship training (familiarization firing), basic survival
- Civil-Military operations: understanding the relationship between the military and communities, including disaster response and community service
- Public Information: understanding national security concerns (knowing the enemy of the state), anti and counter terrorism, peace human (human rights advocacy)

ROTC 2 provides specialized instruction. Students receive specific training based on their branch of service (Army, Navy, or Air Force). For example, Navy ROTC cadets may learn about seamanship and navigation, whereas Army cadets may focus on small unit tactics and marksmanship (De La Salle University, n.d.; Emilio Aguinaldo College, n.d.).

ROTC and Life-Saving Skills

Life-saving skills are abilities to help oneself and other people survive during life threatening situations (South Florida Health care Institute, 2022). According to the American Red Cross (n.d.), learning life-saving techniques is easy to learn and does not require professional medical background. Seven life-saving skills include cardiopulmonary resuscitation (CPR) and usage of automatic external defibrillator (AED) for cardiac arrest; back blows/abdominal thrusts, also known as Heimlich Maneuver, for choking; recognizing signs of stroke through FAST rule (Face, Arm, Speech, Time); First Aid, Tourniquet and Hemostatic dressing for sever bleeding; recognizing symptoms of severe allergic reaction (anaphylaxis); first aid for burns; and, first aid for bites and stings.

In 2016, the Armed Forces of the Philippines spokesman Brig. Gen. Restituto Padilla mentioned to enhance the ROTC program by incorporating basic life support and basic life-saving skills and other security functions in the military training, if mandatory ROTC will be revived (Villanueva, 2016). This was supported by the statement of Commission on Higher Education (CHED) Chairperson J. Prospero de Vera III in October 2022. He stated that the ROTC program should include teaching students with basic life-saving skills (e.g., swimming, first aid), especially during accidents and calamities (Sevillano, 2022).

ROTC and Behavioral Improvement

Several researches have proven that the ROTC program have instilled leadership. ROTC fostered an individual's sense of leadership, as cadets became better leaders and had positive leadership development experiences (Campbell, 2017). This is confirmed by a local study's findings that ROTC students gained skills to become "authentic leaders who set exemplary standards" and inculcate obedience and respect for others (Salazar et al., 2023). Specific factors in ROTC education contributed to the

enhancement of leadership skills. Real-life scenarios allow students to practice leadership, develop self-confidence, and build stress resilience. Also, reliable mentor feedback on their successes and failures, rather than simply learning various leadership theories, had a greater impact on their leadership (Campbell, 2017).

The ROTC program have also brought positive behavioral changes in students. The program instilled the values of humility and obedience to authority, as well as helped in the self-improvement and physical well-being among Criminology ROTC cadets (Pacatang & Montallana, 2022). In terms of health aspects, the physical exercises including running, push-ups, and sit-ups have improved the perseverance, strength and stamina of ROTC cadets. Students who participated in ROTC also demonstrated nationalism, as they recognized the importances of giving respect to the Philippine flag, adhering to the Philippine Constitution, and showing respect (Salazar et al., 2023). On the contrary, an earlier study found no changes, particularly in the resilience and self-control between ROTC cadets and non-ROTC students at Georgia Southern University (Campbell, 2014).

There is evidence that parents supported the ROTC program. Parents who experienced ROTC claimed that they gained positive effects on their well-being (Candaza et al., 2024). Moreover, Caangay and Baradillo (2023) found that a sample of Filipino parents believed that ROTC could instill discipline, which is lacking in students today, inculcate certain values, and prepare them for war. The lack of discipline is a peculiar attitude among 21st century learners, and ROTC's practice of military courtesy and discipline can help address this problem (Salvador, 2021). Thus, parents advocated for making ROTC program mandatory for all Filipino senior high school students regardless of status, except for the physically incapable (Caangay & Baradillo, 2023). In fact, instilling leadership and discipline has been a driving force behind people's decision to enlist in ROTC (Dianga, 2023).

ROTC and Capacitating Students in Times of Disasters

Given the Philippines' location along the Pacific Ring of Fire and typhoon belt, as well as the effects of climate change, Filipinos should be prepared for emergencies (Philippine News Agency, 2022; Salvador, 2021). The national government saw ROTC as an effective way to train civilian students for disaster

response and emergency management. Thus, the current Marcos administration sought to revive ROTC for this purpose (Philippine News Agency, 2022). Senator Ronald "Bato" dela Rosa introduced a bill in April 2024 to prioritize comprehensive disaster response training for students, citing the massive damage caused by Typhoon Carina in Metro Manila and Luzon. The bill proposed that the Department of National Defense (DND), Commission on Higher Education (CHED), and Technical Education and Skills Development Authority (TESDA) develop and implement modules to enhance students' disaster preparedness and disaster response, focusing on the four pillars of disaster risk reduction management: mitigation, preparedness, response, and rehabilitation (Senate of the Philippines, 2024).

Local studies found that parents believed that the proposed mandatory ROTC plays a significant role in the country's disaster preparedness and in helping victims of calamities (Brecio et al., 2023; Candaza et al., 2024). To better prepare students for emergency situations, Gantalao (2023) recommended that universities/colleges form partnerships with Local Disaster Risk Reduction Management councils to help ROTC cadets understand the local and national situation.

ROTC and Capacitating Students in Times of Insurgency

Insurgency refers to an organized groups' conscious efforts "to seize political power by inciting the population to overthrow the existing government thru illegitimate and coercive means" (De La Salle University, n.d.). In the Philippines, the government has been fighting with two long-running insurgencies: a Moro-Muslim conflict since the early 1970s and a communist struggle since the 1950s led by the Communist Party of the Philippines (CPP) and its military arm, the New People's Army (NPA) (Yuson, 2021).

The primary role of the ROTC program is to prepare students to provide sufficient response during national defense situations through military education and training (Gantalao, 2023; Salvador, 2021). Gantalao (2023) emphasized the significance of universities and colleges in preparing graduates (a) for service in defense establishments during emergency situations, and (b) as allies and partners in safeguarding national interests, particularly the protection of people and the territorial sovereignty. In his study, defense and security preparedness reflected in high ratings

in ROTC subjects, especially in the Field Artillery, as well as in national defense and security activities, such as support to national development, internal security cooperations, territorial defense, disaster response, peacekeeping operations, and international humanitarian assistance.

A sample of ROTC graduates attested that the ROTC program instilled patriotism and a profound love and devotion for the country (Salazar et al., 2023). Some Filipino parents are optimistic that the mandatory ROTC will play an important role in the country's protection, especially in defending the country against threats of terrorism, coup d' etat (kudeta), war, and social unrest (Cadanza et al., 2024). However, there are still reservations among ROTC graduates about the program's role in preparing the country for any potential threats (Salazar et al., 2023). This could be supported by Pasion et al.'s (2024) findings on ROTC's limited efforts to educate students about counterterrorism. According to his research, ROTC units in six schools in Metro Manila conducted anti-terrorism information drive to students to a lesser extent than anti-hazing law campaigns and illegal drugs awareness campaigns.

In a study, Salvador (2021) found that Marksmanship and Basic Weapon Training should be emphasized in ROTC training. According to the respondents, marksmanship activities were centered on classroom instruction, which limited actual experience that led to boredom and dissatisfaction with the lesson.

To improve defense and security preparedness, Gantalao (2023) suggested intensifying the implementation of ROTC aspects and features such as "Major Services, Unified Commands, Echelons of Command," as well as training on patrolling techniques (i.e., conducting raids, ambushes, and handling compromise situations). Furthermore, Salvador (2021) suggested that because ROTC is a year-long program, lessons should take a more practical rather than theoretical approach.

Problems encountered in the Implementation of ROTC

Few local studies have revealed the issues encountered in the implementation of ROTC. Dianga's (2023) study identified two major concerns that affect the effectiveness of the ROTC program

in Tarlac schools: a lack of training facilities and equipment, which influences students' learning outcomes, and a negative perception of the program (i.e., hazing and abuse). Tullao (2019) previously found that the instructional and training materials used by the ROTC Commandant and Staff, as well as classroom and training facilities for basic and advanced ROTC cadets, are significant predictors of ROTC performance. This implies that appropriate instructional materials and a high-quality learning environment have a significant impact on student learning outcomes.

Furthermore, Dianga (2023) identified the schedule of ROTC training day as a problem. Some parents and ROTC students believed that the training days were sometimes in conflict with academics and family time (Sunday), resulting in a decreased interest in pursuing advanced ROTC and leaving the program. Another minor issue is a lack of government funding for the ROTC unit to carry out the program's mission. The author cited a lack of consistency in providing cadet uniforms and benefits.

Synthesis

The Reserve Officers' Training Corps (ROTC) is a component of the National Service Training Program (NSTP) that provides military education to students to enhance national defense preparedness, as reflected in the ROTC's Program of Instruction (POI). The ultimate goal of the ROTC is to develop a pool of Citizens Armed Forces pursuant to RA No. 7077, also known as the "Citizen Armed Forces of the Philippines Reservist Act of 1991."

Numerous studies have identified the potential benefits to ROTC students' personal and social growth and development, such as improving leadership qualities, humility, obedience, physical strength, and having a sense of pride for one's country, as cited in Campbell (2017), Salazar et al. (2023), and Pacatang and Montallana (2022). Moreover, the ROTC program has also trained students with defense and security activities, which influenced students and parents' perception of the program's ability to help protect the country from potential security threats. However, there are contradictory claims regarding this aspect, as mentioned in Salazar et al. (2023). Despite the clamor of critics against mandatory ROTC, studies involving students and parents who participated in ROTC favorably supported this national

initiative, as noted in the studies of Candaza et al. (2024), Caangay and Baradillo (2023), and Dianga (2023).

Moreover, parents believed that the ROTC program could train students to become reliable partners in disaster preparedness and response, as mentioned in Brecio et al. (2023) and Candaza et al. (2024), and this is what the Executive and Legislative branches of the Philippine government envision if mandatory ROTC is implemented. However, these studies are based on parents' and students' sentiments. There is a dearth in literature on ROTC graduates' experiences with how the program capacitates students in times of disasters and insurgency, as well as the development of life-saving skills as suggested by the Commission on Higher Education. There is also limited research into the weaknesses of the ROTC program that is implemented in schools. The current study focuses on these research gaps, with the noble goal of enhancing the ROTC program's POI to make it more responsive to the needs of the national government and local communities today, as well as develop future members of an efficient Citizens Armed Forces.

METHODOLOGY

Research Design

This study utilized the descriptive research design to gather data. Descriptive research is a type of research that defines and describes a phenomenon (Bachman & Schutt, 2020). Specifically, this study utilizes the survey method to understand the demographic profile of the respondents, the perceived advantages and weaknesses of the existing ROTC program, and suggestions to improve the existing ROTC program.

Research Locale

The study was conducted in selected colleges and universities in the CALABARZON region offering a government-recognized BS Criminology program. CALABARZON stands for Cavite, Laguna, Batangas, Rizal, and Quezon.

Respondents

A total of 121 respondents comprising of 58 graduates and 63 fourth-year Criminology students participated in the study. Respondents were selected based on the following criteria: (1) enrolled in colleges/universities in Region IV-A (CALABARZON) offering CHED-recognized BS Criminology programs, (2) completed ROTC 1 and 2, and (3) male or female. In this study, 92 (76%) are male and 29 (24%) are female.

Sampling Technique

This study utilized the purposive and convenience sampling methods in identifying respondents. In purposive sampling, the researcher uses his or her judgment about whom to select for the sample. At the most, prospective respondents should be knowledgeable about the situation or experience being studied and should represent a range of points of view (Jhangiani et al., 2019). This study selected respondents who completed the ROTC program to obtain insights on the full ROTC experience. The study also used convenience sampling, which selects respondents based on accessibility and availability (Matira & Estrada, 2022). In this study, the survey was posted in alumni group chats and sent personally to them via messenger. Only those who responded were included in the study.

Data Gathering Procedure

The researchers submitted an official letter of permission to the Deans of the respective colleges and universities to conduct the study. Upon approval, the researchers forwarded the link of the google survey questionnaire to the respective deans. The google survey was opened to prospective respondents for a period of one week. When data gathering was completed, the researchers downloaded the CSV file of the results, summarized, and analyzed the data.

Research Instruments

This study utilized a researcher-made questionnaire converted into a google survey. It began with a message informing prospective respondents about the survey's purpose, time allotment, and confidentiality clauses. In terms of consent, the

message stated that answering the survey indicates their willingness to participate in the study.

The questionnaire consisted of four parts. Part 1 gathers demographic data such as sex and current employment status. A 4-point Likert scale was applied for Parts 2 and 3, which measured the perceived advantages and weaknesses of the ROTC program, respectively, in terms of life-saving skills, behavioral improvement, capacitating students in times of disasters, and capacitating students in times of insurgency. Respondents were asked to rate the items with 4- Strongly Agree (SA), 3- Agree (A), 2- Disagree (D), or 1- Strongly disagree (SD). Part 4 contains open-ended questions to gather respondents' suggestions to improve the existing ROTC program considering the four aspects.

The questionnaire was reviewed by three experts to obtain face validity. It was also pre-tested to 39 Criminology students who were excluded from the actual data gathering. Pre-test results were summarized and reliability was tested, resulting in an overall Cronbach alpha score of .98 for the advantages scale and .98 for the weaknesses scale.

This study also reviewed the existing syllabus/program of instruction of the ROTC program implemented by the Armed Forces of the Philippines.

Data analysis

The study used frequency and percentage distribution and mean to analyze the advantages and weaknesses of the ROTC program. Results from the Likert scale were interpreted as follows:

Table 1

Interpretation of mean scores for advantages and weaknesses of the ROTC program

Score	Range of Mean Scores	Description	Verbal Interpretation
4	3.26-4.00	Strongly agree (SA)	The respondent strongly agreed that the category/indicator is an advantage/ weakness.
3	2.51-3.25	Agree (A)	The respondent disagreed that the category/indicator is an advantage/ weakness.
2	1.76-2.50	Disagree (D)	The respondent agreed that the category/indicator is an advantage/ weakness.
1	1.00-1.75	Strongly disagree (SD)	The respondent strongly disagreed that the category/indicator is an advantage/ weakness.

Further, content analysis was used to interpret qualitative data focused on the suggestions for improvement.

Ethical Consideration

This study underwent ethical review by the Institutional Ethics Review Board and was granted approval.

RESULTS

Advantages of the ROTC Program

Table 2

Frequency and mean scores of advantages of ROTC program in terms of life-saving skills

	Indicator	SA	A	D	SD	Mean	Verbal Interpretation
1	The ROTC program equipped students with essential life-saving skills.	84	34	1	2	3.65	SA
2	ROTC training enhanced students' ability to respond effectively in emergency situations.	86	32	0	3	3.66	SA
3	The program's focus on first aid and basic medical procedures is valuable for students.	78	37	2	4	3.56	SA
4	The learning in ROTC can be potentially used in saving lives during accidents or disasters.	83	35	1	2	3.64	SA
5	ROTC graduates were more likely to be prepared to assist others during accidents or disasters.	81	38	0	2	3.64	SA
General Average						3.63	SA
Legend:		3.26-4.00 – Strongly agree (SA)		1.76-2.50 – Disagree (D)			
		2.51-3.25 – Agree (A)		1.00-1.75 – Strongly disagree (SD)			

Table 2 presents the frequency and mean scores of life-saving skills as an advantage of the ROTC program. The data shows that the majority of responses fall on the Strongly Agree-Agree continuum, resulting in a general average of 3.63, which indicates that the respondents strongly agreed that the ROTC program taught students with life-saving skills.

In particular, the ability to respond to emergency situations obtained the highest mean ($M=3.66$), and the lowest is the focus on first aid and basic medical procedures ($M=3.56$), both interpreted as “strongly agree.” This finding indicates that the respondents strongly agreed that the ROTC program prepared them for emergencies, but there might be some room for

improvement in their knowledge and skills related to first aid and basic medical procedures.

Table 3

Frequency and mean scores of advantages of ROTC program in terms of behavioral improvement

	Indicator	SA	A	D	SD	Mean	Verbal Interpretation
1	ROTC fostered discipline and leadership skills among students.	88	31	0	2	3.69	SA
2	The program enhanced teamwork and collaboration abilities.	89	30	0	2	3.70	SA
3	ROTC helped develop problem-solving and decision-making skills.	86	32	1	2	3.67	SA
4	The physical training in ROTC improved overall fitness and resilience.	90	29	0	2	3.71	SA
5	ROTC instilled a sense of responsibility and commitment.	88	31	1	1	3.70	SA
General Average						3.70	SA
Legend:		3.26-4.00 – Strongly agree (SA)		1.76-2.50 – Disagree (D)			
		2.51-3.25 – Agree (A)		1.00-1.75 – Strongly disagree (SD)			

Table 3 presents the frequency and mean scores of behavioral improvement as an advantage of the ROTC program. The data shows that the majority of responses fall on the Strongly Agree-Agree continuum, resulting in a general average of 3.70, indicating that respondents strongly agreed that the ROTC program facilitated the development of certain skills.

The improvement of overall fitness and resilience through ROTC's physical training obtained the highest mean (M=3.71), followed by enhancement of teamwork and collaboration abilities and instilling a sense of responsibility and commitment, both with a mean of 3.70 interpreted as "strongly agree." On the other hand, the development of problem-solving and decision-making skills was rated the lowest (M=3.67), but still interpreted as "strongly agree." The finding suggests that the respondents generally viewed the ROTC program favorably, particularly for its strong focus and contributions to physical fitness, teamwork, and character development. However, the slightly lower mean

indicates a perception that the ROTC program might have dedicated lesser time in developing individual cognitive skills.

Table 4

Frequency and mean scores of advantages of ROTC program in terms of capacitating students in times of disasters

	Indicator	SA	A	D	SD	Mean	Verbal Interpretation
1	ROTC prepared students to assist in disaster relief and recovery efforts.	84	35	1	1	3.67	SA
2	The program's training can be valuable in organizing and managing communities during disasters.	84	35	1	1	3.67	SA
3	ROTC instilled a sense of civic duty and responsibility in students to help others during crises.	83	36	1	1	3.66	SA
4	ROTC graduates can play a vital role in responding to the victims by lessening the impact of disasters.	79	38	3	1	3.61	SA
5	The program equipped students with the skills to assess risks, provide basic needs, and contribute to community resilience in the face of disasters.	85	35	0	1	3.69	SA
General Average						3.66	SA
Legend:		3.26-4.00 – Strongly agree (SA)		1.76-2.50 – Disagree (D)			
		2.51-3.25 – Agree (A)		1.00-1.75 – Strongly disagree (SD)			

Table 4 presents the frequency and mean scores of capacitating students in times of disasters as an advantage of the ROTC program. The data shows that the majority of responses fall on the Strongly Agree-Agree continuum, resulting in a general average of 3.66, indicating that respondents strongly agreed that the ROTC program prepared students to respond more effectively during disasters and crises.

Equipping students with risk assessment skills, providing basic needs and contributing to community resilience obtained the highest mean ($M=3.69$), followed by being prepared to assist in disaster relief and recovery efforts as well as organizing and managing communities, both with a mean of 3.67 interpreted as “strongly agree.” On the other hand, honing students in lessening

the impact of disasters had the lowest mean of 3.61, still interpreted as “strongly agree.” This finding indicates that the respondents felt the ROTC program had a stronger emphasis on preparing students to be active and engaged members of their community during disasters, with a focus on risk assessment, providing support, and participating in relief efforts. The slightly lower emphasis on directly preventing or minimizing the effects of disasters may indicate that respondents believe this aspect is less crucial than others, or it could be emphasized or improved within the ROTC program.

Table 5

Frequency and mean scores of advantages of ROTC program in terms of capacitating students in times of insurgency

	Indicator	SA	A	D	SD	Mean	Verbal Interpretation
1	ROTC provided basic knowledge about national security and defense.	88	32	1	0	3.72	SA
2	The program helped students understand the dynamics of insurgency and counterinsurgency.	85	35	1	0	3.69	SA
3	ROTC can contribute to building community resilience against insurgent threats.	85	36	0	0	3.70	SA
4	ROTC graduates can support national security efforts in their communities.	85	35	1	0	3.69	SA
5	The program fostered patriotism and a willingness to serve the country.	92	29	0	0	3.76	SA
	General Average					3.71	SA
Legend:		3.26-4.00 – Strongly agree (SA)		1.76-2.50 – Disagree (D)			
		2.51-3.25 – Agree (A)		1.00-1.75 – Strongly disagree (SD)			

Table 5 presents the frequency and mean scores of capacitating students in times of insurgency as an advantage of the ROTC program. The data shows that the majority of responses fall on the Strongly Agree-Agree continuum, resulting in a general average of 3.71, indicating that respondents strongly agreed that the ROTC program prepared students for challenges related to insurgency.

Fostering patriotism and a willingness to serve the country obtained the highest mean ($M=3.76$), followed by providing students with basic knowledge about national security and defense ($M=3.72$). Helping students understand the dynamics of insurgency and counter-insurgency, as well as honing students to support national security efforts in their communities, obtained the same lowest mean of 3.69, still interpreted as “strongly agree.” This finding indicates that the respondents believed that the ROTC program effectively instills a sense of national duty and commitment in students and in educating students about security concepts. However, the slightly lower rating for understanding insurgency and counter-insurgency indicates that this aspect may be perceived as slightly less emphasized compared to others.

Table 6

Summary of general averages on advantages of ROTC program

Category	Gen Ave	Verbal Interpretation
Life-saving skills	3.63	SA
Behavioral improvement	3.70	SA
Capacitating students in times of disasters	3.66	SA
Capacitating students in times of insurgency	3.71	SA

Table 6 presents the summary of general averages of the components of the ROTC program’s advantages. Data shows that capacitating students in times of insurgency obtained the highest average, followed by behavioral improvement and capacitating students in times of disasters. Obtaining life-saving skills obtained the lowest average. This finding suggests that the respondents strongly believed that the ROTC program effectively equips students to handle situations related to internal conflict and national security threats. They also recognize the broader value of ROTC in improving behaviors and preparing students for various emergencies, including natural disasters. However, the slightly lower average for life-saving skills indicate that the respondents may perceive ROTC to be less focused on this area of training compared to others.

Weaknesses of the ROTC Program

Table 7

Frequency and mean scores of advantages of ROTC program in terms of life-saving skills

	Indicator	SA	A	D	SD	Mean	Verbal Interpretation
1	The life-saving skills training in ROTC was insufficient for real-life emergencies.	49	31	30	11	2.98	A
2	The ROTC program lacked adequate resources and equipment for practical life-saving training.	46	39	27	9	3.01	A
3	The focus on military training overshadowed the development of essential life-saving skills.	42	40	31	8	2.96	A
4	The ROTC curriculum did not adequately prepare students to handle complex medical emergencies.	36	43	32	10	2.87	A
5	The program may not provide sufficient opportunities for students to practice and apply life-saving skills in realistic scenarios	41	37	31	12	2.88	A
General Average						2.94	A
Legend:		3.26-4.00 – Strongly agree (SA)		1.76-2.50 – Disagree (D)			
		2.51-3.25 – Agree (A)		1.00-1.75 – Strongly disagree (SD)			

Table 7 presents the frequency and mean scores of the weaknesses of the ROTC program in terms of life-saving skills. The data shows that the responses varied across the continuum, resulting in a general average of 2.94, indicating that respondents agreed that the ROTC program has some shortcomings when it comes to developing life-saving skills.

The lack of adequate resources and equipment for practical life-saving training is the highest-rated weakness (M=3.01) in this category, indicating that the ROTC program could have insufficient first aid supplies or limited access to realistic training settings. Second, the ROTC program provides insufficient life-saving skills training for real-life emergencies (M=2.98), which implies that the program is not comprehensive or practical enough

to prepare students for real-life emergencies, and may require more hands-on training or a broader range of skills taught.

Table 8

Frequency and mean scores of advantages of ROTC program in terms of behavioral improvement

	Indicator	SA	A	D	SD	Mean	Verbal Interpretation
1	The ROTC program focuses too much on discipline and obedience, hindering the development of critical thinking skills.	49	39	26	7	3.07	A
2	The hierarchical structure of ROTC has discouraged initiative and independent decision-making.	44	40	26	11	2.97	A
3	Sometimes the development of other important skills was neglected in favor of physical training.	43	42	27	9	2.98	A
4	The time commitment required for ROTC can negatively impact students' academic performance.	43	35	34	9	2.93	A
5	The program may not offer enough opportunities for students to develop leadership skills in a practical setting.	39	32	39	11	2.82	A
General Average						2.95	A
Legend:		3.26-4.00 – Strongly agree (SA)		1.76-2.50 – Disagree (D)			
		2.51-3.25 – Agree (A)		1.00-1.75 – Strongly disagree (SD)			

Table 8 presents the frequency and mean scores of the weaknesses of the ROTC program in terms of behavioral improvement. The data shows that the responses varied across the continuum, resulting in a general average of 2.95, indicating that respondents agreed that the ROTC program has some shortcomings when it comes to improving behaviors.

The highest-rated weakness in this category is the increased emphasis on discipline and obedience which stifled the development of critical thinking skills ($M=3.07$). The respondents may have believed that the ROTC program prioritized following orders than encouraging students to analyze, inquire, analyze, and think in new ways. Second, the emphasis on physical training

comes at the expense of developing other valuable skills (M=2.98). This suggests that the respondents may have perceived that the program could offer a more balanced approach to skill development.

Table 9

Frequency and mean scores of advantages of ROTC program in terms of capacitating students in times of disasters

	Indicator	SA	A	D	SD	Mean	Verbal Interpretation
1	The ROTC program's disaster preparedness training was not comprehensive enough to address the diverse range of disasters in the Philippines.	37	40	36	8	2.88	A
2	The ROTC program's instructors lacked sufficient expertise in disaster preparedness and response.	36	38	35	12	2.81	A
3	The ROTC program's curriculum failed to give adequate priority to disaster preparedness and response training.	38	34	39	10	2.83	A
4	The focus on military-style drills may not be the most effective way to prepare students for community-based disaster response.	38	40	33	10	2.88	A
5	The program may not provide sufficient opportunities for students to participate in actual disaster response efforts.	37	38	34	12	2.83	A
	General Average					2.84	A
Legend:		3.26-4.00 – Strongly agree (SA)		1.76-2.50 – Disagree (D)			
		2.51-3.25 – Agree (A)		1.00-1.75 – Strongly disagree (SD)			

Table 9 presents the frequency and mean scores of the weaknesses of the ROTC program in terms of capacitating students in times of disaster. The data shows that the responses varied across the continuum, yielding a general average of 2.84, indicating that respondents agreed that the ROTC program has some shortcomings in terms of preparing students for disasters.

The highest-rated weaknesses are the lack of comprehensive disaster preparedness training for a variety of disasters, as well as the ineffectiveness of military-style drills in preparing students

for community-based disaster response. Both have mean score of 2.88, which is interpreted as “agree.” This finding suggests that training should cover various disaster scenarios including, natural and man-made disasters, as well as practical skills training relevant to disaster situations, such as first aid, search and rescue, evacuation procedures, and community organization.

Second, the ROTC program's curriculum failed to give adequate priority to disaster preparedness and response training, as well as the lack of sufficient opportunities for students to participate in actual disaster response efforts. Both have a mean score of 2.83, which is interpreted as “agree.” This finding suggests that respondents may believe it should be a more central component of the program, as well as a need for more hands-on experience and practical application of skills in simulated or actual disaster scenarios.

Table 10

Frequency and mean scores of advantages of ROTC program in terms of capacitating students in times of insurgency

	Indicator	SA	A	D	SD	Mean	Verbal Interpretation
1	The ROTC program's training on insurgency and counterinsurgency was outdated and irrelevant to the current security context.	37	41	36	7	2.89	A
2	The program have not sufficiently addressed the root causes of insurgency, limiting its effectiveness in preventing conflict.	34	40	37	10	2.81	A
3	The ROTC's focus on military solutions may perpetuate a cycle of violence rather than promoting peacebuilding.	33	38	34	16	2.73	A
4	The involvement of students in counterinsurgency operations can put them at risk and expose them to ethical dilemmas.	36	40	34	11	2.83	A
Table 10 (continued)							
5	The program may not adequately prepare students to understand and address the complex social and political dynamics of insurgency.	32	45	35	9	2.83	A
	General Average					2.82	A
Legend:		3.26-4.00 – Strongly agree (SA)		1.76-2.50 – Disagree (D)			
		2.51-3.25 – Agree (A)		1.00-1.75 – Strongly disagree (SD)			

Table 10 presents the frequency and mean scores of the weaknesses of the ROTC program in terms of capacitating students in times of insurgency. The data shows that the responses varied across the continuum, yielding a general average of 2.82, indicating that respondents agreed that the ROTC program has some shortcomings in terms of preparing students for insurgency situations.

The highest-rated weakness is the outdated or irrelevant program training on insurgency and counterinsurgency (M=2.89). This could mean the curriculum focuses on past conflicts or tactics that are no longer relevant, or that it does not adequately address

the evolving nature of insurgency. Second, the respondents agreed to the concern that students' involvement in counterinsurgency operations can put them at risk and expose them to ethical dilemmas, as well as the program may not adequately prepare students to understand and address the complex social and political dynamics of insurgency. Both have mean score of 2.83, which is interpreted as "agree."

Table 11

Summary of general averages on weaknesses of ROTC program

Category	Mean	Verbal Interpretation
Life-saving skills	2.94	A
Behavioral improvement	2.95	A
Capacitating students in times of disasters	2.84	A
Capacitating students in times of insurgency	2.82	A

Table 11 summarizes the general averages of the ROTC program's weaknesses. Data shows that behavioral improvement obtained the highest mean for weaknesses, followed by life-saving skills, capacitating students in times of disasters, and capacitating students in times of insurgency. The finding suggests that respondents believed the most significant shortcomings is in how the ROTC program improved student behavior despite military-specific skills. There is also a significant room for improvement in how ROTC equips students with essential life-saving skills and prepares them for various disaster scenarios. Furthermore, data also suggests that, while still perceived to have some shortcomings, respondents viewed ROTC's preparation for insurgency as relatively stronger compared to other areas like behavioral improvement, life-saving skills, and disaster preparedness.

Respondents' Suggestions to Improve ROTC Program

The respondents were asked to list five areas for improvement to be included in the ROTC program based on the following aspects: developing life-saving skills, behavioral improvements, capacitating students in times of disasters, and capacitating students in times of insurgencies. This section discusses the top five responses for each category.

Developing life-saving skills

This study identified the conduct of practical life-saving skills training (n=68) as the primary suggestion under this category. The responses focused on first aid (n=30) and basic life support (BLS) (n=28). Some respondents emphasized:

“enhancing the students’ ability to respond effectively in emergency situations.”

“Practical exercises regarding the BLS”

“use of all equipment for life saving, CPR, AED”

“Dapat i improve pa yung pagtuturo ng basic life support.”

“In-depth actual first aid training”

“Dapat mas lawakan pa yung pagtuturo about sa first aid”

“adequate resources and equipment for practical life-saving training.”

These responses suggest the importance of ROTC units providing in-depth knowledge, practical exercises, and adequate resources, as well as teaching the use of life-saving equipment, so that students can learn to respond effectively to emergency situations.

The respondents also suggested areas for focus in disaster preparedness and response (n=23). In terms of disaster preparedness, some respondents suggested conducting disaster preparedness training, fire and earthquake drills, and proper disaster response, particularly in the event of a fire (fire safety and evacuation procedures) and other calamities.

Leadership development was also identified as an area for improvement by the respondents (n=22). Though not directly related to life-saving skills, they recommended this aspect because effective emergency response requires a sense of leadership.

Additionally, they identified water competency (n=13) as an area for improvement. Water competency is defined as “a way of improving water safety for oneself and others through avoiding common dangers, developing fundamental water safety skills to be safer in and around the water, and knowing how to prevent and respond to drowning emergencies (American Red Cross, n.d.). Respondents in this study mentioned water safety skills, water survival, swimming, and water search and rescue as competencies that they need to learn more about in order to save lives. Respondents also identified combat skills (n=13), such as

firearm handling and unarmed self-defense, as areas for improvement to help save lives.

Behavioral Improvement

Despite the perceived ROTC's overemphasis on discipline, several students still felt the need to enhance students' self-discipline (n=33). In terms of leadership, some respondents believed that cadets, not just ROTC officers, needed to improve their leadership skills (n=27). One respondent stated, "Enhance leadership not only among officers but also among subordinates through some group activities." Another responded, "... ROTC cadets, develop their leadership and start initiative." Several others suggested improving students' communication and interpersonal skills (n=19), as well as teamwork and collaboration (n=19). One respondent stated to conduct "program of activities that would strengthen the sense of camaraderie and resilience." A few suggested improving decision-making skills among ROTC cadets (n=11).

Capacitating Students in Times of Disasters

The respondents suggested focusing on disaster awareness, preparedness, and response (n=50). Several respondents recommended organizing disaster awareness and preparedness training covering various disasters and conducting more drills (fire, earthquake, typhoon). In terms of disaster response, the respondents stated:

"change the mindset of student that 'disasters cannot be avoided' but we can do action if needed."

"Being calm, proper way to do when earthquake happens, knowing how to respond, preparation, to recover right away."

"Organizing relief efforts"

"Improved curricula on how to take action during disaster"

"Dapat magkaroon ng seminar at mga programa na nakatuon sa disaster na may kasamang action."

These responses suggest the importance of providing students with a deeper understanding of effective disaster response through effective teaching methodologies and emphasizing disaster response in the ROTC's program of instruction.

Given the nature and impact of disasters, respondents (n=22) felt a need for in-depth practical training in developing life-saving skills, particularly first aid and basic life support. Some respondents (n=16) suggested improving students' leadership development, which was indirectly related to disaster preparedness. This could be due to the need for leadership when engaging with communities during disasters. Furthermore, they suggested improving communication skills (n=13), particularly crisis communication, coordination, and interpersonal relationships.

Capacitating Students in Times of Insurgency

Responses varied widely within this category. The area with the highest frequency was leadership development (n=15). This could be due to the fact that leadership is needed to succeed in counter-insurgency efforts. Several others recommended improving counter-insurgency awareness (n=14) as reflected in the statements:

"terrorist group awareness"

"counterinsurgency tactics and strategy"

"program of activities to address different acts of insurgency"

"improved outline of instruction for insurgency awareness"

"Drills or practices aligned with proactive and reactive campaign against insurgency"

These responses indicate the need of conducting a more profound training on insurgency and counter-insurgency awareness to better prepare students for these realities.

Furthermore, respondents suggested improving communication skills (n=11), particularly those related to communication and reporting protocols, radio equipment use, and crisis communication. Crisis communication is the practice of developing skills for effective communication during a crisis, such as how to clearly disseminate information and manage misinformation. Furthermore, respondents proposed improving students' community engagement or understanding of civil-military relations (n=9). They suggested that students improve their situational awareness and threat assessment skills (n=9), which involve recognizing and assessing environmental risks. Additionally, some respondents suggested improving tactical skills and operations (n=9).

DISCUSSION

This study has revealed the strengths and weaknesses of the ROTC program in terms of developing life-saving skills, behavioral improvements, capacitating students in times of disasters and insurgencies based on ROTC graduates' feedback.

The participating ROTC graduates strongly agreed that the ROTC program taught them valuable life-saving skills, particularly in preparing them to respond to emergencies. This is because the ROTC's Program of Instruction (POI) includes topics like Basic Survival and First Aid. While this is so, the respondents acknowledged some weaknesses in life-saving skills training. The most commonly perceived weakness is the lack of resources and equipment for practical training, which may include inadequate first aid supplies or a lack of realistic training environment. Tullao (2019) and Dianga (2023) emphasized the importance of the availability of instructional/training materials, equipment, and facilities to students' learning outcomes and performance. Another weakness is that the training may have not provide practical experience to fully prepare them for real-life emergencies. This could explain why the respondents gave focus on first aid and basic medical procedures with the lowest rating among the strengths. The findings imply a need to improve the program by investing in better resources and equipment, providing more hands-on exercises and simulations in life-saving techniques, and focusing on first aid and basic life support or medical procedures. These implications are consistent with the respondents' recommendations to improve the ROTC program. Strengthening life-saving skills training in the ROTC POI strongly aligns with the AFP and CHED's goals.

The respondents also strongly agreed that the ROTC program helped improved their behavior. The program excelled at improving physical fitness and resilience through its physical training component. This aligns with Salazar et al. (2023) that physical exercises improve cadets' strength, stamina and perseverance. Moreover, the program has enhanced teamwork and collaboration skills and instilled a sense of responsibility and commitment. Despite these positive sentiments about ROTC, the respondents also perceived some weaknesses in this aspect. First, while ROTC training instilled discipline and obedience, it has

somehow hampered critical thinking and exercise of cognitive skills. They may have felt being discouraged from analyzing and thinking independently. This may well explain why developing problem-solving and decision-making skills was the lowest-rated strength in this category. Second, there was a perceived imbalance between physical training and development of other skills, such as leadership, communication, and cognitive skills. This finding implies that to enhance the efficiency of the program in the behavioral aspect, the ROTC units could incorporate more scenarios that require critical thinking, independent decision-making, and problem solving, as well as activities to foster leadership, communication, and other opportunities for personal development. The respondents' suggestions also reflect improvement in these values and skills.

Furthermore, the respondents strongly agreed that the ROTC program has prepared them to handle disasters. The program is seen effective in preparing students to be active and engaged community members during disasters, particularly in risk assessment, providing support, and participating in relief efforts. The POI includes the topic on disaster preparedness taught for one semester. Nonetheless, the respondents perceived some weak points in how the program prepares students for disasters. The most common concern is the lack of comprehensive disaster preparedness training that covers a variety of disaster scenarios, including both natural and man-made disasters. This implies a need to expand the training to cover both natural disasters (e.g., earthquakes, floods, fire) and man-made disasters (e.g., terrorist attacks). Second, military-style drills were ineffective in preparing students for community-based disaster response. This implies that practical skills training relevant to real-life disaster situations, such as search and rescue, evacuation procedures, and community organizations may be considered for inclusion in the program. Third, the program was perceived as not giving enough priority to disaster preparedness and response training, and there is a lack of opportunities for students to participate in actual disaster response efforts. To fulfill this objective, the ROTC units could incorporate disaster preparedness and response in the ROTC POI with training modules and exercises (simulated or actual disaster scenarios) to enhance preparedness and response capabilities. In this study, several respondents also recommended including disaster response strategies in the program. These initiatives strongly align with President Marcos

Jr.'s mandate for the ROTC program to effectively train students for disaster response and emergency management. They also support the Senate bill to prioritize comprehensive response training for students.

Finally, the respondents strongly agreed that the ROTC program equipped them for challenges related to insurgency. The program's strength was in fostering patriotism and a willingness to serve the country, aligning with the findings of Salazar et al. (2023). It has also provided the students with a good understanding of national security and defense concepts. This reflects that the program is fulfilling its role to prepare students for national defense situations (Gantalao, 2023; Salvador, 2021). This is because the POI included topics such as combat training (e.g., basic weapon training and pre-marksmanship), National Security Concerns (Insurgency and Counter-Insurgency), Anti and Counter Terrorism, Civil-Military Relations, among others. However, the program has weaknesses in preparing students for insurgencies, based on respondents' feedback. The most significant concern is the outdated or irrelevant training on insurgency and counterinsurgency, which suggests that the POI may not reflect the current realities and complexities of insurgency. This implies a need to update the training with the current realities, tactics, and evolving nature of insurgencies. Second, the respondents acknowledged the risk and ethical challenges associated with student involvement in counterinsurgency operations. This highlights the need for careful consideration of student safety. Third, the program has not adequately prepared students to understand the complex social and political factors that contribute to insurgency. This implies the need to enhance the POI to include a deeper understanding of these factors, which helps in better analysis on how to address the root causes of conflicts. In this manner, students will also be able to exercise critical thinking and problem-solving skills in insurgency situations.

Overall, this study demonstrates that the respondents believed that the ROTC program is most focused in preparing students for challenges related to insurgency and national security threats and in fostering patriotism, despite having some weaknesses. It also has positive impact on students' behaviors, however, they felt that the program has most significant weaknesses in how it improves behaviors. This suggests a need

to address concerns about potential overemphasis on discipline and obedience and to focus on developing a broader range of skills, including critical thinking and leadership. The program also has equipped students in handling emergencies and disasters. However, there is room for improvement in how ROTC equips students with essential life-saving skills and prepares them for various disaster scenarios, especially in providing more comprehensive and practical training in these areas.

Conclusion

The results of the study strongly indicate that the ROTC program is a valuable educational training program and offers a range of advantages in developing skills, both personal and in promoting civic responsiveness through community engagement during emergencies or serving the nation. However, the need for more in-depth, practical training related to first aid and basic medical procedures is an area for improvement.

The study revealed that the most challenging aspect of the program is the development of student behavior toward adapting to changing circumstances. The delivery of program contents is more focused on theory and less on the practical aspect, which is more beneficial especially during times of calamities or other emergencies. The respondents viewed ROTC's preparation for insurgency as relatively stronger compared to other areas like behavioral improvement, life-saving skills, and disaster preparedness.

The respondents' appeal for areas of improvement supports the less explored training aspect and the identified weaknesses, which focus on the needed lifesaving skills during emergencies/disasters and preparedness to assist in protecting the country during national security crises.

Recommendations

A review of the ROTC Program of Instructions and delivery of training should be conducted by introducing simulated activities which will prepare the students to respond effectively in an

emergency. This should include the inclusion of more in-depth training on the proactive measures rather than reactive.

Development of behavioral responses to environment and sociological areas need to be considered in the training, by developing the flexibility of the learners in relation to possible life circumstances especially during the time disaster. This should also include developing critical thinking, instinctual responses, and increased resiliency.

It is also recommended to build among the learners a sense of belongingness to the nation, love of the country through introduction of its heritage, and development of their patriotic characteristics.

To further explore the potential of the program, a much wider study is also recommended though the lens of the different generations.

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Exploring Training Needs and Challenges of Library Personnel: A Strategic Plan for Professional Growth and Development

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KEYWORDS:

- **Training Needs**
- **Challenges**
- **Training Development Plan**
- **Library Personnel and Staff**
- **Professional Growth and Development**

Abstract. This research paper explores the training needs and challenges faced by library personnel in the context of their professional growth and development. The study aims to identify the training requirements of library staff, examine the barriers to participating in training programs, and propose a strategic plan for enhancing their development. Given the evolving nature of libraries in the 21st century, library personnel must acquire both technical and human

skills to meet changing user demands and technological advancements. Through a mixed-methods approach, data was collected from staff members at two institutions, Emilio Aguinaldo College Cavite and Immaculate Conception Academy. The findings highlight the high demand for training in customer

service, leadership, and technology-driven tools such as e-resources management and artificial intelligence. Major challenges identified include time constraints, financial limitations, and scheduling conflicts. Based on these results, a comprehensive training and development plan is proposed, emphasizing the importance of hybrid training modalities, scheduling flexibility, and addressing financial barriers. The study underscores the need for targeted professional development programs to improve service delivery, staff morale, and career growth opportunities. By addressing these challenges and aligning training initiatives with staff needs, libraries can foster a supportive environment for continuous professional development and enhanced library services.

Exploring Training Needs and Challenges of Library Personnel: A Strategic Plan for Professional Growth and Development

INTRODUCTION

The 21st century has seen a dramatic change in the role of libraries, with staff members being expected to administer traditional resources as well as aid with research, give community programming, and facilitate access to digital material. Considering these growing duties, library staff training and continuing professional development (CPD) are now essential. To effectively fulfil changing demands, libraries must make sure that its staff members stay current on new tools, techniques, and abilities as technology develops and user expectations shift. Investigating the training and development requirements of library staff, identifying obstacles to their participation in such training, and creating a thorough strategy to assist their professional development are the goals of this study.

The continuously evolving nature of digital tools, new service delivery models, and information technology further highlights the necessity for training in the library profession. For library staff to maintain high service standards, guarantee job happiness, and provide career growth chances, training programs are essential.

I. Objectives

This research will specifically address three objectives:

1. To identify the needs for training of personnel in libraries to support their professional growth.

2. To find out exactly what challenges library personnel face when taking part in training and capacity-building activities.
3. To develop a plan for the library personnel's training and development.

II. Literature Review

The need of ongoing education and the challenges library professionals encounter when trying to obtain training opportunities are just two of the many subjects covered in the literature on training and professional development in libraries. Important studies and ideas pertaining to the three research objectives are reviewed in this section.

Training Needs for Library Personnel

Training needs in libraries are driven by technological advances, changes in user expectations, and the evolving role of libraries in society. According to Shukla & Kaur (2019), libraries must adapt to technological changes by ensuring that library staff are proficient in digital tools, information management systems, and emerging technologies such as artificial intelligence and machine learning. Libraries are now required to possess advanced skills in digital literacy, data management, information retrieval, and user experience design to meet the needs of their diverse user bases (Meyer, 2020). As such, identifying the specific skills gaps among library personnel is critical for creating targeted professional development programs that enhance staff capabilities and improve service delivery (Rosenbaum, 2018).

Additionally, research has shown that training programs can boost morale, improve job satisfaction, and contribute to the retention of qualified personnel in libraries (Monk, 2017). A study by Gorman (2016) found that libraries with structured, well-designed training programs are more likely to offer innovative services, leading to greater patron satisfaction. Training initiatives also foster professional growth by providing library

personnel with opportunities for career advancement, making them an essential part of employee development strategies.

Challenges in Training and Capacity-Building Activities

While training is essential for professional growth, numerous challenges hinder the participation of library personnel in training and capacity-building activities. One major barrier is time constraints. According to studies by Okojie et al. (2021), many library staff members struggle to find the time for training due to heavy workloads and insufficient staffing. This is especially true in libraries with limited resources, where staff may be responsible for multiple roles beyond traditional library services, such as IT support and administrative tasks.

Other challenges identified include lack of funding, inadequate support from management, and limited access to high-quality training programs. Training programs are often underfunded, and library professionals may be forced to rely on free or low-cost resources that may not always meet their developmental needs (Zhao & Liu, 2020). Moreover, library personnel may lack the necessary motivation to engage in professional development if there are limited incentives or opportunities for career progression (Sharma & Ghosh, 2018).

Additionally, geographic location can also influence access to training. In some regions, particularly rural or underdeveloped areas, library personnel may face difficulties in accessing high-quality professional development programs due to limited infrastructure and connectivity issues (Jones, 2019). These challenges necessitate a closer examination of the barriers that library staff face and how they can be overcome to ensure effective participation in professional training programs.

Developing a Training and Development Plan

To overcome these challenges and enhance the professional growth of library personnel, it is essential to develop comprehensive training and development plans that are tailored

to the needs of the staff and aligned with the goals of the library. As highlighted by Kumar & Yadav (2020), an effective training plan should involve a clear needs assessment, and methods for evaluating the effectiveness of training programs. The development of such plans requires input from library staff, stakeholders, and management to ensure that the training activities are relevant and address the current and future needs of the profession.

Best practices in library staff training often include blended learning models that combine face-to-face workshops with online courses and self-paced learning opportunities. These methods allow for greater flexibility and wider access to training resources (Liu, 2022). Furthermore, continuous professional development should not be limited to technical skills but should also encompass leadership development, communication skills, and customer service training, as these are essential for fostering a supportive and effective library environment (Luo & Nguyen, 2021).

The role of leadership in facilitating training programs is also crucial. Libraries that prioritize professional development through dedicated training budgets, time allowances, and a culture of learning are more likely to see positive outcomes in staff performance and satisfaction (Talisayon, 2018). By developing a structured plan that aligns with institutional goals and focuses on overcoming identified challenges, libraries can foster a supportive environment that nurtures staff growth and development.

Synthesis

To ensure that libraries can effectively serve their communities in a continuously evolving information world, library staff training and development are crucial. The literature emphasizes the significance of attending to staff training needs, comprehending the obstacles that prevent attendance at training sessions, and creating strategic strategies to facilitate ongoing professional growth. Libraries can improve staff satisfaction, service quality,

and the long-term professional development of library professionals by implementing these initiatives.

METHODOLOGY

Research Design

This study adopted a mixed-methods approach, combining quantitative and qualitative methods to achieve a comprehensive understanding of the training needs, challenges, and development opportunities for library personnel.

Population and Sampling

All library personnel from the two (2) participating institutions, Emilio Aguinaldo College Cavite and Immaculate Conception Academy are both involved in the study. Survey was conducted through online using the Google Forms.

Data Collection

The authors collected two (2) forms of data: (1) Quantitative, to ascertain the levels of interest and needs, among the library personnel in various categories, quantitative data was collected in the form of general frequencies. (2) Qualitative, two open-ended questions requesting participant comment was included in qualitative data.

RESULTS AND DISCUSSION

The results of the training needs analysis for the library personnel and staff at Emilio Aguinaldo College Cavite and Immaculate Conception Academy Dasmarinas, Cavite are as follows:

1. Training Needs and Preferences of the Library Personnel and Staff

1.1. Training Needs. The results are divided into four categories and listed by questions. The table below shows the rating scale used to interpret the data of the survey.

Mean Rating Scale	Verbal Interpretation
3.25 – 4.00	High Need for Training
2.50 – 3.24	Low Need for Training
1.75 – 2.49	No Need for Training
1.00 – 1.74	No relevance to the work

1.1.1. Human Skills-based. The library personnel's and staff's top pick or choices related to the soft skills, as derived from the responses are customer service skills, leadership skills, and lifelong learning skills trainings.

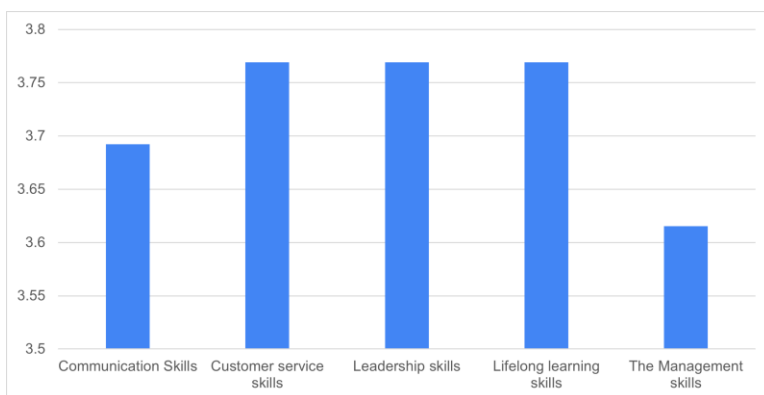


Figure 1. Human Skills-based

1.1.2. Technical Skills-based. The library personnel's and staff's top pick or choices related to the hard skills, as derived from the responses is the e-resources management training.

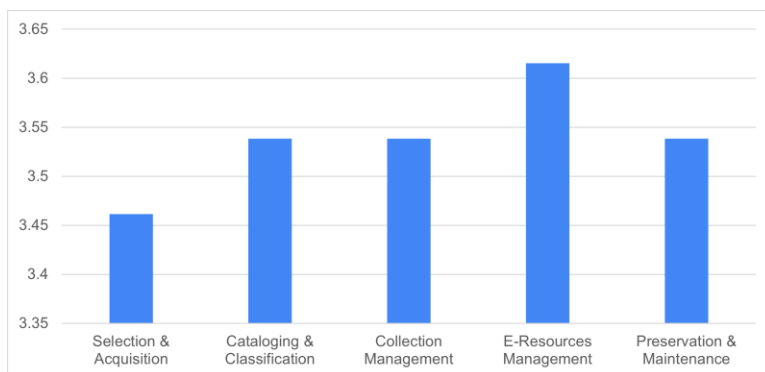


Figure 2. Technical Skills-based

1.1.3. Work-related Skills. The library personnel's and staff's top pick or choices related to the rendering readers' services, as derived from the responses are readers advisory and library reference/information trainings.

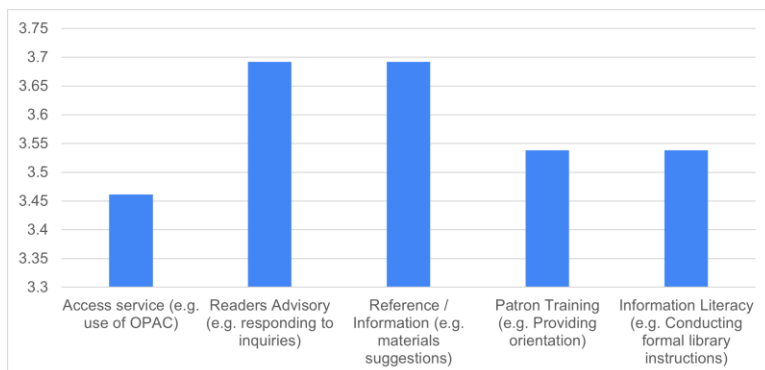


Figure 3. Work-related Skills

1.1.4. Adoption of technology-driven tools. The library personnel's and staff's top pick or choices related to technology-based instruments, as derived from the responses is software design tools training.

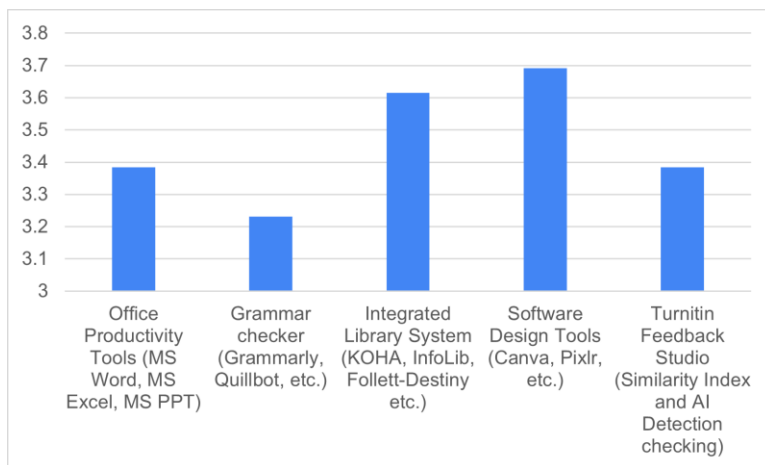


Figure 4. Adoption of technology-driven tools

1.1.5. It may be gleaned from the word cloud that the library staff-participants are interested to have a training related to the use of artificial intelligence for the library services.

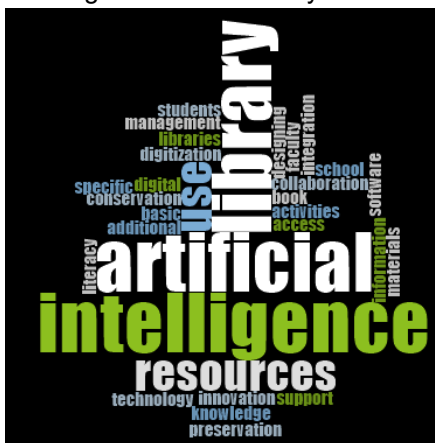


Figure 5. word cloud regarding other training topics the library personnels wishes to attend

1.2. Training Preferences

1.2.1. Preferred Format. Survey results showed that the library personnel and staff of the EACC and ICA preferred training in seminar format (92.31%).

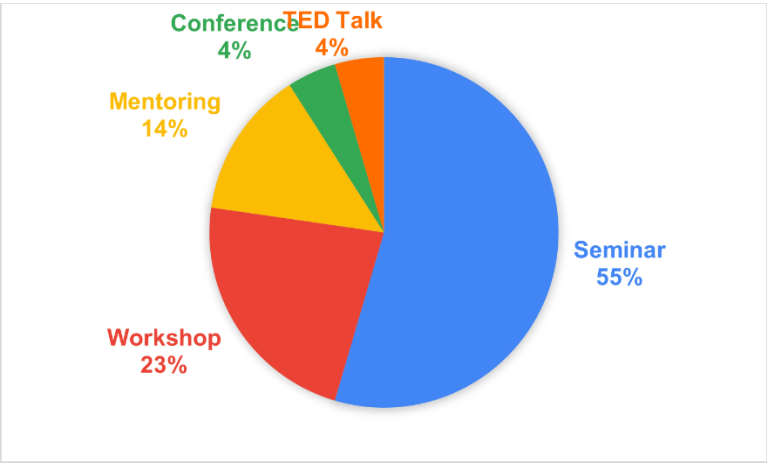


Figure 6. Preferred Format

1.2.2. Preferred Modality. Survey results showed that the library personnel and staff of the EACC and ICA preferred training to be conducted in hybrid modality (38.46%).

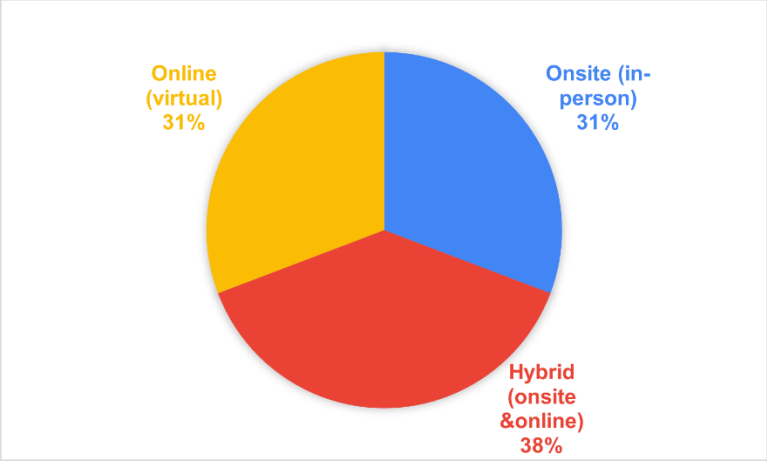


Figure 7. Modality

1.2.3. Preferred Day. Survey results showed that the library personnel and staff of the EACC and ICA preferred training to be done on a Friday (69.23%).

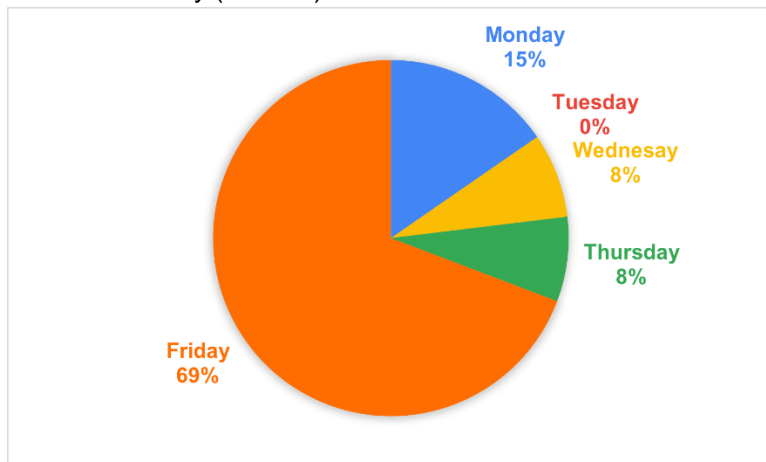


Figure 8. Preferred Day

1.2.4. Preferred Time. Survey results showed that the library personnel and staff of the EACC and ICA preferred training to be scheduled in the early morning (38.46%).

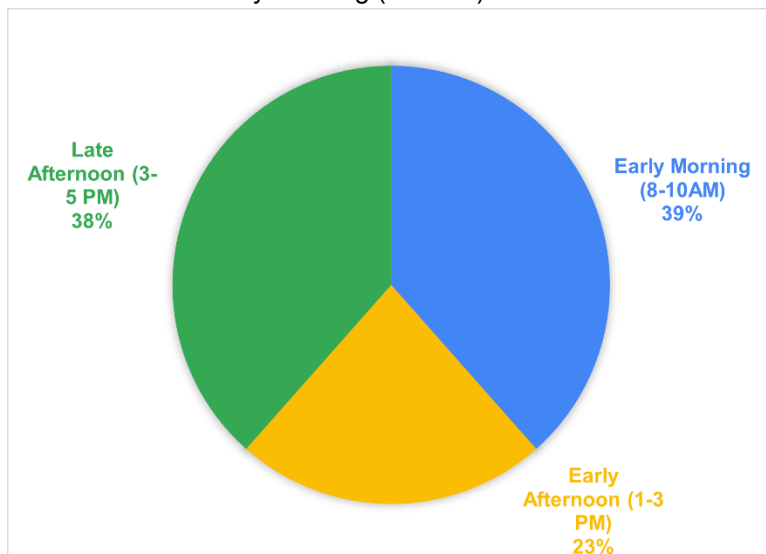


Figure 9. Preferred Time

2. Challenges encountered by library staff members participating in capacity-building and training activities.

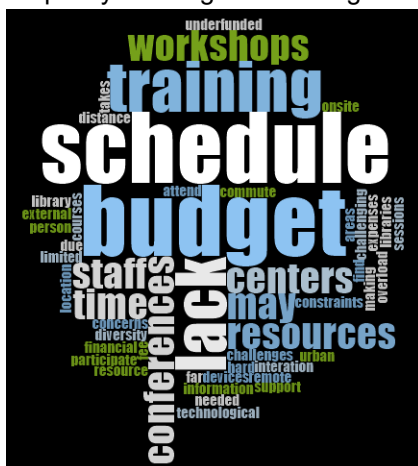


Figure 10. word cloud regarding the challenges encountered by library personnel participating in training activities

It may be gleaned from the word cloud that the library staff-participants' challenges encountered when participating in training and capacity-building activities are the training schedule and the financial resources to register.

3. Library Personnel's Training Development Plan

LIBRARY PERSONNEL'S TRAINING DEVELOPMENT PLAN For Calendar Year 2025

The Purpose

The researchers' main objective is to determine what training library staff members require to promote their professional development.

1. To provide library staff with training and capacity building based on the findings of the training needs analysis.
2. To improve the library staff's work-related abilities.
3. To encourage library employees to take part in further training linked to library services.

The Plan

Workshops and trainings will be held from January to December of 2025 to achieve the aforementioned goals. Two trainings will take place from January to May of 2025, four trainings will take place from June to July during the summer break, and two more will take place from August to December of 2025.

*Exploring Training Needs and Challenges of Library Personnel: A Strategic Plan
for Professional Growth and Development*

Activities	Objectives	Targets	Person Responsible	Target Dates	Budget
Webinar on effective communication skills for library personnel (Internal)	To improve the library personnel's customer-service skills in dealing library patrons.	100 % participation of the library personnel	Library Personnel Budget Officer VPAA	February 21, 2025 7-9 AM	5,000 For Resource Speaker
Seminar on Reference Services work for library personnel particularly in helping researchers in finding the right resources (external)	To help library personnel in rendering library services in addressing patron's concerns regarding the use of library collection.	60% participation of the library personnel	Library Personnel Budget Officer VPAA	May 9, 2025 7-9 AM	1,000 Per Participant
Webinar on life-long learning skills particularly in building positive culture in the workplace (internal)	To develop positive culture among library personnel and in the workplace.	100% participation of the library personnel	Library Personnel Budget Officer VPAA	June 13, 2025 7-9 AM	5,000 For Resource Speaker
Training-workshop on Management of e-resources particularly on Digitalization of materials (external)	To improve library personnel's skills in accessing, preserving and retrieving digital information	60 % participation of the library personnel	Library personnel budget officer VPAA	June 27, 2025 7-9 AM	1,000 Per Participant
In-person Mentoring Session on Readers Advisory Effective ways in answering	To improve library personnel's skills in answering library patrons' queries	100% participation of the library personnel	Library personnel VPAA	July 4, 2025 7-9 AM	Gratis

queries (internal)					
Webinar on the use of software design in the library ex: CANVA (external)	To help library personnel in creating multimedia presentations, design projects, <i>and</i> fostering creativity <i>and</i> innovation in their own field of work using software design	60% participation of the library personnel	Library Personnel Budget Officer VPAA	July 25, 2025 7-9 AM	1,000 Per participant
In-person training on Leadership skills among library personnel EX: decision making, relationship building (external)	To guide library personnel to work towards the attainment of common organizational goals.	60% participation of the library personnel	Library Personnel Budget Officer VPAA	August 8, 2025 7-9 AM	1,000 Per participant
Webinar on the use of AI in library services (external) <i>*additional recommended topic</i>	To help the library personnel to analyze the patron's reading preferences and interest and providing relevant reading recommendations using AI	60% participation of the library personnel	Library Personnel Budget Officer VPAA	November 21, 2025 7-9 AM	1,000 Per participant

Conclusion

The following conclusions were drawn in light of the study's results:

1. Due to the service-oriented nature of their work, library personnel and staff prefer to attend trainings or workshops that focus on human skills, such as leadership, customer service, and lifelong learning, over those that focus on technical skills.

2. The main challenges that library personnel and staff have while taking part in capacity-building and training programs are the schedule of activities and the financial resources required to attend the training. Because Fridays are likely the off-peak times for library patrons, most responses chose to plan training sessions for these days in the early morning.

3. Based on the results of the training needs analysis of library staff and employees, a training and development plan is created for them as a starting point to support and enhance their professional development.

Recommendations

The following improvements are suggested in light of the research's preceding findings:

1. The training and development plan for library workers, which is based on the need analysis results, should give priority to the top responses for each survey item to meet the needs of the staff and library personnel.

2. To guarantee that an adequate number of library workers from the concerned institutions attend the training sessions, schedule them considering the training preferences data.

3. Provide other possible solutions to address the identified challenges and training requests given by the library personnel-participants.

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Laboratory Performance and Internship Grades of BSBA Students in Emilio Aguinaldo College-Cavite: A Correlational Study

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KEYWORDS:

- **Internship**
- **Correlation**
- **Laboratory performance**
- **Emilio Aguinaldo College- Cavite**

Abstract The study's goal is to assess the relationship between laboratory performance for BSBA students and internship grades. The primary objective of the study is to determine whether a student's performance in the lab during their first year of college affects how well they perform in their practicum or internship. The

SY 2021–2022 BSBA graduating class's laboratory performance was examined using a descriptive-correlational study approach which involves 30 BSBA students. To demonstrate this achievement, the students' laboratory grades for the semester and the ratings they received from the businesses during their internships were used. To determine the correlation between the mentioned variables, MS Excel data analysis was used. It was determined that there is a very weak positive correlation between laboratory performance and corporate- supervised academic internships. This evidence runs counter to the bulk of the

research, which may provide a backdrop for investigating other aspects, whether in a lab setting or an actual company.

Laboratory Performance and Internship Grades of BSBA Students in Emilio Aguinaldo College-Cavite: A Correlational Study

INTRODUCTION

The computer lab is very important to the students' education. Students have access to this facility so they can engage in their practical tasks and exercises. If students are introduced to computers during their education, they can explore more knowledge if they have a fundamental comprehension of them. Students can complete many jobs with ease thanks to the various programs. Giving pupils many opportunities to practice organizing data or maintaining records will surely enhance their capacity for planning and managing projects as well (Sharma, 2019).

Computer laboratories are available on campus for use by students in their coursework, research, and other academic pursuits. Often, these labs are filled with numerous computers running a variety of software applications. With the help of computer labs, students can learn, use software, finish homework, and communicate with teachers. These IT labs are essential because they allow people to acquire the digital skills required in the modern workplace without having to buy their own hardware and software.

An internship is a course, typically for a specialized field of study, that seeks to give students supervised practical application of a subject or theory they have previously or are now studying. For all college students, practicums are necessary. The majority of this is done during the students' final semester. To pass their course, they must finish the necessary number of hours. Every course needs a practicum because it gives students a chance to develop their existing abilities and gain new ones. The opportunity to assess a student's readiness for practice outside of the classroom counts as a final exam as well (Venter, 2020). A

transitional experience between the classroom and the working world that students will soon enter is what the practicum is intended to provide. To experience streamlined company operations and increased productivity, students taking business-related courses are required to do their practice with organizations that may provide these experiences.

Literature Review

The correlation between laboratory performance and internship grades of college students has been widely studied, particularly as both are seen as essential metrics for evaluating practical competency and academic success. Studies suggest that laboratory performance often reflects a student's technical and analytical skills, which are crucial for internship success (Smith & Jones, 2019; Thompson, 2021). Additionally, internships provide an arena where students apply theoretical knowledge, making their performance a valuable indicator of professional readiness (Brown & Williams, 2020).

According to recent research, laboratory performance significantly predicts students' success in real-world applications. For instance, a study by Chen et al. (2020) found that students who performed well in laboratory settings demonstrated higher levels of problem-solving skills and attention to detail during internships. Similarly, Sato and Greene (2022) observed that in the field of engineering, students with high lab grades were more likely to receive positive evaluations during internships due to their strong foundation in technical procedures and safety protocols.

Internship grades are frequently used as a measure of a student's ability to adapt and perform in professional settings (Martinez & Liu, 2019). Studies indicate that high internship grades correlate with better job placement rates and higher starting salaries post-graduation (Nguyen, 2021). Brown and Williams (2020) emphasize that internships provide valuable feedback from industry professionals, giving insight into students' practical strengths and areas for improvement.

The degree of correlation between laboratory and internship performance varies by discipline but is generally positive. Thompson (2021) conducted a meta-analysis across health science programs and found a moderate correlation ($r = .45$) between laboratory grades and internship performance. This

finding suggests that while laboratory skills are crucial, other factors, such as interpersonal skills and adaptability, also contribute to internship success. In contrast, Johnson and Taylor (2023) found a stronger correlation ($r = .67$) within engineering programs, indicating that fields with a heavy reliance on technical skills may see a closer link between these metrics.

Individual student characteristics, including motivation and prior experience, significantly influence both laboratory and internship performance (Lee & Kim, 2022). Additionally, the quality of laboratory instruction and mentorship during internships has been shown to play a critical role. A study by Anderson and Miller (2020) indicated that students with access to structured mentorship performed better in both laboratory settings and internships, suggesting the importance of guided learning experiences.

The implications of these findings emphasize the importance of aligning laboratory training with internship expectations. Smith and Jones (2019) argue that improving laboratory curricula to reflect real-world applications can enhance students' internship performance and overall career readiness. Nguyen (2021) also suggests that internship supervisors who understand a student's laboratory performance can tailor experiences to strengthen any skill gaps.

Thus, this research aims to examine the relationship between laboratory performance and internship grades among Bachelor of Science in Business Administration (BSBA) students at Emilio Aguinaldo College-Cavite. This study seeks to identify whether practical skills demonstrated in laboratory settings correlate with the grades students achieve during their internship experiences. The study will provide insights into how well laboratory-based learning prepares students for real-world business environments, as measured by internship performance, and to explore potential areas for curricular enhancement within the BSBA program.

METHODOLOGY

This study utilized a descriptive research design to determine the relationship Laboratory Performance and Internship Grades of BSBA Students in Emilio Aguinaldo College- Cavite. Purposive samples were utilized where thirty (30) students

participated. Under the BSBA curriculum, there were three (3) consecutive semesters where students have undergone the course with a laboratory grade. The average from these mentioned periods was identified as the laboratory grades and will be used as an independent variable. The dependent variable used in this study was the grade they obtained from the internship program. The relationship of these data was tested using MS Excel Office's Data analysis.

Ethical Consideration

The data for this research were obtained from the AIMS database, a platform that provides faculty members access to students' academic records, including their grades. Notably, the researchers were the faculty members assigned to the respective subjects from which the data were drawn. To ensure appropriate authorization for the use of these records, the researchers formally sought and secured approval from the Dean of the Institute of Management.

RESULTS

This section provides insights into the relationship between students' academic performance in laboratory-based courses and their grades during internships.

Table 1

Relationship of laboratory performance and internship grades of BSBA Students

	R	p-value	Interpretation
laboratory performance VS internship grades	0.17	0.22	Very weak positive relationship

The results revealed that the laboratory performance and internship grades obtained by BSBA students have a very weak positive correlation ($r = 0.22$) between laboratory performance and internship grades. This suggests that while there is some

relationship between the two, laboratory performance is not a strong predictor of internship success among BSBA students at Emilio Aguinaldo College-Cavite. This is contrary to the findings of Chen et al. (2020) and Sato and Greene (2022) where they have determined that laboratory performance has a significant relationship with academic internship.

DISCUSSION

The results indicating a very weak positive correlation ($r = 0.22$) between laboratory performance and internship grades among BSBA students at Emilio Aguinaldo College-Cavite highlight important distinctions between theoretical or classroom-based competencies and real-world applications in professional settings. This weak correlation implies that laboratory skills, although valuable, may not translate directly to the practical demands or evaluative criteria of internships in business settings. While laboratory exercises tend to focus on structured, academically driven tasks and assessments, internships require broader competencies, including adaptability, interpersonal communication, and situational problem-solving—skills not easily captured or predicted solely by laboratory performance.

This finding contrasts with prior research by Chen et al. (2020) and Sato and Greene (2022), which found a significant positive correlation between laboratory performance and internship success, particularly in fields requiring highly technical skills, such as health sciences and engineering. Chen et al. (2020) demonstrated that students with strong laboratory performance often excelled in internships due to a close alignment between their technical knowledge and the requirements of their professional roles. Similarly, Sato and Greene (2022) observed that in technical fields, laboratory experiences provide foundational competencies that are directly applicable to the procedural tasks within internships.

The disparity between these findings and the present study may be attributed to the differences in required competencies across academic disciplines. For instance, BSBA students often encounter less technically demanding tasks in laboratory settings than those found in STEM fields, where hands-

on skills are integral to both academic and professional success. Business-related laboratory tasks might include simulations or case analyses, which, while beneficial, may not prepare students for the interpersonal and adaptive skills required in real-world business environments. Internships in business settings often emphasize “soft” skills, including client communication, teamwork, and adaptability—skills which may not be as readily developed or measured within laboratory coursework.

Moreover, the weak correlation suggests that internships likely evaluate a range of competencies beyond the technical skills emphasized in laboratory courses. Business internships tend to place high value on students' ability to integrate and apply diverse business concepts in real-world contexts, effectively communicate, make quick decisions, and handle unexpected challenges. These competencies are not easily measured by traditional academic assessments or laboratory exercises. Therefore, while laboratory performance may indicate a student's understanding of fundamental concepts, it may have limited influence on their performance in more dynamic, client-oriented business settings.

Another possible interpretation of the results is that the laboratory curriculum in the BSBA program at Emilio Aguinaldo College-Cavite may not be fully aligned with the practical skills and knowledge required in internships. This misalignment could mean that laboratory work provides students with a strong foundation in theoretical concepts but lacks the experiential components necessary for internship success. Enhancing the laboratory curriculum to include more real-world problem-solving exercises, teamwork-oriented tasks, and case-based simulations that mirror internship responsibilities could potentially strengthen the correlation.

Conclusion

In conclusion, the weak correlation between laboratory performance and internship grades for BSBA students suggests that laboratory work alone may not adequately prepare students for the diverse challenges they face in business internships. Unlike fields with a more direct application of technical skills from laboratory to internship, business internships require a skill set that includes adaptability, critical thinking, and interpersonal

abilities. This finding indicates a potential need for curricular adjustments to better integrate skills applicable to professional business environments, bridging the gap between academic preparation and the competencies required for internship success.

Recommendations

Based on the results which found a very weak correlation between laboratory performance and internship grades, the following recommendations are suggested:

Curriculum Development	Enhance Laboratory Curriculum to Include Practical Business Applications	Incorporate more real-world, business-oriented problem-solving activities and case-based simulations within the laboratory curriculum to better align laboratory exercises with internship and workplace requirements.
	Integrate Soft Skills Training in Laboratory Courses	Since business internships require adaptability, interpersonal communication, and situational problem-solving, laboratory courses should integrate training on these “soft” skills through group projects, role-playing scenarios, and client simulation exercises.

	Develop Interdisciplinary Modules Connecting Theory with Practice	Design modules that link theoretical learning in laboratory settings to practical internship scenarios, helping students make clearer connections between academic concepts and real-world business applications.
Faculty and Staff Training	Train Faculty on Bridging Academic and Practical Skills	Offer professional development for faculty to better understand industry expectations and how laboratory work can be adapted to prepare students for these demands. Faculty can then incorporate professional skills into laboratory sessions.
	Encourage Faculty-Industry Collaboration for Curriculum Alignment	Establish partnerships with industry professionals who can advise on curriculum

		modifications that align with current business practices and internship expectations.
	Implement Faculty Mentorship Programs for Internship Preparation	Create a faculty mentorship program where students preparing for internships receive guidance on professional skills and can discuss how to translate laboratory learning into practical applications.
Institutional Support	Establish an Internship Support Program	Develop an internship support program that includes guidance on transitioning from academic learning to workplace application, focusing on skills such as professional communication, task management, and conflict resolution.
	Increase Access to Career Counseling and Internship Placement Services	Enhance career counseling resources to help students identify internship opportunities that align with their strengths and provide tailored

		advice on bridging academic and practical skills.
	Conduct Regular Evaluations of Laboratory-Internship Alignment	Periodically review and assess the laboratory curriculum to ensure it remains relevant to the skills needed in internships, using feedback from students, faculty, and industry partners.
Further Research	Explore Additional Factors Influencing Internship Success	Conduct follow-up studies to investigate other variables, such as soft skills, extracurricular activities, and prior work experience, to better understand what influences internship performance among BSBA students.
	Examine Correlation Across Other Disciplines for Comparative Analysis	Research how laboratory performance and internship grades correlate in other fields within Emilio Aguinaldo College-Cavite, comparing business-related programs to technical or health sciences to identify discipline-specific trends.

	Longitudinal Studies on the Impact of Curriculum Changes	Perform longitudinal studies to assess the effectiveness of curriculum adjustments and additional training programs on improving the correlation between laboratory performance and internship success over time.
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Leveraging Molecular Techniques to Assess the Microbiological Quality of Water in Commercial Establishments

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KEYWORDS:

- **Antibiotic sensitivity test (AST)**
- **coliforms**
- **molecular techniques**
- **Polymerase chain reaction (PCR)**
- **Water quality**

Abstract

Water quality in commercial establishments is crucial for public health. Conventional microbiological techniques for evaluating the quality of water can be labor-intensive and time-consuming. In order to quickly and precisely identify coliform bacteria in water samples from different commercial facilities, this study will use molecular approaches. To isolate coliform bacteria, water samples were

gathered and put through routine microbiological procedures. The isolated colonies underwent additional genotypic and phenotypic analysis. Using 16S rRNA primers, DNA was taken from the separated colonies and amplified. Agarose gel electrophoresis was used to visualize the amplified products.

All isolated colonies showed phenotypic traits typical of coliform bacteria, according to the study's findings. Additionally, all isolates

confirmed their identity as coliform bacteria by producing DNA bands of the proper size when amplified using 16S rRNA primers.

This study shows how molecular methods can be used to quickly and accurately evaluate the quality of water in commercial buildings. Public health organizations can efficiently detect and reduce any health hazards connected to tainted water sources by using molecular techniques into regular water quality monitoring programs.

Leveraging Molecular Techniques to Assess the Microbiological Quality of Water in Commercial Establishments

INTRODUCTION

Ensuring safe water quality is essential in business operations to protect public health (Esiri, Jambol, and Ozowe, 2024). Contaminated water can act as a conduit for several waterborne pathogens, resulting in epidemics of diarrheal illnesses and other infections (Albert et al., 2024). Contemporary approaches for evaluating microbiological water quality frequently depend on conventional culture-based procedures, which are laborious, time-consuming, and may lack the sensitivity required to identify low levels of contamination (Oon et al., 2023). The postponement in acquiring results can impede timely intervention and efficient control strategies during probable outbreaks (Albert et al., 2024). This requires the creation and implementation of more effective and sensitive methods for swift and precise evaluation of water safety.

Despite the prevalent use of conventional microbiological techniques, their constraints have necessitated the exploration of new approaches that provide enhanced speed and precision. Molecular diagnostic approaches, including PCR-based methods, have the capability for expedited identification and quantification of bacteria relative to culture-based procedures [Panwar et al., 2023]. Nonetheless, the utilization of these molecular techniques for routine water quality assessment in various commercial environments remains insufficiently investigated (Lyons et al., 2023). A notable research gap persists in assessing the effectiveness and feasibility of integrating molecular diagnostics in commercial entities to improve their water safety monitoring protocols.

Molecular diagnostics have numerous benefits compared to conventional techniques. They facilitate the swift identification of target microorganisms, even at minimal quantities, without requiring significant cultivation (Khodaparast, et al., 2024).

Methods such as PCR can enhance specific DNA sequences, enabling definitive identification of coliform bacteria and other indicator species (Zulu, 2023). Moreover, these techniques facilitate high-throughput analysis, potentially permitting economical monitoring of numerous samples (Zhao et al., 2023). The use of molecular diagnostics into standard water quality monitoring protocols could markedly improve the efficiency and precision of identifying possible contamination hazards in commercial entities.

Objectives of the Study

This study specifically aimed to:

1. Analyze the efficacy of molecular approaches in swiftly and precisely evaluating the microbiological quality of water in commercial enterprises.
2. Isolate and identify coliform bacteria from water samples obtained from various commercial facilities utilizing both traditional and molecular method.

Scope and Limitations of the Study

This study involves the collection and testing of drinking water samples from selected fast-food chains in Dasmariñas, Cavite where the researchers have access to. Samples were limited to service water provided by the commercial establishments, and the water sources whether piped water connection, treated piped water, hand pumps, dug wells, rainwater, water vendors, or filtered water were not specified in this study. Other physico-chemical parameters such as pH, biological oxygen demand (BOD), electric conductivity (EC), total dissolved solids (TDS), free and total chlorine, color, turbidity, odor, and taste of drinking water were not determined, analyzed or correlated with the results of the bacteriological tests and the indicator organisms. Detection of pathogens such as *Salmonella* sp. or other Enterobacteriaceae, apart from *Escherichia coli* and other fecal coliforms, were not the focus of this study.

METHODOLOGY

Research Design & Inclusion Criteria

This study is a continuation of the previous study about the detection of the presence of antibiotic-resistant bacteria in drinking water. Drinking water samples (n=20) were collected from commercial food establishments using sterile collecting bottles. Tested for the presence of coliforms and heterotrophic plate counts. Those that tested positive for coliforms (n=11) undergone DNA extraction. Those that have high concentration from DNA extraction (n=5) have undergone gel electrophoresis. These samples were then tested for antibiotic susceptibility tests (AST), and those that are resistant (n=3) to one of the four antibiotics used were sent out for DNA barcoding.

Study Area: Dasmariñas, Cavite

Dasmariñas City is the second largest city in CALABARZON in the Philippines, with an area of 90.13 km². According to the 2020 population census it is the second most populous city in CALABARZON, with 703,141 inhabitants. Among the 20 municipalities and three cities comprising Cavite, the largest and most populous place was Dasmariñas with 18.4 percent share to the total population of the province. It is also the wealthiest Local Government Unit (LGU) in Cavite (PSA, 2021).

Selection of Commercial Establishment

As it is not possible to collect service and drinking water available in all commercial establishments in Dasmariñas, Cavite, 20 were randomly selected from different locations as part of the population enough to determine the possibility of determining the feasibility of the study.

Water sampling from various sources and water quality analysis

A total of 20 samples from various commercial food establishments using sterile collecting bottles with a minimum of 500 mL each location. Collected water samples were then brought to the laboratory for analyses and were analyzed immediately. MTT and HPC procedures and the discussion on the detection of pathogens using VRBA were described in Standard Methods for the Examination of Water and Wastewater (APHA, 2017).

Bacterial strain and growth condition

The *Escherichia coli* used as a positive control was obtained from a tertiary level hospital in Dasmariñas, Cavite. It was grown in Luria-Bertani (LB) Agar at 37°C, 18-24 hours prior to use. Coliform isolates were grown using the same medium and same condition, 18-24 hours prior to DNA extraction.

Isolation and Purification of Genomic DNA from Coliform Isolates

The DNA extraction was conducted using the Wizard® Genomic DNA Purification Kit (Promega, USA). An overnight culture of 11 coliform isolates was centrifuged for 2 minutes to obtain the cell pellets. These pellets were resuspended in 1 mL of Normal Saline Solution (NSS) and washed twice before adding a lytic enzyme and incubating at 37 °C for 60 minutes. After incubation, the mixtures were centrifuged again for 2 minutes, and 600 µL of Nuclei Lysis solution was added, followed by a 5-minute incubation at 80 °C. Subsequently, 3 µL of RNase solution was added and incubated at 37 °C for 45 minutes. The solutions were then cooled to room temperature before adding 200 µL of Protein Precipitation Solution. The mixtures were vortexed, incubated on ice for 5 minutes, transferred to a spin column, and centrifuged for 3 minutes. After protein precipitation, DNA was precipitated and rehydrated by transferring the supernatant to new tubes containing 600 µL of isopropanol each. The tubes were centrifuged again, followed by the addition of 600 µL of room temperature 70% ethanol. The tubes were centrifuged one last time for 2 minutes, the ethanol was aspirated, and the pellets were

air-dried for 15 minutes. The DNA pellets were rehydrated using 100 µL of DNA Rehydration Solution overnight at 4°C. The concentration (ng/µL) and purity/quality (A260/A280 and A260/A230 ratios) of the extracted DNA were assessed using a Nanodrop 300 Microspectrophotometer (iGene Labserve).

16s rRNA Detection Using Polymerase Chain Reaction (PCR)

Phenotypically isolated and confirmed coliform isolates were further evaluated by Polymerase Chain Reaction (PCR) amplification.

Antibiotic Susceptibility Test (AST)

Five coliform isolates, with a high DNA concentration and purity (A260/A280) of between 1.8 to 2.0 were selected and subjected to Antibiotic Susceptibility Test (AST) following the 31st edition of M100 of Clinical and Laboratory Standards Institute (CLSI) guidelines. The Kirby-Bauer Disk Diffusion Susceptibility Test is performed to determine the sensitivity or resistance of the isolates to the 30-ug ceftiofur, amikacin, amoxicillin, and ciprofloxacin discs. A 0.5% McFarland standard of colony suspension was lawn cultured on a Mueller-Hinton Agar (MHA) plate before placing the 30-ug ceftiofur, amikacin, amoxicillin, and ciprofloxacin discs. MHA plates were then incubated overnight ~16 hours at 37 °C. MHA plates are read in reflected light and the zone of inhibition is measured using a calibrated caliper. These antibiotics were chosen because they were all effective against Gram-negative bacteria.

RESULTS & DISCUSSION

Table 1 *DNA Concentrations and Purity of Coliforms from Drinking Water Samples (n=9)*

Sample Number	DNA Conc (ng/uL)	A260/A280	A260/A230
1	1828.65	1.45	1.3
4	57.956	1.4	1.07
9	104.887	1.47	1.27
10	496.964	1.82	1.63
11	159.964	1.68	1.34
12	735.756	1.96	1.75
13	640.187	1.61	1.2
16	439.467	1.89	1.71
17	516.724	1.82	1.23
18	515.165	1.61	1.26
20	544.692	1.96	1.43

Table 1 shows different results on the DNA concentrations (ng/uL) and purity (A260/A280 and A260/A230). According to Claassen et al. (2013), DNA extraction is challenging since several substances may be co-extracted, resulting in inhibitory effects on downstream applications.

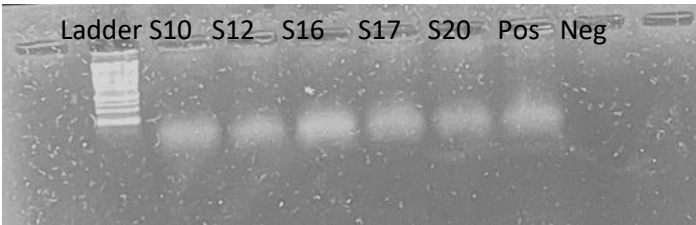


Figure 1. Amplified DNA of the isolated coliforms as seen in gel electrophoresis.

Figure 1 unequivocally illustrates the effective amplification of 16S rRNA gene segments from all six isolated

coliform bacterial strains. The existence of distinct bands of the anticipated size (approximately 1500 bp, though the exact size will vary based on the specific primer set utilized – specify the primer set in the methods section and reference the expected amplicon size (Dogan and Adiguzel, 2024) validates the successful extraction and amplification of bacterial DNA. The uniform enhancement observed in all six isolates robustly corroborates the phenotypic classification of these colonies as coliforms, based on their preliminary isolation and characterization. The consistency underscores the dependability of the 16S rRNA gene as a phylogenetic marker for bacterial identification at the genus and species levels, affirming its appropriateness for our investigation (Zhang et al., 2024). The distinct and well-defined bands signify a high degree of purity in the DNA samples, reducing potential interference from non-target DNA and underscoring the efficacy of the applied DNA extraction and purification techniques (Habib et al, 2024)

Table 2 *Antibiotic Sensitivity Test of Coliforms with High Concentration and Purity (n=5)*

Sample Number	Cefoxitin n	Amikacin n	Amoxicillin n	Ciprofloxacin n
10	R	R	S	R
12	R	R	R	S
16	S	S	S	S
17	R	S	R	S
20	S	S	S	S

*R= Resistant, S= Susceptible

Table 2 shows Antibiotic Susceptibility Test (AST) results using Cefoxitin (Cephalosporin), Amikacin (Aminoglycoside), Amoxicillin (Penicillin), and Ciprofloxacin (Fluoroquinolone). These antibiotics are all effective against Gram-negative bacteria which included coliforms. McLaughlin et al. (2009) mentioned that fecal coliform sensitivity analysis can identify effective antibiotic therapies for patients with antibiotic-resistant coliforms.

The effective amplification of the 16S rRNA gene further corroborates the methods employed in this work for the identification of coliform bacteria in water samples from commercial premises. This molecular technology, in contrast to conventional techniques prone to errors from selective culture or phenotypic misidentification (Heihnen et al., 2024) offers a very specific and sensitive means of identifying bacterial presence. The lack of extraneous bands or smearing in the gel picture indicates minimal contamination during the DNA preparation or PCR process, hence bolstering confidence in the findings (Silva et al., 2023). The implementation of a positive control (specify the positive control utilized and its representation on the gel, if applicable (Jeon et al., 2023). The inclusion of a negative control, together with its results confirming the lack of contamination in the reagents and techniques (Jeon et al., 2023), further emphasizes the rigor of this experimental design and the dependability of the data obtained.

Nonetheless, although the data unequivocally demonstrate successful amplification of the 16S rRNA gene from the isolates, more characterization is required to ascertain the exact species or even the genus within the coliform group (e.g., *Escherichia*, *Klebsiella*, *Enterobacter*) (Alegbeyele and Sant' Ana, 2023). Sequencing the amplified fragments is essential for attaining this enhanced taxonomic resolution and verifying the identity of the isolates (Pun et al, 2024). 16S rRNA gene sequencing serves as a highly reliable phylogenetic marker, enabling the comparison of amplified sequences with known databases like GenBank to precisely identify species and strain-level differences (Hiergeist et al., 2023). This information would provide substantial insights into the precise types of coliform bacteria found in the water samples and could also assist in identifying probable sources of contamination in the examined business facilities.

Moreover, subsequent research could employ quantitative PCR (qPCR) techniques to get a more accurate quantification of the coliform bacterial concentration in the water samples (Tambi et al., 2023). This would yield a more thorough evaluation of the microbiological quality of the water and facilitate a clearer comprehension of the risks linked to potential contamination. The utilization of qPCR and potentially other

sophisticated molecular methodologies, coupled with advanced statistical analysis, may improve the future implementation of molecular techniques for monitoring water quality in commercial settings (Demeter et al., 2023). This study's findings provide a robust basis for subsequent research aimed at enhancing the efficacy of molecular diagnostic techniques to guarantee safe and high-quality water in commercial settings.

Conclusion

This work effectively established the viability of utilizing molecular techniques, notably PCR amplification of the 16S rRNA gene, for the swift and efficient identification of coliform bacteria in water samples from commercial premises. All six isolated colonies, previously classified phenotypically as coliforms, produced positive amplification results, so validating their identification as coliform bacteria at the genus level. The distinct bands detected in the gel electrophoresis (Figure 1) indicated the high quality and specificity of the amplification process, confirming the dependability and sensitivity of this molecular technology relative to traditional culture-based techniques. The uniform good outcomes across all samples underscore the capacity of molecular diagnostics to markedly enhance the efficiency and precision of water quality assessment in business environments.

Nonetheless, the findings of the current investigation offer only genus-level identification of coliform bacteria. Sequencing of the amplified 16S rRNA gene segments is critical for achieving exact species-level identification and facilitating robust DNA barcoding for complete epidemiological tracking and source tracing. Subsequent study ought to prioritize the sequencing of these amplicons to ascertain the precise species of coliform bacteria present in each sample. This will facilitate more accurate risk evaluations, identification of probable contamination sources, and the formulation of more focused interventions to avert future contamination incidents. Moreover, subsequent research could investigate the utilization of high-throughput sequencing methodologies (e.g., next-generation sequencing) to concurrently examine a broader spectrum of microbial communities in the water samples, potentially uncovering additional pathogenic microorganisms beyond coliforms. Incorporating quantitative PCR (qPCR) techniques into the workflow would yield quantitative data on bacterial load, hence augmenting the predictive capability of

the monitoring process. Ultimately, extensive use in various commercial environments and geographical areas would confirm the generalizability and practical usefulness of this molecular method for regular water quality monitoring.

Recommendations

The possible extension of the study are the following:

1. To enhance the accuracy of coliform bacteria identification, future studies should focus on sequencing the amplified 16S rRNA gene segments. This will enable precise species-level identification, facilitating robust DNA barcoding for comprehensive epidemiological tracking and source tracing.
2. Incorporating high-throughput sequencing techniques, such as next-generation sequencing (NGS), in future research will allow the examination of a broader spectrum of microbial communities in water samples. This can potentially uncover additional pathogenic microorganisms beyond coliforms, providing a more specific understanding of water quality.
3. Implementing qPCR in the testing workflow that will yield quantitative data on bacterial load, enhancing the predictive capability of the monitoring process. This combination of techniques will improve the overall accuracy and efficiency of water quality assessment in various commercial environments at different geographical areas.

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Licensure Examination Performance and Academic Achievement of Teacher Education Graduates of EAC Cavite

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KEYWORDS:

- **Academic Performance**
- **Licensure Examination for Teachers Performance**
- **Physical Facilities and Laboratories**
- **Teacher Education Program (TEP)**
- **Retention Policy**

Abstract. It has been a fact that all who seek to pursue teaching as a career need to pass the Licensure Examination for Teachers (LET), hence the Professional Regulation Commission (PRC) implements the R.A. 7836 otherwise known as Philippine Teachers Professionalization Act. It states that no person shall practice the teaching profession in the Philippines without having a valid professional license from the Commission. In the Teacher Education Program, passing the LET is one measure of quality education. Thus, this study

determined the correlation between the academic and LET performance of graduates of Emilio Aguinaldo College School of

Education from 2018-2023. Data on academic performance were retrieved from the Registrar's office, while the LET ratings were obtained from the Professional Regulation Commission (PRC) Manila office. The researcher used Mean and percentages in describing the Performance, and Pearson Product Moment Coefficient Correlation in determining the significance of the relationship between academic performance and LET rating. The study revealed that the pre-service teacher's academic performance correlated with their LET performance rating. Hence, the graduates' academic performance indicated graduates' success in the Licensure Examination for Teachers. Teacher Education Institutions must continue to adapt their curriculum and instructions in the evolving 21st century teacher education. Findings are useful in planning for the enhancement of the program and for preparation for the board licensure exam focusing on the subjects with the lowest ratings. For future research, other variables may be included to determine the other predictors of successful licensure examination performance.

Licensure Examination Performance and Academic Achievement of Teacher Education Graduates of EAC Cavite

INTRODUCTION

“Excellence is a habit” according to the Greek Philosopher Aristotle. The substance that fuels every school on becoming the center of excellence; therefore, to understand the experience of every student and stakeholders of the school is necessary to determine what contributes to the success of the licensure examination for teachers. The School’s PMV should radiate the school’s physical and professional environment; define its core values and overflow positive academic feedback from its administrators, faculty and staff, students and other stakeholders.

The professionalization of teachers was first conceived by then President Ferdinand Marcos when he issued Presidential Proclamation 1006 to upgrade the quality of teachers. Similarly, the intent of Republic Act 7836 was to strengthen the regulation and supervision of the practice of teaching in the Philippines and the prescription of a licensure examination in which Republic Act 9293 amended the qualifications of teacher applicants. These and among other legislative measures were triggered by the need to achieve an excellent output in the field of education.

Emilio Aguinaldo College Cavite is one of the best private Higher Education Institutions (HEIs) in the southern part of Luzon offering Bachelor of Elementary Education (BEEd) and Bachelor of Secondary Education (BSEd) courses. As part of the first school of choice in Dasmariñas, EACC is serious in producing LET passers. For the last three years, the College has been

maintaining the high mean scores in LET. It is always higher than the national percentage rate of passing. It is recommended that the College must concentrate on the area of specialization in the conduct of review classes and strengthen the college wide admission and retention policy (Balinario et al., 2023) As part of the commitment to help the students to pass the licensure examination, the School of Education imposes the Seminar in Education 1 and 2 professional subjects on its students. The Teacher Education Department must maintain and improve academic performance by reviewing syllabi and ensuring that Teaching-Learning Activities (TLA's) and Assessment Tasks (AT's) are implemented, particularly in the major field (Dagdagui et al., 2022).

In the study of Lintao (2018), the academic performance of students is a high factor of licensure examination results. The academic performance is affected by the instructional materials, enrichment tests, strict completion of requirements implemented by the professors, school environment, support system from family and stakeholders. The performance of licensure examinees is affected by the processing of documents and study habits.

As teachers are often cited as the second most important source of socialization for children other than the children's families, a clear paradigm and purpose of a values curriculum within the teacher education programs (e.g., service learning) is essential for encouraging student teachers to reflect and develop a value-based teaching philosophy (Boland, 2009; NIE, 2009). Teachers are responsible for the education of the whole-child—morally, intellectually, physically, socially, and aesthetically (NIE, 2009).

Paliokas (2013) proposed that tiered licensure must consider educator effectiveness policies. She concluded that licensure should support and promote state goals of educator development and improved student learning. The licensure system should include a continuum of performance-based

expectations and licensing assessments from novice to veteran teachers.

Evans, Kelly, and Sitora (2014) found that a key aspect of scholarly culture—the number of books in the family home—exerts a strong influence on academic performance in ways consistent with the cognitive skill hypothesis, regardless of the nation's ideology, political history, or level of development.

The Institution can predict that the better the academic performance of students, the greater the possibility to pass the LET; and the poorer the academic performance of students, the lower the possibility to pass the LET; therefore, the Institution can also give possible measures to improve the teacher education graduates' rating in the LET (Bongalosa et al., 2021).

Statement of the Problem

General: The goal of this research was to develop techniques for improving academic supervision of teaching and learning. It specifically strove to fulfill the following objectives:

1. To find out if there was a significant relationship between LET performance and academic achievement;
2. To examine the factors that affected academic achievement and licensure examination performance; and
3. To improve the performance of the academic deans, heads and faculty of the EACC-SOE in helping the students to maximize their full potential.

Specific:

1. What was the LET performance of the graduates in three subject areas included in the board exam namely general education, major subjects and professional education?

2. What was the passing percentage of Emilio Aguinaldo College Cavite from 2018 to 2023?
3. What were the factors that affected the academic achievement of pre-service teachers?
4. What were the factors that affected the preparation of teacher education graduates for licensure examination?
5. Was there a correlation between the GWA and LET scores of EACC teacher education graduates?
6. What recommendations could be made based on the findings?

METHODOLOGY

This study utilized a quantitative design of research. The researcher used an adopted questionnaire from Caridad C. Lintao study: Retrospective Analysis of Academic Performance and Licensure Examinations Results of Biomedical Graduates in Emilio Aguinaldo College-Cavite which was validated and pilot-tested. The study employed a survey, as part of its data collection strategy, that was used to determine the factors that affected licensure examination performance.

This study was conducted in the Philippines, mainly in the province of Cavite, where Emilio Aguinaldo College-Cavite (EACC) is located. The researcher chose to pursue this study in this locale since the target participants are alumni of the School of Education (SOE).

Participants and/or Other Sources of Data and Information

The research respondents were all from the EAC-C who graduated in Elementary and Secondary Education from A.Y. 2018-2023. This research employed a purposive sampling technique in choosing the respondents. The respondents were chosen using these criteria: (1) EACC graduates in the SOE, (2) took the Licensure Examination for Teachers (3) willing to

participate in the study. Crossman (2020) stated that purposive sampling is a type of non-probability sample that is primarily selected solely on the exclusive characteristics of the population and the objective of the study.

Data Gathering Methods

The researcher prepared an Closed-Ended Survey Questionnaire and transferred this to a Google survey form. Items focused on measuring the factors equipped with a five-point Likert Scale as part of a quantitative instrument. Secondly, this questionnaire was sent to all graduates in the SOE from AY-2018-2023. Only those who were willing to participate sent their responses via Google Drive and these were gathered, analyzed, and interpreted. The study utilized the survey for data collection and purposive as its sampling technique. The researcher adopted the survey questionnaire of Caridad C. Lintao from her study Retrospective analysis of academic performance and licensure examination results of biomedical graduates in Emilio Aguinaldo College–Cavite. The scale for Contributing Factors Affecting the Academic Achievement and LET Performance illustrated a 5-point Likert scale: Strongly Agree, Agree, Neutral, Disagree, and Strongly Disagree.

Data Analysis Plan

Data analysis was limited to the use of the following statistical tools: frequency count percentage, weighted mean and standard deviation to find the descriptive measures of the independent and dependent variables in this study. The data were further subjected to Pearson Product Moment Correlation Coefficient analysis in order to establish the correlation; thus, the correlation between the general weighted average and licensure examination scores of teacher education graduates from 2018-2023 was measured.

Ethical Consideration

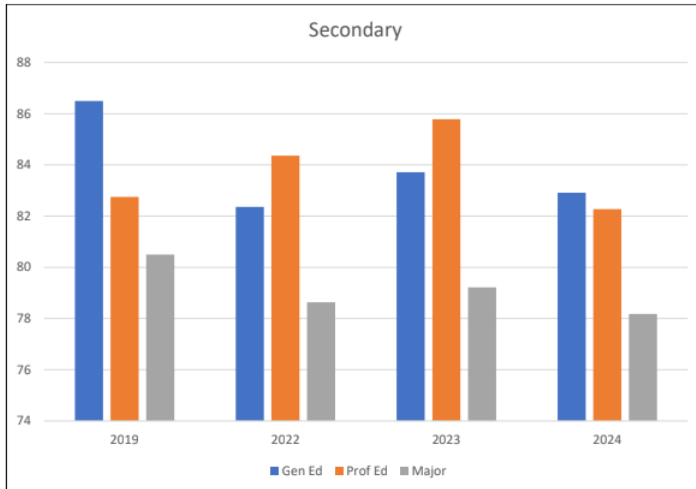
Respondents informed adequately about the study's purpose and the significance of their participation in the research to understand their role in obtaining the necessary data without feeling rushed. Before distributing the questionnaire, all respondents received a consent form to begin learning about the research study. The questionnaire questions were scrutinized to ensure that no offensive, discriminatory, or objectionable language was used, as this could impair participants' ability to respond. The study followed appropriate procedures and protocols to protect the respondent's dignity, and the confidentiality of the data collected. The respondents' identities were concealed, and the questionnaire's questions were concise enough that they could complete in a short period. The research adhered to and followed the rules established in the research objectives throughout the data collection process to provide parallel information. The Data Protection Act was adhered to strictly. The respondents' responses were analyzed and recorded anonymously.

RESULTS AND DISCUSSION

This chapter presents the collected data, their results, and analysis in accordance with the statement of the problem. The researcher's interpretations and inferences from factual evidence are also discussed.

Graph 1

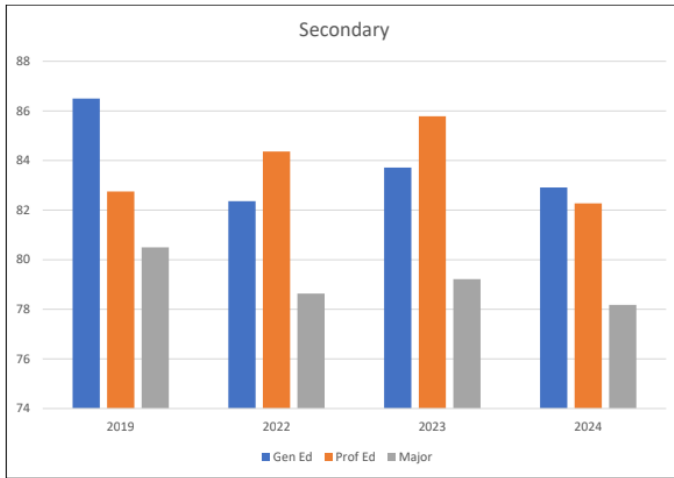
LET performance of the graduates in three subject areas included in the board exam: general education, major subjects, and professional education at the Elementary level



The graph shows Emilio Aguinaldo College's passing rate in Elementary in the years 2022, 2023, and 2024. In 2022, the Professional Education Subject obtained a higher average than the General Education Subject. In 2023, the Professional Education Subject obtained a higher average than the General Education Subject. However, in 2024, the two subjects obtained the same average.

Graph 2

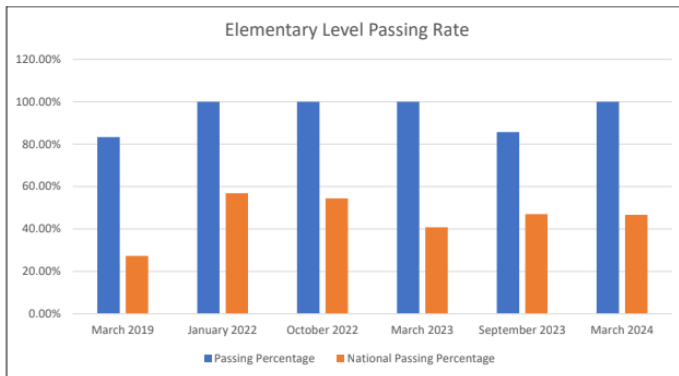
LET performance of the graduates in three subject areas included in the board exam, namely general education, major subjects, and professional education at the Secondary level.



The graph shows Emilio Aguinaldo College's passing rate in Secondary in the years 2019, 2022, 2023, and 2024. In 2019, General Education obtained the highest average among the three subjects. In 2022, the Professional Education Subject obtained the highest average. In 2023, the Professional Education Subject obtained the highest average. However, in 2024, General Education obtained the highest average among the three subjects.

Graph 3

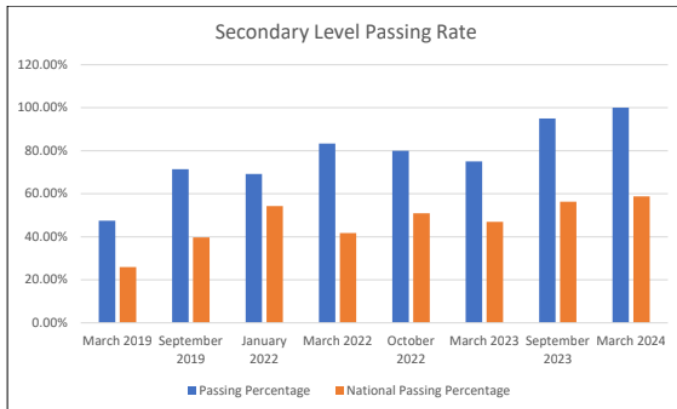
Passing percentage of Emilio Aguinaldo College Cavite from 2019, 2022, 2023, and 2024 in Elementary Level.



The graph shows Emilio Aguinaldo College's Elementary passing rate in 2019, 2022, 2023, and 2024. A passing rate of 100% was obtained in January 2022, October 2022, March 2023, and March 2024. The National Passing Percentage of 57% was obtained in January 2022, which is the highest among the national passing percentages in 2019, 2022, 2023, and 2024.

Graph 4

Passing percentage of Emilio Aguinaldo College Cavite from 2019, 2022, 2023, and 2024 in Secondary Level.



The graph shows Emilio Aguinaldo College's passing rate at the Secondary level in the years 2019, 2022, 2023, and 2024. A passing rate of 100% was obtained in March 2024. The National Passing Percentage of 59% was obtained in March 2024, which is the highest among the national passing percentages from 2019, 2022, 2023, and 2024.

Table 1

*Contributing factors affecting academic achievement of
pre-service teacher and licensure examination performance of
teacher education in terms of Instructional Strategies and
Materials*

A. Instructional Strategies and Materials	Weighted Mean	Interpretation
1. Instructional materials used are appropriate to the subject matter.	4.65	Always
2. Teaching strategies encourage students to think critically and do problem solving.	4.80	Always
3. Teacher-made tests can improve students' comprehensive learning.	4.68	Always
4. Remedial examination is given to those who have low grades.	3.55	Often
5. The faculty member regularly gives feedback to students regarding their performance.	4.4	Often
OVERALL WEIGHTED MEAN:	4.42	Often
Legend	Always 4.51-5.00	Often 3.51-4.50
	Sometime s 2.51-3.50	Rarely 1.51-2.50
		Never 1.00-1.50

Table 1 shows the weighted mean of each factor in terms of instructional strategies and materials, and the factor that affected the students was the: "Teaching strategies that encouraged students to think critically and do problem-solving," which also has a weighted mean of 4.80 with an interpretation of Always. This finding is concurred with the study of Amanonce and Maramag (2020), which noted that TEIs must align their instruction with the LET competencies. The weighted mean for instructional strategies and materials is 4.42, with an interpretation of Often.

Table 2

Contributing factors affecting academic achievement of pre-service teachers and licensure examination performance of teacher education in terms of School Environment

B. School Environment	Weighted Mean	Interpretation
1. School administrators allow the graduates to use library facilities during board review.	3.53	Often
2. The school provides a room conducive to learning during the board review.	3.40	Sometimes
3. The school conducts in-house review programs for its graduates.	2.65	Sometimes
4. The librarian allows graduates to use and borrow books that could enhance their knowledge during the board review.	3.48	Sometimes
5. The school immediately complies with the requests for Professional Regulation Commission (PRC) requirements	4.30	Often

for taking the
licensure
examinations.

OVERALL WEIGHTED 3.47 Sometimes
MEAN:

Legend	Always 4.51-5.00	Often 3.51- 4.50	Someti mes 2.51- 3.50	Rare ly 1.51- 2.50	Neve r 1.00- 1.50
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Table 2 shows the weighted mean of each factor in terms of the school environment, and the factor that affected the students was the: “The school complies immediately to the requests for Professional Regulation Commission (PRC) requirements in taking the licensure examinations,” which has a weighted mean of 4.30 with an interpretation of Often. The overall weighted mean for the school environment is 3.47, with an interpretation of Sometimes. This indicates that school-related factors have a moderate impact on the academic performance of teacher-education students (Bugwak, E. R., 2023).

Table 3

Contributing factors affecting academic achievement of pre-service teachers and licensure examination performance of teacher education in terms of Support System

C. Support System	Weighted Mean	Interpretation
1. Students' excellent performance is recognized through tuition fee discounts, awards, recognition, and scholarships.	4.63	Always
2. Faculty members offer enhancement programs such as review in the professional course, attendance at seminars, and case analysis through film viewing.	4.18	Often
3. Assistance or aid is granted to the graduates, like scholarships and funding reviews for the licensure examination.	2.45	Rarely
4. Teachers and administrators conduct monitoring and evaluation of progress to help graduates during the board review.	3.20	Sometimes
5. The family supports the financial	4.18	Often

needs of a student
undergoing the
licensure
examination.

OVERALL WEIGHTED 3.73 Often
MEAN:

Legend	Always 4.51-5.00	Often 3.51- 4.50	Someti mes 2.51- 3.50	Rare ly 1.51- 2.50	Neve r 1.00- 1.50
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Table 3 shows the weighted mean of each factor in terms of the support system. The most significant factor that affected students was the: “Excellent performance of students is recognized through tuition fee discounts, awards, recognition, and scholarship,” which has a weighted mean of 4.63 with an interpretation of Always. In the study examined by Ozcan (2021), school and family support are factors that influence students’ academic achievement. The weighted mean for instructional strategies and materials is 3.73, with an interpretation of Often.

Table 4

Contributing factors affecting academic achievement of pre-service teachers and licensure examination performance of teacher education in terms of Retention Policy

D. Retention Policy	Weighted Mean	Interpretation
1. The students clearly understand policies on admission and retention, which are strictly implemented.	4.25	Often
2. Completing requirements in the subject matter per semester is strictly implemented.	4.68	Always
3. Faculty-student consultation sessions enhance student's awareness of individual academic performance.	4.03	Often
4. Faculty members and administrators conduct enrichment test programs like comprehensive examinations, qualifying examinations, diagnostic tests, achievement tests, and oral	4.03	Often

revalidations.

5. Policies on 4.55 Always

attending class

discussions and

participation are

strictly implemented.

OVERALL WEIGHTED 4.31 Often

MEAN:

Legend	Always 4.51-5.00	Often 3.51- 4.50	Some- times 2.51- 3.50	Rare -ly 1.51- 2.50	Ne- ver 1.00- 1.50
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Table 4 shows the weighted mean of each factor in terms of retention policy, and the factor that affected the students was the: "Completion of requirements in the subject matter per semester is strictly implemented," which has a weighted mean of 4.68 with an interpretation of Always. This suggests that deans/heads and teachers of TEIs recognize the value and relationship of retention policy towards quality education and LET performance (Alfonso, 2019). The overall weighted mean for instructional strategies and materials is 4.31, with an interpretation of Often.

Table 5

*Correlation of Academic General Weighted Average (GWA)
and Licensure General Average*

Pear- son r	Interpreta- tion	p-value	Alpha level of signifi- cance	Signifi- cant	Deci- sion
-0.55	Nega- tive Mode- rate Correla- tion	0.00	0.05	Yes	Reject null hypo- thesis

Since the person r value of -0.55 with an interpretation of negative moderate correlation having fifty samples got a p -value of 0.00, which is less than the 0.05 alpha level of significance, the null hypothesis is rejected at 0.05 alpha level of significance. This means that there is a significant correlation between the general weight average in academics and general average in Licensure Examination for Teachers among the respondents. As a result, TEIs must align their educational offerings with the LET's list of prerequisites. According to Delos Reyes (2020), passing the Licensure Test for Teachers determines the effectiveness of the Teacher Education program.

Conclusion

For the past five years, the LET performance of elementary and secondary education graduates in school of education has surpassed the national passing percentage rate. The data also reflect that teacher education graduates have consistently been academically competent in professional subjects from 2022 to recent results. On the other hand, graduates' LET rating in terms of Specialization Category is lower compared to General Education. It is interesting to know that General Education obtained a higher rating compared with Professional and Specialization subjects before the COVID-19 pandemic began.

The Bachelor of Elementary (BEED) and Secondary Education (BSED) curriculum and instruction of the school of education are relevant in preparing the students for the teaching profession wherein the academic achievement of BEED and BSED graduates, along their GWA, indicated good performance. In the study of Maramag et al. (2020), the BSEd graduates obtained satisfactory ratings for the General and Professional Education components but not in their specialization. More so, it needs emphasis on the field of specialization.

Despite the three sets of Licensure Examination for Teachers in 2022, the School of Education graduates always comply with the requirements of the Professional Regulation Commission with the help of the registrar. However, there is an adjustment with the shorter span of submission of pertinent documents to PRC due to the different graduation days of the college since 2021.

The students, who have met the scholarship eligibility criteria, feel full support from the school system. This factor has gained a very high extent, which means that the education students who take LET consider the student's recognition through tuition fee discounts, awards, recognition, and scholarships as factors contributing to a successful LET result. In terms of retention policy, the students' requirements are strictly monitored to meet the standards of education programs. Continuous monitoring should be done, such as surveying the students and identifying their weaknesses for training and development (Ventayan, 2020).

The results show that academic performance can predict the outcome of the Licensure Examination for Teachers scores. The educational achievement of School of Education graduates is significantly correlated to their performance in the LET. Graduates' academic standing significantly impacts their performance on the Licensure Examination for Teachers (LET). The term "quality" is essential in education since it simply refers to an institution's most outstanding level of instruction. An institution's ability to develop great professionals is the cornerstone of providing quality education (Pregoner, 2020).

Recommendations

Based on the findings and conclusions, the following recommendations are hereby endorsed:

1. There is a need to review, update, and revise the course syllabi/curriculum in the general and major field of specialization

for both the students and teachers to be further equipped with the needed knowledge. This is also a recommendation in the study of Balinario (2023) stating that the college should concentrate on the area of specialization in the conduct of review or remedial classes and strengthen the college-wide admission and retention policy;

2. The school must start and support the in-house LET review in coordination with licensed review centers. This will ensure that all education students participate in the review to leverage the licensure performance and produce topnotchers;

3. Since academic performance and LET ratings correlate, all members of the academe must always update their teaching skills and competencies to align with the Professional Regulatory Commission's LET Table of Specification for schools to improve their performance in both areas;

4. Maintain and improve the instruction-related program so that students can maintain and improve their academic performance by ensuring that the Teaching Learning Activities (TLAs) and Assessment Tasks (ATs) are implemented, particularly in the field of specialization; and

5. Future researchers should consider studying additional parameters not included in this study.

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Perception on Ethical Issues and Research Output Credibility in the Utilization of Generative Artificial Intelligence in Writing Research

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KEYWORDS:

- Academic writing
- Paraphrasing tools
- Grammarly
- Quillbot
- ChatGPT

Abstract. The technology known as the Generative Artificial Intelligence (GenAI) is particularly making a transformation that allows learners to overcome difficulties in writing academic texts. This study aims to determine the learners' utilization of artificial intelligence, their perception of its ethicality and research output credibility. An online survey was conducted to 111 participants who agreed to participate voluntarily in the study.

The study revealed that the three most favored AI tools are Grammarly, Quillbot, and ChatGPT, remarkably having a moderate to low usage and dependency. The most prominent ethical issues with the use of AI tools in writing include AI tools contain unverified information which can affect the truthfulness of the paper; AI tools can make learners lenient and dependent on

AI tools for information as well as commit plagiarism. On this note, participants perceived their research output highly credible for carefully and meticulously following the research protocol. Future researchers may consider further exploration of the topic by using qualitative approaches and study variables.

Perception on Ethical Issues and Research Output Credibility in the Utilization of Generative Artificial Intelligence in Writing Research

INTRODUCTION

The concept of artificial intelligence came about as early as 1950 with Alan Turing who thought that machines can perform with some kind of intelligence. A test described as the Turing Test has been used to measure intelligence in machines. Furthermore, with John MacCarthy and Marvin Lee Minsky, the concept was further developed with improvements in terms of precision with integration of computer science, electronics and cognitive sciences. Later on, AI has achieved various successes in many fields that assist humans in their endeavors (Lexcellent, 2019). Basically, artificial intelligence has evolved to assist humans into doing things faster and more efficiently. These AIs are task-specific machines that deliver outputs as expected and many of these AIs continue to improve based on the data being programmed into it ("4 Types of AI", 2023 June 16). For instance, robots are programmed to perform tasks common to human beings such as "the ability to reason, discover meaning, generalize, or learn from past experiences", according to Copeland (2023 August 23, para 1). In the 21st century, artificial intelligence is absolutely part of human existence - that includes entertainment, health, business, and communication ("Why artificial intelligence is so important", 2021 June 01).

Nowadays, artificial intelligence has also invaded the world of academic writing. The technology known as the Generative Artificial Intelligence (GenAI) is particularly making a transformation that allows learners to overcome difficulties in writing academic texts. As claimed, AI is "revolutionizing education" not only for students but also for teachers in teaching writing (Dobrin, 2023, p. 2). Generative artificial intelligence is a category of artificial intelligence that specializes in creating "new contents" which include text wherein AI is used to write and

translate various types of text in different languages (Routley, 2023 February 06). The ChatGPT gained rapid popularity when it was launched in November 2022, and in just five days, it already garnered one million users (Dobrin, 2023).

Although it brings a lot of promise especially to newbie writers, it is undeniably questionable for some because of the possibility it provides for students to simply cheat on their writing assignments. When ChatGPT was introduced, many educational institutions around the world were caught unprepared and they had to acknowledge its irreversible effect in education. They understand that they must comply with the challenges it brought. With students who are akin to technology, teachers and learning institutions are facing the challenge of taking advanced information about generative artificial intelligence to communicate with their students its ethical implications and proper handling of information provided by GPT.

In the Philippines, especially during the two-year pandemic period, a lot of students were left accessing information on the Internet without any guidance. The same students most likely have engaged in using the technology in doing assignments and research because of lack of assistance from teachers. In the same way, teachers allowed these students to explore the internet as part of self-learning management that amplified their eagerness to learn from accessing the world wide web. After the pandemic period, these students brought with them the new skills they have learned and incorporated them into their face-to-face learning. Understanding the learners' utilization of artificial intelligence and their perception of its ethical issues and research output credibility is a good way to devise means to align the school's educational philosophy with the existing technology that learners are in.

Review/Survey of Related Literature

Artificial intelligence

Artificial intelligence is a breakthrough technology in the field of computing. It was conceptualized in 1950 by Alan Turing who published a paper 'Computing Machinery and Intelligence'. Schroer (2023 July 27) explained that artificial intelligence is a branch of computer science that creates machines with special

functions like human intelligence. Having this capability, many industries are investing in AI to help in their operations. Many of these AI-operated machines can perform “cognitive functions” such as “interpreting speech, playing games and identifying patterns”. However, not all machines generated by AI perform the same; there are those that are classified as strong AI and weak AI. Strong AIs are those that can “solve problems”, while weak AIs have limitations and can perform single tasks only (Schroer, 2023 July 27, para. 3).

Other proponents of AIs came afterwards such as John McCarthy, Frank Rosenblatt, and others. Its basic purpose is to create machines that can perform human intelligence in terms of problem solving and decision making (“What is artificial intelligence (AI)?”, n.d.). Artificial intelligence offers various applications such as speech recognition, customer service, computer vision, recommendation engines, and automated stock trading (“What is artificial intelligence (AI)?”, n.d.).

Artificial intelligence continues to invade the world and revolutionize how people will live from health to cybersecurity (“artificial intelligence”, n.d.). In the field of health care for instance, many developed machines/gadgets were developed to obtain results that are difficult to detect like the German-made Merantix that can detect lymph nodes. In criminal justice, the AI-driven “strategic subject list” is used in analyzing humans that have potential to become perpetrators. In transportation, billions of dollars are being spent to innovate vehicles that are operated by AI or known as “autonomous vehicles” (West & Allen, 2018 April 24). In businesses, more and more data become easily accessible that is critical for business innovations that put them in a highly competitive advantage (*accenture*, n.d.).

Generative Artificial Intelligence and Learning

In terms of classification of artificial intelligence, generative AI is considered a deep-learning model that takes raw data to produce simplified data (“What is artificial intelligence (AI)?”, n.d.). Prabhu (2022) defined generative artificial intelligence as “a groundbreaking branch of artificial intelligence that empowers machines to create, compose, and produce original content, often resembling human-

created output” (p. 4). Generative artificial intelligence is a branch of artificial intelligence and is considered a breakthrough in the field of AI because it is designed to imitate the “creative processes of humans” (Prabhu, 2022, p. 4).

Generative artificial intelligence such as the ChatGPT is a good tool that teachers can use to help students face the reality of the technology and how they can interact with it. So, integrating it in the classroom is seen as necessary to prepare students for their future career (Abramson, 2023 June 01). Stephens (2023 May 31) described ChatGPT as simply a “chatbot” that generates responses to queries through “human-like conversations” (para 2). It provides answers to questions as well as contents if requested. This is a tool that is helpful for researchers. GPT stands for ‘generative pre-trained transformer’ and it is created to respond like how a teacher responds to the questions of students to help them better understand the concept (Coursera, 2023 July 22).

Aside from ChatGPT, another GenAI - GPT4 - is more improved because it has the capability to understand, generate, and write texts. It can even solve physics questions and many others (Vargas, 2023 March 23). In addition, Gartner organization predicted that in 2022 around 30% of content of any written output can be found on the internet and it is evident now that AI can even produce literary works (“In an AI world”, 2021 February 24).

Generative AI has practical uses today such as the following: 91) written content augmentation and creation, (2) question answering and discovery, (3) tone, (4) summarization, (5) simplification, (6) classification of content for specific use cases, (7) chatbot performance improvement, and (8) software coding (Gartner, n.d.).

Utilization of GenAI in the educational system

In the Philippines, many economists are welcoming the emergence of AI and find its significant in the growth of the economy. Different government agencies including the DTI do necessary programs for the adoption of the technology in the country (Ibrahim, 2022 August 16).

Vargas (2023 March 23) believed that artificial intelligence, particularly generative AI will have a big impact on the lives of the Filipinos. He even mentioned that Filipino students are using ChatGPT in writing essays - these students are not only in high school but also from the University of the Philippines, which for him can be a threat to the credibility of future professions, for instance of the future lawyers.

“There is no turning back, as the utilization of artificial intelligence (AI) into the Philippine educational system has catapulted scholarly discourses on the line” (Estrellado & Miranda, 2023 May 5). This is how the researchers introduced their paper believing that technology can alter many aspects in the delivery of education to name: data privacy, the digital divide, faculty training and development.

Ethical Issues Associated with the utilization of GenAI

Artificial intelligence has posed many challenges in education more particularly in the teaching and learning process. More so, most schools around the globe are not ready for it. One ethical issue with AI according to an article is the harm it can cause. It says, “Ethical issues arise when AI algorithms or underlying data are deployed in a manner that introduces bias, violates individual privacy, or compromises other human rights” (“Teaching AI”, n.d. para. 16).

Statement of the Problem/Objective of the Study

General:

The study aims to determine how students perceive the ethical issues and research output credibility in their utilization of AI tools when writing academic papers, particularly research papers.

Specific:

1. What GenAI-based tools are the respondents utilizing when writing their thesis?
 - a. Usage
 - b. dependency
2. What ethical issues are perceived by the respondents whenever they use GenAI-based tools in writing their research?

3. What level of credibility of research output do the respondents perceive when they use GenAI tools?

Conceptual/Theoretical Framework of the Study

The study aims to determine how the respondents perceive the ethical issues and research output credibility associated with the utilization of Generative Artificial Intelligence in writing research. The variables of the study are the GenAI tools that students use when writing research, their perception of ethical issues and of research output credibility.

Significance of the Study

The study would be significant in many ways as the results can assist in decision making for the following groups of people:

Students may find means to appropriately use AI tools without resorting to acts of plagiarism and other academic dishonesty.

Research Teachers could be able to discuss with the students some ways to properly use AI tools that do not violate the standards set for academic papers.

The School may develop policies in relation to accessing and utilizing artificial intelligence [ChatGPT]. This is also an opportunity for the school to provide teachers with orientation on how to utilize artificial intelligence in developing the potential of students in terms of critical thinking and research writing.

Definition of Terms

Generative Artificial Intelligence – it is a branch of artificial intelligence that is concerned with text generation as well as images and other media.

Ethical issues – many ethical issues are involved in writing academic paper and they are referred to as academic dishonesty, confidentiality, biases, and many others.

Research output credibility – this refers to the trustworthiness of the research output. Research output credibility in research has also its root in the literature review which is used as basis in any research endeavor.

Scope and Limitation

The study which aims to determine the perception of the respondents regarding the ethical issues and research output credibility of utilizing artificial intelligence when they write academic papers. To achieve this objective, the researchers regardless of age, sex, and college courses, purposely selected respondents from Emilio Aguinaldo College-Cavite who were enrolled in Thesis 1 and Thesis 2 subjects this First Semester for the SY 2023-2024. A survey questionnaire was prepared to address the specific variables of the study such as the utilization of GenAI tools in academic writing, and perception of ethical issues and of research output credibility.

METHODOLOGY

The study utilized descriptive design to determine the perceived ethical issues and research output credibility in the utilization of artificial intelligence when writing their thesis. Using purposive-convenience sampling, the researchers gathered data from different institutions in Emilio Aguinaldo College- Cavite. They were enrolled in either Thesis 1 or Thesis 2 during the First Semester of School Year 2024-2025. A letter to request to conduct the study was sent to the office of the deans to seek approval and assistance. After two weeks, a total of 114 turn ins were recorded, but four were removed due to insufficient data. The research instrument used in the study is a researcher-made questionnaire. It has three parts: profile, the AI tools they use, their perception on ethical issues, and their perception of the research output credibility. To validate, the researchers requested three research experts to evaluate the test items for the improvement of the tool. A reliability test was also conducted with 20 senior high school students from Dasmarinas Integrated High School to check its consistency. After testing it using Cronbach alpha it yielded a result of .841.

Data Analysis (Statistical Tool and Treatment of Data)

The study used weighted mean to measure the utilization of artificial intelligence in writing research papers. Utilization includes the usage and dependency of the respondents in GenAI tools. Weighted mean was also used to measure the perception of the respondents regarding the ethical issues of its utilization, as well as the perceived level of credibility of research output.

Ethical Consideration

The study observed ethical guidelines during the process of data collection and analysis by protecting participants' privacy and confidentiality. First, it sought the approval of the Institutional Ethics Review Board and the Office of the VPAA before it began data collection. The request letter addressed to school deans to conduct a study was secured and that the sending of the google form link was initiated by every school upon the approval of school deans. In the consent form, it stated that participation in the study is purely voluntary, and they can withdraw if they felt discomfort from participating. Names and/or identity of participants are kept confidential to protect their privacy.

RESULTS

Profile

Table 1.
Demographic Characteristics of the Sample

Demographic Variable	Categories	F	%
Sex	Male	34	30.6
	Female	77	69.4
Institution	Humanities and Social Sciences Institute	29	26.1
	Biomedical Sciences Institute	18	16.2
	Institute of Management	55	49.5
	Engineering, Sciences & Technology Institute	9	8.1
Research Phase	Beginning	41	36.9
	Continuing	66	59.5
	Final Phase	4	3.6

The students that voluntarily participated in the online survey reached 111. It consisted of students from 4 institutes of Emilio Aguinaldo College-Cavite. In terms of sex many are female (69.4%) than male (30.6%) respondents. Many of them are from the Institute of Management (49.5%) followed by the students from the Humanities and Social Sciences Institute (26.1%). A total of 115 students participated, however, only 111 entries were accepted because of missing information.

The respondents come in three research phases. The beginning phase which comprised the 36.9 percent are writing their proposal study, while the continuing (59.5%) are either in data gathering or data analysis phase. The final phase (3.6%) is in the revising phase until the submission of their manuscript.

GenAI Tools Utilized by the Respondents

Table 2.
Utilized GenAI Tools

	Generative AI Level of Usage (WM)	Level of Dependency (WM)
Grammarly	Moderate (2.3)	Moderate (2.03)
Quillbot	Low (2.55)	Moderate (2.22)
ChatGPT	Low (2.97)	Low (2.53)

Legend: 1.00-1.75 – high usage Legend: 1.0-1.66 – high
1.76-2.50 – moderate usage 1.67-2.33 – moderate
2.51-3.25 – low usage 2.34-3.00 – low 3.26-4.00 – very low or no usage

Out of ten (10) Generative AI tools, only three (3) were utilized by the participants. The participants mostly utilized Grammarly at a moderate level (2.31) and Quillbot at low level (2.55) to assist them in writing academic papers, and ChatGPT (low, 2.97) comes in third place. On the other hand, their dependency level on Grammarly (2.03) and Quillbot (2.22) is moderate, while low in ChatGPT (2.53).

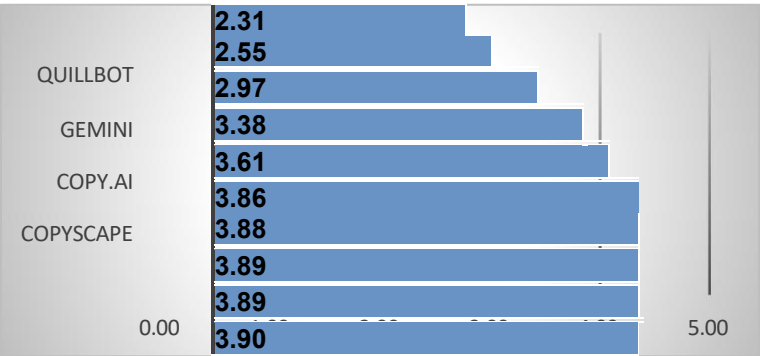


Figure 1. Participants’ Level of Utilization of Generative Artificial Intelligence Tools

Based on the mean results as shown on Figure 1, the GenAI tools that have very low or no usage at all in academic writing are Gemini, Turnitin, Copy.ai, MyMap, Copyscape, DeepL, and Bit AI. Only three AI tools are utilized by the participants; they are Grammarly, Quillbot, and ChatGPT.

Perceived Ethical Issues in the Utilization of GenAI Tools

Table 3.
Perceived Ethical Issues

Ethical Issues	WM	SD	Interpretation
The information generated by AI tools should be verified first to check its accuracy and truthfulness.	1.39	0.56	Highly unethical
Too much reliance on ChatGPT for sought information may cause one to include unverified or inaccurate information in their paper	1.46	0.58	Highly unethical
When using AI-generated text without checking whether it is from a legitimate source can result in plagiarism.	1.47	0.58	Highly unethical
Relying on AI tools like ChatGPT, MyMap, Bit AI, etc. for generated information to include in the RRL may cause to miss citing the sources	1.65	0.68	Highly unethical
When using ChatGPT or any AI tools, it is important to acknowledge it and explain why it is used to be transparent.	1.83	0.59	Moderately unethical

Paraphrasing AI tools such as Quillbot, copy.ai, DeepL, and others make it easier to produce an intelligent paper hassle-free and fast, but user does not feel ownership of the ideas.	1.87	0.65	Moderately unethical
ChatGPT, Elicit, and other AI tools used in academic writing are essential as supplementary to understanding some research concerns.	2.07	0.63	Moderately unethical
Using AI tools like ChatGPT and Quillbot to paraphrase and rephrase each paragraph may result in an incoherent paper.	2.08	0.61	Moderately unethical
AI tools like ChatGPT and Quillbot are writing tools that can help in paraphrasing. However, they tend to divert from the original idea	2.11	0.62	Moderately unethical
Since AI is known to mine information from many sources without crediting the owners, it will help to just cite AI as a reference	2.56	0.89	Slightly unethical
WEIGHTED MEAN	1.89		Moderately unethical

Legend: 1.00-1.75 – highly unethical
1.76-2.50 – moderately unethical 2.51-3.25 – slightly unethical
3.26-4.00 – not unethical

This study revealed students' perceptions of ethical issues behind AI utilization. Items with highly unethical interpretations are considered the most alarming for students because they are frequently heard issues as to AI utilization. On the contrary, those items that are regarded as slightly or moderately unethical are those issues that are less tackled and therefore, they were perceived not so alarming.
The respondents are keenly aware that AI may contain unverified information and therefore its accuracy and truthfulness is

questionable (1.39). Secondly, they are aware that anyone can become reliant on information generated by AI making them less attentive to false information (1.46). Another issue that is highly alarming is the tendency of its users to engage in plagiarism (1.47). Lastly, if the information is taken from AI, there is no point of referencing the source (1.65).

Some issues for the respondents are moderately unethical which could mean they do not find them alarming. First is failure to acknowledge AI tools as the source of information (1.83). Next is, the paraphrasing tools do not make them feel ownership of their works (1.87). Also, failure to acknowledge the function of ChatGPT and other AI tools as supplementary support to understanding of some concepts; that means, they help explain an idea (2.07). Another is, using tools in paraphrasing without human to assist in organizing the idea may lead to incoherent paper (2.08), or divert from original idea (2.11). Lastly, the least recognized ethical issue is citing AI tools as the source of information since it is impossible to determine where AI tools get the information (2.56).

Perceived Credibility of Research Output

Table 4.

Perceived Level of Credibility of their Research Output

Perceived Credibility	WM	SD	Interpretation
I based the analysis of my findings on the gathered evidence, not on gut feeling	1.13	0.45	Highly credible
The study was conducted systematically with what is described in the research methodology	1.22	0.46	Highly credible
Table 4 continued	1.24	0.47	Highly credible
I strive to reduce errors and biases in my paper by being meticulous during research	1.26	0.46	Highly credible
I consider the identified limitation of my study in interpreting the results.	1.27	0.54	Highly credible
The results of my research are consistent with previous studies	1.34	0.49	Highly credible
The research methodology of my study is anchored on theoretical perspective(s).	1.34	0.51	Highly credible
Any discrepancy in my/our result with prior studies is explained using RRL for having such results.	1.45	0.55	Highly credible
If my interpretation of the results is in contrast with previous studies, I consider the limitation of my study as a point of reference	1.51	0.64	Highly credible
WEIGHTED MEAN	1.31		Highly credible

Legend: 1.00-1.75 – highly credible

1.76-2.50 – moderately credible 2.51-3.25 – slightly credible 3.26-

4.00 – not credible

Table 6 shows that the participants' perception of the credibility of their research output is based on the indicators. These indicators are: the findings of gathered evidence (1.13), the systematic way of conducting the study (1.22), adherence to the planned protocol (1.24), their effort to reduce errors and biases in the paper (1.26), their consideration of the limitations of the study in interpreting the

results (1.27), the consistency of the result of the present study with previous studies (1.34), research methodology anchored on theoretical perspectives (1.34), alignment of the result with existing RRL for any discrepancies from previous studies (1.45), and acknowledging the limitations of the study if the results and interpretation differ from previous studies (1.51). With a weighted mean of 1.31, the perceived level of the research output is highly credible.

DISCUSSION

The participants of the study are Emilio Aguinaldo College- Cavite students enrolled in Thesis 1 and/or Thesis 2 during the conduct of the study. Majority of them are from the Institute of Management, female, and at the middle part (continuing) of research phase or between data collection and data analysis phase.

They utilize only three AI writing tools on a moderate level (Grammarly) and low level (Quillbot and ChatGPT) usage. However, the study shows a moderate level of dependency on Grammarly and Quillbot, while very low dependency level in the utilization of ChatGPT. The present study coincides with the study of Fabro et al (2024) explaining that Grammarly is the most favored AI tools followed by Quillbot, because they find these tools helpful in assisting them in writing academic papers. In the same study, ChatGPT comes in third place. This indicates that despite a wide array of choices of available AI tools, students are not showing much interest in exploring other AI tools, which according to Fabro et al (2024), students' choice is based on the kind of support they get from these tools, which are "enhancing writing skills and workflow efficiency (p. 8). Being at moderate and low level of usage is indicative of the respondents' moderate and low level of knowledge on how these AI tools can fully assist them in academic writing. In another study conducted by Bulante et al (2024) among Grade 10 students, it revealed that students are not confident with AI tools because they know it has "negative implications" which shows students' ignorance of its proper utilization (abstract).

The students' utilization of AI tools is influence by how they perceived these tools in terms of its ethicality. To summarize,

learners believed that AI content may have unverified and questionable information; that utilizing it can make them reliant on them; that there is a tendency to engaged in plagiarism; and they do not know how to reference a specific content from the tool if they would use it. These perceptions are counter productive which can only make them resistant of the new technology.

On the other hand, in some issues which are identified as moderately unethical, students may have the tendency to consider them less alarming and may ignore its implications. For instance, failure to acknowledge AI tools as the source of a specific information may cause them to commit plagiarism. An article explained that in case an AI tool was used as a source of information, it is important to acknowledge it within the body of the text; it is recommended to follow the guidelines in referencing content taken from AI tools ("referencing guidelines", 2024). Another is failure to acknowledge the supplementary support function of ChatGPT and other AI tools. Because of that students may develop dependency on these tools when needing much important information. According to Chan and Hu (2023), GenAI tools "respond to user prompts" (para. 4), for specific queries or clarification of some concepts.

For the participants, their research output is highly credible. Credibility in research is observed differently between quantitative and qualitative research. According to Leach et al (2024), credibility in qualitative research is based on the "trustworthiness, verisimilitude, and plausibility of a study's findings", while in quantitative, credibility is based on "reliability and replicability... achieved through findings that feel real, persuasive, and dependable" (p. 473). Based on the result, the students are highly convinced their research output is highly credible for carefully following or observing the meticulous process of research from adhering to the planned protocol down to the sound interpretation of the results anchored on RRL.

Conclusion

It is obvious from the study that participants are aware of AI tools, but their utilization of the tools is limited to what is common to all based on their uses. Grammarly became famous because of online promotion, so does the Quillbot and ChatGPT. Also,

students understand that utilizing AI tools have ethical implications, which run contrary to their values indicative of their low to moderate level of usage. However, they have limited knowledge of the guidelines to help them ethically use these AI writing tools to avoid being tagged of plagiarism and other known ethical issues. Based on this finding, students seem unwilling to explore AI tools for their own benefits because they are not fully equipped of ethical guidelines. This indicates that their acceptance of the technology is between moderate and low as well, and therefore, the very purpose of AI as writing tools is not fully understood and utilized

On the other hand, students' perception of credibility of their research output is based on what has transpired in the classroom with teachers teaching the methods of research, and that is very effective. Students have been committed to that principle that any technology that would be in contrary or could bring damage to the result will not be trusted by these students. In the long run, students must also be adept in technology since their future job would require them to be knowledgeable in that area. The study shows that their perception of the ethicality of these AI tools contributes to their non-acceptance of the technology for having a moderate and low usage of them.

Recommendations

Based on the stated conclusion, it is recommended for colleges and universities to draft ethical guidelines in utilizing AI tools for students to follow. It is high time to introduce AI tools to these students to maximize their benefits and to become aware of its ethical issues to avoid academic misconduct associated with AI utilization.

Teachers may maintain the level of commitment of these students in achieving quality research and at the same time introduce AI tools to them to assist them in their effort to have a credible research paper.

Teachers may undergo training on various AI writing tools and how to properly utilize them, so they can guide their students in using them.

Future researchers may conduct a qualitative approach related to the present study.

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Performance in the Criminology Licensure Examination: Basis for Program Enhancement

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KEYWORDS:

- **Criminal Law and Jurisprudence**
- **Law Enforcement Administration**
- **Crime Detection and Investigation**
- **Forensic Science**
- **Criminal Sociology**
- **Correctional Administration**

Abstract. Licensure examination results reveal the graduates' preparedness in taking the examinations, quality of faculty instruction, and exposure of students to practical learning experiences. This study analyzes the Criminology Licensure Examination (CLE) performance of graduates in a higher education institution since its Criminology program's inception. It also determined the performance of graduates in six Criminology board subject areas and proposed measures to enhance the institution's Criminology program. This study employed a quantitative-archival research design, utilizing

secondary data sourced from the Philippine Regulation Commission (PRC). The study population was the 588 Criminology graduates of Emilio Aguinaldo College-Cavite who took the CLE from October 2006 to February 2024. The CLE

periods were grouped into CLE clusters with five-year brackets for easier comparison: October 2006-August 2010, April 2011-April 2015, and October 2016-June 2022 under the old curriculum, and December 2022-February 2024 under the new curriculum. Descriptive statistics such as frequency and percentage distribution and weighted mean were used to analyze data. Findings revealed an increasing number of examinees over time, with most examinees being male. Overall, Law Enforcement Administration had the highest General Weighted Average (GWA), followed by Criminal Sociology. On the contrary, Correctional Administration obtained the lowest GWA, followed by Criminal Law and Jurisprudence. Despite that the Criminology program generally had above average institutional passing rate between 2006 and 2024, continuous improvement in the performance in board subject areas is required, specifically employing strategies addressing effective student preparation, faculty support, and curriculum enhancement to achieve graduates' higher passing averages and better career preparation.

Performance in the Criminology Licensure Examination: Basis for Program Enhancement

INTRODUCTION

Passing the licensure examinations is not just a graduate's achievement but is also an indicator of the quality of education in a degree program (Delos Angeles, 2020; Barreda & Barreda, 2020). This implies that quality education is linked to success in the licensure examination results. Guadamor (2020) stated that the licensure examination results reveal the graduates' preparedness in taking the examinations, quality of faculty instruction, and exposure of students to practical learning experiences.

The Commission on Higher Education (2018) mandates all higher education institutions (HEIs) offering the Criminology program to "produce graduates with knowledge, skills, attitude, and values in addressing the problem of criminality in the country..." However, to be able to lawfully practice the profession as Criminologists, they are first required to take and pass the licensure examination given by the Professional Regulation Commission (PRC) and be a registered criminologist. The Republic Act No. 11131, otherwise known as "The Philippine Criminology Profession Act of 2018," empowers the State to "develop and nurture competent... and well-rounded criminologists whose standards of professional practice and service shall be excellent... and globally competitive through sacred, honest, effective and credible licensure examinations..."

Section 13 of the Philippine Criminology Act of 2018 required the graduates to pass the licensure examination as a pre-requisite for the Criminology practice, particularly in six major areas: criminal law and jurisprudence, law enforcement administration, crime detection and investigation, forensic science (criminalistics), correctional administration, and criminal sociology. The examinee must have a weighted average rating of 75% with no grade less

than 60% in any given subject to be able to pass the licensure examination.

Emilio Aguinaldo College-Cavite has offered the Bachelor of Science in Criminology since 2001, with graduates entering the Criminologist Licensure Examination starting 2006. For over a decade, the School of Criminology has consistently achieved average to above-average national passing rates. To further enhance the program's effectiveness and maintain its high standards, this study undertakes a comprehensive analysis of graduates' performance across six board subject areas. This assessment will provide valuable insights to guide curriculum enhancement and optimize faculty resources to ultimately ensure the continued success of the program and its graduates.

Statement of the Problem

This study aims to analyze the performance of the Criminology graduates who have taken the Criminology Licensure Examination (CLE) from October 2006 to February 2024. Specifically, this study aims to answer the following research questions:

1. What is the profile of the Criminology graduates in terms of sex and year that the Criminology Licensure Examination (CLE) was taken;
2. What is the Criminology Licensure Examination (CLE) performance of the graduates?
3. What is the performance of the graduates in the six (6) Criminology board subject areas:

- 3.1 Criminal Law and Jurisprudence
- 3.2 Law Enforcement Administration
- 3.3 Crime Detection and Investigation
- 3.4 Forensic Science
- 3.5 Criminology
- 3.6 Correctional Administration

4. Based on the findings of the study, what measures can be proposed to enhance the Criminology program of EAC-Cavite?

Conceptual Framework

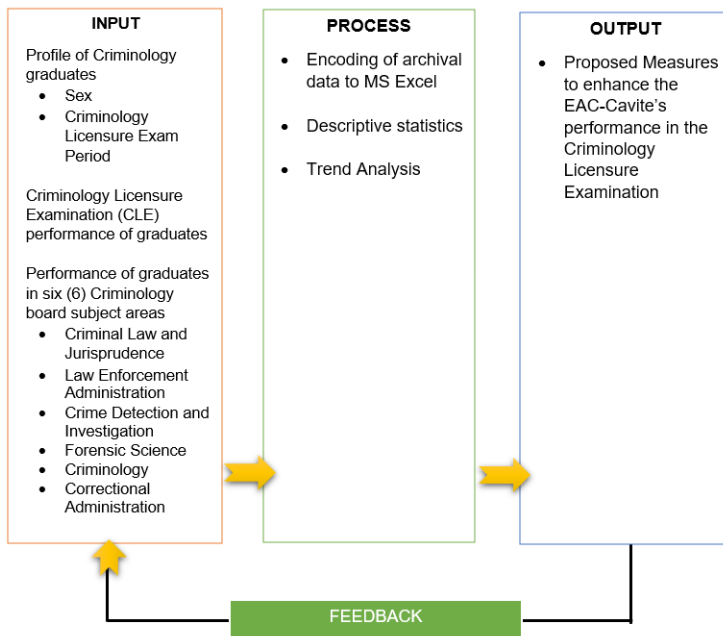


Figure 1. Paradigm of the Study

Figure 1 illustrates the Input-Process-Output (IPO) framework employed in this study. The inputs consist of profile data of EAC-Cavite graduates who took the Criminologist Licensure Examination (CLE) from 2006 to 2024, overall CLE performance, and examinees' performance in six Criminology board subject area. The processes involved encoding secondary data from the PRC into Microsoft Excel for analysis. This included trend analysis of CLE performance and the use of descriptive statistics to analyze data. The output of this study are the proposed measures aimed at enhancing EAC-Cavite's CLE performance, based on the insights gleaned from the data analysis. This IPO framework provides a clear and concise overview of the study's methodology and anticipated outcomes.

Significance of the Study

The researchers aim that the results of this study will benefit the following:

Criminology Students. The conclusion of this study will serve as their motivation to prepare for the Criminology Licensure Examinations by doubling their efforts in reviewing the different board exam subjects.

School of Criminology. This study will provide the school with baseline information on the board subject areas needing particular attention. This information will serve as a basis for enhancing the curriculum and syllabi of board subjects to better hone students and for reviewing the qualifications and competencies of instructors.

Faculty. The result of this study will provide a basis for enhancing teaching skills and strategies in line with preparing the students for taking the Licensure Examinations.

School Administration. This study will provide the school administration with a reference for improving the delivery of the curriculum through faculty, instruction, laboratories, and facilities for achieving quality education for its Criminology students.

Present and Future Researchers. This study will benefit them in understanding the board performance of Criminology graduates as well as the factors that could have contributed to the success and failure of examinees. The results of this study will serve as their reference in conducting research investigations of a similar topic.

Scope and Limitation

This study focused on analyzing the Criminology Licensure Examination performance of Emilio Aguinaldo College-Cavite graduates from October 2006 to February 2024, aiming to identify trends and patterns since the program's inception. This study employed an archival research method, utilizing secondary data sourced from the Philippine Regulation Commission (PRC).

The study did not cover the investigation of factors affecting the board performance of the examinees, such as academic performance, review center, and others. The analysis of the results is limited only to the school under consideration and does not generalize results to all schools.

Definition of Terms

To better understand the terms used in this study, the following terms are operationally defined:

Criminology. The Republic Act No. 11131 defined it as the “scientific study of crimes, criminals, and victims, and deals with the prevention and solution of crimes.”

Criminology board subject area. This refers to the cluster of subjects that is the focus of the CLE such as criminal jurisprudence and procedure, law enforcement administration, crime detection and investigation, criminalistics, correctional administration, and criminal sociology.

Criminology Licensure Examination (CLE) cluster. In this study, it refers to the groupings of the CLE periods into five-year brackets namely, October 2006-August 2010, April 2011-April 2015, October 2016-June 2022, and December 2022-February 2024.

Criminology Licensure Examination (CLE) period. It refers to the schedule (month and year) that the Professional Regulation Commission (PRC) has set for the CLE.

Criminology Licensure Examination (CLE) performance. In this study, it refers to the general weighted average of examinees' overall board examination results across all CLE clusters.

Failed. In this study, it refers to (a) failing the subject with a score less than 60 for each criminology board subject area, and (b) failing the overall CLE with an average score of less than 75.

General Average. In this study, it refers to the average of averages per CLE cluster of (a) examinee scores for a specific subject area or (b) examinees' overall board examination scores.

General Weighted Average. In this study, it refers to the average of averages across all CLE clusters on (a) examinee scores for a specific subject area or (b) examinees' overall board examination scores.

Passed. In this study, it refers to (a) passing the subject with a minimum score of 60 for each criminology board subject area, and (b) passing the overall CLE with an average score of 75.

Subject Area Performance. In this study, it refers to the general average of examinees for specific Criminology board subject area under each CLE cluster, as well as the general weighted average for a specific board subject area across all CLE clusters.

Review of Related Literature/Synthesis

Criminology Licensure Examination (CLE)

The Criminology Licensure Examination (CLE), administered by the Professional Regulation Commission (PRC), is the Philippine government's mechanism to ensure a competent and globally competitive criminology workforce, as mandated by Republic Act No. 11131 (The LAWPHIL Project, n.d.).

Further, the Act mandated six major areas to be covered in the CLE with their relative weights:

Board subject area	Specific subjects	Weight
Criminal Jurisprudence and Procedure	• Criminal Law Book I, Criminal Law Book II, Related Special Penal Laws • Criminal Procedure • Evidence • Court Testimony	20%
Law Enforcement Administration	• Police Organization and Administration, Police Planning • Police Patrol Operations, Police Communication System • Police Intelligence • Police Personnel and Records Management, Comparative Police Systems • Industrial Security Management	20%
Crime Detection and Investigation	• Fundamentals of Criminal Investigation • Special Crime, Organized Crime Investigation, Fire Technology and Arson Investigation • Traffic Management and Accident Investigation • Drug Education and Investigation • Vice Control	15%
Forensic Science (formerly Criminalistics)	• Forensic Photography, Personal Identification, Forensic Medicine, Polygraphy, Examination, Forensic Ballistics • Questioned Documents	20%
Correctional Administration	• Institutional Corrections, Non-Institutional Corrections	10%
Criminal Sociology	• Introduction to Criminology and Psychology of Crimes • Philippine Criminal Justice System • Ethics and Values • Juvenile Delinquency and Crime Prevention • Human Behavior and Crisis Management, Criminological Research and Statistics	15%

Performance of Criminology Graduates in the Criminology Licensure Examinations

Bajeta et al. (2015) conducted a descriptive study on the performance in the CLE of Criminology graduates from 2008 to

2013 in a private university, especially in six professional board subjects. Findings revealed that most of the examinees passed the Criminal Jurisprudence and Procedure for the year 2008, while from 2009-2013, the majority passed the Crime Detection and Investigation (CDI). Further, the majority passed the overall licensure examination from 2008 to 2013, though there was a fluctuating trend in the board results. The researchers recommended the reinforcement review every semester based on the major subjects taken by students as well as implementing a ladderized program for the Criminology program.

Barreda and Barreda (2020) determined the relationship between the demographic profile and grade point average in six professional board subjects of the CLE among examinees in Solis Institute of Technology, Bulan, Sorsogon for the examination period 2011 to 2016. Findings revealed that Criminal Law and Jurisprudence had the highest mean while Correctional Administration had the lowest mean. The trend implied that the strength of the faculty in the Criminology Department was in criminal law and jurisprudence and the identified weakness was in correctional administration. Data also revealed that age, gender, civil status and general point average were significantly related in the performance in the licensure examination. The researchers recommended hiring faculty with specialization in correctional administration to increase the performance of the graduates in CLE.

Guadamor (2020) conducted a comparative analysis on the board and academic performances of Criminology graduates of 2016 and 2017 in Cagayan State University, Cagayan. Results showed that examinees obtained high college grade weighted averages (GWA) in Crime Detection and Investigation and Correctional Administration, while had difficulty in Criminal Law and Jurisprudence and Criminalistics. In terms of licensure examination performance, the examinees had difficulty passing Criminal Law and Jurisprudence, Criminalistics, and Correctional Administration. For both graduates, it was found that if the GWA is low, the CLE rating tends to be low. On the other hand, the higher the GWA, the higher the CLE ratings.

Badua (2020) assessed the CLE performance of 100 graduates from the College of Criminal Justice Education of Northwestern University from 2009-2013. The study revealed that

the respondents have moderately good academic performance and obtained a low passing percentage in almost all CLE period, which signifies a need for improvement in the institutional passing rate. Among the board subject areas, Criminal Investigation and Detection yielded the highest passing average, while Criminal Jurisprudence had the lowest. Furthermore, the respondents encountered average difficulty in all board subject areas. Criminal Jurisprudence had the highest average difficulty score and Criminal Investigation and Detection had the lowest. The difficulty in Criminal Jurisprudence was attributed to the need for analysis and application, which students struggled with. Conversely, students' familiarity with police functions gained through on-the-job training and demonstrations likely contributed to their better performance in Criminal Investigation and Detection. Respondents reported facing challenges related to study habits, faculty instruction, review class management, as well as financial and health issues during their time in school, review courses, and the board examination. The study recommended implementing targeted interventions to enhance the quality of instruction and review services.

Barreda (2022) analyzed the impact of college grade point average in the licensure examination performance of Criminology graduates from 2017 to 2021. Both passers and non-passers obtained a high weighted averages in the exams for Law Enforcement Administration and the lowest mean average for Correctional Administration. Further, despite that there is a negative weak correlation between academic and licensure examination performance, which indicated that school performance is a good indicator of passing the board examination. The study recommended evaluating the instructional design and assess teachers' strategies in handling major subjects to improve the performance in six major subject areas in the CLE.

Synthesis

Several studies have investigated the performance of Criminology graduates in the Licensure Examination (CLE). Bajeta et al. (2015), Guadamor (2020), and Barreda (2022) all found a correlation between academic performance (GPA) and CLE results, suggesting that strong academic foundations are crucial for success in the licensure exam. However, Badua (2020) observed a need for improvement in the institutional

passing rate despite moderately good academic performance, indicating that factors beyond GPA may influence CLE outcomes.

Criminal Jurisprudence consistently emerged as a challenging subject, with lower passing averages and higher perceived difficulty (Bajeta et al. 2015; Badua, 2020; Guadamor, 2020). Barreda and Barreda (2020) found it as the subject with the highest mean, which highlights the need for focused interventions in this area. Conversely, Criminal Investigation and Detection often yielded higher passing averages (Bajeta et al., 2015; Badua, 2020), potentially due to practical exposure gained through training and demonstrations (Badua, 2020).

Barreda and Barreda (2020) identified age, gender, civil status, and GPA as significantly related to CLE performance, suggesting a need for tailored support based on individual characteristics. Badua (2020) highlighted challenges related to study habits, faculty instruction, review class management, and financial and health issues, emphasizing the importance of holistic student support.

The School of Criminology at EAC-Cavite lacks research on identifying the specific board examination subjects that are strengths and weaknesses for its graduates, as well as analyzing the trends in board performance for each subject area over time. This study aims to fill these gaps in the existing research literature.

METHODOLOGY

Research Design

This study utilized archival research to collect data. Archival research, as defined by the American Psychological Association (2019), involves the examination of existing materials such as books, journals, historical documents, and other stored records or data for scientific inquiry. This study utilized archival data from the Professional Regulation Commission (PRC), specifically the CLE results from October 2006 to February 2024, to analyze board performance. Statistical analysis was employed to address

the research questions and derive meaningful insights from the collected data.

Research Locale

The specific locale of this study was the School of Criminology in Emilio Aguinaldo College – Cavite located along Governor D. Mangubat Avenue in Barangay Buroi Main, City of Dasmariñas, Cavite. Since the researchers are from this institution, they have selected it as the research locale in order to understand the board performance trend in the institution and provide data-driven recommendations to enhance board performance.

Sources of Data

This study employed a total enumeration approach, encompassing all examinees listed in the PRC board examination results for data interpretation and analysis. The study population was the Criminology graduates of Emilio Aguinaldo College-Cavite who took the CLE from October 2006 to February 2024. This study utilized secondary data sourced from the Professional Regulation Commission (PRC). The data, obtained through the request from the Dean's Office, primarily consisted of board examination results grouped according to CLE period. The CLE periods were then grouped into CLE clusters with five-year brackets for easier comparison: October 2006-August 2010, April 2011-April 2015, October 2016-June 2022, and December 2022-February 2024. The first three brackets include examinees who completed the curriculum developed under CHED Memorandum Order No. 21, series of 2005 (old curriculum). Those who took the licensure exam between June 2022 and February 2024 graduated from the curriculum developed under CHED Memorandum Order No. 5, series of 2018 (new curriculum).

Data Gathering Procedure

The researchers first sought the approval of the Dean of the School of Criminology and the President of Emilio Aguinaldo College-Cavite to conduct this study. Upon securing approval, the researchers obtained access to the compiled board examination results from 2006 to 2024 upon the approval of request. The data, comprising of examinees' scores per criminology board subject

area, were then meticulously encoded and summarized into Microsoft Excel to facilitate subsequent statistical analysis. The researchers ensured the utmost confidentiality of the collected data, adhering to strict ethical guidelines and data protection protocols. To maintain the anonymity of the graduates, personal identifiers were replaced with numerical codes throughout the dataset.

Data analysis

This study employed descriptive statistics to analyze data and address the research questions. Frequency and percentage distributions were used to examine profile variables and CLE performance. Weighted means were calculated to provide additional analysis of CLE performance, while bar graph was utilized to visualize the trend of graduates' CLE performance in each subject area.

Ethical Consideration

This study underwent ethical review by the Institutional Ethics Review Board and was granted approval.

RESULTS

Criminology Licensure Examinees' Profile

Table 1

Profile of Criminology licensure examinees from Emilio Aguinaldo College-Cavite (2006-2024)

CLE Period	Male	%	Female	%	Total	%
Oct 2006 - Aug 2010	24	83%	5	17%	29	5%
Apr 2011 - Oct 2015	129	84%	25	16%	154	26%
Apr 2016 – June 2022	217	70%	94	30%	311	53%
Dec 2022 - Feb 2024	59	63%	35	37%	94	16%
Total	429	73%	159	27%	588	100%

Table 1 depicts the frequency and percentage of examinees' sex and CLE period. According to data from 2006 to 2024, most examinees are male (73%), with only 27% being female. This reflects the institution's Criminology program, which is significantly male dominated. It is worth noting, however, that the proportion of female examinees is higher during the CLE cluster December 2022-February 2024 (37%), indicating that the female population is increasingly interested in pursuing a criminology program.

Further, the data indicates an increase in the number of examinees for each CLE cluster, with the highest number being 311 (53%), between October 2016 and June 2022. This indicates that male and female enrollment in the Criminology program has increased over time. The CLE cluster December 2022-February 2024 was excluded from the comparison because it covered less than three years.

Overall Performance in the Criminology Licensure Examinations (CLE)

Table 2

General averages of examinee scores and institutional and national passing rates in Criminology Licensure Examination (CLE) per CLE Cluster

CLE Cluster	Passed	%	Failed	%	Total Examinees	Gen Average Examinee Scores	Gen Ave Institutional Passing	Gen Ave National Passing
Oct 2006 - Aug 2010	13	45%	16	55%	29	72.01	53.37	32.34
Apr 2011 - Oct 2015	87	56%	67	44%	154	70.67	56.86	35.71
Apr 2016 – June 2022	154	50%	157	50%	311	70.33	44.58	33.11
Dec 2022 - Feb 2024	48	51%	46	49%	94	72.81	45.10	38.04
Overall/ Gen Weighted Ave	302	51%	286	49%	588	71.46	49.98	34.80

Table 2 presents the general averages of Criminology Licensure Examination (CLE) ratings grouped according to CLE clusters. The institutional and passing rates per CLE period were sourced from the report from the Philippine Regulations

Commission (PRC) provided for the institution. The general averages for each CLE cluster were calculated.

Data shows that the average institutional passing rates for all CLE clusters are higher than their corresponding average national passing rates. However, data shows a declining and seemingly close difference or gap between the institutional and national passing rates from CLE cluster April 2016-June 2022 (diff=11.47) to December 2022-February 2024 (diff=7.06). In addition, half of the population in these clusters passed the CLE while the other half failed. Despite these observations, the general average of examinees scores was higher in CLE cluster December 2022-February 2024 (72.81), indicating that graduates of the new curriculum performed better than those from the old curriculum. However, the general average is not adequately high, indicating that there is a need to improve the licensure examination performance of the Criminology graduates, as well students' comprehension of the criminology board subject areas covered by the new curriculum.

Criminologist Licensure Examination (CLE) Performance in Six Criminology Board Subject Areas

Table 3

CLE ratings in Criminal Law and Jurisprudence (2006-2024)

CLE Cluster	Passed	%	Failed	%	Total Examinees	Gen Ave
Oct 2006 - Aug 2010	20	69%	9	31%	29	70.14
Apr 2011 - Oct 2015	121	79%	33	21%	154	71.98
Apr 2016 - June 2022	249	80%	62	20%	311	69.38
Dec 2022 - Feb 2024	81	86%	13	14%	94	71.03
Overall/ Gen Weighted Ave	471	80%	117	20%	588	70.63

Table 3 summarizes the examinees' general averages in Criminal Law and Jurisprudence (CLJ) over four CLE clusters. The CLJ area covers principles and concepts of criminal law, as well as procedures and their practical application.

Data shows that the general weighted average in Criminal Law and Jurisprudence is 70.63, which is above the national passing rate. It is also worth noting that 80% of 588 examinees

have passed this subject area since the first batch of examinees' CLE in October 2006. However, the weighted average for this subject area is not adequately high, indicating that a significant number of graduates struggled with or lacked mastery and understanding with the CLJ area.

Data also shows a positive trend in the subject area performance as the percentage of examinees passing the CLJ area has increased over time. However, the general averages over four CLE clusters fluctuated, indicating that performance in this area has not consistently improved across all groups. This inconsistency could be attributed to a variety of factors, including differences in student preparation, instructional quality and resource availability, student demographics, or changes in licensure exam format or content over time.

The data also shows that examinees from CLE cluster April 2011-April 2015 who graduated from the old curriculum had the highest general average of 71.98, followed by examinees from CLE cluster December 2022-February 2024 who graduated from the new curriculum with an average score of 71.03. This slight drop in performance can be attributed to the impact of online classes during the COVID-19 pandemic. All professional courses transitioned to online classes, where internet connection is sometimes intermittent, which made it difficult for students to grasp or understand the subjects. This was experienced not only in the institution but in the entire country. Another attributing factor is that CLJ area was taken by the students prior to the refinement of the Table of Specifications (TOS), which focuses on the area or study or review. Despite the slight decrease, the CLE cluster December 2022-February 2024 had a higher proportion of passers (86%) for the specific subject area than April 2011-April 2015 (79%).

Moreover, examinees from CLE period October 2016-June 2022 had the lowest performance for CLJ, with a general average of 69.38, indicating that the examination for this subject area was most difficult during this specific timeframe.

Table 4

CLE ratings in Law Enforcement Administration (2006-2024)

CLE Cluster	Passed	%	Failed	%	Total Examinees	Gen Ave
Oct 2006 - Aug 2010	23	79%	6	21%	29	71.23
Apr 2011 - Oct 2015	137	89%	17	11%	154	70.14
Apr 2016 – June 2022	286	92%	25	9%	311	72.55
Dec 2022 - Feb 2024	91	97%	3	3%	94	76.29
Overall/ Gen Weighted Ave	537	91%	51	9%	588	72.55

Table 4 summarizes the examinees' general averages in Law Enforcement Administration (LEA) over four CLE clusters. The LEA area focuses on the organization, management, and operation of law enforcement agencies. It also covers the history and development of law enforcement, their organization and structure, operational functions and their interagency cooperation.

The general weighted average for Law Enforcement Administration is 72.55, which is above the national passing percentage. It is also worth noting that a remarkable 91% of 588 examinees have passed this subject since the first batch of examinees' CLE in October 2006. However, the weighted average for this area is not adequately high, indicating that a significant number of graduates struggled with or lacked mastery and understanding with the LEA area.

Interestingly, data also shows a positive trend in the subject area performance as percentage of examinees passing the LEA area, as well as general averages over four CLE clusters, have been significantly increasing over time indicating effective student preparation.

The data show that examinees from CLE cluster December 2022-February 2024 had the highest general average of 76.29, as well as the highest proportion of passers (97%) for this specific subject area when compared to others. These figures indicate that graduates from the new curriculum have a higher level of proficiency in this area than those from the old curriculum. On the contrary, examinees from CLE period April 2011-April 2015 had the lowest performance for LEA, with an average of 70.14, indicating that the examination for this subject area was most difficult during this specific timeframe.

Table 5

CLE ratings in Forensic Science (2006-2024)

CLE Cluster	Passed	%	Failed	%	Total Examinees	Gen Ave
Oct 2006 - Aug 2010	25	86%	4	14%	29	72.89
Apr 2011 - Oct 2015	145	94%	9	6%	154	71.11
Apr 2016 – June 2022	257	83%	54	17%	311	69.76
Dec 2022 - Feb 2024	89	95%	5	5%	94	71.36
Overall/ Gen Weighted Ave	516	88%	72	12%	588	71.28

Table 5 summarizes the examinees' general averages in Forensic Science over four CLE clusters. The Forensic Science area is a critical component of the CLE, focusing on the scientific methods and techniques used to analyze physical evidence for criminal investigations and legal proceedings. This covers the principles and practical application of different systemic body of knowledge regarding Personal Identification such as Fingerprint and DNA, Photography, Examination of Disputed Documents, Chemistry and Toxicology, Lie Detection Techniques, and lastly Ballistics and Firearms Identification.

The general weighted average for the Forensic Science area is 71.28, which is above the national passing percentage. It is also worth noting that 88% of 588 examinees have passed this subject area since the first batch of examinees' CLE in October 2006. However, the weighted average for this area is not adequately high, indicating that a significant number of graduates struggled with or lacked mastery and understanding with the Forensic Science area.

Data also shows an inconsistent trend in subject area performance as the percentage of examinees passing the Criminalistics area, as well as general averages over four clusters, were fluctuating indicating that performance in this area has not consistently improved across all groups.

The data show that examinees from CLE cluster October 2006-August 2010, which included the first batch of examinees, had the highest general average of 72.89. During this period, the Republic Act No. 6506 designated Forensic Science (previously known as Criminalistics) as a critical component of the board exam, accounting for 20% of the total score. Examinees must

therefore prioritize mastering this subject. This average was followed by CLE period December 2022-February 2024 with a general average of 71.36. During this period, Republic Act No. 11131, which amended RA No. 6506, renamed Criminalistics into Forensic Science and reduced the subject weight to 15% in the overall score. Consequently, the CLE content for this subject area shifted towards a more practical and application-oriented approach.

Moreover, examinees from CLE period October 2016-June 2022 had the lowest performance for Criminalistics/Forensic Science, with an average of 69.76, indicating that the examination for this subject area was most difficult during this specific timeframe.

Table 6
CLE ratings in Crime Detection and Investigation (2006-2024)

CLE Cluster	Passed	%	Failed	%	Total Examinees	Gen Ave
Oct 2006 - Aug 2010	26	90%	3	10%	29	74.46
Apr 2011 – Oct 2015	138	90%	16	10%	154	70.78
Apr 2016 – June 2022	266	86%	45	14%	311	70.99
Dec 2022 - Feb 2024	80	85%	14	15%	94	69.59
Overall/ Gen Weighted Ave	510	87%	78	13%	588	71.45

Table 6 summarizes the examinees' general averages in Crime Detection and Investigation (CDI) over four CLE clusters. The CDI area focuses on the methods and techniques used to identify, analyze, and solve crimes. It covers a wide range of topics that are crucial for understanding how criminal investigations are conducted and how evidence is collected and analyzed.

The general weighted average in Crime Detection and Investigation area is 71.45, which is above the national passing percentage. It is also worth noting that 87% of 588 examinees have passed this subject area since the first batch of examinees' CLE in October 2006. However, the weighted average for this area is not adequately high, indicating that a significant number of graduates struggled with or lacked mastery and understanding with the CDI area.

Data also shows a declining trend in subject area performance as evidenced by a decreasing percentage of examinees passing the subject over time. This suggests that there may be a problem with examinees' preparation, training, or assessment in this crucial subject area. Moreover, the general averages over four CLE clusters were fluctuating, indicating that performance in this area has not consistently improved across all groups.

The data show that examinees from CLE cluster October 2006-August 2010 had the highest average score of 74.46 with 90% examinees passing the subject area, followed by CLE cluster April 2016-June 2022 with an average of 70.99. On the contrary, examinees from CLE period December 2022-February 2024 had the lowest performance for Crime Detection and Investigation, with an average of 69.59, indicating that the examination for this subject area was most difficult during this specific timeframe. This difficulty can be attributed to the relevance of the exam contents to the new curriculum implemented by the Commission on Higher Education (CHED). These changes in the new curriculum include the removal of courses from the old curriculum and the introduction of four new courses that affected examinees who belonged to the old curriculum.

Table 7
CLE ratings in Criminal Sociology (2006-2024)

CLE Cluster	Passed	%	Failed	%	Total Examinees	Gen Ave
Oct 2006 - Aug 2010	25	86%	4	14%	29	72.39
Apr 2011 - Oct 2015	131	85%	23	15%	154	71.05
Apr 2016 – June 2022	252	81%	59	19%	311	69.28
Dec 2022 - Feb 2024	89	95%	5	5%	94	76.07
Overall/ Gen Weighted Ave	497	85%	91	15%	588	72.20

Table 7 summarizes the examinees' general averages in Criminal Sociology (CS) over four CLE clusters. The CS area focuses on the sociological aspects of crime, criminal behavior, and the societal response to crime. This area of study is crucial for understanding the broader social context in which criminal activities occur and how societal structures and processes influence both criminal behavior and the criminal justice system.

The general weighted average for Criminal Sociology area is 72.20, which is above the national passing percentage. It is also worth noting that 85% of 588 examinees have passed this subject area since the first batch of examinees' CLE in October 2006. However, the weighted average for this area is not adequately high, indicating that a significant number of graduates struggled with or lacked mastery and understanding with the Criminal Sociology area.

Data also shows a declining trend in the subject area performance under the old curriculum, as evidenced by decreasing percentage of examinees passing the subject, as well as declining general averages of 72.39 (October 2006-August 2010), 71.05 (April 2011-October 2015), and 69.28 (April 2016-June 2022). It is worth noting that the performance of CLE cluster December 2022-February 2024, in which graduates used the new curriculum, had the highest average of 76.07, indicating that the curriculum had a positive impact on examinee licensure performance. It also indicates that examinees have a higher level of subject matter competency, as well as better student preparation and improved instruction.

On the contrary, examinees from CLE period April 2016-June 2022 had the lowest performance for Criminal Sociology, with a general average of 69.28, indicating that the examination for this subject area was most difficult during this specific timeframe.

Table 8
General weighted average of CLE ratings in Correctional Administration (2006-2024)

CLE Cluster	Passed	%	Failed	%	Total Examinees	Gen Ave
Oct 2006 - Aug 2010	22	76%	7	24%	29	71.64
Apr 2011 - Oct 2015	123	80%	31	20%	154	68.35
Apr 2016 - June 2022	243	78%	68	22%	311	68.11
Dec 2022 - Feb 2024	84	89%	10	11%	94	70.91
Overall/ Gen Weighted Ave	472	80%	116	20%	588	69.75

Table 8 summarizes the examinees' general averages in Correctional Administration (CA) over four CLE clusters. The CA area covers two subjects: Institutional and Non-institutional

corrections. It focuses on the management and operation of correctional facilities and programs, including national prisons, jails, and community-based corrections. This area of study is essential for understanding how to effectively manage and rehabilitate offenders while ensuring public safety.

The general weighted average for Correctional Administration area is 69.75, which is above the national passing percentage. It is also worth noting that 80% of 588 examinees have passed this subject area since the first batch of examinees' CLE in October 2006. However, the weighted average for this area is not adequately high, indicating that a significant number of graduates struggled with or lacked mastery and understanding with the Correctional Administration area.

Data also reflects a declining trend in subject area performance under the old curriculum as the general averages over three clusters were decreasing. This indicates that the examinees may have not paid close attention to this area, which only encompasses two subjects and has a low subject weight of 10% of the total exam score. However, it is worth noting that CLE cluster December 2022-February 2024 (new curriculum) has a significantly higher percentage of examinees who passed (89%) compared to other clusters. Also, the average rating increased to 70.91, indicating that the new curriculum improved examinee licensure performance.

The data also shows that examinees from CLE cluster October 2006-August 2010 had the highest average score of 71.64 with 76% examinees passing the subject area. On the contrary, examinees from CLE cluster April 2016-June 2022 had the lowest performance for Correctional Administration, with an average of 68.11, indicating that the examination for this subject area was most difficult during this specific timeframe.

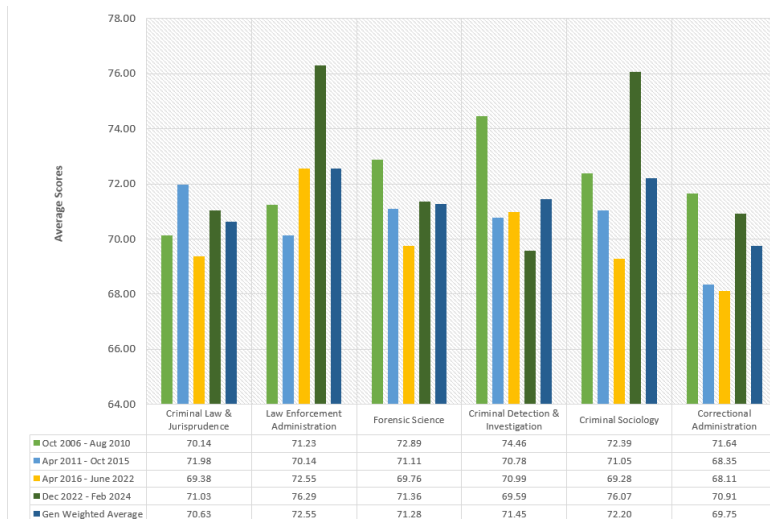


Figure 2. Comparison of general weighted averages in Criminology Board Subject Areas (2006-2024)

Figure 2 presents a comparison of general weighted averages across all Criminology board subject areas grouped according to CLE cluster. Data shows that Law Enforcement Administration had the highest general weighted average (72.55). In April 2016-June 2022 and December 2022-February 2024 clusters, it was the strongest area among examinees, with the highest average ratings. Criminal Sociology subsequently followed with the second highest weighted average (72.20), particularly in December 2022-February 2024 cluster.

On the contrary, Correctional Administration obtained the lowest general weighted average (69.75). This was also the case in April 2011-October 2015 and April 2016-June 2022. Criminal Law and Jurisprudence also had a low weighted average (70.63). This finding indicates a need for significant attention and improvement in these subject areas.

Since the School of Criminology operates under the new curriculum, it is important to understand the general average ratings of examinees under CLE cluster December 2022-February 2024. Law Enforcement Administration has the highest general average (76.29), followed by Criminal Sociology (76.07). This finding suggests that the new curriculum adequately prepared students in these subjects, possibly through revised materials,

improved instructional techniques, or alignment of class standards with examination requirements. Whereas, Criminal Detection and Investigation had the lowest general average (67.59), along with Correctional Administration (70.91), indicating that these subject areas are particularly difficult and may necessitate specific interventions to improve students' comprehensions and graduates' licensure examination performance.

Proposed Measures to Enhance the Criminology Program

Based on the findings of the study, the researchers propose the following measures to be undertaken to improve the performance of existing students and future graduates in the CLE:

Aspect	Proposed Measures/Strategies	Person/s Responsible
Student Preparation	• Conduct comprehensive examinations to professional courses every end of the semester from 1st year to 4th year • Establish an organization of students with excellent academic records to help students that need coaching • Conduct consultation with both parents and student if a student was determined of having deficiencies before final grading period • Conduct a seminar/orientation teaching students about time management techniques and importance of all subjects in the CLE	Dean, Instructors Dean, Criminology Student Government Instructors Dean, instructors
Faculty Support	• Recruit highly competent instructors to handle subjects based on their specializations • Attendance to professional instructor development seminars/trainings every semester to align with more appropriate teaching methodologies • Use pen and paper examination instead of cellular phones to avoid cheating among students	Dean, HRD Dean, Program Head Dean, Program Head, Instructors
Curriculum Enhancement	• Conduct course audit or in-house review of 4th year students for the first and second semester to fully prepare them for the CLE	Dean, Program Head

passing specific subject areas, their general averages are quite low, indicating that a significant number of examinees struggled with or lacked mastery and understanding of these areas. This indicates a need to improve the graduates' comprehension and performance in criminology board subject areas to achieve better institutional performance on the licensure examination (Barreda, 2022).

Law Enforcement Administration (LEA) and Criminal Sociology had the highest general average among graduates in the new curriculum as well as overall (2006 to 2024). According to Barreda (2022), LEA was also the highest for examinees in an educational institution between 2017 to 2021. Badua (2020) attributes this finding to the average level of difficulty experienced by examinees in this subject area due to the knowledge and abilities acquired from school, availability of review materials, and better understanding of licensure examination questions.

Correctional Administration had the lowest average among graduates in the new curriculum as well as overall (2006 to 2024). This finding is consistent with Barreda (2022) for licensure examinees in 2017-2021, construing it as a faculty weakness. Therefore, identifying performance in this subject is useful for evaluating teaching methodologies and providing additional support or training to the faculty. This effort applies not only to Correctional Administration, but to all subject areas. Barreda (2022) strongly recommended that the criminology department develop a professional development plan for faculty members, as well as faculty members participate in training and seminars related to the six subject areas to equip them with the latest "knowledge, skills and values" which are crucial in honing competitive criminology professionals.

Furthermore, previous research explained why Correctional Administration had the lowest passing rate. According to Badua (2020), this subject area presents examinees with memorization-intensive questions about theories and history. Also, examinees try to rush through this examination because it is given on the last day and they want to go home. They are also aware that its relative weight is only 10%. Based on this perspective, the School of Criminology can further improve performance in this subject area by holding review sessions focused on this subject, teaching time management techniques, or conducting an

orientation/seminar emphasizing the importance of all subjects in the exam. Bajeta (2015) stressed the importance of conducting seminars about preparations for CLE and examination techniques to enhance examinees' performance.

Moreover, Criminal Law and Jurisprudence is the second lowest overall, followed by Criminal Detection and Investigation for those who graduated under the new curriculum. According to Badua (2020), examinees struggled in these subjects because they require analysis and application. This implies that the School of Criminology can improve examinees' performance in these subject areas by incorporating more analytical and application-based learning activities into classes.

The low passing averages in these subject areas encourage the School of Criminology to continuously strengthen its Criminology program in terms of student preparation, faculty support, and curriculum enhancement strategies to achieve the two-fold objective: to attain higher passing averages for its graduates, and to better prepare them for their future careers.

Conclusion

This study concludes that the Criminology program of the institution generally had an above average institutional passing rate between 2006 and 2024. Through these years, there was room for improvement in the performance of graduates in six criminology board subject areas, in the following order: Correctional Administration, Criminal Law and Jurisprudence, Forensic Science, Criminal Detection and Investigation, Criminal Sociology, and Law Enforcement Administration. The implementation of the 2018 curriculum provided learning management systems and strategies that better prepared students for the Criminology Licensure Examination (CLE). However, continuous improvement in the performance in the board subject areas is required. Strategies addressing effective student preparation, faculty support, and curriculum enhancement are all essential in achieving incoming graduates' higher passing averages and better preparation for their future careers.

Recommendations

The researchers recommend the following to the School of Criminology:

1. Review and implement this study's proposed measures for student preparation strategies, faculty support, and curriculum enhancement outlined in the Results section.
2. Implement more effective strategies to address gaps in graduates' performance in Correctional Administration, Crime Detection and Investigation, and Criminal Law and Jurisprudence areas; and
3. Conduct an in-depth study to identify the factors that contributed to graduates' difficulty in each criminology board subject area, to strengthen existing intervention programs that improve CLE performance.

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Spatiotemporal Dynamics, Taxonomic Diversity, and Distribution of Airborne Fungi in Selected Premises of Emilio Aguinaldo College

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- **Fungal ecology**
- **Indoor ventilation**
- **Mycotoxigenic**
- **Settle Plate Method**

Abstract

The Philippines is at an elevated risk of airborne mycotoxigenic contamination due to its tropical, warm, and humid climate, which provides airborne fungi with the optimal conditions to propagate. Emerging studies highlight the potential impact of climate change on fungal ecology by altering meteorologic conditions, resulting in new growth patterns and the dispersal of fungi into new regions. To ascertain the correlation between the airborne

fungal community structure and spatiotemporal dynamics in selected premises of Emilio Aguinaldo College-Cavite, this study was conducted. Using the Settle Plate Method and morphocultural characterization of airborne fungal isolates, seven genera

were isolated on PDA culture media. The most prevalent species isolated was *Aspergillus niger*, followed by *Aspergillus fumigatus*. Both species have significant clinical implications due to their ability to cause infections in immunocompromised individuals, trigger allergic reactions, and produce mycotoxins. The highest frequency of fungal detection occurred in May 2024. Lobby 3 and the canteen exhibited the greatest fungal diversity and distribution. The Shannon Index of Diversity revealed a moderately diverse airborne fungal community across the sampling sites. Relative humidity exhibited a perfect positive correlation with the structure of airborne fungal community. Environmental temperature also suggested a strong positive correlation with fungal community structure, while human traffic did not show a remarkable influence. The study of airborne fungi in school settings is crucial not only for safeguarding the health and well-being of students, educators, and staff, but also for facilitating proactive measures and gaining a comprehensive understanding of how fungal ecology can impact learning, health, and productivity.

Spatiotemporal Dynamics, Taxonomic Diversity, and Distribution of Airborne Fungi in Selected Premises of Emilio Aguinaldo College

INTRODUCTION

Airborne fungal infections are an increasing global public health concern due to their significant impact on human health and various aspects of daily life. Exposure to airborne fungi has been reported to cause allergies, mycotoxin poisoning, and aspergillosis (Mousavi et al., 2016), as well as respiratory problems, skin infections, and infections of other body organs (Li et al., 2016). Several epidemiological studies have disclosed that individuals exposed to high levels of mold and dampness in homes are more susceptible to both lower and upper respiratory infections, which are characterized by symptoms such as cough, chest tightness, exertional dyspnea, wheezing, and nasal and sinus irritation (Li et al., 2016).

Airborne fungal contaminants in classrooms may increase the risk of health-related issues for both students and teachers, potentially reducing learning and productivity (Balolong et al., 2017). The incidence of respiratory allergies and asthma among students has been rising globally, making it crucial to assess the burden of inhalant biological particles in school environments, where learners and educators spend one third of their life.

In humans, the impact of airborne fungi has been exacerbated by climate change, which favors the propagation of the fungal spores (Fagade et al., 2023). Infectious diseases caused by the inhalation of airborne fungi depend not only on the number of spores inhaled but also on the site of deposition in the respiratory system. Some researchers have characterized fungal bioaerosols and assessed exposure risks in various communal buildings, including hospitals (Ablola et al., 2020; Hiwar et al.,

2021), libraries (Wu et al., 2020), and offices (Guo et al., 2021).

The effects of airborne fungi on human health have prompted researchers to study the diversity of aeroallergens, leading to the identification of nearly 80 genera of fungi primarily responsible for respiratory ailments or anomalies (Liu et al., 2014). Elevated loads of fungal spores in the environment can lead to an increased number of asthma cases (Lanier et al., 2012). Furthermore, airborne fungi are identified as one of the etiologic agents of lung cancer. Aflatoxin B1 produced by *Aspergillus flavus* was observed to cause liver and lung cancer when fungi are ingested or inhaled (Ahmed et al., 2017; Marchese et al., 2018). *A. fumigatus* is responsible for about 90% of all cases of invasive aspergillosis, while *A. niger* causes a range of invasive pulmonary diseases (Marr et al., 2002).

The reasons why fungi have historically been understudied and largely excluded from microbial research are complex. However, fungi have clearly demanded immediate attention, as numerous fungi-related health issues are currently emerging, if not re-emerging. A better understanding of fungal bioaerosol community dynamics (including biodiversity and distribution) in human dwellings is crucial for evaluating potential health hazards (Nageen et al., 2021; Fang et al., 2019). Knowing which fungal species are prevalent and where they are found helps in formulating targeted prevention and control measures. This can lead to more effective interventions, such as cleaning protocols in vulnerable environments or specific strategies to reduce fungal spore contamination in the air.

Gaining insights into the composition of airborne fungal species helps identify areas that are more susceptible to fungal contamination, where the risk of exposure to mycotoxin-producing fungal species is markedly heightened. By identifying fungal pathogens in the air, strategies can be developed to mitigate exposure and reduce the risk of fungal infections, particularly in immunocompromised individuals. The primary benefit of studying the community structure of airborne pathogens is the protection of human health, through early detection of pathogenic species, understanding of fungal allergy triggers, and assessment of fungal exposure risks in various contexts.

Statement of the Problem

Despite growing concerns, airborne fungal infections receive marginal attention and resources, leading to a dearth of quality data on fungal disease distribution and antifungal resistance patterns. This has created a significant gap in the epidemiological database of our country, resulting in a poorly grasped airborne fungal community structure and dynamics, habitat associations, and associated health hazards, particularly in school settings. To address this gap, this study was conceptualized and designed to assess the taxonomic diversity, abundance, and distribution of airborne fungi on the EAC-C premises to promote the health and safety of students, teachers, and staff against pathogenic airborne mycological species. The diversity, abundance, and distribution profile of airborne fungi in the EAC-C premises was determined by obtaining samples from ten different sampling sites and performing morphological characterization of the fungal isolates.

Objectives of the Study

1. To isolate and identify the taxonomic diversity of culturable airborne fungi from selected sampling sites at EAC-Cavite
2. To determine the diversity index of isolated airborne fungi in the frequently occupied areas of the school premises
3. To assess whether there is a significant difference in the abundance and distribution of isolated airborne fungi across different sampling sites
4. To investigate the significant correlation between the isolated airborne fungi community structure and spatiotemporal dynamics:
 - a. Spatiotemporal dynamics (relative humidity, temperature, and human traffic)
 - b. airborne fungi community structure (diversity, abundance, and distribution)

Null Hypotheses

1. There is no significant difference in the abundance and distribution of isolated airborne fungi across different sampling sites.
2. There is no significant correlation between the airborne fungal diversity and distribution and spatiotemporal dynamics.

Conceptual Framework

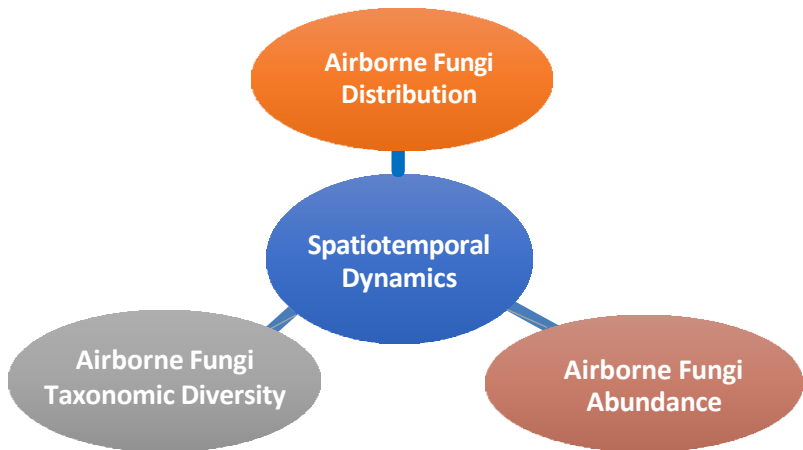


Figure 1. The conceptual framework of the research study

The conceptual framework outlines the direction of this study, which aims to explore the complex and interactive ways in which spatial and temporal factors shape the community structure of airborne fungi. The airborne fungal community structure includes aspects such as taxonomic diversity, abundance, and distribution. The combined influence of both spatial (geographic) and temporal (time-based) factors suggests that airborne fungal diversity varies spatially and temporally. Certain airborne fungi may thrive in warm and humid conditions during the summer months, while others may dominate in cooler, drier conditions. Given the geographic features of the study sites, this study seeks to determine the

changes in the distribution and diversity of fungi across seasonal variations, defined by environmental factors such as temperature, relative humidity, and human traffic. Human traffic can introduce fungi from different sources into indoor environments, affecting local diversity and distribution patterns.

To manage indoor air quality, it is essential to clearly understand the dynamics that influence airborne fungal diversity, abundance, and distribution. This understanding forms the basis for assessing health risks and developing effective strategies for fungal control and mitigation, which are crucial for safeguarding the health and safety of students, educators, and staff who spend extended hours on school facilities.

Significance of the Study

School Administrators

The findings of this study could serve as a crucial resource for air quality monitoring, the prevention of airborne diseases, and the control of fungal contamination in densely populated areas in EAC-Cavite, ultimately contributing to the protection of public health. By identifying specific factors such as classroom ventilation, humidity levels, and mold infestations, administrators will be equipped to implement targeted strategies that mitigate health risks. Early intervention in these areas will not only safeguard student and staff well-being but also help prevent costly repairs and avoid the escalation of more serious environmental issues. This study has also the potential to enhance energy efficiency by optimizing ventilation systems, which can improve air quality while simultaneously reducing energy consumption and operational costs across school facilities. Overall, the research will guide the development of sustainable practices that benefit both the health of students and the financial resources of educational institutions.

Students, Educators, and Nonteaching Personnel

This study aims to contribute to the growing body of knowledge on indoor air quality and public health, particularly in the context of fungal exposure in educational environments. By identifying airborne fungi and understanding their potential health impacts, the study will help reduce the risk of respiratory issues, allergic reactions, and asthma among students, educators, and staff. Identifying fungal contamination levels can guide preventive actions to improve air quality, protect vulnerable individuals, and prevent the spread of allergens. Understanding pathogenic fungi can help safeguard the health of vulnerable students, educators, and staff.

Health and Education Sector of the Government

This study could provide valuable data on airborne fungi in school environments, helping government healthcare agencies advance research and gather essential information to support evidence-based policies and regulations for air quality standards in schools. Reducing fungal contamination would create a healthier learning environment, enhancing student performance and reducing health-related absences. The findings could provide valuable insights that help formulate proactive indoor air monitoring practices, medical evaluations, and risk assessments, while also raising awareness about the importance of proper maintenance of school facilities, ventilation, and humidity control. Enforcing these standards will safeguard public health and shield educational institutions from potential legal or financial repercussions.

Future Researchers

Data collection on airborne fungi in schools helps monitor changes over time and establishes a baseline for future studies. Preliminary findings of this study can help assuage future directions towards a more in-depth analysis of fungal growth patterns and the efficacy of intervention strategies. School-based research on airborne fungi advances scientific knowledge of air quality and fungal ecology, guiding mitigation strategies, practices, and regulations in diverse contexts.

Scope and Limitation

A descriptive quantitative research design was used to assess the taxonomic diversity, abundance, and distribution of airborne fungi in selected areas of EACC. The study aimed to explore the correlation between spatiotemporal factors (relative humidity, temperature, and human traffic patterns) and the community structure of airborne fungi, including its diversity, abundance, and distribution.

Samples were collected during the warmer months (May to July) and the wet month of September 2024 using a culture-dependent method called the Settle Plate technique with triplicate sampling. Sampling sites included various locations within EACC, such as the canteen, classrooms, comfort rooms, laboratories, library, lobbies, and the General Education office.

The Settle Plate Method, nonetheless, only captures airborne fungi that fall onto the agar plates through wind dispersal during the 20-minute exposure period. This method may not capture all airborne particles and does not provide complete information on the size or viability of these particles. The unavailability of Andersen air sampler equipment, which could have facilitated the impaction of airborne fungal spores onto the prepared Potato Dextrose agar (PDA) plates was one limitation of this study. The key limitation of this study was the absence of molecular characterization and identification of airborne fungal species, which would have been vital in determining a highly credible fungal profile. Due to financial constraints, the molecular identification of airborne fungal isolates was not conducted.

The study focused solely on airborne fungi that could be detected and identified through the sampling methods employed, meaning that other microscopic or less abundant fungi may not have been accounted for. Air sampling was conducted using specific apparatus and protocols, which may limit the identification to fungi detectable by the methods employed.

Quantitative analysis of the contamination levels was beyond the scope of this study. The frequently used measure of exposure to microbial air pollution is the degree of such pollution, typically expressed in terms of the number of colony-forming units (CFU)

per cubic meter (1 m^3) of air (Górny et al., 2016). The unavailability of an Andersen air sampler or similar equipment prevented the determination of air volume in the sampling protocol.

Definition of Terms (Conceptual and/or Operational)

Airborne fungi: The fungal spores, fragments, and other particles that are suspended in the air.

Community structure: This is the distribution of fungal species in the air, how diverse they are, and how numerous they are.

Elevated moisture: This refers to the high amount of water vapor in the air. If there is a lot of water vapor in the air, the humidity will be high.

Fungal Spores: They constitute the primary form of airborne fungi that are microscopic reproductive units capable of developing into a new airborne fungal organism.

Indoor Air Quality: High concentrations of airborne fungi indicate poor indoor air quality. Elevated fungal levels indicate moisture issues, poor ventilation, and substandard building maintenance.

Mycological air contamination: The presence of fungal spores and other fungal particles in the air that can potentially impact health, environment, and indoor air quality.

Relative humidity: It is the amount of water vapor present in air expressed as a percentage of the amount needed for saturation

Respiratory Issues: High concentrations of fungal spores in the air can exacerbate asthma or other respiratory conditions, particularly in individuals with pre-existing health issues.

Spatiotemporal dynamics: The study of how phenomena change over both space and time to describe how certain variables evolve across different locations (spatial) and at different times or periods (temporal). Relative humidity, temperature, and human traffic patterns vary across different locations (within the premises) and change over time.

Species abundance: The number of fungal colonies or spores of

a particular species present in the air indicates species abundance. Species with high abundance have high spore counts in the air.

Species distribution: It is the geographic location where certain fungal species is found.

Species diversity: It is a measure of the variety and distribution of species in a given area. A location with many species that are all equally abundant has high species diversity, while an area dominated by a few species with others being rare would have low species diversity.

METHODOLOGY

Research Design

Descriptive quantitative research design was employed to investigate the taxonomic diversity, abundance, and distribution of airborne fungi in selected premises of EAC- Cavity. This research design aimed to comprehensively assess airborne fungi in school facilities and premises focusing on possible correlation between spatiotemporal dynamics (relative humidity, environmental temperature, human traffic and activities) and fungal community structure that includes fungal diversity, abundance, and distribution.

Data Gathering Procedure

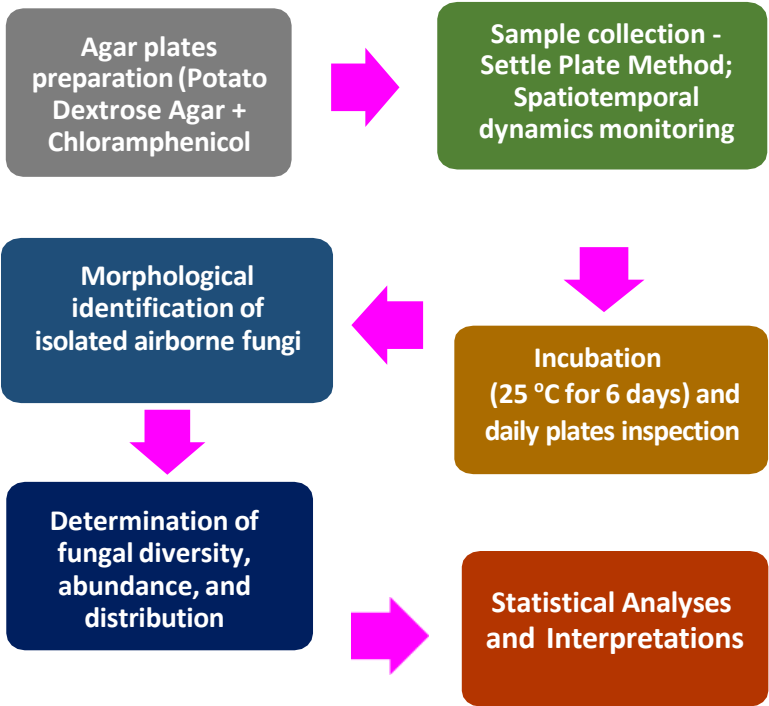


Figure 2. The flowchart of the laboratory procedure

The Settle Plate Method is a cost-effective laboratory method that provides a direct measure of airborne fungal concentration and is thus valuable for assessing airborne fungal load and identifying fungal species in various environments for routine monitoring and comparison across different sampling sites. Sampling was performed during summer months of May and July, and the rainy months of September 2024 in selected EACC areas namely canteen, classroom, comfort rooms, laboratories, library, lobbies, and General Education department office in triplicate sampling.

A. Preparation of Potato Dextrose Agar (PDA) Plates

Following the manufacturer's instructions, 39 grams of HiMedia Potato Dextrose Agar (PDA) were used to prepare 1 liter of culture medium. The weighed PDA powder was added to 1 liter of distilled water in a sterile 1000 mL beaker. The mixture was stirred until the PDA powder was completely dissolved. The pH of the PDA mixture was then measured using an Ohaus pH meter and adjusted to approximately 5.6.

Sterilization of the Fungal Medium

After boiling the PDA mixture for 15 minutes using a Bunsen burner, it was autoclaved at 121°C for 15 minutes to ensure sterilization.

Post-Sterilization Cooling and Plating

After sterilization, Chloramphenicol (50 mg/L) was added to inhibit most bacterial contamination without hindering fungal growth. The PDA mixture was allowed to cool to approximately 45°C in the BioBase laminar flow hood. This cooling step was essential to prevent condensation and contamination. Once the PDA mixture had reached 45°C, it was poured into sterile agar plates. A volume of 20 mL of the autoclaved PDA was added to each 90 mm agar plate. The transfer of the PDA medium to the sterile plates was performed within the sterile BioBase laminar flow hood to prevent contamination.

Preparation and Storage of Agar Plates

The agar plates were set aside at room temperature until the medium was completely solidified. Once solidified, the agar plates were sealed with their lids to prevent contamination. The agar plates were stored upside down (lid side down) in a refrigerator at 4°C and were ready to be used.

B. Airborne Fungi Sample Collection and Incubation

Each plate was labelled with relevant information, such as the sampling site, date, and time. In every sampling site, three agar plates were positioned at least 2 meters apart from each other and at a height of 1.5 meters in a stable and flat manner to avoid spillage. The plates were left exposed to the air for 20 minutes. After the 20-minute exposure period, the plates were carefully covered with their lids to prevent contamination. The sampling sites included the Zoo Lab, Physics Lab, canteen (lounge and food stalls), GE office, Lobby 1 and 3, boys and girls CRs, and the library. The agar plates were incubated at 25°C for 6 days.

C. Morphological Examination of Fungal Isolates

After incubation, the plates were inspected for colony growth. The number and types of colonies that had developed were counted and expressed as colony-forming units (CFU). A sample of each airborne fungal species was cultured on separate agar plates for clearer identification. The necessary procedures were then performed to identify the fungal species present on the incubated agar plates. The identification of airborne fungal isolates relied on the trusted resources or manuals for identifying airborne fungi.

Research Locale

The research was conducted across several frequently inhabited areas within Emilio Aguinaldo College-Cavite, a highly suitable site for isolating airborne fungi due to its diverse, high-traffic environment. The college serves a large population of students, educators, and staff, which increases the likelihood of varied fungal spore distribution, making it an ideal setting for this study. The premises, including classroom, library, laboratories, lobbies, canteen, and comfort rooms are subject to varying environmental conditions, such as fluctuating relative humidity, ambient temperature, and human traffic patterns, all of which could significantly influence fungal diversity, abundance, and distribution. This study sought to investigate these factors and their impact on fungal communities. The data obtained are considered crucial for advancing the understanding of indoor air

quality and for promoting a healthier, more conducive educational environment.

Data Analyses (Statistical Tool and Treatment of Data)

Diversity Indices

Shannon Diversity Index was utilized to assess the level of diversity of airborne fungal species isolated during four sampling periods across different sampling sites.

Descriptive Statistics

Mean scores were obtained to provide central tendencies of fungal counts and diversity indices across sampling periods and study sites.

Analysis of Variance (ANOVA) was performed to analyze the significant differences in airborne fungal diversity, abundance, and distribution across tested sites and sampling periods. The potential impact of human traffic and activities were also assessed by comparing fungal community structure in high-traffic versus low-traffic periods in EACC school facilities.

Spearman's Rank Correlation Coefficient (Spearman's ρ or Spearman's Rho) a non-parametric statistical method was used to assess the correlation between spatiotemporal dynamics (relative humidity, site temperature, and human traffic) and airborne fungi community structure (taxonomic diversity, abundance, and distribution) in study sites.

RESULTS

After the incubation of the airborne fungal contamination PDA plates at 25°C for six days, the final identification was performed through morphological examination of the culturable colonies and guided by trusted mycological databases. Microscopic examination of isolated airborne fungi was conducted using a dissecting microscope. Airborne fungal counts were presented through the number of colonies forming unit (CFU) per Potato Dextrose Agar (PDA) plate.

Table 1
Relative abundance of culturable airborne fungi from selected sampling sites at EAC-C

Airborne Fungi	May	June	July	September	Total Count	Percentage (%)
<i>A. niger</i>	60	42	58	69	229	19.10
<i>Penicillium spp.</i>	58	46	38	55	197	16.43
<i>A. fumigatus</i>	35	25	31	38	129	10.76
<i>A. flavus</i>	32	14	27	32	105	8.76
<i>Mucor sp.</i>	17	20	28	28	93	7.76
<i>C. herbarum</i>	29	24	22	11	86	7.17
<i>C. clavata</i>	23	16	19	15	73	6.09
<i>A. alternata</i>	31	10	13	17	71	5.92
<i>A. terreus</i>	25	15	15	13	68	5.67
<i>T. rubrum</i>	21	12	14	18	65	5.42
<i>A. glaucus</i>	20	14	15	15	64	5.34
<i>Fusarium sp.</i>	0	0	0	19	19	1.58
Total	351	238	280	330	1199	100.00

Note: Fungal counts of colonies are expressed as Colony Forming Units (CFUs)

Table 1 presents the distribution of airborne fungi isolated from the school premises of EACC, revealing that *Aspergillus* was the most prevalent genus, comprising 49.63% of the total isolates. Among the *Aspergillus* species, *Aspergillus niger* was the most abundant, accounting for 19.10%, followed by *Aspergillus fumigatus* at 10.76%. Sample collection occurred on four occasions in 2024: May 25th, June 22nd, July 20th, and September 23rd, to examine the impact of environmental factors such as humidity, temperature, and human activity on the diversity, abundance, dominance, and distribution of airborne fungi in areas frequently occupied by students, educators, and other school occupants.

The highest fungal abundance and diversity were observed during May, with a subsequent decrease in June, while September also showed significant fungal presence. Most fungal isolates reached their peak frequency in May and September. These findings align with the observations of Njokuocha et al. (2016), who recorded

the highest spore counts during the months of July, June, and October. Similarly, their study indicated that fungal spore concentrations were elevated during the rainy season, from June to October, extending into the early dry season (November–December). Temperature and relative humidity were identified as the primary environmental factors influencing the frequency of airborne fungal spores in the atmosphere. Karmakar et al. (2020) noted the highest spore concentrations in March, attributing this to favorable conditions such as optimal temperature, humidity, and low rainfall. In contrast, Premila (2013) observed the lowest spore concentrations in March, highlighting the variability of fungal distribution in relation to environmental conditions.

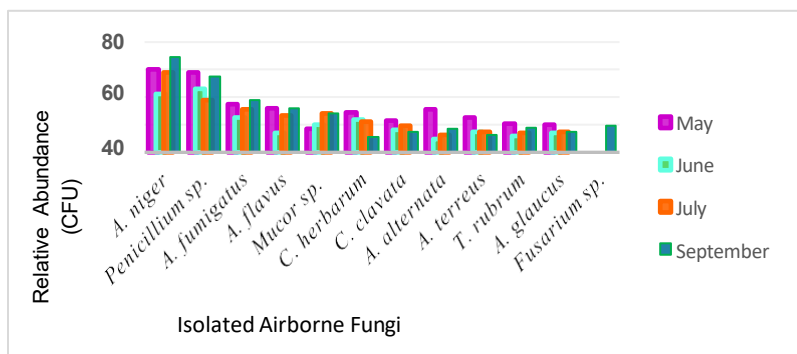


Figure 3. Relative abundance of isolated airborne fungi across four sampling periods

The results of this study showed that the month of May recorded the peak frequencies for all detected airborne fungal species. September recorded the second peak frequency. *A. niger* was most prevalent in September sampling period. *Fusarium spp.* was only detected in September.

Table 2

Summary of Shannon Diversity indices of four sampling periods

Sampling Period	Diversity Index Value	Interpretation
May	2.3132	Moderately diverse
June	2.2728	Moderately diverse
July	2.2849	Moderately diverse
September	2.1436	Moderately diverse

The calculated values for Shannon Diversity Index are an indicator of biodiversity which considers both the number of species (richness) and the distribution of individuals among those species (evenness). Values closer to 3 or above generally indicate high diversity, while values around 2.0 to 3.0 suggest moderate diversity. An index value below 2 signifies lower diversity, with few species or a dominant species. The calculated values, as summarized in Table 2, suggested a moderately diverse and healthy community with multiple species present and a relatively even distribution of individual fungal species. As indicated, a high level of fungal diversity suggested that the airborne fungal community was relatively diverse and stable across sampling periods which could be alarming. This value suggested that the community had multiple species of airborne fungi that produced and released compounds proven to be toxic to humans at certain levels.

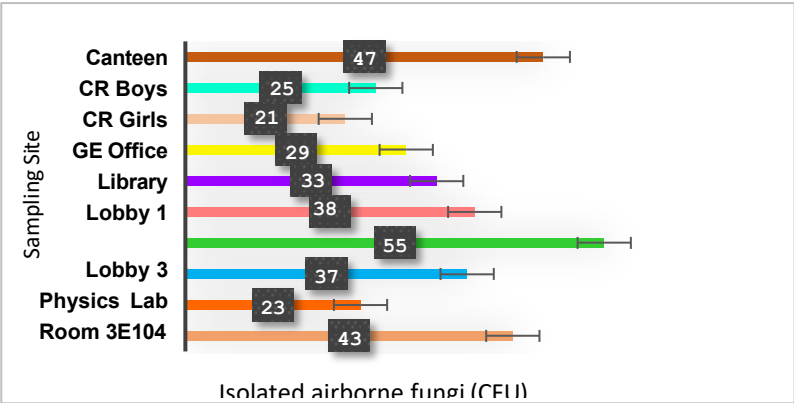


Figure 4. Abundance and Distribution of airborne fungi in CFU

Lobby 3, followed closely by the school canteen, were the two sampling sites that exhibited the most diverse populations of airborne fungal species. They not only had the highest number of individual fungal species but also the greatest abundance per species. Outdoor settings showed greater taxonomic diversity, abundance, and distribution than indoor spaces. Among the indoor settings, the Zoology Lab recorded the highest distribution and abundance of airborne fungal species.

Table 3

Statistical difference in the distribution of isolated airborne fungal species across sampling sites and periods

Sampling Period	Variation	Degrees of Freedom (df)	F-statistic s (F)	p-value	F-Critical (F crit)
May	Between groups	9	2.773747	0.006098	1.974829
	Within groups	100			
June	Between groups	9	4.356526	0.000083	1.974829
	Within groups	100			
July	Between groups	9	3.220462	0.001813	1.974829
	Within groups	100			
September	Between groups	9	1.676928	0.103001	1.966054
	Within groups	110			

The results for the month of May show that F-statistic (2.773747) is greater than F-critical (1.974829), which suggests that the differences in fungal distribution between the groups are statistically significant. The p-value (0.006098) is less than 0.05, providing additional evidence to reject the null hypothesis and conclude that there is a significant difference in airborne fungal

distribution across the different sampling sites during May.

For the month of June, F-statistic (4.356526) is much greater than F-critical (1.974829), indicating a significant difference in fungal abundance between the groups. The p-value (0.000083) is much smaller than the 0.05 threshold of significance, indicating very strong evidence to reject the null hypothesis. There is a highly statistically significant difference in airborne fungal distribution across the sampling sites in June. For July, F-statistic (3.220462) is greater than F-critical (1.974829), signifying a significant distribution difference between the groups. The p-value (0.001813) is lower than 0.05, which again suggests that the differences in fungal distribution between the sampling sites are statistically significant.

Statistically significant differences in airborne fungal distribution were observed between the sampling sites, as shown by the obtained F-statistics and p-values. However, in September, there was no significant difference in airborne fungal distribution across the sites. In other words, May, June, and July showed clear differences in fungal distribution between sampling sites, whereas September did not display any significant differences.

Table 4

Calculated Spearman Rank Correlation Coefficient between spatiotemporal dynamics and airborne fungi community structure

Spatiotemporal Dynamics	Spearman Rank Correlation	Interpretation
Average Relative Humidity	1.0	Perfect positive correlation
Average Site Temperature	0.9	Strong positive correlation
Human Traffic	0.0	No correlation

The Spearman Rank Correlation Coefficient = 1.0 indicates a perfect positive correlation between the diversity index and relative humidity in this dataset. A value of 1.0 means that as one variable increases, the other variable also increases in a perfectly linear manner. A value of 0.9 indicates a strong positive

correlation between the diversity index and site temperature, suggesting that as site temperature increases, the diversity index tends to also increase. Human traffic appeared not to influence the diversity and distribution of the airborne fungi. The statistical analysis reveals that the diversity of airborne fungi did not appear to be influenced by the level of human traffic in the school premises. This suggests that whether human traffic was high or low, it did not significantly impact the diversity index.

The absence of a significant correlation suggests that other variables, such as environmental conditions, maintenance practices, or localized sources of fungal spores, may play a more prominent role in shaping fungal diversity than human presence. Consequently, further investigation is warranted. While the current dataset does not demonstrate a correlation, it does not preclude the possibility that a larger or more comprehensive dataset could uncover different patterns. Exploring other potential influencing factors would provide a more thorough understanding of the

dynamics underlying fungal diversity.

DISCUSSION

Among the seven genera of fungi detected across the selected school premises of EACC, *Aspergillus* was the most abundant genus of airborne fungi. This finding aligns with the study by Giri et al. (2018), which identified *Aspergillus* as the most prevalent genus, followed by *Penicillium* and *Cladosporium*, particularly in humid classroom environments. Several factors may account for this predominance. First, the warm and humid conditions typical of the school environment create an ideal habitat for these fungi. The presence of organic materials, such as food residues and paper, provides abundant nutrients that support fungal growth. The high spore production of *Aspergillus niger* and *Penicillium* species further contributes to their widespread distribution, as their spores can easily become airborne and settle on various surfaces. The prevalence of *A. niger* may be attributed to its ability to rapidly disperse conidia, which facilitates its survival and persistence in diverse environments for extended periods.

The tropical, warm, and humid climate of the Philippines provides an ideal environment for the growth and proliferation of mycotoxigenic fungi, placing the country at an elevated risk for mycotoxin contamination. To date, seven species of *Aspergillus*, four species of *Fusarium*, and one species of *Penicillium* have been isolated from a range of agricultural crop commodities. Balendres et al. (2019) identified five major mycotoxin groups— aflatoxin, fumonisin, ochratoxin, nivalenol, and zearalenone—that have been detected in both the raw forms and by-products of major crops cultivated in the Philippines.

Generally, abundance of fungi was significantly high during the wet season in all the studied locations (Odebode et al., 2020). The dynamic nature of aeroallergens in the atmosphere is obscurest and attributable to many different conditions, such as the time of day, geographic location, air pollution, weather conditions, human activities, and local vegetation resources (Grinn-Gofron 2011).

Penicillium species are mainly mesophilic fungi (optimal temperature around 25°C), and as fast-growing fungi produce a

high number of airborne conidia that are easily dispersed by air (Perrone et al., 2017). Exposure to high levels of *Penicillium* spores is associated with an increased risk of respiratory symptoms in infants at risk for respiratory infections and asthma (Bundy et al., 2009). Due to the flexibility of morphological features of *Penicillium* species, precise identification is difficult (Visagie et al., 2014).

Conclusion

This study has provided valuable insights into the role of spatiotemporal dynamics in shaping the taxonomic diversity, abundance, and distribution of airborne fungi across different environments. These findings underscore the need for continuous monitoring of airborne fungi, particularly in environments that offer optimal conditions for the proliferation of potentially pathogenic and allergenic species. Understanding spatiotemporal patterns is crucial not only for ecological studies but also for assessing potential health risks, particularly in indoor spaces with poor ventilation. Conclusively, the study of airborne fungi in school settings is critical not only for safeguarding the health and well-being of students, educators, and staff but also for advancing a more comprehensive understanding of how indoor environmental factors influence learning, health, and overall productivity.

Recommendations

For future researchers: Study Interactions are important considerations such as the interactions between fungi and other microorganisms, as these relationships can influence community dynamics and health outcomes. Explore non-linear relationships and interactions using advanced statistical methods or regression analyses.

Expand Sampling Strategy and Increase Sample Size. Collect more samples across different locations and times to improve the robustness of findings. Consider seasonal variations and urban versus rural comparisons. Longitudinal studies can help improve the study findings due to repeated measurements over time to assess trends and changes in airborne fungal communities and contamination levels.

Devise Mitigation Strategies and Recommendations for Air Quality Management. Based on this research findings, suggested measures for reducing airborne fungal levels, such as improving ventilation in indoor settings, using air filtration systems, and managing moisture levels to prevent fungal growth are important areas for consideration and exploration, especially in crowded places such as school facilities with vulnerable individuals.

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THE USE OF GAMIFIED-FLIPPED CLASSROOM AND GENDER DIFFERENCES IN STUDENTS' PROJECT MANAGEMENT PROCESS- BASED PERFORMANCE

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- **Quasi-
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Abstract. Gamified flipped learning is a cutting-edge approach that encourages students to participate in interactive activities by fusing gamification with the idea of the flipped classroom. The study of gender disparities, however, focuses on the differences between individuals who identify as different genders. This has an impact on choices, academic performance, and policies in higher education that support diversity and gender-equality. Gamified flipped learning approaches, which integrate these

two ideas, can be used to examine gender variations in academic performance and learning outcomes. This study intends to examine the effects of employing student performance based on project management tasks by comparing the gamified-flipped classroom instructional approach to the traditional classroom instructional

approach. A flipped classroom paradigm has been presented in this quasi-experimental study to encourage the use of gamification approaches, gender-neutral pedagogy, and significant student collaboration. The data was supplied by fifty undergraduate students, from a higher education institution in Dasmariñas, Cavite. The results of the two-way ANOVA demonstrated that students' performance in the course was significantly impacted by the gamified flipped classroom instructional method. The findings of the 2-way ANCOVA demonstrated a substantial impact of the flipped classroom approach on students' performance, even after controlling for each student's grade point average.

THE USE OF GAMIFIED-FLIPPED CLASSROOM AND GENDER DIFFERENCES IN STUDENTS' PROJECT MANAGEMENT PROCESS- BASED PERFORMANCE

INTRODUCTION

As new technologies have been introduced, courses in higher education have gradually changed in recent years. The paradigm of instructor-based instruction can be supplemented or replaced by various active, student-centered techniques. This transformation is being made possible by the introduction of new technologies and methods, continuous development, and a wealth of digital resources. The flipped classroom technique is one of these effective active learning strategies for teaching. The paradigm motivates students to engage in active learning by cultivating more profound connections among the learner group and the instructor [1].

A hybrid of in-person and virtual instruction gave rise to the flipped classroom model, in which students complete most of their coursework outside of class and use much of their in-class time for interactive exercises and problem solving [2]. To ensure that students may access the course material from anywhere, the instructor typically creates and distributes the material in a multimedia format, such as audio-visual videos on the internet [3]. Students thus have more active learning chances thanks to technology-mediated practical learning [4]. Students can learn at any time, from any place, and according to their own differences when they follow the flipped classroom paradigm. Academic accomplishment exhibits students' competencies in extracurricular activities and serves as a reflection of their capacity to meet a set of related learning outcomes [5, 6]. Schools' primary goal is to increase student accomplishment, which is why many researchers are interested in studying and implementing innovative educational technologies.

METHODOLOGY

Given this context, the research's primary goal is on the problem of the need to diversify undergraduate engineering education using new technologies and teaching methods, especially in the project management course where low achievement is typically noted. Given the sophisticated level of the students and their diversity, a project management course needs more resources and explanations in addition to a variety of teaching techniques and multimedia. Due to individual variances, students are unable to comprehend the abstract course concepts due to a lack of time in class. The final year design project and passing concerns for every course also add to the workload and stress experienced by senior students.

The main objective of the research is to figure out whether the flipped classroom method has greater impact on students' project management process-based performance than traditional instruction method. To achieve this, the following objectives are provided:

1. To define the methods that could be used for designing a flipped classroom with gamification, a gender- neutral pedagogy, and significant student collaboration.
2. To determine how instructional methods and gender affect project management process-based performance of the students.
3. To determine if students' project management process-based performance is influenced differently by the instructional method and gender.

The study seeks to determine whether these factors have significant effects, both independently and in interaction with each other.

Flipped Learning Framework

Flipped learning is more than simply working in class and watching a lecture at home. The goal of flipped learning is to allow students flexibility and time to review information outside of the classroom, with the goal of making learning exciting and dynamic in the

classroom [8]. Flipped learning is a teaching strategy that makes use of technology to provide learning materials outside of the classroom (individual space) and during class time for group projects and collaboration (class space). The traditional classroom paradigm changes in a flipped learning course, as instructors take on more of a facilitator role rather than a lecturer one [9].

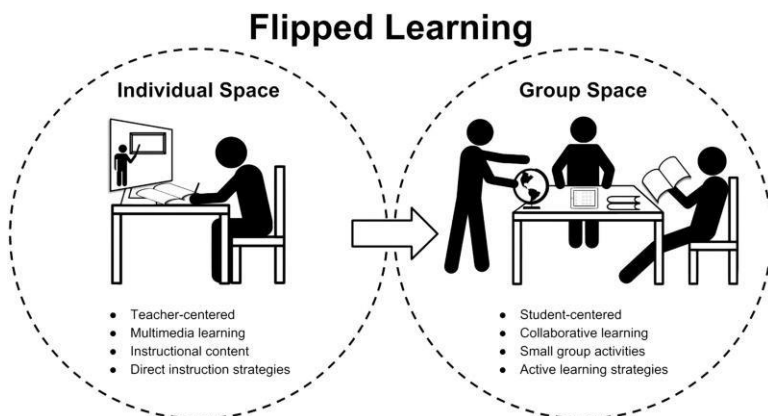


Figure 1. The Flipped Learning Framework (adapted from Winter, J. W., 2018).

Figure 1 illustrates how flipped learning specifically operates in both a group setting and an individual setting. In flipped learning, traditional teaching methods are reversed. Students review instructional materials (such as video lectures) independently before class and use class time for discussions, collaborative activities, and practical application of concepts.

Game-based Learning Framework

Through game-based learning, classrooms are exposed to the social dynamics, tactics, and regulations of playing games. Instructors can concentrate on specific objectives that will help students apply concepts in real-world settings by using the game-based learning strategy. This may result in more interactive and group learning possibilities.

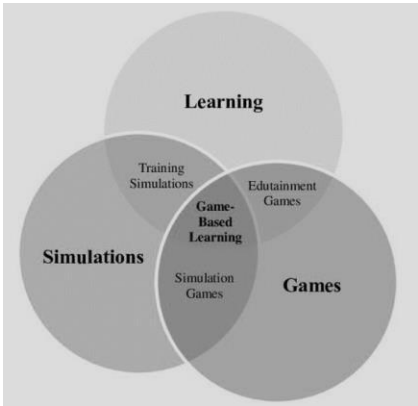


Figure 2. The Game-based Learning Framework.

Figure 2 shows how the simulation, games, and learning processes intersect to come up with various types of game-based learning. Game-based learning involves using elements of games, such as competition, challenges, and rewards, to engage and motivate learners. It often incorporates educational goals into a game-like environment.

Gender Equality Framework in Education

This is patterned on the UNESCO conceptual framework for gender equality and includes a variety of equity policies and tactics such as curriculum, teacher training, gender-responsive pedagogy, gender policy, and challenges encountered when promoting gender equality.

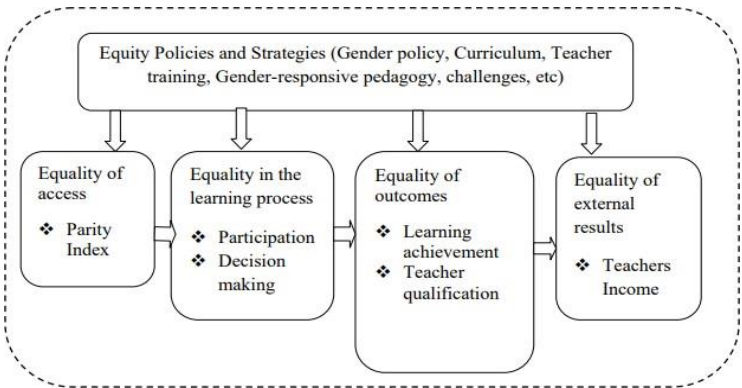


Figure 3. Modified dynamic framework for gender equality in

education (adapted from Moges, B. T., 2018)

As illustrated in Figure 3, achieving complete gender balance in education would entail the following four points:

(1) equality of opportunities as determined by the gender equality index and teachers' attitudes toward equality in schools; (2) equality in the learning process as determined by students' involvement in learning activities, curricula, leadership in groups and organizations, curriculum, decision making, and use of school resources; (3) equality of outcomes as determined by academic achievement, length of school careers, academic qualifications, and credentials would not vary by gender; and (4) equality of external results as measured by men and women's earnings with similar experiences and qualifications. In addition, there are difficulties in addressing gender differences in all these school processes. Therefore, a key component of the study is figuring out what these problems might be in our environment [10].

The above-mentioned framework served as a guide for developing broad strategies and policies related to gender equality undertakings, including curriculum, instructor preparation, gender-responsive pedagogy, gender policy, and challenges faced during the journey towards of gender equality.

Research Design

A quasi-experimental design is used in the study. This design was selected because it enables researchers to evaluate the impact of differences in gender and the gamified flipped classroom on students' project management performance while still operating within the parameters of pre-existing class groups. Random assignments are a great way to control variables, but it might not work in a classroom.

Research Participants

The sample had fifty undergraduate students, with sixty-four percent being male and thirty-six percent being female. The students were equally divided into two groups, one for the flipped classroom instructional approach and the other for the standard instructional method. Each group had twenty-five students. The students in both groups are enrolled for a project management course offered by the school of engineering and technology of a private institution in Cavite, Philippines. During the first semester of the academic year

2023–2024, students were randomly assigned to both groups, and the instructor taught both groups.

Instrument

An instrument was used in assessing the students' project management process-based performance. The items in the assessment are all based on the Project Management Book of Knowledge – 6th Edition, the course's main book

reference. The stratified alpha method was used to evaluate the reliability of each test. The stratified alpha coefficient of the summative assessment was found to be 0.895 which weighs 50 points.

Procedures

Random assignment was used to divide the participants into two groups: the control group, which received traditional teaching, and the experimental group, which received instruction using the flipped classroom model. Preparing students for in-person classroom activities and discussions via the Brightspace and Google Classroom platforms, the flipped classroom learning method involved delivering them pre-recorded video lectures. When the experimental students attend in-person lectures, the teacher goes over the material from the recorded lectures with them and leads various interactive learning exercises, including group discussions and question-and-answer sessions. The traditional method of instruction was giving lectures to the students in person in the classroom, giving them homework that was given via the Brightspace platform, correcting it, and giving it back to them so they could discuss it in the next meetings. The individual project activity mapping exercise that followed the project management knowledge area discussion yielded the student's project management process-based performance. A written reflection paper is also done to document the reasons why the lesson used in the flipped lecture and in lecture session achieved the planned learning objectives.

Gamified Flipped Classroom Intervention

This section provides a thorough explanation of the design and implementation of the gamified flipped classroom, as well as the technology tools and platforms used, content delivery strategies, gamification integration techniques, and approaches for

encouraging student involvement and participation.

The gamified flipped classroom was created with the primary goal of promoting 21st century teaching and learning by offering alternative instructional methods and improving students' academic performance, particularly in computer engineering courses. Digital games, pre-recorded videos, and learning management systems like Brightspace and Google Classrooms are some of the technical tools and platforms utilized to carry out this teaching strategy. Making an effective storyboard is one of the content delivery strategies that incorporates gamification to increase student participation and engagement.

In one of the recent trips of the principal researcher in Hanoi, Vietnam the last quarter of 2023, an idea was begun. introducing and applying the logical and mathematical game "The Tower of Hanoi" to a flipped learning environment. The initial part of the design is to come up with a unique introductory video about the "Tower of Hanoi" and build a demonstration film on how to play the Tower of Hanoi game using an executable software file of the game and provided to the students. To help students better grasp the game's premise, a straightforward demonstration movie using three discs is being sampled as shown in figure 4.

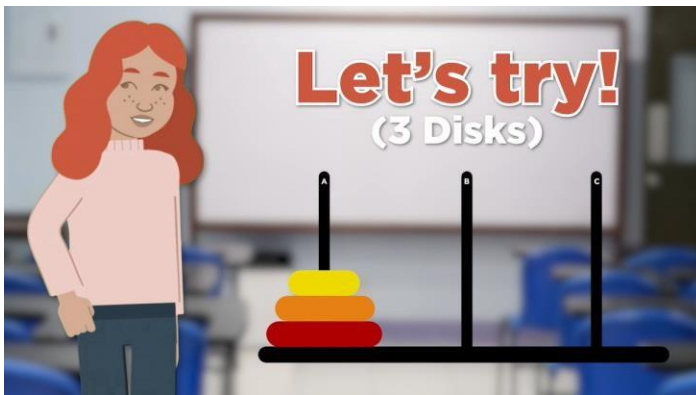


Figure 4. Screenshot of the sample video demonstration of the game in the flipped lecture video.

Subsequently, the students were directed to utilize the 5 and 6 discs to play the Tower of Hanoi game. They were also asked to snap screenshots of their game progress and share them via Google Classroom as presented in figure 5.

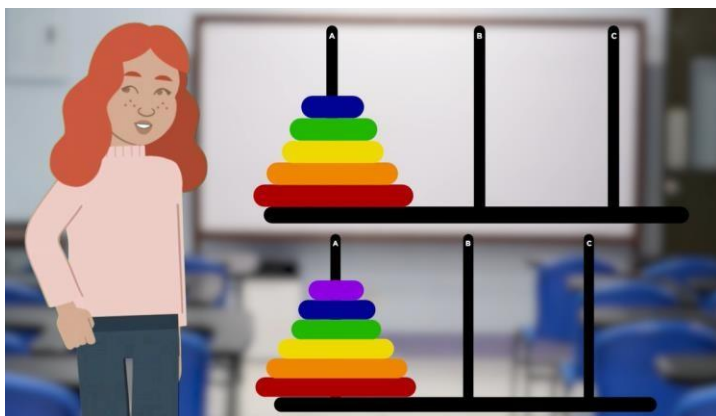


Figure 5. Screenshot of the game-task to be done by the students in the flipped lecture video.

After playing the Tower of Hanoi game as shown in figure 6, the students were asked the following questions: (1) What actions should be taken before you even begin moving the disks? (2) While playing the game, what can you learn about sequencing? (3) What challenges do you experience while playing the Tower of Hanoi?

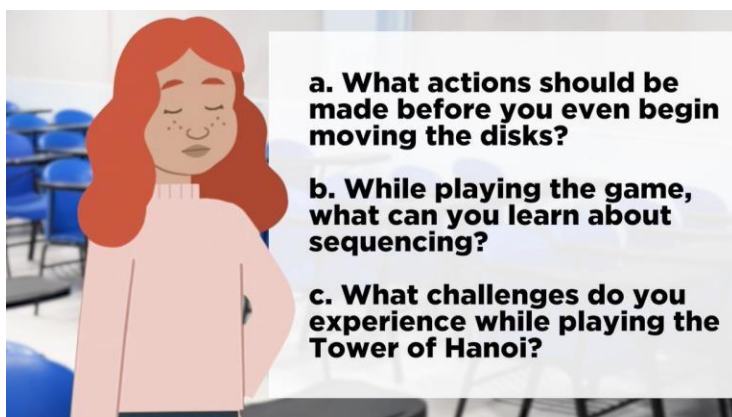


Figure 6. Screenshot of the reflection-questions to be answered by the students through the flipped lecture video

Project Management Process-based Performance Assessment

This section provides an explanation of how project management process-based performance of the students is assessed. This involves the activity completion time, teamwork, and the assessments.

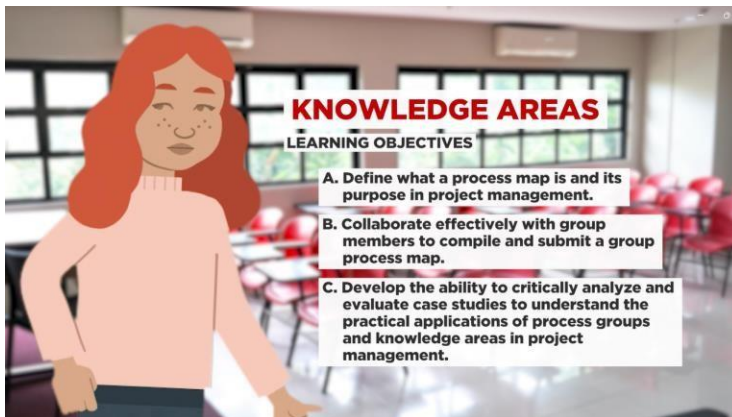


Figure 7. Screenshot of the learning objectives in the teaching session video.

The learning objectives of the project management class teaching session video are shown in figure 7, which outlines what the students should be able to accomplish after observing the video.

The Project Management Book of Knowledge, Sixth Edition, is the primary source used to verify that the various project activities are correctly mapped out when assessing the process-based performance of project management. The group and individual activities should be completed in thirty minutes as presented in figure 8.



Figure 8. Video screenshot of the instructions on the individual and group activities in the teaching session video.

PMBOK: What Edition Number? ____	Project Integration Management	Project Scope Management	Project Time Management	Project Cost Management	Project Quality Management	Project HR Management	Project Communications Management	Project Risk Management	Project Procurement Management	Project Stakeholder Management
Initiation										
Planning										
Execution										
Monitoring & Controlling										
Closing										

Figure 9. Teaching session video screenshot of the activity on mapping the project activities to the project management process groups and knowledge areas.

Figures 8 and 9 display the activity, instructions, and the template to be used in performing the tasks during the teaching session.

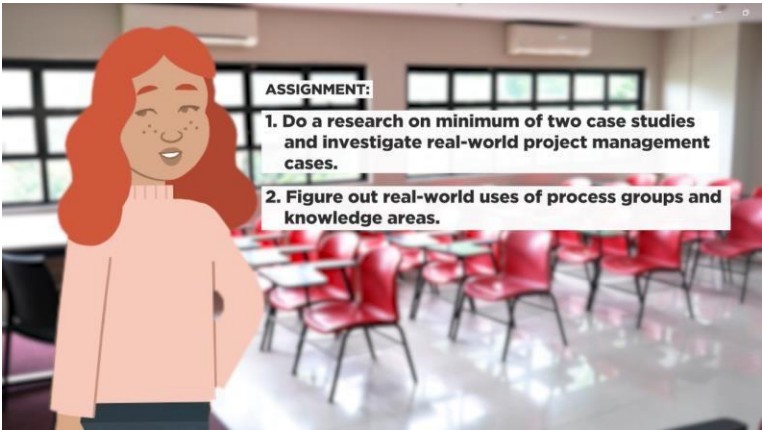


Figure 10. Screenshot of the students' assignment on real-life applications of the project management process groups and knowledge areas.

Figure 10 presents the students' assignment for the project management topic that would complete the attainment of the listed learning objectives in the session.

RESULTS AND DISCUSSION

Together with student gender, descriptive measures of the students' process-based performance in each instructional method's activities were computed and displayed in table 1.

Table 1. Descriptive metrics of the participants' process-based performance in the project management course.

Instructional Method	Male	Mean Score	Female	Mean Score	Total no. of participants	Mean Score
Traditional Classroom	16	51.96	9	41.90	25	48.94
Flipped Classroom	16	62.08	9	59.10	25	60.10
Total	32	57.02	18	50.50	50	54.52

Table 1 shows that, regardless of the gender of the students, the experimental group's project management process- based performance (M = 60.10) outperforms that of the control group

($M = 48.94$) using the flipped classroom teaching method. Furthermore, regardless of group, it was found that the male's total project management process- based performance ($M = 57.02$) is higher than the female's ($M = 50.50$). On the other hand, in the experimental group (flipped classroom instructional approach), it was found that the males ($M = 62.08$) did better than the females ($M = 59.10$). Similarly, in the control group (traditional teaching approach), the results showed that the males ($M = 51.96$) did better than the females ($M = 41.90$).

To investigate the main effects of each independent variable—the gender and the instructional method—as well as the interactions between the two independent variables and the dependent variable—the student's project management process-based performance—a 2-way factorial analysis of variance was carried out. The interaction effect between gender and instructional design did not result in any statistically significant variations in the academic performance of the students ($F(1,46) = 1.943$, $p = 0.160$). However, no statistically significant main effect due to gender was observed on the student's academic performance ($F(1,46) = 3.214$, $p = 0.069$), despite the results showing a statistically significant main effect of the instructional method on the student's academic performance ($F(1,46) = 15.000$, $p < 0.000$) in favor of the experimental group, with a large effect size (Partial $\eta^2 = 0.250$). Table 2 presents the findings.

Table 2. The effects of gender and the method of instruction, their interaction effects, on the performance of the students were determined using the results of a two-way ANOVA.

Source	Ins. Method	Gender	Ins. Method*Gender	Error	Total
Type III SS.	2052.995	426.952	256.997	6092.99	157142.00
df	1	1	1	6	0
MS.	2052.995	426.952	256.997	46	50
F. Value	15.000	3.214	1.943	132.465	-
Sig.	0.000	0.069	0.160	-	-
Partial η^2	0.250	0.060	0.040	-	-

Table 3 presents the findings of the two-way ANOVA that the gamified flipped classroom educational strategy had a statistically significant impact on students' performance. After

controlling for the student's GPA as a covariate, a two-way analysis of covariance (2-way ANCOVA) was conducted to determine whether the main effects of each independent variable—gender, instructional method, and interaction between the two—as well as the interaction effect between the two independent variables, contributed to any differences in the students' performance mean scores. Boxplots assessment revealed that there were no outliers in the data. The Shapiro-Wilks test showed that the scores for each level of the instructional approach were normally distributed ($p = 0.276, 0.190$) for the experimental and control groups, respectively. The homogeneity of variances among the groups was revealed by Levene's test for equality of variances assumption ($p = 0.289$). Table 3 displays the results.

Table 3. Results of a 2-way ANCOVA used to account for the student's grade point average and the effects of the instructional method and gender on performance and their interaction effects.

Source	GPA	Ins. Method	Gender	Instructional Method*Gender	Error	Total
Type III SS.	608.010	720.827	407.170	163.422	5484.187	157142
df	1	1	1	1	45	.000 50
MS.	608.010	720.827	407.170	163.422	121.865	-
F. Value	4.987	5.725	3.232	1.252	-	-
Sig.	0.020	0.017	0.062	0.243	-	-
Partial η^2	0.110	0.105	0.059	0.039	-	-

The findings displayed in table 4 demonstrated that there was no statistically significant interaction effect between the gender and the method of instruction independent variables on the performance of the students: Instructional Method*Gender > ($F(1,45) = 1.252, p = 0.243$). The findings also showed that there was no statistically significant main effect of gender on the performance of the students: Gender > ($F(1,45) = 3.232, p = 0.062$). However, after controlling for the student's GPA and ignoring (averaging over) the levels of gender, that is, taking gender into account but ignoring whether a participant was male or female, a statistically significant main effect with a large

effect size of the instructional method on the student's performance was observed after controlling for the student's GPA. Stated differently, there is a difference in the performance of students between those who received the flipped classroom instructional method and those who received the traditional instructional method when the experimental group—that is, the group that received the flipped classroom instructional method—is considered instead of the student's gender. This is after adjusting for the student's GPA. Instructional Method > (F (1,45) = 5.725, $p = < 0.05$) and general point average > (F (1,45) = 4.987, $p = < 0.05$), respectively.

Discussion

The research questions can now be clearly addressed by adhering to the following research objectives with respect to the results indicated in the previous section:

1. To define the methods that could be used for designing a flipped classroom with gamification, a gender- neutral pedagogy, and significant student collaboration.

Given the significant findings presented in the results, it is ideal to propose the research paradigm (shown in figure 11) employed in this quasi-experimental study, which emphasizes the application of the game-based instructional approach and the flipped classroom model to promote student collaboration which involve both the online and the onsite learning deliveries.

**THE USE OF GAMIFIED-FLIPPED CLASSROOM AND GENDER
DIFFERENCES IN STUDENTS' PROJECT MANAGEMENT PROCESS-BASED
PERFORMANCE**

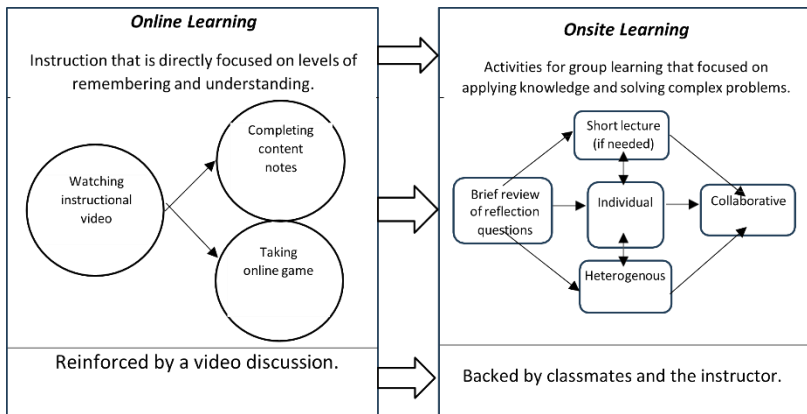


Figure 11. The proposed paradigm of the gamified flipped classroom model.

Figure 11 presents the proposed research paradigm that was used in the project management class of computer engineering students using the gamified flipped classroom approach, with reference to the issues of process groups and knowledge areas. The paradigm shows how onsite learning was concentrated on knowledge application, whereas online learning was concentrated on remembering and understanding levels. Both phases were supplemented by various forms of reinforcement, ranging from giving instructional videos to watch during the flipped lecture phase to having students complete collaborative outputs during the teaching session.

2. To determine how instructional methods and gender affect project management process-based performance of the students.

The results of this investigation aligned with other findings in pertinent studies and literature that examined the effects of the gamified flipped classroom instructional approach in comparison to the traditional classroom delivery. Regardless of the participants' gender, the study's results showed that students, regardless of group, performed better academically in the experimental group—that is, using the gamified flipped classroom instructional method—than in the control group—that is, using the traditional instructional method. These findings are in line with previous research, which has shown that using the flipped classroom learning model could improve students'

academic performance, much like the computer engineering students' performance in this case, which was based on project management.

3. To determine if students' project management process-based performance is influenced differently by the instructional method and gender.

The gamified flipped classroom learning method's ability to deliver information through technology and multimedia may have contributed to the experimental group's outstanding performance. The improved performance of the students in the experimental group may have been attributed to the benefits of the gamified flipped classroom instructional method, which include computerized materials, learning method, learner-computer interaction, location, and time advantage [7]. Additionally, it might be linked to how the educational resources are created, which make studying more enjoyable. They are created with digital multimedia and are meant to be visually appealing, captivating, and interesting for students. The visual and auditory elements in the materials vastly outweigh the stiff illustrations in the textbook. Additionally, so that students could review the information again and get new ideas, it was recorded and made available to them on any computer or mobile device at home, free from time constraints during class. The new approach for providing lessons through computer multimedia is also contributing to this. Gender-wise, the statistical findings in Table 5 indicate that participant gender has no bearing on the students' project management process-based performance.

To summarize, a project management course that incorporates gamified flipped learning can successfully accomplish learning objectives while taking equality between genders into account. This is achieved by creating a flexible, inclusive, and dynamic learning environment that accommodates the needs and preferences of all students, promoting equal opportunities for growth and success for all students, regardless of gender.

CONCLUSION AND RECOMMENDATIONS

With the narrative discussion in the previous section, the following are the summary of the key findings of this study:

The results of this study indicate that, when compared to the traditional method, the flipped classroom approach to learning is beneficial. Furthermore, it may be inferred that implementing the flipped classroom approach enhances students' process-based learning outcomes. Although we advocate the use of the flipped classroom approach, its impact may be restricted to subjects and environments. Further research is therefore required to investigate the impact of using the flipped classroom instructional design in a variety of subjects and contexts while taking differences in gender into account. Additionally, rather than employing traditional methods, it is advised to compare the outcomes of implementing the flipped classroom method of instruction with alternative approaches. Examining the impact of this approach on other student aspects such as academic self-concept, self-efficacy, and confidence is also highly advised. The teaching-learning process has undergone a paradigm shift because of the flipped classroom approach, we might say. Our viewpoint is that to make the traditional teaching approach more effective both within and outside of the classroom and to facilitate easy access to electronic resources, it needs to be developed and improved. By learning at their own pace, repeatedly, and in accordance with the way they learn, students can improve their understanding of the subject's abstract ideas using the method known as flipped classroom. Miscommunication amongst students outside of the classroom is one issue that needs

to be addressed since students find it difficult to interact and contribute. As a final note, while the results of this investigation are encouraging, we acknowledge that the study was limited by the small sample size. Thus, it might be desirable for future researchers to do a larger-scale replication of this work. Along with studying gender differences, future research could also compare, contrast, and test in related or unrelated contexts. It is advisable to conduct this study again in environments other than the project management course.

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Thriving Through Reflecting: Preparedness Level of Pre-Service Teachers Towards A Framework for Innovative Teaching Strategies for the MATATAG Curriculum

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KEYWORDS:

- **K-10 Matatag Curriculum**
- **Reflective Teaching**
- **Philippine Professional Standards for Teachers**
- **descriptive survey**
- **strategies**

The Philippines' K–10 MATATAG Curriculum and the rapidly changing educational landscape emphasize the importance of reflective teaching methods for improving teacher readiness and professional development. Four levels of pre-service teachers' preparedness for reflective activities were evaluated in this study: pre-reflection, surface reflection, pedagogical reflection, and critical reflection, aiming to propose strategies aligned with the Philippine Professional Standards for Teachers (PPST). Data was gathered via

questionnaires and focus sessions using a descriptive survey methodology, and statistical methods such as weighted means, standard deviations, and ANOVA were used for analysis. The findings demonstrated opportunities for growth by showing that although pre-service teachers performed exceptionally well in pedagogical and critical reflection, there were significant gaps in the pre-reflection and surface reflection phases. Proposed strategies to address these gaps include pre-reflection activities, inquiry-based teaching methods, culturally responsive pedagogy, reflective journal writing, and collaborative reflection.

Thriving Through Reflecting: Preparedness Level of Pre-Service Teachers Towards A Framework for Innovative Teaching Strategies for the MATATAG Curriculum

INTRODUCTION

One of the more stirring reforms in the past two decades in the field of education is Republic Act 10533, or the Enhanced Basic Education Act of 2013 ("Enhanced Basic Education Act"). Passed by Congress on January 30, 2013 and approved by the President on May 15, 2013, the law in its full name stands as "An Act Enhancing the Philippine Basic Education System by Strengthening its Curriculum and Increasing the Number of Years for Basic Education, Appropriating Funds Therefor and for Other Purposes." The law became effective on June 4, 2013.

The Enhanced Basic Education Act establishes the Enhanced Basic Education Program, which espouses the following objectives: (1) give every student an opportunity to receive quality education that is globally competitive based on pedagogically sound curriculum that is at par with international standards, (2) broaden the goals of high school education for college preparation, vocational and technical career opportunities as well as creative arts, sports and entrepreneurial employment in a rapidly changing and increasingly globalized environment, and (3) make education learner-oriented and responsive to the needs, cognitive and cultural capacity, the circumstances and diversity of learners, schools and communities through the appropriate languages of teaching and learning, including the mother tongue as a learning resource (Sec. 2).

Importantly, the SEC. 3. *Basic Education* states that "Basic education is intended to meet basic learning needs which provides the foundation on which subsequent learning can be based. It encompasses kindergarten, elementary and secondary education as well as alternative learning systems for out-of-school learners and those with special needs."

In addition, the law mandated DepEd to adhere to the specific standard and principle below in developing the enhanced basic education curriculum: to wit: (e) the curriculum shall use pedagogical approaches that are constructivist, inquiry-based, **reflective**, collaborative and integrative.

After 10 years, under the leadership of the new Department of Education Secretary and Vice President Sara Z. Duterte, enhancement of the law will be implemented. She announced that the current K to 12 Curriculum will be decongested by the MATATAG Curriculum.

"MATATAG" stands for "**MA**ke the curriculum relevant to produce job-ready, active, and responsible citizens; **TA**ke steps to accelerate the delivery of basic education services and provision facilities; **TA**ke good care of learners by promoting learner well-being, inclusiveness learning, and positive learning environment; and **GI**ve support for teachers to teach better."

Another reason for this study is that the notion of the 'reflective teaching practices' has emerged as the new paradigm of teacher education in many countries. In this environment, our country must not be left behind. Reflection has to be promoted in order to reduce the diversity and imbalance between the theory, which is mainly accumulated from Western research, and good practice, which is embedded in the professional culture of Philippine teacher education.

Background of the Study

Currently, with the fast changing climate of the education system in embracing the 21st century learning skills, the demands of the new **K-10 Matatag Curriculum**, continuous development of human and material resources has enabled the raising of teachers' qualifications anchored in the Philippine Professional Standards for Teachers (PPST) in providing classroom observation and supervision for the attainment of the goal, vision and mission of the Department of Education, with vital consideration in the dynamism of curricular offerings in recent years.

There are several reasons why this study is important. First, future teachers are expected to make autonomous pedagogical

decisions, to be accountable for the education and academic achievements of their students, and to be socially involved in the school community. Reflective teachers are not those who have been programmed with theory-based answers to many discrete teaching situations but instead are those who are able to conceive of their teaching in purposeful terms, can size up a particular teaching situation, choose a teaching approach that seems appropriate to that situation, attempt the approach, judge the results in relation to the original purposes and reconsider the original purposes.

Reflective teaching can make all the difference when we consider that many teachers have good days; however, many more teachers feel overwhelmed and do not know how to cope at the end of a very stressful and gruelling day. In this case, developing reflective teaching practices among future teachers is an imperative tool needed for the success of the implementation of the new curriculum.

Review/Survey of Related Literature

Reflective practices in education according to Machost (2023), are widely advocated for and have become important components of professional reviews. The advantages of reflective practices are many; however, the literature often focuses on the benefits to students, rather than the benefits for the educators themselves. Additionally, the extant literature concerning reflective practices in education is laden with conflicting terminology and complex studies, which can inhibit educators' understanding of reflective practices and prevent their adoption.

Reflective practice (Suphasti, 2021) has become a buzzword in teacher education as a mark of professional competence. Although the significance of reflective practice has long been acknowledged, a mutual agreement has still not been reached on how it should be defined or what processes should be initiated in teacher education programs.

Reflective practice enables pre-service teachers to assess their teaching performance, particularly in classroom management and pedagogical skills. Furthermore, Rozimela (2017) commented that reflective practice benefits pre-service teachers in understanding their strengths and limitation as well as

what needs to be improved or what is worth to be continued. Regarding the classroom's problem, reflective practice can facilitate preservice teachers to find more strategic solution

Reflective teaching is a result of teachers practicing critical reflection. Critically reflective teachers make decisions about their teaching based on self-reflection as well as by processing feedback from others as they recognize their prior assumptions and embrace challenges to improve their teaching (Mackay & Tymon, 2013).

Hostetler (2016) explained that all teachers do not reflect on their instructional experiences the way that novice teachers may need to or be encouraged to do. Novice teachers may be at a loss during situations that arise in the classroom and reflection may be necessary. He explained that expert teachers often use their intuition and experience to make decisions informally.

Reflective practice is a process that facilitates teaching, learning and understanding, and it plays a central role in teachers' professional development (Matthew, 2017). When student teachers carry out systematic enquiry into themselves, they understand themselves, their practices and their students. By constantly looking into their own actions and experiences, they professionally grow in their own.

New curricula and pedagogical standards from professional organizations, institutions, or departments can fundamentally alter the modes of instruction and the concepts and skills being taught. As described by Brookfield (2017)., reflection can act as a "gyroscope," helping educators stay balanced amid a changing environment Through the process of reflection, practitioners focus on what drives them to teach and their guiding principles, which define how they interact with both their students and their peers.

Statement of the Problem/Objective of the Study

General: This study will determine the preparedness level on Reflective Practices of pre-service teachers of the School of Education towards the development of innovative reflective teaching strategies under the new MATATAG curriculum.

Specific:

1. What is the profile of the respondents in terms of:
 - 1.1 Sex
 - 1.2 Age
 - 1.3 Major
2. What is the level of preparedness of pre-service teachers' reflective practices in terms of the following levels?
 - 2.1 Pre-reflection
 - 2.2 Surface reflection
 - 2.3 Pedagogical reflection
 - 2.4 Critical reflection
3. Is there a significant difference on the respondent's perception on their use of reflective practices when profile is taken as test factor?
4. What are the issues and problems in the use of reflective practices as observed by their immediate superiors?
5. Based on the results of the study, what innovative reflective teaching strategies can be proposed under the new MATATAG curriculum?

Conceptual/Theoretical Framework of the Study

The theoretical framework for this study is John Dewey's (1933) theory of critical reflection. Dewey was the philosophic pioneer on the study of reflective practice. Dewey explored the ethos of thinking and how individuals form their thoughts. In *How We Think*, Dewey (1933) defined reflection as the "active, persistent, and careful consideration of any belief or supposed form of knowledge in the light of the grounds that support it and the further conclusions to which it tends". This conceptual understanding of critical reflection provides teachers with opportunities to more effectively use instructional reflection within an IB framework as well as heighten their insight into their own reflective practices. Dewey saw reflective thinking and research as one and the same. Rolfe (2014) furthered Dewey's explanation of reflective practice by explaining that research is defined in terms of the process rather than the outcome. As Dewey is seen as the pioneer of defining instructional reflection, the epistemology of reflective practice is seen through the work of several other theorists and has changed over time (Clarà, 2015).

METHODOLOGY

The descriptive survey analysis which is a fact-finding with interpretation will be utilized in this study. This study will employ data gathering concerning the current state of things and investigations through the distribution of a questionnaire and focus group discussion. It will also involve the collection of data in order to test hypotheses or to answer questions concerning the current status of the subject of the study.

Data Analysis (Statistical Tool and Treatment of Data)

- **Frequency Count and Percentage.** The researchers will use these two measures on the profile variables in the study.
- **Weighted Mean.** The weighted mean with its adjective rating will be used to determine the level of the indicators of; Pre-reflection, Surface Reflection, Pedagogical Reflection and Critical Reflection.
- **Standard Deviation.** This will be employed in every item that requires the mean values to determine the measures of dispersion of the responses given by the respondents.
- **t-test or ANOVA.** This parametric test will be used by the researchers in testing the significant differences in the self-assessment of the respondents if their profile is taken as test factor.

Ethical Consideration

Respondents informed adequately about the study's purpose and the significance of their participation in the research to understand their role in obtaining the necessary data without feeling rushed. Before distributing the questionnaire, all respondents received consent form to begin learning about the research study. The questionnaire's questions will be scrutinized to ensure that no offensive, discriminatory, or objectionable language is used, as this will impair participants' ability to respond. The study will follow appropriate procedures and protocols to protect the respondent's dignity and the confidentiality of the data collected. The respondents' identities were concealed, and the questionnaire's questions were concise enough that they

could complete in a short period. The research adhered to and follow the rules established in the research objectives throughout the data collection process. to provide parallel information. The Data Protection Act is adhered to strictly. The respondents' responses will be analyzed and recorded anonymously.

RESULTS AND DISCUSSION

This chapter presents the collected data, their results, and analysis according to the statement of the problem. The researcher's interpretations and inferences drawn from factual evidences and experiences will also be presented.

1. Profile of the Respondents

Tables 1-4 present the profile of the respondents in terms of sex, age, and Practice Teachers' Profile in Terms of Major/Specialization

Table 1
Frequency Distribution of the Practice Teachers'
Profile in Terms of Sex

Sex	Frequency	Percentage
Male	8	31%
Female	18	69%
Total	26	100%

Table 1 Table 1 presents the frequency-percentage distribution table of the respondents according to gender. The majority of the respondents were female, with a frequency of eighteen (18) or 69%, while male respondents were eight (8) or 31%. Notably, the portion of women in the teaching force is developing. Statistics discoveries unveiled that in the Philippines, teaching is a woman- dominated profession.

According to Statista Research Department (2021), There were approximately 1.5 females per one male in tertiary education enrolment in the Philippines. Tertiary level education in the Philippines comprises colleges that offer one or more specialized programs and universities with eight undergraduate degree programs.

Table 2
**Frequency Distribution of the Practice Teachers’
Profile in Terms of Age**

Age	Frequency	Percentage
21	8	31%
22	14	53%
23	2	8% %
24	0	0%
25	1	4%
26	1	4%
Total	26	100%

The statistics display the frequency and percentage distribution of practice-teacher respondents by age. Most respondents age 22 represent 54% ($n = 14$) of the sample. Those 21 years old come next, making up 31% ($n = 8$) of the respondents. Individuals who are 23, 25, and 26 years old make up a substantially smaller fraction of the group; they account for 7% ($n = 2$), 4% ($n = 1$), and 4% ($n = 1$) of the respondents, respectively. 24-year-olds made up 0% of the total replies, or none at all. Based on this pattern, most practice teachers are 21–22.

Table 3
**Frequency Distribution of the Practice Teachers’
Profile in Terms of Major/Specialization**

Major/Specialization	Frequency	Percentage
English	11	42%
Filipino	3	12%
Mathematics	4	15%
Social Studies	3	12%
Elementary Education	5	19%
Total	26	100%

According to the data in Table 3, most practice teachers are English majors, with 11 responses accounting for 42% of the total. The next one comes from elementary education, with 5 responses, constituting 19% of the total. Afterward, the mathematics major received 4 responses, comprising 15% of the total. As for the final two, they are majoring in Social Studies and Filipino, respectively. There are 3 responses for each expertise, each accounting for 12%.

2. What is the perceived impact of the practice teachers on their reflective practices in terms of the following levels?

2. 1 Pre-reflection

Table 4
Practice Teachers' Perceived Impact on their Reflective Practices in Terms of Pre-reflection

Pre-reflection	Mean	Standard Deviation	Qualitative Description	Rank
1. I perform in a survival mode, reacting automatically without consideration of alternative responses.	2.308	0.736	Somewhat Aware	3
2. I function based on preset standards of operation without adapting or restructuring based on students' responses.	2.346	0.797	Somewhat Aware	2
3. I do not support beliefs and assertions with evidence from experience, theory or research.	1.615	0.852	Somewhat Aware	9
4. I am willing to take things for granted without questioning.	1.577	0.703	Somewhat Aware	11
5. I am preoccupied with classroom management, control and student compliance.	2.538	0.811	Aware	1
6. I ignore the interdependence between teacher' and students' actions.	1.577	0.809	Somewhat Aware	10
7. I view student and classroom circumstances as beyond my control.	2.154	1.084	Somewhat Aware	4

8. I dismiss students' perspectives without due consideration.	1.308	0.679	Not Aware	13
9. I see no need for thoughtfully connecting teaching actions with student learning or behavior.	1.385	0.898	Not Aware	12
10. I discuss problems simplistically or unidimensionally.	2.077	0.891	Somewhat Aware	5.5
11. I do not see beyond immediate demands of a teaching episode.	1.846	0.732	Somewhat Aware	7
12. I attribute ownership of problems to students or others.	2.077	0.891	Somewhat Aware	5.5
13. I fail to consider differing needs of learners.	1.654	0.797	Not Aware	8
Composite Mean	1.882	0.822	Somewhat Aware	

Legend: 3.51-4.00 Always/Fully Aware; 2.51-3.50 Often/Aware; 1.51-2.50 Sometimes/Somewhat Aware; ; 1.00-1.50 Never/Not Aware

The table shows how reflective practices affect practice teachers before they reflect on their actions deeply and consider different teaching strategies. It also shows how these affect student outcomes based on teachers' perceptions. The highest mean in this table is, for item 5, "I am preoccupied with classroom management, control and student compliance" with an average of 2.538 with a deviation of 0.811. This indicates that teachers prioritize maintaining order and enforcing classroom rules. The slight standard deviation suggests that this belief is widely shared among teachers in the group. Item 8 stated, "I dismiss students' perspectives without due consideration." received an average score of 1.308 and a standard deviation of 0.679 at the end of the spectrum. This indicates that educators seldom overlook their students' viewpoints, and the minimal standard deviation implies a shared perspective among teachers on this issue.

On the other hand, item 7 mentioned, "I view student and classroom circumstances as beyond my control." has a standard deviation of 1.084 with an average of 2.154, which suggests that teachers hold differing views on this matter. Some believe they can influence classroom dynamics, while others feel limited in their control over it. In contrast, the statement "I dismiss students' perspectives without due consideration." has a deviation of 0.679. Most teachers value students' opinions consistently based on the data from the study results mentioned above. On average, before reflecting on their actions or decisions in teaching situations, teachers rated themselves at 1.882 with a deviation of 0.822, indicating that they do sometimes take time to reflect but might also tend to react without fully exploring other options or considering the broader implications of their teaching approach. The variation in practice scores suggests a range of experiences among teachers, with behaviors related to classroom management receiving the highest ratings and those about disregarding student perspectives earning the lowest scores.

Teaching methodologies that involve self-reflection have been proven significant in shaping teaching approaches (Schön, 2019). Current educational theories highlight the importance of reflection over responses (Dewey, 2020). Additionally, Farrell's research (2021) suggests that teachers frequently face challenges in managing control and introspective examination during classroom interactions—a trend that resonates with the observations documented in this dataset.

In the follow-up interview conducted by the researchers, one respondent mentioned that *"A reflective teacher constantly monitors his/her teaching and how deeply it affects students."* On the other hand, one respondent stated, *"A reflective teacher is someone who knows how to adjust and respond to underlying issues related to teaching and learning process. Thus, reflective teaching allows teachers to critically evaluate teaching classroom management strategies"*. Based on the given responses, reflective teaching is a continuous self-assessment. It also involves flexibility in teaching that always requires adjustments based on the needs and interests of the learners. This result is similar to the definition cited by Farell (2019). According to Farell (2019), reflective teaching is a journey of self-evaluation and development where educators review their day-to-day methods to enhance their teaching approaches (Farrell, 2019). In the study, Larrive (2022) noted that reflective educators adjust their

strategies to cater to the requirements of their students, showcasing adaptability as a trait.

2.2 Surface Reflection

Table 5
Practice Teachers' Perceived Impact on Their Reflective Practices in Terms of Surface Reflection

Surface Reflection	Mean	Standard Deviation	Qualitative Description	Rank
14. My analysis of teaching practices is limited to technical questions about teaching techniques.	2.038	0.774	Somewhat Aware	8
15. I modify teaching strategies without challenging underlying assumptions about teaching and learning.	1.923	0.845	Somewhat Aware	11
16. I do not connect specific methods to underlying theory.	1.769	0.815	Somewhat Aware	12
17. I support beliefs only with evidence from experience.	2.385	0.898	Somewhat Aware	3
18. I provide limited accommodations for students' different learning styles.	2.038	0.824	Somewhat Aware	8
19. I react to student responses differentially but	2.038	0.916	Somewhat Aware	8

fail to recognize the patterns.				
20. I adjust teaching practices only to current situation without developing a long-term plan.	2.154	0.732	Somewhat Aware	5
21. I implement solutions to problems that focus only on short-term results.	1.962	0.662	Somewhat Aware	10
22. I make adjustments based on past experiences.	3.077	0.891	Aware	1.5
23. I question the utility of specific teaching practices but not general policies or practices.	2.308	0.679	Somewhat Aware	4
24. I provide some differentiated instruction to address students' individual differences.	3.077	0.845	Aware	1.5
25. I tend to follow orders rather be innovative because I do not want to get in trouble.	2.192	0.895	Somewhat Aware	6
Composite Mean	2.247	0.815	Somewhat Aware	

Legend: 3.51-4.00 Always/Fully Aware; 2.51-3.50 Often/Aware; 1.51-2.50 Sometimes/Somewhat Aware; ; 1.00-1.50 Never/Not Aware

The results presented in Table 5 underscore the influence of surface reflection on the practices of future teachers by emphasizing the aspects of their reflections. The highest mean

score of 3.077 was discovered in two items. " I make adjustments based on past experiences." (item 22) and " I provide some differentiated instruction to address students' individual differences." (item 24). Both fall under the qualitative description of AWARE describing behaviors and indicate that teaching practitioners commonly adapt their methods based on experiences and cater to student diversity to some extent. The results support research suggesting that new teachers adjust their teaching methods based on experience. However, their changes typically involve modifications focused on elements rather than questioning fundamental beliefs about teaching and learning. This recurrent interaction with experiences demonstrates a dependence on valuable knowledge yet has limitations in nurturing profound and sustainable development.

The item with the lowest average is 1.76, which is number 16, where respondents indicated that they do not effectively link methods to underlying theory in their teaching practices. This difficulty highlights a common challenge faced by practice teachers who find it hard to align their hands-on techniques with theoretical concepts. According to Kiggundu (2022), novice educators frequently encounter problems integrating their teaching approaches with established theory frameworks. This struggle often hinders them from engaging in more profound levels of reflection on their teaching methodologies. The description "SOMEWHAT AWARE" implies that teachers may sometimes try to link experience with knowledge, but it is not a regular aspect of their reflective practices.

Regarding Standard deviation in the data, item 19 states, " I react to student responses differentially but fail to recognize the patterns." this shows the SD (0.916). This means a spectrum of responses is observed – some teachers adjust their feedback based on what students say, while others find it challenging to spot recurring trends in student actions that could help plan teaching approaches. The lack of consistency in practice is reflected in research that points out the difficulties educators encounter when identifying and responding to patterns in student answers (Leijen et al., 2022). Conversely, item 21 exhibited a deviation (0.662): " I implement solutions to problems that focus only on short-term results." The minimal fluctuation implies teachers' tendency to tackle issues with quick fixes rather than aiming for long-lasting enhancements. Recent studies indicate

that this pattern could be due to the stress placed on novice educators to address classroom needs promptly. This pressure might hinder them from reflecting on the future (Richards, 2021).

The total average score of 2.247 falls under the “SOMEWHAT AWARE” category. Indicates that practice teachers tend to engage in surface-level practices as a general trend. Despite adjusting teaching methods based on experience and student requirements, they typically do not delve deeper into reflection. Studies have highlighted the importance of teacher training programs in fostering thinking among educators. It suggests connecting experiences with knowledge and cultivating strategic long-term thinking, which is critical for improving teaching practices. Various authors have addressed this issue, including Mena & Clarke in 2020—and Yildirim in 2023. Although practice teachers show some ability to reflect on their work to some extent, their tendency to focus on contemplation highlights the importance of specialized training programs that encourage more profound and analytical reflection. This deeper reflection can ultimately result in lasting enhancements in both teaching and learning outcomes.

When asked by the researchers, one respondent cited the difference between reflection and reflective practices. According to her, *“reflection is the passive reaction a person does after learning or experiencing a situation. Meanwhile, a reflective action is the active response. For instance, he/she changed his/her behavior because of what he/she experienced.”* It could be concluded that reflection is a process of contemplation rather than engagement with past experiences. At the same time, reflective action is about taking action through implementation. This interpretation is similar to the study conducted by Rodgers (2022). According to him reflective action comes the phase of putting insights into practice by adjusting, to teaching approaches guided by thoughtful reflection.

2.3 Pedagogical Reflection

Table 6
Practice Teachers' Perceived Impact on their Reflective Practices in Terms of Pedagogical Reflection

Pedagogical Reflection	Mean	Standard Deviation	Qualitative Description	Rank
26. I analyze relationship between teaching practices and student learning.	3.577	0.578	Fully Aware	4.5
27. I strive to enhance learning for all students.	3.692	0.549	Fully Aware	1
28. I seek ways to connect new concepts to students' prior knowledge.	3.615	0.571	Fully Aware	2.5
29. I have genuine curiosity about the effectiveness of teaching practices, leading to experimentation and risk-taking.	3.577	0.578	Fully Aware	4.5
30. I engage in constructive criticism of one's own teaching.	3.308	0.788	Aware	10.5
31. I adjust methods and strategies based on students' relative performance.	3.308	0.736	Aware	10.5
32. I analyze the impact of task structures, such as cooperative learning groups,	3.269	0.724	Aware	12

partner, peer or other groupings, on students' learning.				
33. I have commitment to continuous learning and improved practice.	3.615	0.697	Fully Aware	2.5
34. I identify alternative ways of representing ideas and concepts to students.	3.231	0.765	Aware	13
35. I recognize the complexity of classroom dynamics.	3.346	0.562	Aware	9
36. I acknowledge what students bring to the learning process.	3.538	0.582	Fully Aware	7
37. I consider students' perspectives in decision making.	3.500	0.707	Aware	8
38. I see teaching practices as remaining open to further investigation.	3.538	0.582	Fully Aware	7
Composite Mean	3.470	0.648	Aware	

Legend: 3.51-4.00 Always/Fully Aware; 2.51-3.50 Often/Aware; 1.51-2.50 Sometimes/Somewhat Aware; ; 1.00-1.50 Never/Not Aware

Table 6 presents the effects of practices on practice teachers' teaching methods, focusing on pedagogical reflection, analysis, and interpretation of means and standard deviations, which offer insights into strengths and areas for improvement in

their teaching techniques. The highest average in item 27 stated, "I strive to enhance learning for all students." with an average of 3.692 and a standard deviation of 0.549. This rating suggests that most practicing teachers consistently work towards enhancing learning for all students, demonstrating a qualitative description of "FULLY AWARE." The narrow range of differences implies that teachers' responses closely matched the opinion. This indicates a level of agreement among the teachers regarding this approach (Freiberg et al., 2020).

Compared to the rest of the items evaluated in the study report, item 34 "I identify alternative ways of representing ideas and concepts to students." has the lowest mean, with an average of 3.231 and a standard deviation of 0.765. This rating implies a level of reflection since the descriptive term used is "AWARE." The wider standard deviation in this item indicates variation in how teachers respond to it; some teachers are more inclined to contemplate alternative teaching approaches, while others do so less regularly. This suggests an area where gaining skills through growth could be helpful (Schön, 2019).

Conversely, thoughts on item 28, "I seek ways to connect new concepts to students' prior knowledge," and item 33, "I have a commitment to continuous learning and improved practice," both received a score of 3.615 with standard deviations of 0.571 and 0.697, respectively. These impressive ratings marked as "FULLY AWARE" indicate teachers' enthusiastic involvement in linking ideas and striving for development.

Reflective thoughts on item 30, "I engage in constructive criticism of one's own teaching." and item 31, "I adjust methods and strategies based on students' relative performance," both have an average of 3.308, with deviations of 0.788 and 0.736 correspondingly; these ratings suggest a lesser degree of contemplation when contrasted with other aspects and are categorized as "AWARE." The more significant variations imply a range in teachers' involvement in these methods. This indicates an area for enhancement to promote teaching (based on Killion & Harrison's study from 2021).

The findings presented in Table 6, with an overall average of 3.470, show that although practicing teachers tend to be thoughtful overall—in aspects related to improving student

learning and refining their methods—some areas could benefit from more attention and growth. In particular, encouraging involvement in self-evaluation and exploring ways to present ideas could enhance teachers' reflective habits even more.

In connection with the result, in the post-interview conducted by the researchers, the importance of reflection in their teaching pedagogy was discussed. One respondent stated, *"It is important because it improves the way a teacher executes his/her teaching method, hence, improve the learning of the students"*. The other respondent stated, *"I personally believe that reflecting on my teaching allows me to assess and evaluate my own teaching style and strategies. By doing that, it opens realization on how to better students' learning"*. Thus, both statements show that reflective practice is essential because it enhances teaching skills that focus on the student's growth. This result aligns with the study conducted by Farrell (2020). According to him, reflective teaching was seen as crucial in adjusting teaching methods to meet the needs of students and addressing their strengths and weaknesses. Reflecting on growth and teaching efficacy is a tool for teachers to enhance their performance and develop professionally.

2.4 Critical Reflection

Table 7
**Practice Teachers' Perceived Impact on their Reflective
Practices in Terms of Critical Reflection**

Critical Reflection	Mean	Standard Deviation	Qualitative Description	Rank
39. I view practice within the broader sociological, cultural, historical, and political contexts.	3.269	0.604	Aware	7.5
40. I consider the ethical ramifications of classroom policies and practices.	3.385	0.637	Aware	6
41. I address issues of equity and social justice that arise in and outside of the classroom.	3.038	0.720	Aware	12
42. I challenge status quo norms and practices, especially with respect to power and control.	3.231	0.652	Aware	9.5
43. I am aware of incongruence between beliefs and actions and takes action to rectify.	3.346	0.562	Aware	5
44. I acknowledge the social and political consequences of my teaching.	3.269	0.533	Aware	7.5

45. I am an active inquirer, both critiquing current conclusions and generating new hypotheses.	3.346	0.629	Aware	5
46. I challenge assumptions about students and expectations for students.	3.462	0.582	Aware	1.5
47. I suspend judgments to consider all options.	3.000	0.693	Aware	9.5
48. I recognize assumptions and premises underlying beliefs.	3.231	0.652	Aware	11
49. I call commonly-held beliefs into question.	3.154	0.613	Aware	2.5
50. I acknowledge that teaching practices and policies can either contribute to, or hinder, the realization of a more just and humane society.	3.462	0.582	Aware	1.5
Composite Mean	3.296	0.611	Aware	

Legend: 3.51-4.00 Always/Fully Aware; 2.51-3.50 Often/Aware; 1.51-2.50 Sometimes/Somewhat Aware; ; 1.00-1.50 Never/Not Aware

Reflective practices play a role in improving the quality of education for practice teachers by addressing issues and ethical concerns while also challenging assumptions about students'

learning experiences and pedagogy within broader societal contexts, as shown in the data presented in the table. Two items share the highest mean in the table, items 46 and 50. “ I challenge assumptions about students and expectations for students.” And “ I acknowledge that teaching practices and policies can either contribute to or hinder the realization of a more just and humane society” scored an average of 3.462. This shows that teachers “AWARE” question established norms and understand the implications of their teaching methods on social equality. These items also exhibit a deviation of 0.582, which shows a range in responses among teachers who practice these techniques-, implying that while many teachers use these methods-, there is some variation in how extensively they apply them-, indicating a nuanced approach across the board. Recent research in teaching supports the importance of reflection in education today. Jones and Smith (2021) highlight how focusing on justice in teacher training programs after 2019 has become crucial. These reflective exercises help educators recognize inequalities in both the classroom and society. They empower teachers to adjust their teaching methods to promote inclusivity in learning environments.

The aspect with the lowest rating is item 41, “ I address issues of equity and social justice that arise in and outside of the classroom, “scoring an average of **3.038**. This indicates that although teaching practitioners think about these matters often, they do not actively tackle them as much as other critical reflection areas do directly. The corresponding deviation from this item is 0.720, which sits at the top of the chart, showing a range of responses. It is possible that a few teachers actively work towards fairness and equality while others might find it challenging or less willing to act in those areas Smith and Jones (2020); it is evident that teachers acknowledge the significance of justice but differ in how they integrate it into their teaching methods comprehensively due to variations in confidence and experience when addressing such intricate matters.

The total average of this table is **3.296**, and a **standard deviation of 0.611** indicates that in general practice, teachers tend to reflect on their work with steady involvement. Analysis displays that educators frequently partake in ponderings concerning moral considerations and questioning presumptions. However, differences are observed in the extent and regularity of their attentiveness toward fairness and societal justice problems.

In teacher training programs, it is crucial to focus on building thinking skills that specifically tackle challenges in the field of education (Brown, 2023). The evaluation shows that practice educators tend to be thoughtful overall and excel in challenging assumptions and understanding the implications of their teaching efforts. Nevertheless, there is an opportunity for improvement in tackling equity and social justice matters.

Table 8
Practice Teachers' Preparedness Level on the Use of
Reflective Practices

CRITERIA	OVERALL MEAN	OVERALL SD	INTERPRETATION	RANK
1. Pre-reflection	1.882	0.822	Somewhat Aware	4
2. Surface reflection	2.247	0.815	Somewhat Aware	3
3. Pedagogical reflection	3.470	0.648	Aware	1
4. Critical reflection	3.296	0.611	Aware	2
TOTAL MEAN	2.723	0.724	Aware	

Examining these measures provides insight into how educators or learners utilize reflective practices in their activities. Pre-reflection has a mean of 1.882 and a standard deviation (SD) of 0.822, being the lowest among the categories; this group tends to engage less in pre-reflection than other forms of reflective thinking. Pre-reflection refers to the reactions to encounters without delving into thorough analysis or assessment right away—a practice that can restrict chances for enhancing pedagogical approaches (Gattis, 2020). The lower average could suggest that individuals contemplate post-experience rather than pre- or during the actual events.

Surface reflection ranks third on the surface level with a score of 2.247 with an SD of 0.815. This type of reflection emphasizes the effects of a teaching encounter without delving into assumptions critically. Although significant in its right is the limitation in depth that might hinder the transformative learning process; as Rolfe (2019) pointed out, surface reflection tends to focus on outcomes like “what worked and what did not work” rather than delving into the underlying reasons behind them.

Pedagogical introspection takes the lead, scoring 3.470 and a lower standard deviation of 0.648. This implies that individuals are deeply involved in reflecting on teaching. Reflection involves critically evaluating teaching strategies and their impact on learning outcomes. It entails educators continually exploring the connection between theory and application (Zeichner & Liston, 2020). The lower standard deviation indicates an approach among participants in engaging in this reflective process. This consistency likely results in impactful teaching methods.

Lastly, critical thinking skills are ranked second, with a mean of 3.296 and a standard deviation of 0.611. This type of reflection involves questioning the underlying assumptions that guide teaching methods and often results in changes in how educators perceive their roles and strategies. The similarity in ratings between reflection and pedagogical reflection suggests that both are highly regarded aspects of the teaching process. However, critical reflection may demand cognitive involvement, which could explain its slightly lower ranking.

Considering all the categories, the average is 2.723, with a standard deviation of 0.724. This indicates that although an emphasis is placed on critical reflections, there remains potential for improvement in promoting more significant involvement in both pre-reflection and superficial reflection aspects. Encouraging teachers and students to participate in all forms of reflection can lead to a more well-rounded approach to learning and career advancement.

3. Is there a significant relationship on the respondent's perception on their use of reflective practices when profile is taken as test factor?

Table 9
Relationship of Respondents' Perception and the Use of Reflective Practices

Grouping Variable	df	Chi-square value	P-Value	Interpretation
Gender	25	2.575	0.99999999581 1 or 0.99	No significant relationship
Age	25	3.217	0.99999994945 or 0.99	No significant relationship
Specialization/Major	25	7.346	0.99976619387 2 or 0.99	No significant relationship

Based on the Chi test results shown in the table provided and analyzing the variables of gender, age, and specialization/major related to the studied outcome, it is evident that there is **no significant relationship** found between these factors and the result under investigation. The high P values across all three variables, at 0.99, suggest that these differences are likely attributed to chance. Therefore, based on this analysis, we cannot dismiss the hypothesis for any of these variables.

Based on the data we have analyzed here, it seems that gender differences or age and specialization don't really affect the outcome—that is to say, the data we saw matches up with what we expected if there was no impact from these factors.

Conclusion

In summary of the findings, analyzing the data provided insights into the demographics of practice teachers and their reflective practices were uncovered. In particular, the higher number of respondents reflects the pattern in the Philippines, where teaching is mainly dominated by women. This discovery is consistent with figures showing an increasing presence of women in education, as research highlights that female teachers now

make up a considerable majority in the teaching profession (Santos & Salonga, 2023). The demographic breakdown also backs up this idea because most practicing educators are in their twenties. This indicates that younger people are joining the field of education and could introduce viewpoints and approaches to teaching (Cruz, 2022). In addition to that. The majors the participants chose heavily favor studies, indicating a need for English teaching in schools. This preference for subjects also raises concerns about the variety of classroom teaching methods. Stresses the importance of diverse training to cater to different learning requirements.

The data shows a pattern when it comes to practices in education settings. While pedagogical reflection and critical reflection is highly emphasized as educators' preferred form of reflection, the lower levels of pre-reflection and surface reflection are lacking as form of reflections. This indicates that while educators are reflecting actively, there is room for improvement in the stages of reflection, which could enhance their teaching methods and impact significantly. Recent studies back up this idea by showing that teachers tend to focus on reviewing results rather than thoroughly examining their teaching methods (referencing Garcia's research from 2021).

The research on how gender and age impact practices suggests that these factors may not influence the results obtained from such activities. This discovery emphasizes the idea that teaching and reflective practices go beyond differences. In the end, the research suggests that a comprehensive method should be adopted in teacher training programs when it comes to practices. It proposes that teachers participate actively in forms of reflection, including pre-reflection and surface reflection. This could lead to changes in learning experiences that could significantly affect teaching techniques and student results. Establishing a setting where reflective practices are consistently incorporated into teaching could not only improve individual teacher development but also play a role in creating a lively and adaptable educational framework. Investigating and reflecting upon teaching methods is essential for educators to remain mindful of their approaches and be prepared to adjust and introduce ideas in a constantly changing educational environment.

Recommendations

The MATATAG Curriculum aims to enhance the quality of education by improving skills and effectively catering to students' individual needs. The following are the reflective teaching strategies **that can be proposed for the new MATATAG curriculum.**

1. **PRE-REFLECTION ACTIVITIES:** One significant discovery from the data is that teachers may operate in a state of "survival mode," item 1, where they react instinctively to classroom situations without thought (score of 2.308, with a standard deviation of 0.736). To combat this tendency' teacher training programs should focus on activities that encourage reflection before teaching begins. By prompting teachers to envision classroom situations and consider responses beforehand', they are more likely to exhibit deliberate and flexible teaching practices (Jay'Jay, 2021). Teachers can enhance their skills by engaging in scenario-based discussions where they analyze teaching obstacles in advance to cultivate a habit of reflection.
2. **INQUIRY-BASED TEACHING METHODS:** In Table 6, teachers focus on reflecting on teaching practices to improve student learning item 27 (score of 3. 692 with a deviation of 0. 549). Additionally, they are keen on linking ideas with students' existing knowledge, item 28 (score of 3. 615 With a deviation of 0. 571). To further enhance these aspects, the MATATAG curriculum could integrate teaching approaches that promote inquiry and encourage teachers to evaluate how their strategies align with student learning. According to Reeves (2020), inquiry-based methods enable educators to try techniques and assess their effects on student learning while making accurate time adjustments—actions that correspond with practices.
3. **CULTURALLY RESPONSIVE PEDAGOGICAL APPROACHES:** Reflection on social justice matters is not a priority in the practice of reflection among teachers; they tend to address equity and social justice concerns only occasionally, item 41 (average score of 3.038 with a standard deviation of 0.720). To enhance practices focused on equity issues specifically, teachers must embrace responsive

teaching methods. Reflection assignments that prompt teachers to examine how their teaching approaches either support or obstruct justice are essential for progress. Recent research indicates that educators who contemplate the socio aspects of education—systemic disparities. Tend to adjust their teaching methods to be more inclusive and fair (according to Mendoza's 2022 study).

4. **REFLECTIVE JOURNAL WRITING:** Practicing of keeping a journal with a focus gathering student feedback. Superficial contemplation, without considering future consequences, often involves modifying techniques, item 20 (average= 2.154; standard deviation= 0.732). An unconventional method to enhance reflection could be implementing journal entries where educators document their thoughts on student feedback following every class session—an approach that research indicates aids teachers in recognizing trends in student reactions and evaluating the efficiency of their approaches across time (Salazar et al., 2023). The MATATAG program might incorporate workshops for teachers to enhance their skills by keeping journals and evaluating their entries for long-term enhancements in teaching methods.
5. **COLLABORATIVE REFLECTION:** In light of the outcomes seen in reflection concerning teachers' curiosity and dedication to enhancing their teaching, item 33 (average score of 3.615 with a standard deviation of 0.697) suggests that incorporating group reflection sessions into the MATATAG curriculum could be advantageous.

The study results indicate that practice teachers have levels of engagement in their practices, but there is potential to improve and elevate these practices further through the integration of pre-reflection activities, inquiry-based teaching methods, culturally responsive pedagogical approaches, reflective journal writing, and collaborative reflection sessions included in the MATATAG curriculum. These strategies are consistent, with research highlighting the significance of teaching in enhancing student achievements and fostering fairness in education.

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