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COLLEGE  
CAVITE**



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# Emilio Aguinaldo College-Cavite Organizational Chart AY 2020-2021

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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 for the holistic development of the persons conscious of their national identity and their roles in the global community.

## **VISION**

Emilio Aguinaldo College envisions itself as an internationally recognized autonomous academic institution rooted in its nationalist tradition that consistently pursues the advancement and welfare of humanity.

## **MISSION**

Emilio Aguinaldo College provides an outcomes-based education with relevant curricula geared towards excellent research, active industry cooperation and sustainable community extension.

## **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.

## TABLE OF CONTENTS

Title	Page
<b>A Case Study on Burnout Recovery Associated with Remote Teaching of Professors at Emilio Aguinaldo College Cavite</b> <i>Princess Jessica Feliza P. Adriano, Jinx Mikee A. Balibalos, John Daniel R. Go, Joanna T. Mancol</i>	1
<b>Accessibility of Health Care among the Residents of Barangay 3 Wawa, Rosario, Cavite towards the Management of Upper Respiratory Tract Infection in Young Adulthood</b> <i>Joselyn V. Comodas, Daniel Lyn R. Gacayan, Zhururdena Y. Jawali</i>	38
<b>Alternative Dispute Resolution: A Key to Peace And Order in the Barangay Level</b> <i>Corinne Ann B. Sarabia, Christine Faye W. Alvarez, Margie O. Rivera, Christian Vener A. De Guzman, Lance Cristian D. Carriedo</i>	77
<b>Content and Language Integrated Learning (CLIL) as a Tool in Developing Students' Skill in Writing an Expository Essay</b> <i>Winchester M. Canteras, Abigail M. De Jesus, Ken Bouie M. Guarino</i>	105
<b>COVID-19 Vaccine Literacy on Persons with Comorbidities in Bacoar, Cavite: A Quantitative Study</b> <i>Rebecca Mae Correa, Jessa Faith P. Lace, Jacklyn Risia San Gabriel, RPh, MSc</i>	131
<b>Effects of Different Post-curing Methods on the Flexural Strength of Direct Composite Resin used as an Alternative to Laboratory-processed Indirect Restorations</b> <i>John Mark I. Alonzo, Janssen Carlo R. Armeza, Dominique Nikki B. Catubao</i>	152

<b>In Vitro Activity of Biologically Synthesized Silver Nanoparticles by <i>Escherichia coli</i> Against Multidrug Resistant Biofilm Consortium Isolated from Sewage</b>	163
<i>Ma. Janelle C. Sudaria, Rhowie Erin C. Saylon, Nherrie C. Estrada, Ivan Josh B. Del Rosario, Romyr John Andrei M. Posadas, Christian Angelo A. Bataller, Geraldine B. Dayrit, Supachai A. Basit</i>	
<b>Measurement of Health-related Fitness Components of Physical and Respiratory Therapy Students from Emilio Aguinaldo College Cavite after the Two-year Online Learning Period: A Descriptive Cross-Sectional Study</b>	189
<i>Angelica Nicole Perez, Akiyah Louisa Remo, John Lennard Dimacali, Glenda V. Sangalang, Raymond B. Esperida, Jose Avelino V. Vergara</i>	
<b>Modern Integration of Non-internet General Queueing System (MIONG.qs): The Ticket Queue Dispensing Robot</b>	235
<i>Dronxenette Emerlyn M. Baltazar, John Noah G. Jonson, Arvin Matthew Paguinto, Nikko Angelo P. Quilo</i>	
<b>The Influence of Shopee's User Interface on the Purchasing Patterns of EACC Students</b>	314
<i>Krishna Mae D. Bacolod, Sean Patrick Q. Catsao, Edzel F. Nayve, Mella Cassandra R. Ortega</i>	
<b>The Relationship between Employees' Performance and Customer Satisfaction in Volet's Hotel and Resort</b>	337
<i>Vincent Andrew I. Barreda, Kient Rafson R. Candolesas, Trisha Mae R. Quiliza, Crishiel Ann J. Segovia</i>	

# **A CASE STUDY ON BURNOUT RECOVERY ASSOCIATED WITH REMOTE TEACHING OF PROFESSOR AT EMILIO AGUINALDO COLLEGE CAVITE**

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## **KEYWORDS:**

- **Online Classes**
- **Covid-19  
Pandemic**
- **Workplace  
Stress**
- **Work from  
Home**
- **Higher  
Education**

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**Abstract.** It is a well-known fact that the COVID-19 pandemic transformed the workplace for people across the globe, bringing with it a new set of challenges for everyone. And, while there has been significant research into occupational health, little is known about the more recent work-related phenomena brought about by these sudden pandemic-driven changes, such as remote work burnout and, in particular, how to recover from it. This study looks into

the recovery process of a college professor from remote teaching burnout. An intrinsic, explanatory single-case study design was used,



whereby a professor from Emilio Aguinaldo College – Cavite was selected through purposive sampling and underwent a series of data gathering procedures using three empirical tools: (a) Twenty Statement Test, (b) 60-minute Semi-Structured Interview, and (c) Repertory Grid at two different points in time with a 30-day interval in adherence to the study's temporal requirement. Extracted data was subsequently analyzed using thematic analysis, and results showed that the participant's remote work burnout was primarily caused by work-life interference and negatively impacted all work-related aspects, as evidenced by their poor work performance (emotional exhaustion), cynicism (depersonalization), job insecurity (reduced personal accomplishment). Moreover, non-pharmacological strategies were also found to be the most successful approach to burnout recovery. The pandemic predisposes professors to remote work burnout because the unique working conditions it brings about foster burnout. However, recovery is attainable, primarily through individual-level initiatives that work in tandem with other person-specific variables such as one's unique personal characteristics and protective factors.

# **A Case Study on Burnout Recovery Associated with Remote Teaching of Professor at Emilio Aguinaldo College- Cavite**

## **INTRODUCTION**

The pandemic has inarguably changed nearly every aspect of the world. Almost overnight, the occasional quirky Skype calls while wearing underpants became the norm. People's lives changed in critical ways, making a return to pre-pandemic lives extremely unlikely, hence the term "new normal."

Indeed, living through a global pandemic has caused significant changes in jobs, education, and almost every other aspect of life. Aside from the more obvious dangers of COVID-19 to physical health, the psychological impact of the changes it has caused, such as the shift to remote work setup, also poses significant threats to mental health and well-being, as the uncertainty of the pandemic only fosters higher levels of anxiety and stress. Moreover, teachers are forced to adjust to the new post-pandemic educational landscape and are expected to provide effective remedial education almost immediately, with little regard for the possibility that they may not have the technologies, resources, and competencies required to participate in and succeed in this new mode of instruction (Guillasper et al., 2020; Moralista & Oducado, 2020; Rabacal et al., 2020).

Numerous institutions, including the target locale of this study, Emilio Aguinaldo College-Cavite (EAC-Cavite), had never conducted remote teaching until the COVID-19 pandemic compelled them to which inarguably affected not only the school administrators and students, but the professors as well. Moreover, in a roundtable discussion by Segment Head for Education of Globe Telecom, Mark Arthur Abalos and Emilio Aguinaldo College, they recognized the resistance of its stakeholders, students, and faculty members to online learning, boldly stating that "no one... not even the best and the brightest in two institutions [referring to EAC-Manila and EAC-Cavite] are ready for this pandemic" (Emilio Aguinaldo College, 2020, 20:42).

As a matter of fact, according to Miguel et al. (2021), since the emergency shift to distance learning setup began, there has been a heavier workload and a greater demand for a diverse set of skills for educators, such as the ability to navigate electronic gadgets, and multitask in order to balance their professional lives, administrative tasks, and personal lives, all of which can cause stress and worry. With these factors being some of the primary sources of burnout according to Bakker et al. (2001) Job Demands-Resources (JD-R) Model and burnout being one of the main causes of attrition and turnover among teachers as per Lambersky (2016), the researchers believe it is necessary to conduct a detailed investigation on burnout recovery associated with remote teaching of professors in order to inspire and motivate other educators who may be going through something similar.

However, although a number of studies have already delved into faculty burnout, only a select few have looked into burnout recovery as a topic of interest, particularly in the context of remote teaching. Hence, the researchers believe that conducting this study, which aims to explore the burnout recovery process of a college professor, is crucial because if the foundation of modern society, education, and those who deliver it, namely educators, are unacquainted with the fact that recovery from burnout is possible, or if, as in the study of Edú-Valsania et al. (2022), there is a lack or absence of reference models who have gone through a similar experience and have overcome it, it will undoubtedly have a negative impact on them as well as the quality of Philippine education on a larger scale. Additionally, while efforts are being made to alleviate the burnout phenomenon, there is an evident scarcity of relevant literature that can inform the prevention and recovery processes. As a result, the findings of this study may be useful not only to professors on a personal level, but also to the policymakers in charge of mitigating this global phenomenon.

### ***Statement of the Problem***

The study intends to contribute to an intensive understanding of burnout recovery associated with remote teaching. Thus, this paper aims to answer the following questions:

1. Why did the participant suffer from remote work burnout?

2. How is the participant's work performance affected by the burnout?
3. How did the participant recover from remote work burnout?

### ***Theoretical Framework***

These two empirically established burnout explanatory theories were chosen because, rather than being contradictory, they are complementary, resulting in a more comprehensive view of the syndrome.

### ***Social Cognitive Theory***

The Social Cognitive Theory is one of the most widely accepted theories for explaining human behavior, particularly in the workplace context (Bandura 1977, 1982; Çam & Öğülmüş, 2019; Schwarzer & Greenglass, 1999). Person-specific variables such as self-efficacy, self-confidence, and self-concept play a central role in the emergence and development of burnout in this approach (Cherniss, 2017; Edú-Valsania et al., 2022; Pines, 2002). Bandura (1977, 1986) defined self-efficacy as “people's judgment of their capabilities to organize and execute courses of action required to attain designated types of performances” (p. 391). In other words, in this theory, self-efficacy is the most basic predictor of subsequent task-specific behavior, such as what will be the trigger for an action to be made, how much effort will be expended and how long will the action continue once confronted with failure or obstruction (Rahmati, 2015; Schwarzer & Hallum, 2008). In more concrete terms, self-efficacy refers to a person's beliefs about whether or not they can complete a specific task (Rahmati, 2015; Yang, 2004).

Aside from that, Bandura (1977) discovered that self-efficacy is positively associated with both vicariously and emotionally induced behavioral changes, implying that self-efficacy influences how one thinks, feels, and acts (Rahmati, 2015). In terms of feelings, it has been stated that low self-efficacy may lead to depression, anxiety, and hopelessness, whereas high self-efficacy can lead to higher work satisfaction and a lower burnout rate (Çam & Öğülmüş, 2019; Friedman, 2002; Yulianti, 2018). So, according to this theory, burnout is caused by the workers' doubts about their own or their group's ability to achieve professional goals, or simply by a lack of self-efficacy.

Additionally, workers with low self-efficacy tend to approach challenges in a pessimistic manner, focusing on the risk of failure rather than the opportunity to learn and grow, as those with high self-efficacy do (Bandura, 1989; Çam and Öğülmüş, 2019; Yang, 2004). This defensive behavior is already emotionally strenuous, and when combined with the mounting demands of remote working, the second theoretical framework of this study is arrived at, The Job Demands-Resources (JD-R) Model developed by Bakker et al (2001).

### ***Job Demands-Resources (JD-R) Model***

The first key component of this model is the Job Demands. These are work factors that necessitate prolonged physical or mental effort and are associated with physiological and psychological costs due to sympathetic system activation (such as autonomic and endocrine systems). Common work demands include workload, emotional labor, time pressure, interpersonal conflicts, work environment, and other ergonomic aspects. In a more concrete sense, the more workers exert effort when performing a task, the higher the physiological costs. Accordingly, when an individual engages in such high-cost behavior for a long period of time, they will inevitably run out of energy and become emotionally exhausted. Recovery from these demands, on the other hand, is enabled by the second key component known as "resources" (Çam and Öğülmüş, 2019; Demerouti et al. 2001).

Often considered as "health protective factors," work resources refer to the personal, physical, psychological, organizational, or social aspects of a job that can mitigate the job demands as well as the physiological and psychological costs that accompany them. Common examples of resources would be the feedback, awards, job control, participation, job security and social support that the workers receive. Another notable personal resource would be self-efficacy, a key concept of Bandura's SCT. In the JDR-model, self-efficacy is regarded as a person-environment interaction and believed to be affected by the amount of social support that a person receives, particularly in the workplace (Çam and Öğülmüş, 2019; Leiter & Maslach 1988; Leiter 1991).

In brief, this model postulates that burnout occurs in two stages. In the first stage, job demands place an undue strain on people, resulting in emotional exhaustion. Inadequate resources or resource inefficacy in the second stage force people to face job

demands while underequipped. This leads to an imbalance between the two key components, where the demands exceed the resources, and causes people to manifest withdrawal behaviors such as subjective fatigue; if this imbalance persists for an extended period of time, fatigue becomes chronic, and finally, this would lead to disengagement. Therefore, this model contends that the interaction between job demands and internal resources have a significant effect on burnout and are extremely useful in understanding it (Bakker et al., 2017, Çam and Öğülmüş, 2019; Demerouti et al. 2001; Edú-Valsania et al., 2022).

## **METHODOLOGY**

### ***Research Design***

This research utilized a case study, a design included in the scope of the qualitative research method. While other researches with larger scope can only gather superficial data, a case study, in contrast, delves deeply into a phenomenon using small sample size, allowing an in-depth and intensive investigation of the topic at hand (Erickson, 2018). Another distinguishing feature of a case study is that it is bounded by its temporal element, which means that it investigates the process of occurrences, changes, and development over a period of time (Huseyinzade Simsek, 2020). Moreover, unlike any other research design, the case study utilizes multiple methods, or data triangulation, to explore the study of interest with adequate information. To be specific, this paper used an intrinsic, explanatory, and single-case study. According to Kekeya (2021), an intrinsic case study is bound to explore a specific case that interests the researchers rather than a general phenomenon. In this case, the researchers particularly emphasized burnout recovery associated with remote teaching rather than the burnout in itself. Along with this, the goal of this paper is to understand the said phenomena beyond its mere descriptions, provide a causal link to discover the cause of the emergence of burnout in remote teaching, and contribute additional knowledge to this unexplored trend, which, according to George and Merkus (2021), rationalized the use of an explanatory case study. Moreover, Ozcan et al., (2017) suggested the use of a single-case study on research that necessitates an exploration of an unusual, uninvestigated, and longitudinal phenomena. Provided that burnout recovery has hardly been analyzed in higher education, especially in remote

teaching setup, and seeing that this paper was set to examine the same participant over a period of time, this research utilized a single-case study.

### ***Sampling Technique***

In order to preserve the depth and richness of the analysis, Schoch (2020) recommends using a sample of one in non-multiple case studies. Hence, one participant was adequate to yield the data needed to answer the central problem anchored in this study. The participant was selected through Purposive Sampling under non-probability sampling. This sampling technique was made possible by establishing qualifications suitable for the target participant of this study. Ideally, experiences the participant must be a college remote working professor at Emilio Aguinaldo College - Cavite, aged 25-50, who prior to the study, has had self-reported burnout experiences garnering specific scores in the Maslach Burnout Inventory - Educators Survey (high degree of occupational exhaustion and depersonalization, and a low degree of personal accomplishment), and has already recovered from it, as demonstrated by scoring inversely compared to his previous scores (high degree in personal accomplishment, low degree in occupational exhaustion, and depersonalization). By using the same test, the disparity between the previous and current scores became visible, and the recovery, in turn, was easy to spot.

### ***Data Gathering Procedure***

Considering the safety protocols during the height of the pandemic, the researchers opted to conduct the entire study in an online setup. First, the team posted a call for a participant via Facebook, including the criteria the participant should meet. Second, the researchers immediately approached the willing participant through a direct message on Facebook Messenger, along with the informed consent form whereby indicates that the participation was voluntary and free from any means of coercion. For convenience, a participant received the Informed Consent Form through Google Forms, along with the Maslach Burnout Inventory - Educators Survey that the researchers used to identify the qualified participant. The third step was that, after the screening, the researchers subjected one participant to a series of tests: a) Twenty Statement Test (TST); b) 60-minute Semi-

Structured Interview and on a later date; c) Repertory Grid. The whole procedure, consisting of TST and Interview session, lasted about two hours and was sufficient to get to the bottom of the participant's aspect of life. The proceedings, as well, were practically conducted through Google Meet, entirely recorded using a Windows built-in screen recorder. Interview questions were asked on the spot to provide truthful and richly textured data. Fourth, the researchers transcribed first the entire interview session as the Repertory Grid should be constructed based on the professor's verbatim. The researchers then sent the Repertory Grid to the respected participant via Facebook Messenger shortly after the transcription was done. Fifth, the results gathered from the participant across three data tools were critically analyzed to produce reliable accounts. Sixth, in compliance with the temporal requirement of a case study, the researchers conducted a similar procedure, with identical empirical materials, 30-days after the first session as recommended by multiple scholars (Prasad, 2016; Trevethan, 2016). With this, the researchers could obtain and observe the changes and development, thereby fulfilling the primary goal of a case study. Data collected from the retest were also analyzed and examined as soon as the second session has been completed. Finally, the team compared the accumulated results derived from the two data sets to form a third analysis, which eventually became a framework for a sharp conclusion. Furthermore, thematic analysis was used to analyze the extracted data via OneNote, as it was congruent with the study's goal of exploring the participant's experiences, the causes and outcomes, in relation to the phenomenon of interest (Braun & Clarke, 2016; Kiger & Varpio, 2020). Once the research was done and established, the given data remained confidential and researchers discarded all interview footage immediately.

### ***Ethical Consideration***

The Informed Consent Form (ICF) was provided prior to the study. The team granted the principle of voluntary participation by eliminating coercion and by providing the right to withdraw at any given time. To maintain transparency, the willing participant was given the right to access their information and was aware of how the data collected was used throughout the study. In adherence to the Republic Act No. 10173, known as the Data Privacy Act of 2012, the researchers ensured that all information provided by the participant were treated with the utmost



confidentiality and were used solely for academic purposes. The degree of confidentiality, as well, went beyond censoring their names to filtering identifying statements that could reveal the participant to anyone outside of the research team. All collected data were kept in a Google Drive exclusive for researchers' access and were discarded at the end of the study. With great emphasis, this case study did not use any form of deception and exaggeration concerning the objectives and procedure of the study. Moreover, the research minimized— if not eliminated— potential risk to all spheres, including physical, emotional, and reputational, only treating participant with high regard.

RESULTS

The Twenty Statements Test (TST)

Table 1.1 Total number of categories (First Session)

A-mode Responses	%	B-mode Responses	%	C-mode Responses	%	D-mode Responses	%	Total	%
0	0%	5	25%	13	65%	2	10%	20	100%

Table 1.2 Total number of categories (Second Session)

A-mode Responses	%	B-mode Responses	%	C-mode Responses	%	D-mode Responses	%	Total	%
0	0%	9	45%	11	55%	0	0%	20	100%

13 out of 20 statements used during the first session (see Table 1.1) were classified as C-mode responses (65%), indicating that the participant is “reflective”. Other vital responses were as follows: 5 statements in B-mode responses (25%), and 0 statements in A-mode responses (0%), making it the least among them. Data collected from the second session and it ranks (see Table 1.2) appeared to be consistent with the previous responses, garnering 0 statement in A-mode (0%), 9 statements in B-mode responses (45%), and 11 statements in C-mode responses (55%). Only this time, it includes significant disappearance of previously presented D-mode responses (abstract/existential statements)

and an evident increase in B-mode responses or those that imply social relationships, statuses, and roles. The implication of this is that: participant formed a stronger sense of self and was more socially affiliated in the second session as compared to the first. With Reflective statements (C-mode responses) predominating both sessions, and Physical statements (A-mode responses) being absent throughout, the participant demonstrated a solid foundation of self and portrayed deeper self-orientation that goes beyond skin-deep concepts. In related literature, C-mode descriptions are frequently found to be generated by individuals with higher adaptive capacity and behaviors reflecting this, such as high self-awareness (Rees & Nigelson, 1994; Aypay & Aypay, 2011; Dr. Charles Stangor et al., 2022). Therefore, the participant's inclination towards the C-mode category could be interpreted as an indication of high adaptive capacity.

*Table 2.1 Total number of Positive and Negative C-mode Responses (First Session)*

Positive C-mode Responses	%	Negative C-mode Responses	%	Total	%
5	38.5%	8	61.5%	13	100%

*Table 2.2 Total number of Positive and Negative C-mode Responses (Second Session)*

Positive C-mode Responses	%	Negative C-mode Responses	%	Total	%
9	81.8%	2	18.2%	11	100%

In the first session, 8 out of 13 C-mode responses were identified as negative statements (61.53%), and 5 responses were considered as positive statements (38.46%). However, during the second session, 9 out of 11 C-mode responses were composed of positive statements (81.8%), and 2 responses were specified as negative statements (18.2%). As negative statements were dominant during the first session, prior findings inferred that the participant has a negative outlook on their professional life. The statements during the former session showed a reduced sense of personal accomplishment seen in fear, anxiousness, insecurity, and dissatisfaction with their job. Hints of depersonalization, and cynicism were apparent by the expressed nihilism and by the loss

of regard for usual standards. The reduced sense of personal accomplishment, and observed depersonalization are two of the three dimensions of the Maslach Burnout Inventory (MBI). Therefore, higher chances of burnout were perceived through the statements provided by the professor. In contrast, the dominance of positive C-mode responses indicated a sudden change and development during the second session, where findings revealed participant's positive outlook on their professional life. The recent verbatim of the participant showed an increased personal accomplishment, perceptible through a higher form of job motivation, job satisfaction, work commitment, and great passion for teaching. Moreover, the previous display of depersonalization had dropped dramatically during the latter session, caused by the development of instructor-student engagement. According to the Maslach Burnout Inventory, higher sense of personal accomplishment and lower degree of depersonalization reduces the likelihood of professor's burnout.

It can be observed that there is a discrepancy between the participant's responses in the first and second data gathering sessions, indicating that the changes and development of the participant's burnout recovery process have been successfully investigated. The analysis of the participant's statements during the former session revealed that they had a negative outlook on their professional life, whereas an improved outlook was reported during the latter session, confirming time intervals as a confounding variable. The likely explanation for the observed inconsistency would be the temporal requirement of a month-long interval between tests which could have allowed the participant's recuperation to progress gradually and complete burnout recovery to be achieved.

## **Semi-Structured Interview**

Statement of the Problem 1. Why did the participant suffer from remote work burnout?

*Master Theme no. 1: Stressful Life Events — In Vivo Statements and Summary (First Session)*

Themes	In Vivo Statements	Page	Lines
Recent Breakup	<i>"Eh, during that time, 'yun 'yung isa sa mga— isa na rin 'yung— isa na rin sa malaking factor na, galing ako sa break-up no'n. And, 'di ko ma-control 'yung nangyayari sa buhay ko to the point na... hindi na ako makagawa ng grades. Ayun. May mga ganong instances."</i>	194	128-132
	<i>"During that time, my full attention ko [sic] was... sa partner ko, and if ever man, may conflicts kami, sobrang sakit sa ulo. Like, "Ugh. Kailangan kong ibigay 'yung full attention ko dito. I-solve 'yung problem and such." Or, if ever man— ano— kung para lang... or may mga instances na kailangan ko i-maintain 'yung uh... relationship namin. Kung hindi, 'yun... magka-crumble na naman... Mag-aaway, and paulit-ulit lang. Never ending cycle. So, I never did things na, it was [sic] helpful for me, ayon..."</i>	203	489-496
Recent Breakup	<i>"'yung burnout... it's a mixture of 'yung mismong relationship ko and 'yung workload ko."</i>	198	312-313

*Master Theme no. 1: Stressful Life Events — In Vivo Statements and Summary  
(Second Session)*

Themes	In Vivo Statements	Page	Lines
Recent Breakup	<i>"It's [sic] more of my personal issues kaya ako nagkaroon ng burnout...uhm, mainly dahil sa... uhm, past relationships ko 'non.'"</i>	211	122-124
	<i>"before... especially last year, n'ung nag-start ako magturo hanggang last year— so nag-start ako nung [mentions year] hanggang [mentions following years], madali akong— susceptible ako sa burnout, especially, kapag nakakaapekto na 'yung personal- personal life ko [chuckling]. Susceptible... sobrang susceptible ko."</i>	211	174-178

During both the first and second data gathering sessions, the participant positively identified their most recent failed relationship as one of the primary causes of their burnout. They even stated that their previous relationship not only precipitated their burnout, but in hindsight, it also prevented them from achieving their life goals. It can be observed that participant's statements remained consistent for both sessions, revealing that the apparent pattern of work-life imbalance, particularly in their interpersonal relationships, greatly increases burnout.

*A Case Study on Burnout Recovery Associated with Remote Teaching of  
Professor at Emilio Aguinaldo College-Cavite*

Master Theme no. 2: Overwhelming Job Demands — In Vivo      Statements and  
Summary (First Session)

Themes	In Vivo Statements	Page	Lines
Adminis- trative Work	<p><i>"Ayan... Nabago ko din 'yon... admin works ko kasi, sobrang gulo na eh. Kasi... nangangapa—nung una, nangangapa ako. Ang dami kong 'di ko alam na kailangan gawin. And, once na nadisc—nalaman ko na siya... kakatanong sa mga kapwa ko professors, and sa mga staff ng [mentions department]... Du'n ko na... nag-isip ako ng paraan pa—or strinategize ko, uhh... kung ano 'yung mga best way para maging efficient du'n sa ginagawa ko. Parang ganon..."</i></p>	203	561-567
Preparation of Instructional Materials	<p><i>"Pangalawa, whenever I'm working ... I don't feel 'yung na-feel ko no'n previously, which is... 'yung utak ko gusto magtrabaho pero 'yung katawan ko, ayaw. Ngayon, gusto magtrabaho ng utak ko, nagtatrabaho 'yung katawan ko."</i></p>	205	593-598
Student Assessment	<p><i>"...Ganoong mga instances. And, at the same time, 'yung pangalawang situation, 'yung dami ng— dami ng kailangan mong gawin per 'section. For example, eight or nine or ten sections ibibigay sa'yo or classes [coughing] lahat 'yon sabay-sabay mong gagawan ng quizzes, sabay-sabay mong gagawan ng activities, lahat 'yon sabay-sabay mong ichi-check yan"</i></p>	194	182-187

*A Case Study on Burnout Recovery Associated with Remote Teaching of  
Professor at Emilio Aguinaldo College-Cavite*

Master Theme no. 2: Overwhelming Job Demands — In Vivo Statements and  
Summary (Second Session)

Themes	In Vivo Statements	Page	Lines
Administrative Work	<i>"natatambakan ako ng mga admin works. 'Yun isa din yung source of burnout ko."</i>	210	124-125
	<i>"So, somewhat nakakabigay ng burnout 'yun... at admin works, ayun."</i>	210	134-135
Preparation of Instructional Materials	<i>"Dagdag pa mga teaching materials na need ko i-prepare ahead of time—powerpoint, video presentations, and such."</i>	209	92-94
	<i>"yung ano... uhm, 'yung pagre-ready ko ng mga PPTs na gagamitin ko. Ngayon, siguro yung repetition of discussions, and admin works."</i>	211	179-181
Student Assessment	<i>"it is [sic] somewhat easier in terms of giving out quizzes, because uhm... they [sic] can conduct the quiz online, so... and, it is automatically checked so, it is somewhat easier compared if we're going to— if I'm going to manually check it, eh ang dami ko pa namang sections na ginagawan ng quizzes kaya nakaka-burnout rin talaga."</i>	208	57-61
Monotonous Tasks	<i>"Next is yung... uhm... repetition ng mga lessons na kailangan ko i-discuss. ... Kapag mga major naman, usually dalawang beses ko lang s'ya uulitin sa isang linggo... kapag nag-handle ka ng— 'yung handle ko ngayon Nine... nine na [mentions minor subject], paulit-ulit mong idi-discuss 'yon... So it was difficult na parang— para na akong paulit-ulit sa sinasabi ko [chuckling]."</i>	210	125-133

The verbatim of the participant during the first and second sessions revealed that loads of simultaneous administrative work were the critical determinants of personal remote work burnout experiences. However, it was not until the second session that the participant revealed how their taxing work monotony eventually became the source of their burnout. The findings of this study are firm that even with a new theme identified during the second session, the consistency of the participant's statements is still present as it nonetheless indicates the same result: Overwhelming Job Demands generates an increase in burnout prevalence.

Master Theme no. 3: Abrupt Transition — In Vivo Statements and Summary  
(First Session)

Themes	In Vivo Statements	Page	Lines
Teaching Strategy	<i>"... magbabasa in advance, and ihahanda mo 'yung sarili mo paano mo siya ie-explain, i-elaborate, at the same time, simple sa mga estudyante ... paano intindihin. So ako, nagi-isip ako ng paraan paano ko siya mapapasimple, at the same time, ano pa rin... informative pa rin and professional."</i>	194	157-167
Inexperience in Remote Teaching	<i>"So, dati 'yun nga, may part na nanga—bukod sa nangapa ako, eh, kinakapa ko kung ano 'yung best way para magturo sa online setup"</i>	203	556-557



Master Theme no. 3: Abrupt Transition — In Vivo Statements and Summary  
(Second Session)

Themes	In Vivo Statements	Page	Lines
Teaching Strategy	<i>"I don't [sic] have a grasp on how I can teach it to the students. So, it was somewhat difficult for me on how [sic] I can express the lessons to the students ... it was somewhat difficult for me to— to— to talk about it to the students"</i>	209	79-83
Inexperience in Remote Teaching	<i>"regardless if I have an idea of [mentions academic discipline], I was put into a place where I was not that prepared to teach certain subjects that I wasn't prepared to teach"</i>	208	75-77

Because of the forced adoption of remote learning, the participant admitted during both interview sessions that they had a hard time performing their usual duties as a professor due to a lack of experience and preparedness. They stated that the novelty of the situation, as well as the significant difference between their experience in traditional face-to-face teaching and conducting remote classes, compelled them to completely reinvent themselves as an educator, which was difficult to do while juggling other responsibilities. Despite the month-long gap between interview sessions, it can be seen that the second session consisted primarily of reiterations of previous testimonies, reinforcing the themes previously observed to have contributed to the participant's burnout.

Master Theme no. 4: Exhaustion — In Vivo Statements and Summary (First Session)

Themes	In Vivo Statements	Page	Lines
Sluggish	<i>"I feel the burnout— the sluggish feeling"</i>	195	232
Low Mood	<i>"I felt that... pakiramdam ko... ayaw [chuckling] kumilos ng katawan ko. Gano'n 'yung idea. Ayaw kumilos ng katawan ko kahit sinasabi kong kailangan kong tapusin lahat 'to. Ganon. And, at the same time, may mga instances, ... lets say one PM – one PM 'yung klase ko... alam kong kailangan dapat pumasok na ko ng one PM, pero 'di pa rin ako pumapasok. I felt na I wasn't really... productive because of that"</i>	199	374-381
	<i>"pero at the same time, kinakain na talaga ako ng lungkot no'n [chuckling]. Kinakain na ako ng ano— kinakain na ako ng—uhm— kinakain na ako ng ano— thoughts ko no'n kaysa sa responsibilities ko bilang isang professional."</i>	199	270-273
	<i>"nu'ng sa peak na 'ko ng burnout, bigla 'kong titigil sa kalagitnaan ng klase, ... Tapos ayun, hihinga lang ako ng malalim kasi 'di ako makahinga. Parang ano— kasi wala namang problema sa'kin, 'di lang talaga 'ko makahinga. So— or may instances na iiyak ako gano'n. 'Yon."</i>		389-393

Master Theme no. 4: Exhaustion — In Vivo Statements and Summary (Second Session)

Themes	In Vivo Statements	Page	Lines
Sluggish	<i>“paulit-ulit mong idi-discuss ‘yon... ‘yung lesson sa isang linggo. So it was difficult na parang— para na akong paulit-ulit sa sinasabi ko [chuckling]. Nakakapagod pag paulit-ulit and nagiging boring.”</i>	210	131-134
	<i>“Nung time na ‘yun before, hindi talaga ako makapagtrabaho, pero</i>	211	191-193
Low Mood	<i>gusto ng kataw— gusto ng... isip ko magtrabaho, ayaw ng katawan ko.”</i>	211	186-187
	<i>“‘Di ako makagawa ng maraming bagay kasi ang lungkot ko n’on.”</i>	213	248-250
	<i>“Before, it was low [referring to personal accomplishment]. Okay... It was low due to many factors, mainly my personal problems, personal issues. Sobrang lugmok kasi ako no’n eh.”</i>		

During the first and second sessions of the data collection, the participant confessed to having sluggish feelings amidst burnout experiences. This narrative was demonstrated by the constant dissonance, where their mind pleads to be productive, but their body refuses to cooperate. It was further explained in the second session that their professional responsibilities and monotonous tasks lowered their productivity and increased the pre-observed exhaustion. Moreover, hints of low mood in both sessions were apparent through the extreme sadness and sudden emotional meltdowns that often causes listlessness. Through this, the presumption that burnout reinforces physical and emotional exhaustion was proven correct and honest in professor’s experiences.

Master Theme no. 5: Depersonalization — In Vivo Statements and Summary  
(First Session)

Themes	In Vivo Statements	Page	Lines
Inconsiderate	<i>"May mga instances na... uhm... late ko mabigay 'yung mga needs ng mga students such as 'yung powerpoints, gano'n."</i>	198	345-347
		198	342-343
	<i>"Eh 'yun nga nu'ng time na 'yun, nali-late ako kasi nga, I felt na gusto ko lang humiga, 'yon."</i>	197	296-300
Critical	<i>"Yon, gano'n 'yung- which is ayun nga 'di ko makapa kasi madami sila eh. Probably, some of them understood... some of them na, "Di! responsibility mo yan bilang prof eh," ganyan-ganyan without considering tao lang din kami, 'di ba?"</i>	192	81-82
	<i>"...hindi ko nakikita ang itsura nila na—"Teka lang, nakikinig ba sa aking 'tong mga to?"</i>		

Master Theme no. 5: Depersonalization — In Vivo Statements and Frequency  
(Second Session)

Themes	In Vivo Statements	Page	Lines
Inconsiderate	<i>"Bale, there were a lot of things that I did not consider when I started remote teaching na"</i>	209	96-99
Critical		208	62-65
	<i>"but at the same time, it is a bit difficult to, uhh... administrate the quizzes and exams because uhm... the students— all of the students have the possibility to cheat on the exams."</i>	211	168-171
	<i>"Kung natatakot kayo magtanong, nasa sa inyo na 'yan. Ako nagtanong na ako kung naiintindihan ba. Kung walang sumagot, eh 'di okay." ganon lang yung thinking ko. Nasanay na eh. Na-habituarte ko nalang."</i>		

The participant described how, at the height of their burnout, they struggled to connect with their students and confessed to being unconcerned about what their students thought of them, as well as purposefully starting class meetings late because they only wanted to lie down, demonstrating callousness as well as a disregard for their students' time and effort. They also stated that they doubted students' concern about their well-being and admitted to suspecting their students of cheating on exams during the second interview session, revealing distrust and a tendency to think negatively of them, both of which are signs of cynicism. These statements lead to the conclusion that depersonalization is indeed a primary manifestation of the participant's burnout.

Master Theme no. 6: Reduced Personal Accomplishment — In Vivo Statements and Summary (First Session)

Themes	In Vivo Statements	Page	Lines
Dissatisfied	<i>"Naapektuhan sila sa performance ko, and s'yempre 'di nila nakukuha 'yung best version ko, kasi as a professor or as a colleague. 'Di nila nakikita 'yung best version ko."</i>	198	358-360
Anxious	<i>"During that time, sobrang kinakabahan ako kasi, "di na yata kasi ire-renew 'yung contract ko. sobrang nag-underperform ako eh"</i>	200	417-418
Embarrassed	<i>"I felt embarrassed... I felt embarrassed sa mga ka—colleagues ko kasi hindi ko nagagawa 'yung supposed to be kailangan kong gawin as a professional"</i>	196	274- 276
Insecure	<i>"parang iliteral—illiterate 'yung—[chuckling] 'yung approach ko which is aminado ako do'n... na hindi 'yun 'yung best performance ko as a professor"</i>	192	91-93
Incompetent	<i>"In a way, in a way, nanghinayang ako do'n. Napag-iwanan ako ng mga friends ko na nagti— na patapos na ng Phd"</i>	203	525-527
		199	371-373
Inefficient	<i>"... I wasn't able to, uhm... encode the grades ng prelim at midterm on time. I wasn't able to work properly. I wasn't able to work as I should have, or as I should had [sic]."</i>	199	376-383
	<i>"...nakabukas na</i>	193	136-138

*A Case Study on Burnout Recovery Associated with Remote Teaching of  
Professor at Emilio Aguinaldo College-Cavite*

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*'yung Gmeet pero 'di ako napasok,  
'di ako  
nagi-start. I felt na I wasn't really...  
productive"*

*"... hindi ako  
nakagawa ng grades mula Prelim  
hanggang  
Midterm"*

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**Master Theme no. 6: Reduced Personal Accomplishment — In Vivo Statements  
and Summary (Second Session)**

<b>Themes</b>	<b>In Vivo Statements</b>	<b>Page</b>	<b>Lines</b>
Dissatisfied	<i>"when I was still in the midst of burnout... I was looking at myself in terms of uhh... perceiving it as— perceiving na I wasn't really doing well as an adult."</i>	213	257-259
Anxious	<i>"I was expecting that time I'm not [sic] going to perform that well"</i>	213	87-88
Embarrassed	<i>"Yung evaluation din ni Dean, I was worried no'n kasi baka 'di na ma- renew yung contract nya."</i>	209	99-100
Insecure	<i>"I wasn't really doing well...nakakahiya, actually."</i>	213	259-260
Incompetent	<i>"I wasn't doing okay ... It was affecting my work. Nahihiya ako kay Dean, and sa students."</i>	213 212 212	260-263 232 206-209
Inefficient	<i>"If I'm going to compare, sobrang mababa yung performance ko dati."</i>		
	<i>"In terms of my students, uhh... masasabi—masasabi ko before na somewhat nagkulang ako... For example, that time, late ako nakapag—uhh...encode ng grade"</i>	213 211	280-281 184-186
	<i>"I wasn't doing my admin works 'cause I was constantly thinking about something."</i>	215	280-281
	<i>"Before, hindi ako makapag-trabaho at all. Siguro ang kaya ko lang gawin was magturo, pero somewhat napapatigil-tigil ako no'n"</i>		
	<i>"I wasn't doing my admin works 'cause I was constantly thinking about something."</i>		

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At the height of their burnout experiences, the participant recalled having mediocre teaching performance, which as per the two sessions, led them to experience insecurity, embarrassment, and dissatisfaction with their job. Lack of professor-student engagement further stimulated their anxiousness because the participant was worried about the possibility that their students might not be listening and whether they could deliver the lessons accurately at all times. Results implies that exposure to burnout had caused negative perceptions and dissatisfaction towards their remote work teaching performance and, in general, reduced their sense of personal accomplishment.

Statement of the Problem 3. How did the participant recover from remote work burnout?

Master Theme no. 7: Self-Compassion — In Vivo Statements and Summary (First Session)

Themes	In Vivo Statements	Page	Lines
Self-Contentment	<i>“So, ayun nga... Isa ‘yun sa mga binago kong mindset na, “Pwede ka naman palang maging masaya kahit walang taong kasama eh. Kahit walang—hindi ka naman in a relationship eh.” ‘Yun ‘yung isa sa mga realization ko.”</i>	207	512-515
		206	
Habit Modification	<i>“I stopped dating. ...Then, natutunan kong [chuckling]— cliché man sabihin, natutunan kong mahalin sarili ko.”</i>	206	459-464
	<i>“Changes... Masasabi ko... ‘yung... daily routines ko. Daily routines ko... And, pangalawa na do’n is the mindset. Pangatlo do’n is, the strategies, that I need to do when it comes to my work.”</i>	206	474-476
Master Theme no. 7: Self-	<i>“... I tried, everything that I can think of to help myself improve in all aspect [sic] mentally, emotionally, physically.”</i>		453-470

Compassion — In Vivo Statements and Summary (Second Session)

Themes	In Vivo Statements	Page	Lines
Self-Contentment	<i>"I focused myself with my friends and then eventually... eventually, naging okay ako."</i>	213	267-268
		213	
Habit Modification	<i>"and ayon nga, I seeked [sic] help. I went to a psychiatrist, I did things to improve myself and kung бага sublimation."</i>	213	274-276
			278-280
	<i>"imbis na magkulong lang ako sa bahay, imbis na kumain lang ako nang kumain, hindi na 'ko natutulog. Tinanggal ko sa sistema ko 'yun kasi I was overeating, I wasn't sleeping properly," unclear audio] or playing games."</i>		

According to the participant, self-compassion was the driving force behind their burnout recovery process and self-love journey. Seeing themselves at their lowest point awoke their self-compassion and made them realize they needed to make changes to help themselves get back on their feet. Specific demonstrations of this would be their decision to finally prioritize themselves and make positive lifestyle changes such as taking a break from romantic relationships to focus on their career and wellbeing, engaging in recreational activities like going to the gym, and so on. The participant's statements were consistent across both interview sessions, reinforcing the notion that self-compassion is an essential component of the participant's burnout recovery.



Master Theme no. 8: Healthy Lifestyle — In Vivo Statements and Summary  
(First Session)

Themes	In Vivo Statements	Page	Lines
Gym Attendance	<i>"I tried... everything that I can think of to help myself improve in all aspect [sic] mentally, emotionally, physically. Nagi-gym ako— uhm— nag-gym ako— nagsimula ako mag-gym."</i>	201	456-459
Active Social Engagement	<i>"I did things to help myself. 'Yun nga. Nagi-gym ako."</i>	202	497-
		202	498
	<i>"I started going out with my friends... My old friends, mga gano'n. ...Mas binigyan ko sila ng importance sa buhay ko, kumpara noon."</i>	193	498-502
Psychiatric Intervention	<i>"nagpa-check pa ako sa Psychiatrist, and nagti-take ako ng medicines which is 'yung anti-depressants at yung— ano pa 'yung isa? Anti-depressants at 'yung para ma-regulate 'yung sleep."</i>	205	146-148
	<i>"...seek professional help. Makakatulong talaga siya."</i>		635-636

Themes	In Vivo Statements	Page	Lines
Gym Attendance	<i>"I did things to improve myself uhm... to make myself busy at that time. I worked out,"</i>	213	266-267
Active Social Engagement	<i>"I am currently— as of now, I work out four times a week. On average, in one session, two hours."</i>	214	297-298
		213	
	<i>"I focused myself with my friends and then eventually... eventually, naging okay ako."</i>	213	267-268
Psychiatric Intervention	<i>"Gumawa ako ng mga bagay-bagay na nakaka-improve sa sarili ko, working out, hanging out with friends..."</i>	213	276-277
	<i>"So, what I did was, I went to a uhh... I seeked [sic] help and went to a psychiatrist and asked for help to lessen— to— anything that can easen [sic] my pain in terms of my anxiety."</i>	214	263-266

"Pangalawa is I went to a psychiatrist	287-
to— ayun nga, my personal issues was	289
[sic] taking advantage of my life back	
then."	

Master Theme no. 8: Healthy Lifestyle — In Vivo Statements and Summary  
(Second Session)

The findings found in the first and second session inferred that in order to mitigate remote work burnout, the participant improved their holistic health by enrolling and attending gym classes, hanging out with old friends whom the participant would rarely meet back then, and seeking psychiatric help where they were prescribed antidepressants, and medications to regulate sleep. Although the recovery process did not happen overnight, the participant slowly replenished their wellbeing through these. The participant's statements across the first and second sessions were alike, saying that engaging themselves in a healthy lifestyle through pharmacological and nonpharmacological intervention had been their conscious strategy to recover from the remote work burnout.

## Master Theme no. 9: Goal Orientation — In Vivo Statements and Summary (First Session)

Themes	In Vivo Statements	Page	Lines
Reviving Unmet Goal of Earning a PhD	<p><i>"Ayun... And, bumal—nag—nag-redirect ako du'n sa original plan ko when I was still studying my Master's [sic]. Kasi, ang gusto kong gawin that—during that time, makapag... [mentions higher academic degree]. Maging [mentions higher academic degree] ako"</i></p>	203	521-525
	<p><i>"Yon, so, parang nag-redirect ako du'n sa gusto kong gawin, which is makapag—mag—maging [mentions higher academic degree] at mag—makapag—makapagstart na nang makahanap ako ng scholarship for Phd bago mag-31 or 30 years old."</i></p>	203	537-541

Master Theme no. 9: Goal Orientation — In Vivo Statements and Frequency  
(Second Session)

Themes	In Vivo Statements	Page	Lines
Reviving Unmet Goal of Earning a PhD	<i>"Gusto ko pa rin mag-doctorate pero if I'm being realistic, hindi ko pa kaya ngayon. I need to do a lot of things pa"</i>	215	336-338
	<i>"So, uhh... 'andun pa din sa plano ko 'yon pero hindi ko siya minamadali siguro pag nasa 30's na ako, malapit na rin naman na."</i>	215	343-345

While on their way to full recovery from burnout, the participant described how their burnout recovery journey had led them back to their old dream of obtaining a doctorate degree, driving them to continuously work towards self-improvement. They stated that after recovering from burnout, it was as if their course in life had been corrected and they were redirected to their previously unmet goal, but with a reinvigorated desire to achieve it. No discrepancies were observed in the participant's testimonies from the first and second interview sessions, supporting the idea that the participant's goal and desire to achieve it did, in fact, contribute positively to their burnout recovery and personal development.

REPERTORY GRID A

Remote Work Burnout Factors

First Session			Second Session		
	A39			A39	
Personal issues gave me a difficult time.	A	Personal issues did not bother me at all.	Personal issues gave me a difficult time.	A	Personal issues did not bother me at all.
Relationship problems affected my emotional health.	A	My emotional health was still okay despite of relationship problems.	Relationship problems affected my emotional health.	B	My emotional health was still okay despite of relationship problems.
I was able to handle a recent romantic break-up quite well.	E	A recent romantic break-up greatly affected me in a negative way.	I was able to handle a recent romantic break-up quite well.	D	A recent romantic break-up greatly affected me in a negative way.
Preparation of instructional materials became a source of stress.	B	Instructional material preparation was highly manageable.	Preparation of instructional materials became a source of stress.	B	Instructional material preparation was highly manageable.
Student assessment activities was a source of stress and pressure.	C	Activities connected with student evaluation was completed quite easily.	Repeatedly teaching the same lesson contributed to my burnout experiences.	B	Repeatedly teaching the same lesson did not bother me at all.
Lack of experience in remote teaching did not present problems.	B	Lack of experience in remote teaching presented several difficulties.	Student assessment activities was a source of stress and pressure.	C	Activities connected with student evaluation was completed quite easily.
Assigned administrative functions were manageable.	D	Assigned administrative functions presented additional work pressure.	Assigned administrative functions were manageable.	D	Assigned administrative functions presented additional work pressure.
Academic workload was often difficult to handle.	B	Academic workload was highly manageable.	Academic workload was often difficult to handle.	B	Academic workload was highly manageable.
Teaching strategies know-how was sufficient in meeting student needs.	C	Teaching strategies know-how proved to be insufficient and lacking.	Teaching strategies know-how was sufficient in meeting student needs.	C	Teaching strategies know-how proved to be insufficient and lacking.

The repertory grid A in both sessions showed factors that had affected burnout, with the participant identifying personal issues, overwhelming job demands, and the abrupt transition from traditional face-to-face modality to remote teaching as triggers in the development of burnout. Additionally, in session two of the repertory grid A, a new factor was brought to light by the participant, namely, the monotonous tasks. In accordance with the findings from both sessions, it was found that personal issues could exacerbate the onset of burnout.

**REPERTORY GRID B**

**Burnout and Teaching Performance Factor**

First Session			Second Session		
	A39			A39	
My actions and behavior can be described as listless and lethargic.	C	I became energetic, lively and animated as I went about my daily work.	My actions and behavior can be described as listless and lethargic.	C	I became energetic, lively and animated as I went about my daily work.
My daily work was done in a lighthearted and cheerful mood.	B	I experienced unbearable sadness and unhappiness on a daily basis.	My daily work was done in a lighthearted and cheerful mood.	D	I experienced unbearable sadness and unhappiness on a daily basis.
I continued to demonstrate a fair, objective and pleasant attitude towards my students.	A	My attitude towards the students became critical and unreasonably demanding.	I continued to demonstrate a fair, objective and pleasant attitude towards my students.	C	My attitude towards the students became critical and unreasonably demanding.
I became inconsiderate and unconcerned of the needs of others.	E	I demonstrated kindness and thoughtfulness towards others.	I became inconsiderate and unconcerned of the needs of others.	C	I demonstrated kindness and thoughtfulness towards others.
I felt insecure about my professional capacity and ability to do my work.	B	I felt sure and certain about my professional skills and abilities.	I felt insecure about my professional capacity and ability to do my work.	B	I felt sure and certain about my professional skills and abilities.
I became dissatisfied with my own teaching performance.	B	I was happy and pleased with my own teaching performance.	I became dissatisfied with my own teaching performance.	A	I was happy and pleased with my own teaching performance.
Confidence in my academic-related skills steadily increased.	B	Confidence in my academic-related skills and abilities decreased.	Confidence in my academic-related skills steadily increased.	C	Confidence in my academic-related skills and abilities decreased.
There was a sense of self-fulfillment and satisfaction in relation to my work.	A	I became unhappy and dissatisfied with the kind of work that I was doing.	There was a sense of self-fulfillment and satisfaction in relation to my work.	D	I became unhappy and dissatisfied with the kind of work that I was doing.
Negative evaluation of my own performance created anxiety.	B	Negative evaluation of my own performance reduced my anxiety.	Negative evaluation of my own performance created anxiety.	A	Negative evaluation of my own performance reduced my anxiety.

The repertory grid B, persisting in both sessions, displayed factors that had affected teaching performance and explored the dimensions of burnout. These dimensions that affected the participant's teaching performance included exhaustion, depersonalization, and reduced personal efficacy.

REPERTORY GRID C

Burnout Recovery Factors

First Session			Second Session		
	A39			A39	
I demonstrated kindness and compassion towards the self.	B	I formed a strict and demanding attitude towards the self.	I demonstrated kindness and compassion towards the self.	B	I formed a strict and demanding attitude towards the self.
I decided to change my eating habits to include healthier choices.	A	I continued and did not improve on my previous eating habits.	I decided to change my eating habits to include healthier choices.	A	I continued and did not improve on my previous eating habits.
I allowed hours and days to unfold without clear-cut goals and objectives.	E	I created a goal-focused mindset so as to be able to complete needed tasks.	I allowed hours and days to unfold without clear-cut goals and objectives.	D	I created a goal-focused mindset so as to be able to complete needed tasks.
I became uncomfortable with my own self due to a critical self-attitude.	E	I decided to love myself and to find enjoyment in my own company.	I became uncomfortable with my own self due to a critical self-attitude.	E	I decided to love myself and to find enjoyment in my own company.
I was unable to form an ideal sleeping habit that is good for my health.	B	I formed the habit of making sure that I get sufficient sleep at night.	I was unable to form an ideal sleeping habit that is good for my health.	B	I formed the habit of making sure that I get sufficient sleep at night.
I enrolled in a gym class in order to create a healthier and stronger body.	A	I continued with my lack of motivation to get sufficient exercise.	I enrolled in a gym class in order to create a healthier and stronger body.	A	I continued with my lack of motivation to get sufficient exercise.
I stayed isolated and cut off from my old friends.	E	I reached out and reunited with old friends.	I stayed isolated and cut off from my old friends.	E	I reached out and reunited with old friends.
I did not consider the need to get some form of psychiatric help.	E	I decided to get some psychiatric help and assistance.	I did not consider the need to get some form of psychiatric help.	E	I decided to get some psychiatric help and assistance.
I revived an unmet goal to pursue a doctorate degree.	A	I stayed disinterested in pursuing higher studies.	I revived an unmet goal to pursue a doctorate degree.	A	I stayed disinterested in pursuing higher studies.

The two sessions of repertory grid C revealed the burnout recovery factors listed by the participant. Aspects that aided the recovery from burnout were self-compassion, a healthy lifestyle, and goal orientation.

DISCUSSION

The Case of A39

This case involves A39, a 28-year-old professor at Emilio Aguinaldo College-Cavite who had previously suffered from remote work burnout and has recovered. The remote work burnout began in the middle of 2020 and persisted for the remainder of the year before coming to an end somewhere in the first half of the following year.

Upon the initial onset of burnout, the participant stated they struggled to get out of bed to work and carry out their usual responsibilities as a professor. Then, during the height of their burnout, they admitted to frequently breaking down in tears in the middle of class meetings. The particular life event that influenced A39's burnout was an inability to handle recent relationship

separation. Along with this, the attempt to fulfill the responsibility of a professor became counterproductive as the overwhelming and unmanageable job demands aggravated the already deteriorating mental stability of A39. As a result of the abrupt transition, pre-existing teaching strategies in a traditional setup were proved insufficient in today's modality, and the lack of experience in it further presented burnout. Lastly, the repetitive work lowered A39's productivity and increased their exhaustion.

The previously mentioned burnout impacted A39's work performance, as seen by the participant's sluggish feeling, discontent and lack of confidence in the ability to complete their work successfully. Openly disappointed with their work performance, A39 also expected to lose their job because of how poorly they performed during the height of their burnout. Additionally, their work relationships were also affected, as shown by their apparent cynicism and detachment toward their students and coworkers, which further decreased the quality of their work.

A39 finally sought psychiatric treatment for both their burnout and another mental issue they were experiencing at the time. They were prescribed antidepressants and sleep regulators, which helped improve their condition and allowed them to engage in more introspection and self-reflection. The participant made progress, gradually managed to heal from their past relationship, clear their backlogs at work, and enhanced their overall work performance. They recovered specifically by practicing self-love, which included the skill to appreciate one's own company. The next aspect that facilitated the recovery of A39 was a holistically healthy lifestyle. Particularly, indulging in a beneficial diet, reuniting with old friends, and enrolling in a gym class. Moving on, the final component of recovery was goal orientation. With it, the revival of an unfulfilled goal to pursue a doctorate degree was made feasible by shifting the focus toward it. All of these elements combined ensured the burnout recovery of the participant.

Overall, after a thorough study of A39's case, the results found that the COVID-19 pandemic predisposed the participant to remote work burnout. Secondly, the decline of A39's work performance was caused by the unique pandemic working conditions, as it created an ideal environment for burnout to emerge and thrive. Lastly, that A39's recovery from burnout was possible due to their own unique characteristics, such as their reflective nature and high adaptive capacity.

## **Conclusion**

After a thorough analysis of the research findings, the following conclusions were reached:

Due to the fact that the emergence of the participant's burnout was attributed to poor work-life balance, overwhelming job demands, and the forced adoption of remote learning, all of which are pandemic-induced circumstances beyond their control, it can be concluded that the COVID-19 pandemic predisposed the participant to remote work burnout.

Considering that the participant's remote work burnout caused a decline in their overall work performance, we've concluded that the decline can be largely attributed to the conditions that the participant had to work under due to the COVID-19 pandemic, which caused an increase in their job demands and the depletion of their work resources while simultaneously preventing its proper replenishment, creating the perfect recipe for burnout based on the study's theoretical frameworks.

According to the findings, the participant recovered from remote work burnout by practicing self-compassion, improving their lifestyle, and recommitting to previous goals, all of which began with them accepting the truth and magnitude of their experience. With this, it can be deduced that the participant's recovery was made possible by traits unique to them such as their reflective nature, which is an indication of high adaptive capacity, as reflected by their self-compassionate behavior, which is a protective factor for burnout, and allowed them to start their burnout recovery process from within and make persistent efforts to address the root causes of their burnout in the same outward fashion.

Finally, the researchers concluded that because burnout exists on a spectrum and is multidimensional, there is no universal solution to it; however, as the study repeatedly emphasized, recovery from burnout is indeed possible; and that each person's recovery process will be as unique as their experience.

## **Recommendations**

Based on the findings and conclusions, the following recommendations are hereby presented:

**Professors.** Since remote work burnout manifests itself through feelings of depletion or exhaustion, a cynical attitude

towards work or depersonalization, and a sense of professional inefficacy or reduced personal accomplishment, it is critical for professors to engage in behaviors that combat these, such as focusing on self-care and having compassion towards others, but especially towards oneself, which will facilitate the replenishment of their work resources, preventing an imbalance between their job demands and resources, which causes burnout.

**Students.** Given the nature of students' relationships with their professors, as well as their ability to influence their professors' lives on both a personal and professional level, it is recommended that they educate themselves on faculty burnout and devise ways to interact with their professors in manners that do not contribute to their burnout and facilitate recovery.

**School Administrators.** As numerous studies have conclusively demonstrated that burnout is an organizational problem, as the people in charge, school administrators play a crucial role in their faculty's burnout experiences; therefore, it is encouraged for them to take meaningful action to alleviate the frustrations, disenchantment, and burnout that their professors may be experiencing by implementing system-level changes such as developing clear policies that cater to the professors' needs and improve their working conditions (e.g., developing an effective incentive program) that will combat resource depletion and facilitate burnout prevention and recovery.

**Commission on Higher Education (CHED).** As the government agency directly overseeing the Philippine higher education sector, they are a powerful governing body whose initiatives have the potential to make far-reaching changes capable of influencing the burnout of Filipino professors, and other the related areas; therefore, it would be extremely helpful if they could devise a long-term plan consisting of evidence-informed strategies to tackle remote teaching burnout and foster healthy workplace environments that promote mental health and resiliency among Filipino professors nationwide, ensuring the quality and continuity of learning in the country.

**Future Researchers.** To learn more about the Burnout Recovery process of remote teaching professors, they could modify certain aspects of the study, such as the sample size, or experiment with different research designs, demographics, data collection methods, and instrumentation, allowing for further exploration of the other areas and nuances that the study failed to illuminate. A specific proposal would be to conduct an experimental study using a treatment anchored on a work



resource such as paid time off (PTO) to gain a better understanding of how distancing oneself from work-related stressors for a period of time can affect burnout recovery, and to clearly establish the statistical and practical implications of the proposed approach.

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# ACCESSIBILITY OF HEALTH CARE AMONG THE RESIDENTS OF BARANGAY 3 WAWA, ROSARIO, CAVITE TOWARDS THE MANAGEMENT OF UPPER RESPIRATORY TRACT INFECTION IN YOUNG ADULTHOOD

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## KEYWORDS:

- *Healthcare Accessibility,*
- *Availability of Emergency Transport*
- *Communication Technology, Financial Accessibility*
- *Health center and/or hospital availability*
- *Upper Respiratory Tract Infection*

**Abstract.** This research evaluates on how much the residents of Barangay 3 Wawa, from Rosario Cavite have accessed the healthcare services of the barangay health center or nearby hospitals in the barangay , determining through the factors of health care access within the community such as Hospital/ Health center availability, Availability of emergency transport, Availability of Schedule Appointment for health barangay, Communication technology, and financial accessibility, including the management of Upper Respiratory Tract Infection within young adults.

This study used quantitative approaches together with a descriptive survey methodology. A sample of 344 individuals, specifically 18-25 years old, was drawn from the consensus 2015 population within the range of ages expected to be Young Adult, including those who test positive for URTI or are at risk of obtaining it. To find the public's response to the problem statement, we did onsite surveys and questionnaires in the barangay to determine if we meet their health needs. Although the results show that the majority of respondents were able to state that healthcare services were accessible in their barangay, a small number of respondents were unable to receive healthcare services. In terms of unequal availability, which affects their access to healthcare, it should be acknowledged that some residents were unable to receive healthcare.

# **ACCESSIBILITY OF HEALTH CARE AMONG THE RESIDENTS OF BARANGAY 3 WAWA, ROSARIO, CAVITE TOWARDS THE MANAGEMENT OF UPPER RESPIRATORY TRACT INFECTION IN YOUNG ADULTHOOD**

## **INTRODUCTION**

In the Philippines, access to basic healthcare services remains a major problem. Healthcare needs to be convenient and economical in order to be accessible.

The researchers came up with the thesis title Accessibility of health care among the residents of Barangay 3, Wawa Rosario Cavite towards the management of upper respiratory tract infection in young adulthood, to determine whether the community has an accessibility to healthcare services from the barangay in management of Upper Respiratory Infections and can gather further evidence for improvement within the community services.

### **Statement of the Problem**

This study will determine accessibility of residents with the following specific objectives:

- To assess health care access within the community as to
  - A. Hospital/ Health center availability
  - B. Availability of emergency transport
  - C. Availability of Schedule Appointment for health barangay
  - D. Communication technology
  - E. Financial accessibility

- To identify healthcare services provided in a specific individual that shows signs and symptoms of an upper respiratory infection.
  - To determine action of healthcare provider in early treatment of Upper Respiratory Tract Infection

The Residents of Barangay 3 Wawa is the focus of the study where we can determine the accessibility of healthcare, through the results of the information that was collected, it indicated that the quality of healthcare accessibility in the barangay has met the standard for the residents. By this researcher recommends to continue in providing healthcare services and support in management of URTI.

## **METHODOLOGY**

### **Research Design**

This study used quantitative methods with a descriptive survey methodology. Quantitative research defined by Encyclopedia, 2005 as “the numerical representation and manipulation of observations for the purpose of describing and explaining the phenomena that those observations reflect”. Surveys and questionnaires were used as the research tool. The major instrument for gathering data was the surveys that were given out to the respondents which are the Residents of Brgy. 3 Wawa, Rosario, Cavite specifically young Adults (18-25 years old). Sample taken of 344 participants using population taken from consensus 2015 within age group predicted to be Young Adult resulting in 2,441 population predicted.

### **Research Locale**

The study was conducted in the Barangay 3 Wawa, Rosario, a province in Cavite. It is situated near the quarters Julugan II and Sapa IV, Rosario Cavite. It is composed of 11,890 population based on the latest 2020 consensus. The researchers chosen this barangay as their target area due to lack of locale studies regarding availability of access healthcare services, the respondents answered our surveys and questionnaires anywhere within the community that fits in their comfortability.

### **Research Participants/Respondents**

This study's participants are the Barangay residents in 3 Wawa, Rosario, Cavite, specifically young adults aged 18 to 25 as they



have the largest age range population in the Barangay 3 Wawa. Based on WHO (2022), Approximately 569, 000 older adolescents (15 to 19 years) and 762 000 young adults (20 to 24 years) died in 2020.

#### Data Gathering Procedure

Before implementation, questions included in the survey were assessed, validated by a licensed Respiratory Therapist and a Research coordinator of school and retired professor from Tawi-Tawi Regional Agricultural College before being used as the foundation for data collection in our study and undergone ethical review before the distribution. Pilot testing was done in barangay Punta, Tanza, Cavite due to its criteria that fits our study to test the survey questionnaires, and was done with no issues which led the researchers implemented with the questionnaires.

#### Research Instrument

Surveys and questionnaires were utilized as the research instrument in the study to gather the necessary information. The surveys and questionnaires were based on a previous study from European Patient Forum Survey: "Access to Healthcare" Template and modified by the researcher which contains the demographic profile of the respondents such as sex, age, years of residency. These criteria were involved to get the overview of the respondents of the study.

#### Data Analysis

To answer the research question, the researchers hired a statistician, he is a former professor in Cagayan State University-Lallo, finished in Master of Science in Teaching-Mathematics and a Campus and Technology Management Coordinator in school and he is almost in 8 years at service, he also handles other research paper for statistical analysis. All data were analyzed in simple frequency distribution and percentage frequency distribution.

#### ***Ethical Consideration***

This study was submitted in the Institutional Ethics Review Board and also approved with no concern. EAC ERC Code: 2023-01-012.

RESULTS

Table 2. Distribution of the respondents in terms of demographic profile

Variable	Frequency (n=344)	Percentage
<b>Gender</b>		
Female	182	52.9
Male	162	47.1
<b>Marital Status</b>		
Single	234	68.0
Married	79	23.0
Divorce	16	4.7
Widow	12	3.5
<b>Age</b>		
18 and below	55	16.0
19 to 20	124	36.0
21 to 22	86	25.0
23 to 24		12.2
	42	
25 and above	37	10.8
<b>Mean=20.84</b>	<b>SD=2.21</b>	
<b>Residency</b>		
Months ( 1-11 months)_	48	14
Year (12 months and beyond)	296	86

## DEMOGRAPHIC PROFILE

The demographic profile results suggest that the majority of our respondents were female, with a little difference of percentage in males. In terms of age, the majority of respondents were between the ages of 19 and 20, with 124 responses equaling 36.0%, while the fewest were ages 25 and older, with 37 responses equaling 10.8%. In terms of respondents' residency, there were more participants who lived in the barangay for 12 months and beyond with 296 responding, equivalent to 86%, and the fewest with 48 responding, equating to 14%.

*Table 3. Distribution of the respondents in terms of hospital/health center availability*

Variable	Frequency (n=344)	Percentage
<b>A. How difficult or easy was it to actually obtain the healthcare services you needed a year?</b>		
Very Difficult	7	2.03
Difficult	32	9.30
Moderate	196	56.98
Easy	73	21.22
Very Easy	37	10.76
<b>B. How would you rate access to information of hospitals/centers on available healthcare services from the following sources or channels?</b>		

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<b>School</b>		
Very Good	45	13.1
Good	99	28.8
Average	163	47.4
Poor	28	8.1
Very Poor	9	2.6
<b>Work</b>		
Very Good	30	8.7
Good	112	32.6
Average	140	40.7
Poor	53	15.4
Very Poor	9	2.6
<b>Hospitals</b>		
Very Good	48	14.0
Good	114	33.1
Average	125	36.3
Poor	43	12.5
Very Poor	11	3.2
No Response	3	0.9
<b>Internet Websites</b>		
Very Good	49	14.2
Good	89	25.9
Average	134	39.0
Poor	54	15.7
Very Poor	18	5.2
<b>C. Would you agree with the items, where information about available healthcare services within hospital/ centers?</b>		

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<b>Easy to find</b>		
No	14	4.1
Not Sure	76	22.1
Yes	254	73.8
<b>Easily accessible</b>		
No	14	4.1
Not Sure	99	28.8
Yes	231	67.2
<b>Easy to understand</b>		
No	10	2.9
Not Sure	85	24.7
Yes	249	72.4
<b>Useful</b>		
No	6	1.7
Not Sure	70	20.3
Yes	265	77.0

#### Hospital Availability

The survey's first section contains all the questions that can be used to gauge hospital accessibility. In determining the response for how easy or difficult it was to obtain healthcare services; analysis shows that most respondents had moderate access with 56.98% of the total. The majority of people in the barangay have access to healthcare services since access is neither difficult nor easy; it is moderate for all. Analysis of the ratings of access to information about healthcare services within hospitals or centers showed that responses were mostly average in school, work, hospitals, and internet websites. However, for overall internet services, the response was very good with 14.2% due to massive evolving of technology where it is easier to access information, and the least was in work with 8.7%. A number of unfavorable outcomes were obtained by the website as a result of a lack of internet service, And the majority of respondents said that it is easy to understand, easy to locate, and very beneficial when it comes to accessing healthcare services within hospitals and other facilities. It follows that it is easy for the residents to find

information about healthcare services. Overall, the presence of hospitals in this region has drawn praise.

*Table 4. Distribution of the respondents in terms of availability of hospital transport*

Variable	Frequency (n=344)	Percentage
<b>A. Is emergency transport available for all residents?</b>		
Yes	222	64.5
Sometimes	110	32.0
No	9	2.6

Availability of hospital transport  
The findings show that emergency transportation was available to all residents of the barangay. It illustrates that many of the respondents were able to receive emergency transportation when needed; nevertheless, other respondents may agree that emergency transportation is available but not always available when needed.

*Table 4. Distribution of the respondents in terms of appointment for health barangay*

Variable	Frequency (n=344)	Percentage
<b>A. Over the past 12 months, have you experienced a significant delay in accessing? Your Medicine/s</b>		
Yes	140	40.7
No	188	54.7
Not Applicable	16	4.7

**A treatment  
Intervention:  
surgery or other  
procedure**

Yes	89	25.9
No	187	54.4
Not Applicable	68	19.8

**A medical  
Equipment**

Yes	87	25.3
No	173	50.3
Not Applicable	84	24.4

**For Diagnostic test**

Yes	127	36.9
No	172	50.0
Not Applicable	45	13.1

**An appointment  
with a nurse**

Yes	128	37.2
No	167	48.5
Not Applicable	49	14.2

**An appointment  
with a primary care  
doctor**

Yes	138	40.1
No	164	47.7
Not Applicable	42	12.2

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**An appointment  
with a specialist**

Yes	134	39.0
No	159	46.2
Not Applicable	51	14.8

**Help/support from  
social services**

Yes	131	38.1
No	200	58.1
Not Applicable	13	3.8

**B. Does health  
center help or treat  
with the signs and  
symptoms listed  
below?**

**Earache**

Yes	88	25.6
No	226	65.7
Sometimes	30	8.7

**Sinuses**

Yes	115	33.4
No	182	52.9
Sometimes	47	13.7

**Common cold**

Yes	152	44.2
No	145	42.2
Sometimes	47	13.7



<b>Throat Ache</b>		
Yes	202	58.7
No	105	30.5
Sometimes	37	10.8
<b>Cough</b>		
Yes	222	64.5
No	86	25.0
Sometimes	36	10.5
<b>C. Does healthcare service provider meet your expectation?</b>		
<b>Further Examination</b>		
Yes	157	45.6
No	95	27.6
Sometimes	92	26.7
<b>Information</b>		
Yes	182	52.9
No	84	24.4
Sometimes	78	22.7
<b>Reassurance</b>		
Yes	141	41.0
No	127	36.9
Sometimes	76	22.1
<b>Medication for pain relief</b>		
Yes	230	66.9
No	52	15.1
Sometimes	62	18.0

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<b>Nose drops</b>		
Yes	156	45.3
No	105	30.5
Sometimes	83	24.1
 <b>Medications for cough</b>		
Yes	243	70.6
No	41	11.9
Sometimes	60	17.4
 <b>Referral to hospital or specialist</b>		
Yes	192	55.8
No	76	22.1
Sometimes	76	22.1

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Appointment for health barangay

This survey included questions to determine whether participants had experienced a significant delay in accessing health appointments in their barangay over the previous 12 years .Based on the analysis of the survey , the majority of respondents did not experience a significant delay in obtaining the services they required, indicating that the assumption about the delay in accessing healthcare services such as medicines, medical intervention, and so on is incorrect and has met the satisfaction of the residents within the barangay. According to the findings, the majority of respondents may be able to attend the hospital due to common colds, coughs, and throat ache, though the respondents did not encounter other signs and symptoms such as earache and sinuses. Respondents also shows that they meet expectations towards healthcare service providers meet their expectations in terms of additional inspection, information, reassurance, pain relief medicine, nasal drops,cough medication, and referral to a hospital or specialist, so there are no issues with the healthcare provider's performance.

*Table 5. Distribution of the respondents in terms of communication technology*

Variable	Frequency (n=344)	Percentage
<b>A. What type/ sources of Communication is available from your residence through your nearest Hospitals?</b>		
Telephone numbers	194	56.4
Website Page	42	12.2
Social media	60	17.4
Walk-ins	191	55.5
<b>B. Would you agree with the following statement on the quality of communication you have with healthcare service provider?</b>		
<b>I receive messages from my healthcare provider when there are updates</b>		
Always	76	22.2
Very Often	95	27.7
Sometimes	126	36.7
Rarely	43	12.5
Never	3	0.9

**My healthcare  
provider is  
reachable when I  
call asking about  
my health issue/  
problem**

Always	111	32.4
Very Often	92	26.8
Sometimes	118	34.4
Rarely	19	5.5
Never	3	0.9

**I'm always  
reminded about the  
schedules and  
meetings with my  
healthcare provider  
via text messages  
or email.**

Always	114	33.2
Very Often	81	23.6
Sometimes	120	35.0
Rarely	25	7.3
Never	3	0.9

**Communication technology**

Respondents provided answers to questions on communication technologies in the table below. The majority of them use mobile phones and walk-in clinics to communicate with the closest hospital from their homes, while only a small number use websites and social media, which shows that they have minor issues with the modern technology in communicating with the nearest hospitals/health centers. Regarding with the communication with the healthcare service provider, responders were as about the statement given. In terms of receiving messages for any updates most respondents answered sometimes with 36.7%. In terms of calling, health care service

provider was sometimes reachable also based on the respondents with 34.4%. And lastly, regarding reminders of schedules and meetings most response was also sometimes with 35%.

*Table 6. Distribution of the respondents in terms of financial accessibility*

Variable	Frequency (n=344)	Percentage
<b>A. When you need it, can you afford the following?</b>		
<b>Primary care doctor</b>		
Always	48	14.0
Very Often	49	14.2
Sometimes	140	40.7
Rarely	98	28.5
Never	9	2.6
<b>Specialized healthcare providers</b>		
Always	46	13.4
Very Often	68	19.8
Sometimes	125	36.3
Rarely	87	25.3
Never	18	5.2
<b>Hospital</b>		
Always	64	18.6
Very Often	62	18.0
Sometimes	138	40.1
Rarely	64	18.6
Never	16	4.7
<b>Medicine</b>		
Always	93	27.0
Very Often	75	21.8

Sometimes	121	35.2
Rarely	49	14.2
Never	6	1.7
<b>Medical equipment</b>		
Always	62	18.0
Very Often	45	13.1
Sometimes	125	36.3
Rarely	60	17.4
Never	52	15.1
<b>B. Do you experience financial difficulties as a result of spending on healthcare?</b>		
Never	53	15.4
Rarely	90	26.2
Sometimes	158	45.9
Regularly	43	12.5
<b>C. In the past 12 months, did you reduce your spending on essential needs, such as food or clothing, to be able to cover healthcare costs?</b>		
Yes	257	74.7
No	87	25.3
<b>D. In the past 12 months, did you decline or postpone</b>		

---

**healthcare visits  
because of cost?**

Never	110	32.0
1 time	104	30.2
2 times	71	20.6
3 or more times	59	17.2

**E. What do you think  
of the statement: My  
healthcare costs are  
covered to a sufficient  
degree by my  
healthcare system  
(whether it is tax  
based or social  
insurance based)?**

Strongly agree	68	19.8
Agree	130	37.8
Neutral	95	27.6
Disagree	24	7.0
Strongly disagree	10	2.9
Don't know	17	4.9

**F. Do you need to  
have recourse to a  
private or  
complementary health  
insurance in order to  
cover your healthcare  
cost?**

Yes	214	62.2
No	96	27.9
Don't know	34	9.9

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#### Financial accessibility

This table shows that the majority of respondents stated they had adequate money for doctor visits, healthcare services, hospital stays, prescription drugs, and medical equipment, indicating that the residents of the barangay are at some point between middle-lower class. Financial difficulties were somehow experienced by respondents as a result of healthcare expenses. The majority of participants concurred that they had reduced their spending on basics in order to pay for medical expenses. It does not accomplish its goals, according to Ataguba et al.,2021, because their healthcare bills interfere with their household's ability to pay for basic medical expenses. Despite spending a lot of money on healthcare, respondents did not consider postponing visits, which suggests that residents must rely on private or additional health insurance to cover their medical expenses.

<b>Earache</b>		
Yes	88	25.6
No	226	65.7
Sometimes	30	8.7
<b>Sinuses</b>		
Yes	115	33.4
No	182	52.9
Sometimes	47	13.7
<b>Common cold</b>		
Yes	152	44.2
No	145	42.2
Sometimes	47	13.7
<b>Throat Ache</b>		
Yes	202	58.7
No	105	30.5
Sometimes	37	10.8



<b>Cough</b>		
Yes	222	64.5
No	86	25.0
Sometimes	36	10.5
<b>Medication for pain relief</b>		
Yes	230	66.9
No	52	15.1
Sometimes	62	18.0
<b>Nose drops</b>		
Yes	156	45.3
No	105	30.5
Sometimes	83	24.1
<b>Medications for cough</b>		
Yes	243	70.6
No	41	11.9
Sometimes	60	17.4
<b>Referral to hospital or specialist</b>		
Yes	192	55.8
No	76	22.1
Sometimes	76	22.1

31

#### Signs and Symptoms and Action Treatment

Based on the result of the data, the reasons for visit for hospital care were mentioned. In table 4 Variable B shows signs and symptoms of Upper respiratory tract infection. It includes earache, sinuses, common cold, throat ache and cough, among these symptoms cough are the most common with 64.5% followed by throat ache with 58.7%. Treatment is not a problem at all since healthcare center provides medicines and treatments to relieved their symptoms. Based on the result of the data, there are also referral included if the management of Upper Respiratory Tract

Infection needs to be checked and tested by big hospitals, through referral they were able to secure the health care needs of the residents.

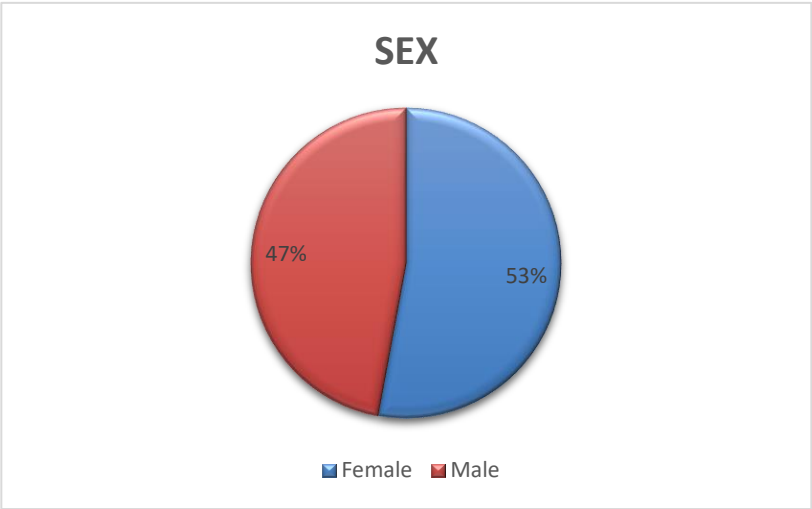


Figure 2: Distribution of Respondents by Sex

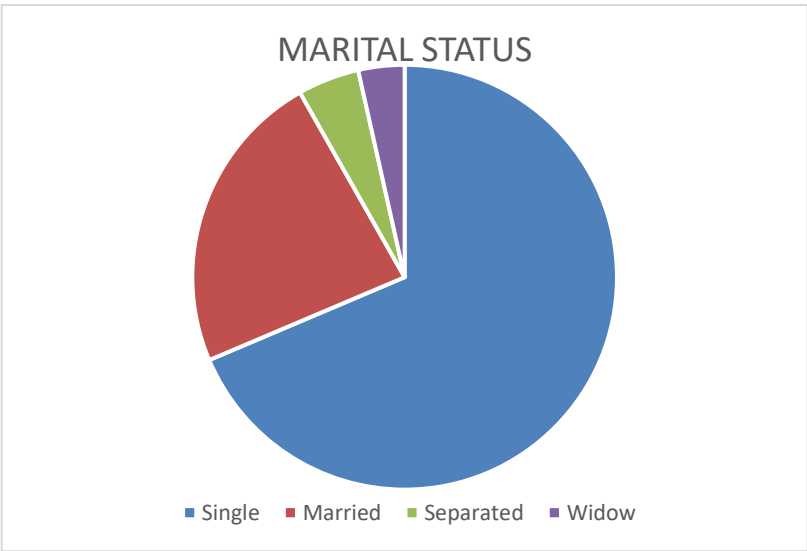


Figure 3: Distribution of Respondents by Marital Status

Accessibility of Health Care Among the Residents of Barangay 3 Wawa, Rosario, Cavite Towards the Management of Upper Respiratory Tract Infection in Young Adulthood

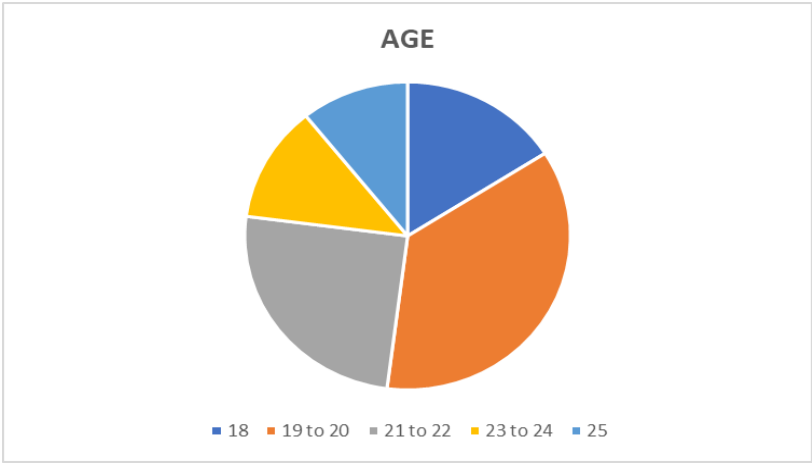


Figure 4: Distribution of Respondents by Age

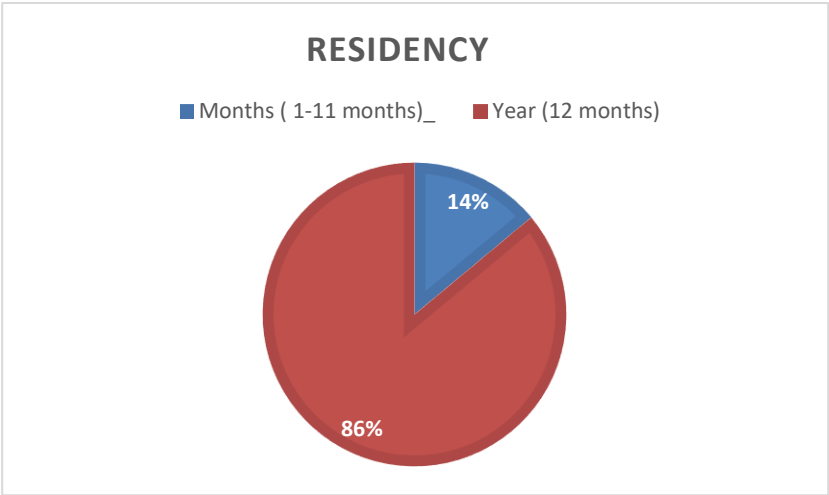


Figure 5: Distribution of Respondents by Residency

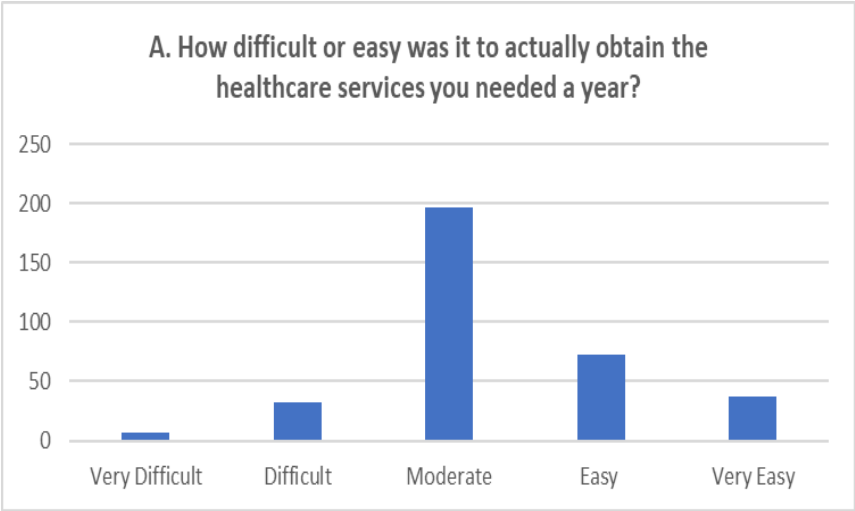


Figure 6: Responses for healthcare service

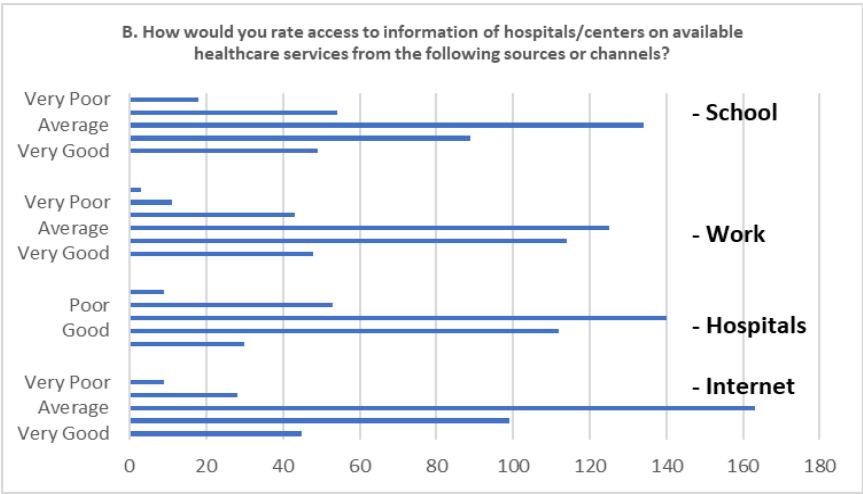


Figure 7: Ratings of Information available in healthcare service

Accessibility of Health Care Among the Residents of Barangay 3 Wawa, Rosario, Cavite Towards the Management of Upper Respiratory Tract Infection in Young Adulthood

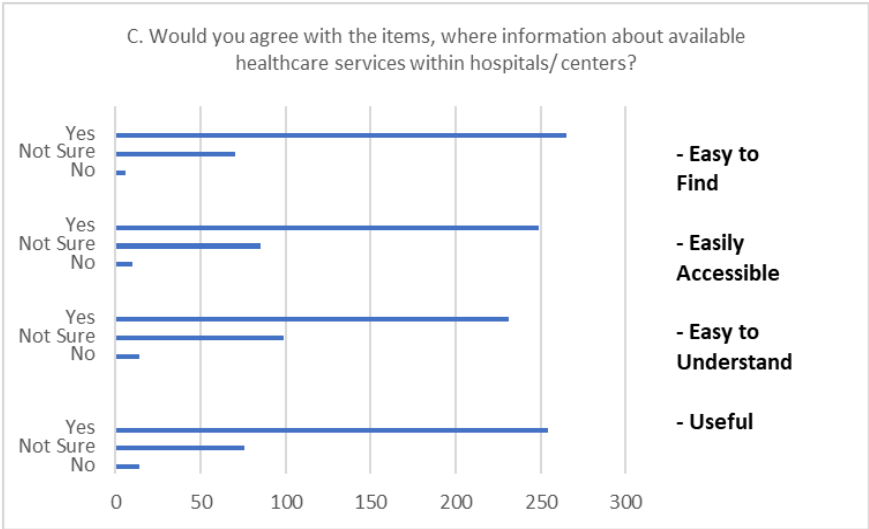


Figure 8: Responses for information of healthcare services

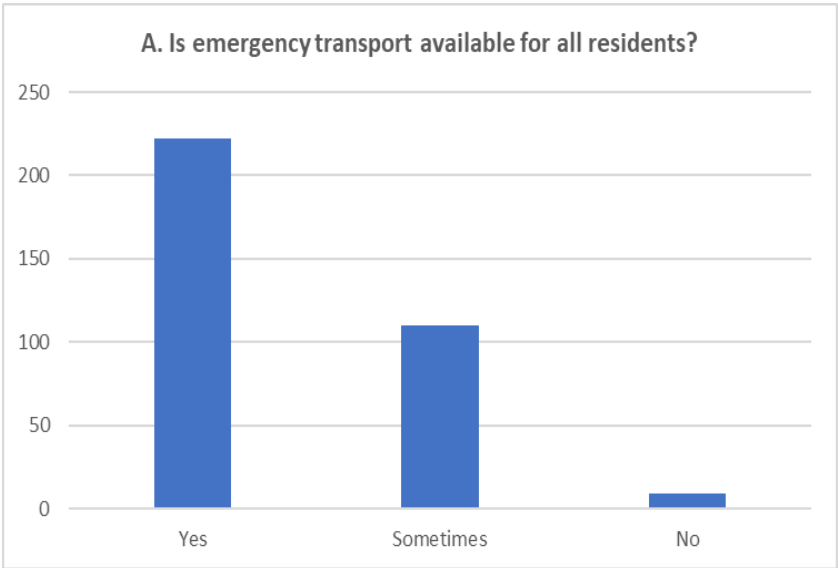


Figure 9: Responses for the availability of emergency transport

*Accessibility of Health Care Among the Residents of Barangay 3 Wawa, Rosario, Cavite Towards the Management of Upper Respiratory Tract Infection in Young Adulthood*

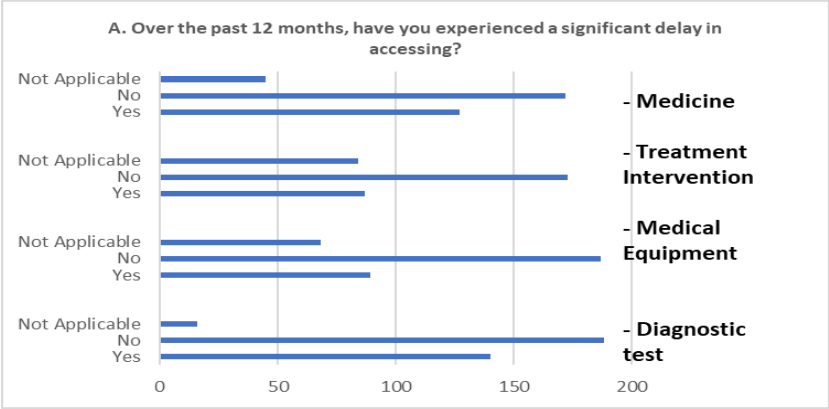


Figure 10.1: Experienced of Significant Delay

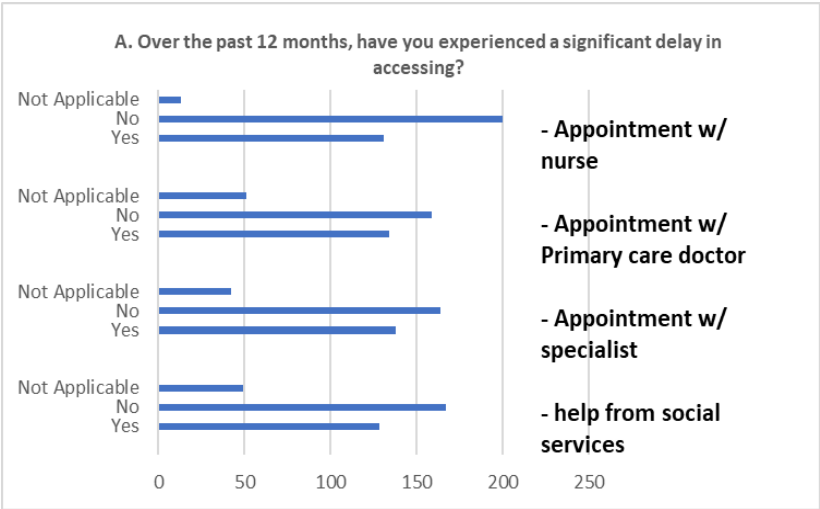


Figure 10.2: Experienced of Significant Delay

Accessibility of Health Care Among the Residents of Barangay 3 Wawa, Rosario, Cavite Towards the Management of Upper Respiratory Tract Infection in Young Adulthood

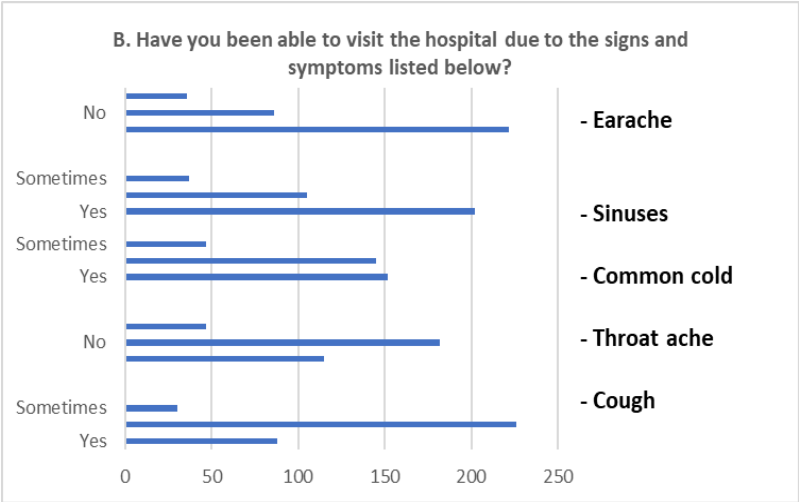
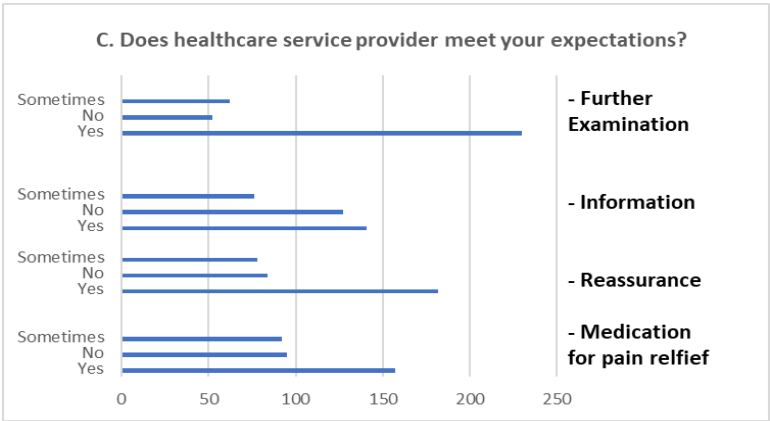


Figure 11: Signs and Symptoms listed for visit



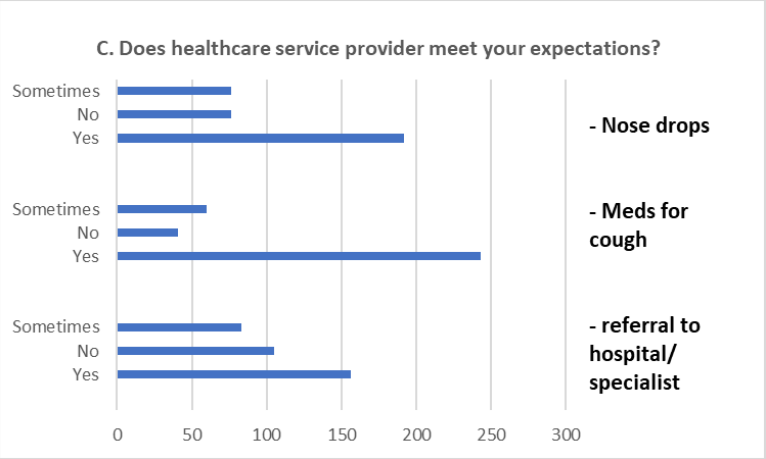


Figure 12: Expectations of the Residents in healthcare service provider

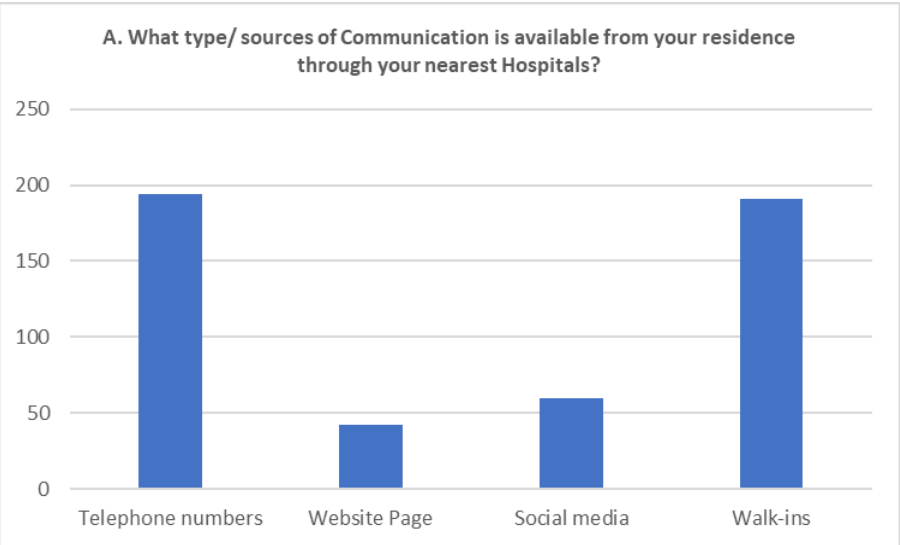


Figure 13: Sources of Communication



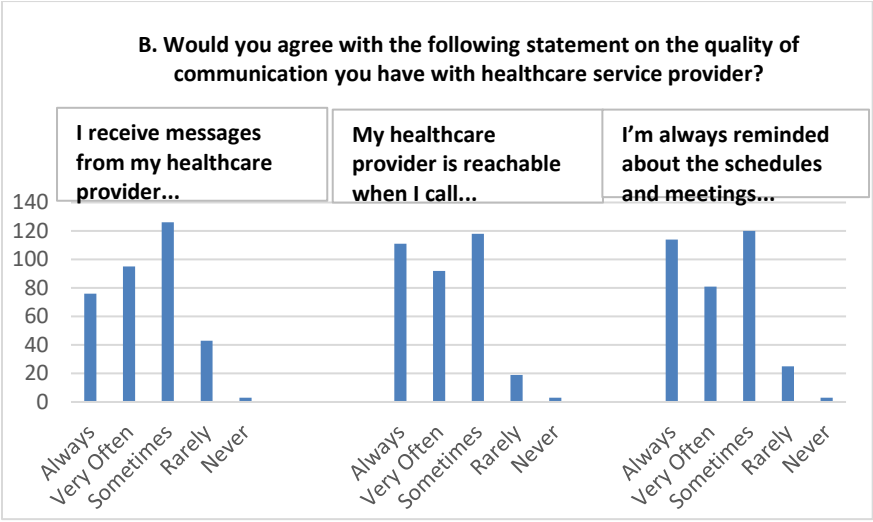


Figure 14: Quality of communication.

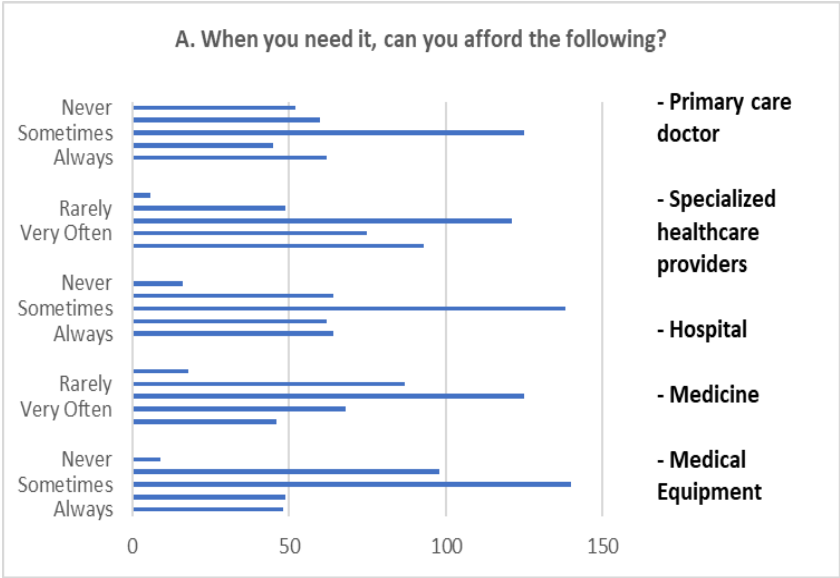


Figure 15: Affordability of Healthcare services.

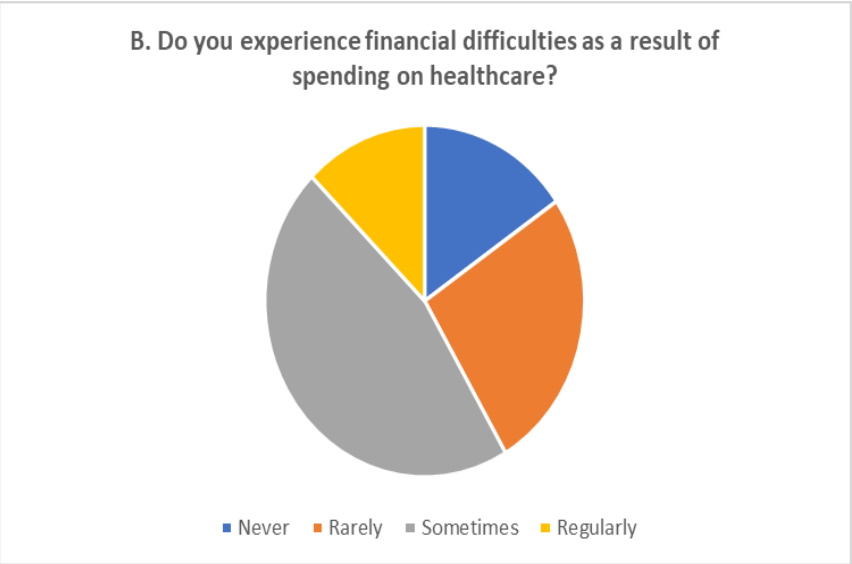


Figure 16: Experience in Financial Difficulties.

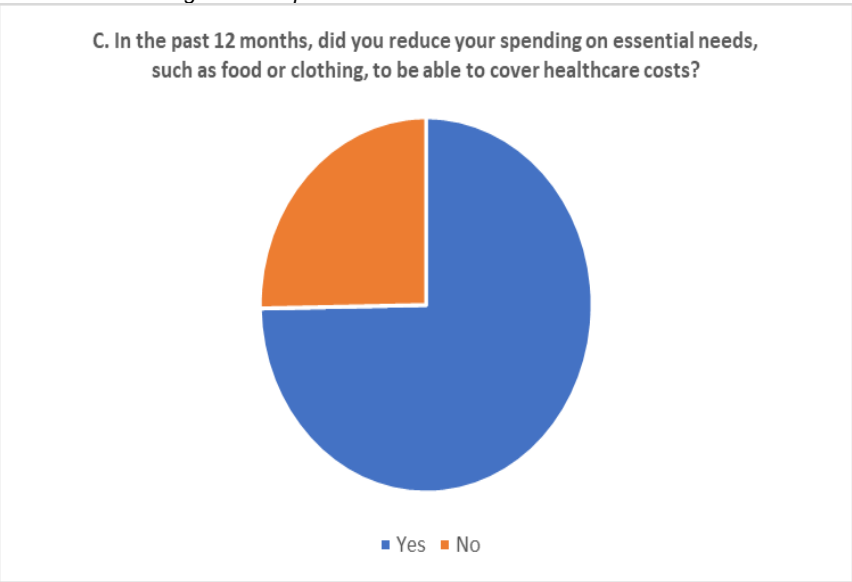


Figure 17: Expenses of essential needs affecting healthcare cost.

Accessibility of Health Care Among the Residents of Barangay 3 Wawa, Rosario, Cavite Towards the Management of Upper Respiratory Tract Infection in Young Adulthood

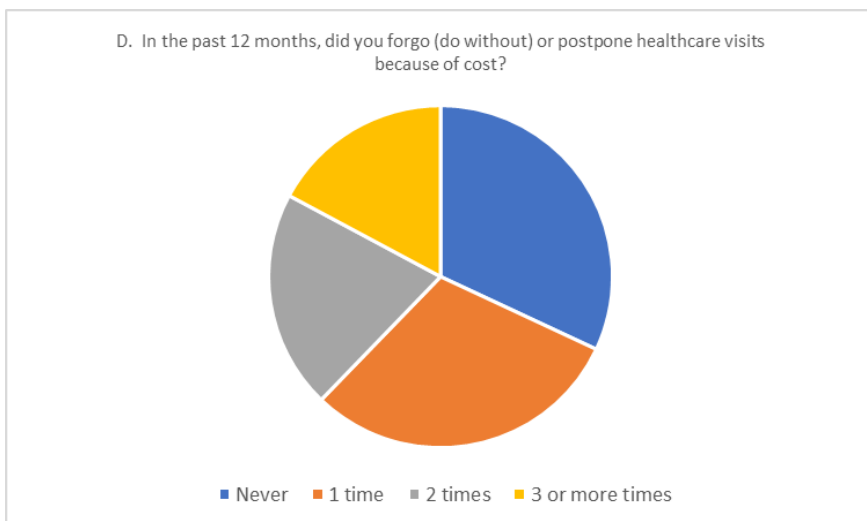


Figure 18: Declining or postpone healthcare visits.

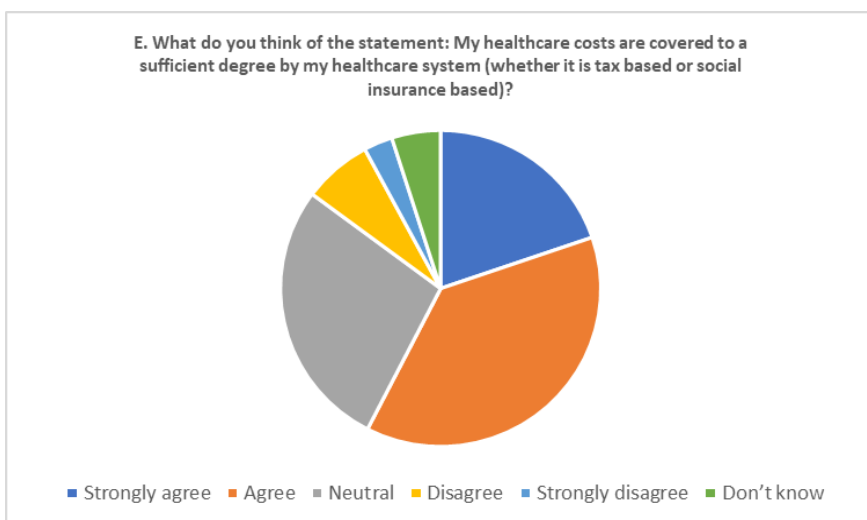


Figure 19: Responses for the statement regarding healthcare system.

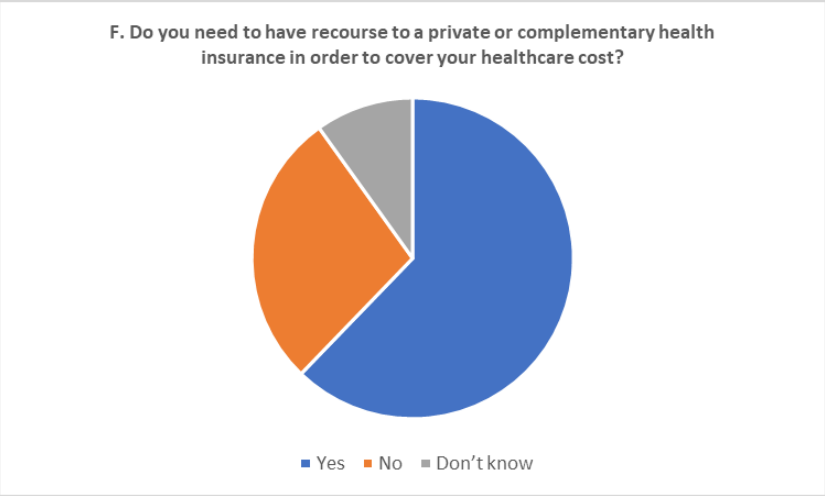


Figure 20: Health insurance for healthcare cost.

**DISCUSSION**

In the demographic profile we used a pie graph. results suggest that the majority of our respondents were female, with a small percentage of males. The majority of them were single, with only a few widowed. In terms of age, the majority of respondents were between the ages of 19 and 20, with 124 responses equaling 36.0%, while the fewest were between the ages of 25 and 25, with 37 responses equaling 10.8%. In terms of respondents' residency, there were more participants who lived in the barangay for more than a year, with 253 responding, equivalent to 73.5%, and the fewest, with 15 responding, equating to 4.4%.

In health care access under the category of hospital availability, a year's worth of statistics suggest that most respondents answered moderately, with 196 replies totalling 56, when it comes to determining the difficulty or ease of access to healthcare services required by residents. Access to healthcare services in the barangay is neither difficult nor easy, it is moderate for all but it means that the majority of them have access to healthcare services in the barangay.

The results for ratings of access to information regarding healthcare services within hospitals or centers revealed that the response was mostly average in school, work, hospitals, and internet websites, but for overall internet services, the response was very good with 49 responses equivalent to 14.2%, and the least was in work with 30 responses equivalent to 8.7%. Because of a shortage of internet service, the website received several unsatisfactory outcomes. And, when it comes to access for healthcare services within hospitals and facilities, most respondents stated that it is easy to find, easily available for everyone, simple to understand, and very helpful. This means that the people have no trouble finding information about healthcare services. Overall, the availability of hospitals in this area has received positive reviews; residents were able to get these services with minor issues.

In terms of transportation availability, the results illustrate that emergency transportation was available to all people in the barangay. It demonstrates that many of the respondents were able to access emergency transport when it was required; yet, other respondents may agree that emergency transport is available but not always available when it is required. And, when asked how long it takes to travel for an emergency situation, the majority of residents respond that, most of the time, it travels on time (44.5% of 153 respondents), and that sometimes, due to uncertainties, it takes more than 30 minutes to arrive, but it does not take too long.

With regards to see if the participants had experienced a significant delay in access in terms of appointment for health in their barangay for the past 12 years, based on the survey that we gathered, the majority of the respondents did not experience a significant delay to obtain what they need. Based on the result most respondents may be able to visit the hospital due to signs and symptoms such as earache, sinuses, common colds and coughs. Survey also revealed that healthcare service providers meet their expectations in terms of further examination, information, reassurance, medication for pain relief, nose drops, medication for cough and referral to hospital or specialist.

In terms of communication available from their residence through the nearest hospital most of them are using their telephones and through walkins and few of them use website pages and social media. Most of the respondents answered "Sometimes" in receiving good quality care according to the standard/guidelines available for their conditions. Also the majority of the respondents

were occasionally satisfied with the safety of care provided to them and with continuity care over time. And lastly, the result in financial accessibility shows that the majority of respondents claimed enough money to spend on appointments with doctors, healthcare providers, hospitals, medications, and medical equipment. Respondents occasionally encountered obstacles as a result of healthcare spending. The majority of the participants agreed that they had lowered their spending on necessities in order to afford healthcare bills. Respondents did not consider deferring healthcare visits, despite the fact that they spend a lot of money on healthcare, which is why they need to rely on private or complementary health insurance to meet their healthcare bills.

## **Conclusion**

The general finding of the data regarding accessibility of healthcare indicates that the accessibility of healthcare services in the barangay is dependent on their availability. Most residents visit the barangay center for some health concern related to upper respiratory tract infections such as colds, sinuses, cough, and throat ache but mostly cough and throat and this health finding show that the barangay provides and meets the residents' expectations in providing necessities for the treatment of their following health concerns. Overall sources of the residents were through mobile and walk-in as it was the easiest way to eventually access healthcare. In terms of financial availability, overall findings show that residents in the barangay have the ability to provide for their health costs, but with the help of health insurance, they may cover a cost for their medical health problems but seek help for social support when it is needed

Although the outcome shows that most of the respondents were able to declare that there is accessibility of healthcare services in their barangay, there were still few that showed unavailability of accessing the healthcare services. In terms of differential availability that affects their access to healthcare, it should also need to be noted that there were residents who did not have the ability to access. Although the results show that the majority of respondents were able to state that healthcare services were accessible in their barangay, a small number of respondents were unable to receive healthcare services. In terms of unequal availability, which influences their access to healthcare, it should

be emphasized that there were residents who were unable to get healthcare.

### **Recommendations**

Study shows that hospital availability, availability of hospital transport, appointment for health barangay, communication technology and financial accessibility can affect individuals' access to healthcare services. On this basis, future research can examine those variables for future reference.

Recognizing the contributions of this research, we also recommend further research because it contains limitations imposed by the data, it does not generalize the results since it had a limited number of participants, and thus the criteria for final conclusion were also limited. Future researchers may add more criteria to study the accessibility of healthcare in the barangay to determine fully what is needed to assess for access to healthcare.

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# **Alternative Dispute Resolution: A Key To Peace And Order In The Barangay Level**

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## **KEYWORDS:**

- **Lupon Tagapamayapa,**
- **Parties,**
- **Conciliation,**
- **Mediation,**
- **Alternative Dispute Resolution**

**Abstract.** This study focused on the effectiveness of Alternative Dispute Resolution in maintaining peace and order in the Barangay Level. It aimed to determine the extent of application of ADR in the Barangay and the level of success of the ADR applied in the three barangays, barangay Sabang, barangay Salitran II, and barangay Sabang I. The researchers utilized the descriptive-correlational research design to determine the

relationship between the extent of application of ADR and the level of success of ADR in the three barangays. The findings of the study reveal “highly applied” in relation to the “extent of application of ADR in the Barangay level.” The assessment found that the Lupon Tagapamayapa properly implemented the application of ADR in the barangay level which provided proper service to the people in accordance with the law (Republic Act No. 7160 or also known as the Local Government Code of 1991). The study showed

that the level of success of ADR applied in three barangays is very successful. The result made by the Lupon Tagapamayapa on the significant relationship between the extent of application of ADR and the level of success of the ADR applied in the barangay is less than or equal to the level of relationship at 0.5 concluded that there was no significant relationship. The results made by the parties on the significant relationship differ from the results made by the Lupon Tagapamayapa. The data presented showed that the essence of ADR in the barangay level to “maintain peace and order” had been practiced.

## **Alternative Dispute Resolution: A Key To Peace And Order In The Barangay Level**

### **INTRODUCTION**

The data released by the Department of Justice for Calendar Year 2016 to 2020 shows the total court case load for the year 2016 is 432,573, for year 2017 is 373,771, for year 2018 is 444,953, for year 2019 is 411,638, and for year 2020 is 389, 591. In the article written by Tadiar, he mentioned that as a result of the indiscriminate filing and delayed processing of cases in the courts of justice, court dockets are excessively and unjustifiably clogged. Hundreds of thousands of cases are still pending resolution or action. The number of cases pending at all levels of the legal system is increasing at an alarming rate. Annually, just 85.83 percent of cases are resolved by the courts. The situation is expected to deteriorate, and the backlog is expected to increase rather than decrease unless judges are given the tool they need to handle more cases through a systematic and long-term judicial reform initiative. The processing of previous instances is slowed or delayed, which impacts the progress of subsequent cases. As a consequence, some cases have incredibly taken as long as a generation to be resolved. Thus, the people have become wary, if not distrustful, of the judicial system as an effective means of violating rights violated and redressing wrongs done. Nonetheless, the crime victim or aggrieved party more often seeks the underworld or underground rebel movement to secure the justice they never get from the courts (Tadiar, n.d.).

Republic Act No. 9825, otherwise known as the Alternative Dispute Resolution Act of 2004 expressly stated the need “to actively promote party autonomy in the resolution of disputes or the freedom of the parties to make their own arrangement to resolve disputes.” To achieve this objective, the Act stipulated that “the State shall encourage and actively promote the use of Alternative Dispute Resolution (ADR) as an important means to achieve speedy and impartial justice and de-clog court dockets.”

The Philippine Barangay Justice System, also known as the Katarungang Pambarangay, was established pursuant to Republic Act No. 7160, also known as the Local Government Code of 1991. The research conducted by Mohammed and Caingat (2017) has listed the Katarungang Pambarangay's multiple objectives. These include encouraging swift administration of justice, minimizing indiscriminate case filing in courts, reducing docket congestion to improve the standard of justice delivered by the courts, and preserving and recognizing the time-honored custom of amicably resolving conflicts at the local level.

According to Rado et. al., (2019), the criminal justice system is not the ideal institution for resolving disputes. The family bond and the harmonious harmony would be destroyed by the criminal justice system's resolution. Due to these flaws, the criminal justice system has a role in dispute resolution, but it also plays a role in speeding the mediation process through custom or village structures because these structures have advantages that do not belong to the criminal justice system.

The inadequacy of legal proceedings for daily interpersonal problems stems from the judicial process' inherent punitive and backward-looking orientation. It is just concerned with the question of "who did what to whom" rather than the why and how. Only the symptoms are identified, not the underlying cause of the problem. A complainant, on the other hand, is frequently uninterested in punishing the other party with a jail sentence or a fine. This is especially true in cases where the parties have some sort of kinship, job, or other working relationship. In these circumstances, it is more vital to restore the damaged connection than to impose consequences, whether in the form of a criminal term or punitive damages. What the complainant is really interested in is an opportunity to ventilate his grievance, explore the cause of the problem and get an assurance that the offending conduct will no longer be repeated (Tadiar, n.d.).

It is for these reasons that the researchers decided to pursue this study to identify the effectiveness of Alternative Dispute Resolution in maintaining peace and order in the Barangay Level. Specifically, the study aims to determine the extent of application employed in implementing ADR in the Barangay and its level of success. At the end of the study, the researchers hoped to help in the improvement of the Barangay

Justice System to help achieve its goals, specifically the maintenance of peace and order.

### **Statement of the Problem**

This study aims to determine the extent of application and level of success Alternative Dispute Resolution applied in the barangay level.

Specifically, this study seeks to answer the following questions:

1. What are the different Alternative Dispute Resolution (ADR) program applied in the Barangay level?
2. To what extent is the application of ADR in the barangay level?
3. What is the level of success of the ADR applied in the barangay?
4. Is there a significant relationship between the extent of application of ADR and the level of success of the ADR applied in the barangay?
5. Is there a significant difference in the extent of application and the level of success of the ADR in the three (3) barangays?

### **Theoretical Framework**

The researchers wanted to know the extent of the application of ADR and the success of ADR applied in the Barangay level. To have a clear understanding of the variables, this research will be guided by *Conflict Transformation Theory* as proposed by John Paul Lederach. The theory states that all conflict is envisioned as a natural, normal and continuous dynamic within human relationships; it brings with it the potential for constructive growth. For positive change, engagement with this opportunity is necessary. Secondly, the conflict has a rhythm and pattern; there is escalation and de-escalation. Lastly, conflict flows from and returns to relationships, making relationships the center of conflict transformation. Relationships have visible and invisible



dimensions, immediate and long-term issues and transformation must heed to all of them.

Conflict Transformation implies responding to social conflict as opportunities to bring about positive change processes that minimize violence, increase justice in personal, and social structures, and address real-world issues in human relationship.

Alternative Dispute Resolution applies the principle of Conflict Transformation theory wherein it views peace as center and rooted in the quality of relationship. The goal of ADR is to transform the conflict into a healthy relationship for peaceful and orderly barangay.

## **Literature Review**

### *Barangay Justice System*

The Barangay Justice System is mandated by Republic Act No. 7160 or the Local Government Code of 1991 and it also had been covered by Presidential Decree 1508 (Establishing A System of Amicably Settling Disputes in the Barangay Level) in 1978 and Batas Pambansa Blg. 337 or the 1983 Local Government Code.

The Barangay Justice System (BJS), which is based on the Katarungang Pambarangay manual, is a community-based conflict resolution system that is run by the barangay, the country's fundamental political unit. The Punong Barangay and other community members (the Lupon members) serve as mediators (conciliators, and sometimes, arbitrators) in this type of community-based dispute resolution, which deals with disputes between people who reside in the same community (typically, the same city or municipality).

The objectives of Katarungang Pambarangay (Barangay Justice System) can be traced back to the original law that created it. The numerous goals of the Katarungang Pambarangay are outlined in the research by Mohamed and Caingat (2017). To improve the quality of justice provided by the courts, these include promoting fast administration of justice, avoiding indiscriminate case filing, lowering docket congestion, and conserving and acknowledging the time-honored practice of amicably resolving disputes at the local level.

### *Alternative Dispute Resolution*

Republic Act 9285, also known as "Alternative Dispute Resolution Act of 2004" defined "Alternative Dispute Resolution System" as any method of proceeding, including arbitration, mediation, conciliation, early neutral evaluation, mini-trial, or any combination thereof, that is used to settle dispute or controversy, other than by the adjudication of a presiding judge of a court or an officer of a government agency, as defined in this Act.

The ADR Act of 2004 (R.A. No. 9285) clearly articulates state policy, to wit: "to actively promote party autonomy in the resolution of disputes or the freedom of the parties to make their own arrangement to resolve disputes. Towards this end, the State shall encourage and actively promote the use of Alternative Dispute Resolution (ADR) as an important means to achieve speedy and impartial justice and de-clog court dockets."

According to the Local Government Code of 1991, mediation, conciliation, and arbitration are legitimate and effective methods of resolving certain kinds of disputes, such as those involving families and communities. With the expansion of its scope and powers over the cases it was allowed to cover, the Katarungang Pambarangay became an integral part of the Barangay Governance. This law states that a person may engage in the Barangay Justice System and present their dispute to the Lupon chairman of the barangay provided they have paid the necessary filing fee.

The Punong Barangay is going to invite the complainant(s), respondent(s), and any witnesses to appear before him for a mediation of their competing interests after receiving the complaint. If the Punong Barangay fails, he will designate a time for the formation of the conciliation panel (pangkat), which will hear testimony from both sides and their witnesses, clarify disagreements, and look into all options for a peaceful resolution. The BJS also recognizes arbitration as a form of ADR, and parties may, at any point in the process, agree in writing to abide by the arbitrator's decision made by the Punong barangay or conciliation panel. In the event that a settlement has been reached voluntarily between the parties, the law grants the settlement "the force and effect of a court judgment" (Tadiar, n.d.). In other words, upon application to the municipal or city court, the prevailing party can have the settlement enforced with a writ of execution.

The study stated various alternatives to be needed for the swift disposition of the cases such as: (a) in civil suits, the conduct of mediation and conciliation should be made mandatory to encourage parties to settle their differences instead of engaging in regular proceedings; (b) Section 320 of the Criminal Procedure Code should be modified to include additional offenses that are thought to be capable of constituting a crime; (c) the Legal Services Act should be adequately amended to raise the presiding officers' authority significantly and also to resolve and take control of criminal offenses; (d) the ADR process must be composed of trained mediators for reconciling and resolving disputes, and (e) in criminal cases should explore the possibility of ADR process similarly to the civil cases for the speedy disposition of cases. Therefore, the study recommended those alternatives be needed to help the decongestion of the court dockets and also as a way to serve justice in the contemporary era (Bharadwaj & Rao, 2021).

According to Rado, et. al. (2019), the criminal justice system is not the ideal institution for resolving disputes. The family bond and the harmonious harmony would be destroyed by the criminal justice system's resolution. Based on those flaws, the criminal justice system plays a role in conflict resolution, but it also streamlines the use of mediation through custom or village structures since it offers benefits outside the jurisdiction of the criminal justice system. First, mediation is quicker than litigation and will lessen the victims' desire for retribution. It is also more flexible and cost-effective. Second, since the criminal court system is swamped with cases, the length of the settlement process can be reduced by having the offender and victim mediate. Thirdly, the mediation allows the victims an opportunity to speak with the offenders about the crime that has affected their lives, to express their concern and feelings, and to request restitution as well. The fourth benefit of mediation is that it recreates the harmonious dynamic between the victim and the offender. Conflict resolution through the criminal justice system does not include this circumstance. The victims' forgiveness of the offenders reduces their sense of guilt and leads to their reunion.

According to Riyanto, Sekartaji and Dewi (2018), The process of settling disputes righteously outside of the trial process becomes part of mandatory administrative requirements. Both the Judge Mediator and the Non-Judge can mediate while carrying out the administrative requirements. It is essential given that the role of the judge who makes decisions in the case does not

correspond to the role of the mediator. Moreover, the role of its law enforcers, along with the role of the parties and cultural variables, impact the extent of the success of mediation in court. In fact, the development of mediation (the most used ADR process) has been driven very much by pragmatic commercial interests which are more appropriate to modern business practices. It has the scope to address factors like fairness or practicality that a tribunal might not have. Wherein it promotes regaining consensus and relationships over the adversarial way of litigation. (Mackie, 2019).

The study of Okeke, A. (2021), suggested that Alternative Dispute Resolution may lead to a decrease in the amount of time and money necessary to deliver justice, leading to a positive impact on society. The person who suffered, the defendants, the neighborhood, and society as a whole were all going to be satisfied.

Further, the findings from the research conducted by Rado (2019), demonstrated the process by which penal mediation is utilized in Kei SARA to resolve disputes through the application of the Sdov mechanism (negotiation/discussion). The mediation process was performed primarily by individuals in their community and then presented to the custom structure which is the mediator. However, the criminal justice process (the village custom institution/the village community institution) used the negotiation/discussion mechanism where the mediator elements are the custom structure. Then, penal mediation forms parts of the criminal justice system (SPP) operating by the law enforcement, prosecutor, tribunal, and corrections where they can perform the role of mediator anchored to their functions.

## **METHODOLOGY**

### ***Research Design***

In this study, the researchers utilized the descriptive-correlational research design to determine the relationship between the extent of application of ADR and level of success of ADR in the barangay level. Descriptive-correlational design involves the calculation of two or more relevant variables as well as the assessment of the relationship between the variables (Stangor & Walinga, 2019). It is a study in which the researchers

are primarily interested in defining relationships between variables, without attempting to establish a causal connection.

**Research Participants**

There are three hundred and forty-nine (349) participants that were included in the study which comprises of thirty-two (32) Lupon Tagapamayapa members in the three (3) barangays and three hundred and seventeen (317) parties who have undergone Alternative Dispute Resolution in their respective barangay. Sample size were computed based on the total number of cases filed in the three barangays in the year 2021. The number of respondents per barangay is as follows:

Table 1. Number of Respondents per barangay

Brgy. Sabang		Brgy. Salitran II		Brgy. Sampaloc I	
Lupon Tagapamaya	Parties	Lupon Tagapamaya	Parties	Lupon Tagapamaya	Parties
15	105	10	113	7	99

**Research Instruments**

The researcher adopted and modified the questionnaires from the study entitled “Effectiveness of Conciliation Process: A Practical Way of Delivering Justice” by Agustin Pajarillo (2018) to assess the extent of application of the Alternative Dispute Resolution in the barangay level. The questionnaire is composed of 22 questions and answerable by:

Always	-	4
Often	-	3
Sometimes	-	2
Never	-	1

The researchers adopted and modified the questionnaire from the study entitled “Assessment of the Centers of Local Governance: Implementation of the Barangay Justice Service

System (BJSS) Project in Mindanao, Philippines” by Blue & Devanadero (2017) to assess the level of success of the Alternative Dispute Resolution Applied in the barangay level. The questionnaire is composed of questions and answerable by:

Very successful in this aspect	-	4
Successful in this aspect	-	3
Less successful in this aspect	-	2
Not successful in this aspect	-	1

The questionnaires were modified to include only the items relevant to the study. The draft was first shown to the researcher’s adviser for comments and suggestions.

### ***Data Gathering Technique***

The researchers submitted a letter to the selected Barangay Captains to secure their permission in administering the questionnaire to the Lupon Tagapamayapa and the parties of ADR in the barangay level. The researchers coordinated with the Barangay Captains for the schedule of the administration of the questionnaires through the paper and pencil method. In the actual data gathering, the researchers personally have been administered the questionnaires to ensure 100% retrieval of the questionnaire. They have elucidated the mechanics to the respondents such as the extent of application of ADR and the level of its success in the barangay level. They have also secured the consent of each respondent for the swift retrieval of the respective data. After the retrieval of the questionnaires, the researcher summarized the data gathered.

### ***Ethical Consideration***

The researchers secured the consent from the selected barangays to conduct the interviews and obtain information. The letter discusses what the study is intended to accomplish and how it will be beneficial to them. Also, the researchers provided informed consent form for the participants to be assured of their willingness to participate in this study. All data gathered were kept confidential and the identity of the respondents will not be divulged. The researchers conducted the study in a way that is fair to the respondents. The ethical guidelines in conducting the study

were observed, allowing the respondents to answer the questions voluntarily and hustle-free.

**RESULTS**

Alternative Dispute Resolution Programs	Sabang		Salitran 2		Sampaloc 1		Overall	
	f	%	f	%	f	%	f	%
Arbitration	5	33.33	3	30.00	3	42.86	11	34.38
Conciliation	10	66.67	3	30.00	7	100.00	20	62.50
Mediation	10	66.67	10	100.00	5	71.43	25	78.13
Others	0	0.00	0	0.00	0	0.00	0	0.00

Table 2

*Alternative Dispute Resolution Programs Applied in the  
Barangay (Multiple responses)*

Table 2 illustrates the different alternative programs applied in the three barangays namely, Brgy. Sabang, Brgy. Salitran II, and Brgy. Sampaloc I according to the Lupon Tagapamayapa. The overall result shows that mediation is the most applied program in the three (3) barangays at 78.13%, followed by conciliation at 62.50% and arbitration at 34.38%.

Table 3

*Extent of the application of ADR in the barangay level*

Extent of Application	Lupon		Parties		Overall	
	Overall mean	Verbal interpretation	Overall mean	Verbal interpretation	Mean	Verbal interpretation
Conciliation Efforts to Reconcile Parties	3.94	Highly Applied	3.58	Highly Applied	3.76	Highly Applied
Issuance of certificate to file action	3.97	Highly Applied	3.53	Highly Applied	3.75	Highly Applied
Enforcement of Rules	3.98	Highly Applied	3.42	Highly Applied	3.70	Highly Applied
Proper application of the legal procedures	3.93	Highly Applied	3.56	Highly Applied	3.75	Highly Applied
<b>OVERALL</b>	<b>3.95</b>	<b>Highly Applied</b>	<b>3.52</b>	<b>Highly Applied</b>	<b>3.74</b>	<b>Highly Applied</b>

Table 3 shows the extent of application of ADR in the Barangay level as perceived by the Lupon Tagapamayapa. Data reveals that the ADR applied in the three barangays is *highly applied* with an overall weighted mean of 3.95. This implies that the Lupon Tagapamayapa in the selected barangays is consciously discharging its functions while continuously making more efforts in rendering excellent service to the people for a more sound and successful conciliation.

It is also observed in the data that among the highly applied ADR, the *enforcement of rules* obtained the highest overall mean at 3.98. Moreover, *proper application of the legal procedures* had the lowest overall mean at 3.93 next to conciliation efforts to reconcile parties at 3.94.

The table also shows the extent of the application of ADR in the barangay level according to the Parties. Data shows that the parties perceive the ADR to be highly applied in the three barangays with an overall weighted mean of 3.52.

It can be seen that among the highly applied ADR, the conciliation efforts to reconcile parties have the highest overall mean of 3.58. Moreover, the enforcement of rules had the lowest



overall mean of 3.42 next to the issuance of certificate to file action at 3.53.

Table 4  
*Level of success of ADR applied in the barangay.*

Level of Success	Lupon Tagapamayapa		Parties		Overall	
	Overall Mean	Verbal Interpretation	Overall Mean	Verbal Interpretation	Mean	Verbal Interpretation
ADR helps to resolve local disputes and conflicts.	3.94	Very Successful	3.51	Very Successful	3.72	Very Successful
Without ADR, local conflicts and disputes would mostly end up in the formal courts.	3.88	Very Successful	3.51	Very Successful	3.70	Very Successful
People in my Barangay have confidence in the Lupon Tagapamayapa and the Barangay Justice Advocate to come to decisions that are fair and acceptable to all parties.	3.88	Very Successful	3.36	Very Successful	3.62	Very Successful
ADR helps to maintain peace and order in the community.	3.97	Very Successful	3.42	Very Successful	3.70	Very Successful
Overall	3.91	Very Successful	3.45	Very Successful	3.68	Very Successful

Table 4 shows that the level of success of ADR applied in three barangays as perceived by the Lupon Tagapamayapa is *very successful* with an overall weighted mean of 3.91.

It has been observed that the highest individual weighted mean of 3.97, about the ADR, *helps to maintain peace and order in the community*. This means that the essence of ADR in the barangay level has been served based on the assessment made by the Lupon Tagapamayapa. Moreover, the results also show that *Without ADR local conflicts and disputes would mostly end up in the formal courts* and *People in the Barangay have confidence in the Lupon Tagapamayapa and the Barangay Justice Advocate to come to decisions that are fair and acceptable to all parties* has the lowest individual weighted mean of 3.88 interpreted as *very successful*.

The table also illustrates the level of success of ADR applied in the three (3) barangays according to the parties are *very successful* with an overall weighted mean of 3.45.

This means that the level of success of the ADR in the barangay level has been very successful according to the Parties. Moreover, the results also show that *People in the Barangay have*

*confidence in the Lupon Tagapamayapa and the Barangay Justice Advocate to come to decisions that are fair and acceptable to all parties* has the lowest individual weighted mean of 3.36 interpreted as very successful.

The data above implies that the parties see the Alternative dispute resolution as very successful in the barangay in terms of resolving local disputes and conflicts and without it local conflicts and disputes would mostly end up in formal courts. The least mean of 3.88 result that the Lupon Tagapamayapa needs to improve is to build trust and confidence that the Lupon Tagapamayapa and the Barangay Advocate come to decision that are fair and just. This is an obvious indication that the Lupon Tagapamayapa are heading in the right direction to resolve any issues between the complainants and respondents regarding the satisfaction of claims through the judicial process as a result of the successful application of the "Katarungang Pambarangay Law."

Table 5

*Relationship between the extent of application of ADR and the level of success of the ADR applied in the barangay according to the Lupon Tagapamayapa*

Variables Tested	Spearman's rho Correlation Coefficient		Interpretation	p-value	Decision Rule	Decision	Interpretation
Conciliation Efforts to Reconcile Parties	Level of Success of the ADR	0.290	weak positive relationship	0.107	Reject Ho if p-value is less than or equal to alpha (0.05)	Failed to reject Ho	No significant relationship
Issuance of certificate to file action		0.544	moderate positive relationship	0.001		Reject Ho	Significant relationship
Enforcement of Rules		-0.148	weak negative relationship	0.420		Failed to reject Ho	No significant relationship
Proper application of the legal procedures		-0.079	weak negative relationship	0.669		Failed to reject Ho	No significant relationship
Application of Alternative Dispute Resolution Overall		0.255	weak positive relationship	0.159		Failed to reject Ho	No significant relationship

Table 5 illustrates the relationship between the extent of application of ADR and the level of success of the ADR applied in the barangays as perceived by the Lupon Tagapamayapa. Data shows the Spearman's rho Correlation Coefficient value of 0.225 is greater than the p-value of 0.159, hence, the null hypothesis is accepted. Therefore, there is no significant relationship between the extent of application of ADR and the level of success of the ADR applied in the barangay.

The data and interpretation presented above clearly implies that there is no significant relationship between the extent of application of ADR and the level of success of the ADR applied in the barangay as assessed by the Lupon Tagapamayapa. This implies that the extent of application of ADR is not relevant to the level of success of the ADR applied in the barangay.

However, it can be observed that there exists a moderate positive relationship between the issuance of certificate to file action and the success of the ADR. This implied that when the issuance of certificates to file action by the Lupon Tagapamayapa is highly applied, the ADR becomes more successful. The favorable outcome implies that issuance of a certificate that is not delayed and furnished in no time from a prompt resolution of disputes leads to peaceful community. It indicates that when the Lupon is easily accessible and flexible in giving the problem's resolutions more opportunities it leads to a more successful ADR.

There also exist a weak negative relationship between the enforcement of rules and the Level of Success of the ADR. This implied that when the enforcement of rules is highly applied, the ADR will not become successful and when the ADR becomes very successful the enforcement of rules is not applied.

Table 6

*Relationship between the extent of application of ADR and the level of success of the ADR applied in the barangay according to the Parties*

Variables Tested		Spearman's rho Correlation Coefficient	Interpretation	p-value	Decision Rule	Decision	Interpretation
Conciliation Efforts to Reconcile Parties	<b>Level of Success of the ADR</b>	0.488	moderate positive relationship	0.000	<b>Reject Ho if p-value is less than or equal to alpha (0.05)</b>	Reject Ho	Significant relationship
Issuance of certificate to file action		0.402	moderate positive relationship	0.000		Reject Ho	Significant relationship
Enforcement of Rules		0.376	weak positive relationship	0.000		Reject Ho	Significant relationship
Proper application of the legal procedures		0.429	moderate positive relationship	0.000		Reject Ho	Significant relationship
<b>Application of Alternative Dispute Resolution Overall</b>		<b>0.476</b>	<b>moderate positive relationship</b>	<b>0.000</b>		<b>Reject Ho</b>	<b>Significant relationship</b>

Table 6 reveals the relationship between the extent of application of ADR and the level of success of the ADR applied in the barangay as assessed by the Parties. The data shows the Spearman's rho Correlation Coefficient value of 0.476, hence, null hypothesis is rejected. Therefore, there is a significant relationship between the extent of application of ADR and the level of success of the ADR applied in the barangay.

The data and interpretation presented above clearly implies that there is a significant relationship between the extent of application of ADR and the level of success of the ADR applied in the barangay according to the Parties. This clearly implies that when the ADR procedures are highly applied, the higher the chances for the ADR to be successful.

Table 7

*Significant Difference in the extent of application of ADR and the level of success of the ADR applied in the barangay according to the Lupon Tagapamayapa.*

Category	Barangay	Mean Rank	p-value	Decision Rule	Decision	Interpretation
Conciliation Efforts to Reconcile Parties	Sabang	15.40	0.740	Reject $H_0$ if p-value is less than or equal to alpha (0.05)	Failed to reject $H_0$	There is no significant difference
	Salitran	17.10				
	Sampaloc	18.00				
Issuance of certificate to file action	Sabang	15.87	0.481		Failed to reject $H_0$	There is no significant difference
	Salitran	18.00				
	Sampaloc	15.71				
Enforcement of Rules	Sabang	17.50	0.377		Failed to reject $H_0$	There is no significant difference
	Salitran	15.90				
	Sampaloc	15.21				
Proper application of the legal procedures	Sabang	17.00	0.812		Failed to reject $H_0$	There is no significant difference
	Salitran	15.50				
	Sampaloc	16.86				
Application of Alternative Dispute Resolution Overall	Sabang	16.33	0.949		Failed to reject $H_0$	There is no significant difference
	Salitran	17.15				
	Sampaloc	15.93				
Level of Success of the ADR	Sabang	17.60	0.705		Failed to reject $H_0$	There is no significant difference
	Salitran	15.75				
	Sampaloc	15.21				

Table 7 shows the significant difference between the extent of application of ADR and the level of success of the ADR applied in the barangay as perceived by the Lupon Tagapamayapa. The three barangays attained a similar evaluation of the extent of application of ADR. As shown in their p-value of 0.949 is greater than to alpha (0.05), hence, there is no significant difference in the extent of application of ADR in the three barangays.

The three barangays also attained a similar evaluation of the level of success of the ADR applied. As shown in their p-value of 0.705 is greater than to alpha (0.05), hence, there is no significant difference in the level of success of the ADR applied in the three barangays.

The data and interpretation presented above clearly shows that there is no significant difference among the three

barangays in the extent of application of ADR and the level of success of the ADR applied as perceived by the Lupon Tagapamayapa.

Table 8

*Significant Difference in the extent of application of ADR and the level of success of the ADR applied in the barangay according to the Parties.*

Category	Barangay	Mean Rank	p-value	Decision Rule	Decision	Interpretation
Conciliation Efforts to Reconcile Parties	Sabang	53.90	0.075	Reject Ho if p-value is less than or equal to alpha (0.05)	Failed to reject Ho	There is no significant difference
	Salitran	69.39				
	Sampaloc	54.96				
Issuance of certificate to file action	Sabang	46.97	0.000		Reject Ho	There is a significant difference
	Salitran	75.26				
	Sampaloc	55.86				
Enforcement of Rules	Sabang	45.09	0.001		Reject Ho	There is a significant difference
	Salitran	73.01				
	Sampaloc	60.05				
Proper application of the legal procedures	Sabang	52.09	0.003		Reject Ho	There is a significant difference
	Salitran	74.19				
	Sampaloc	51.85				
	Total					
Application of Alternative Dispute Resolution Overall	Sabang	47.33	0.001		Reject Ho	There is a significant difference
	Salitran	75.85				
	Sampaloc	54.90				
	Total					
Level of Success of the ADR	Sabang	57.03	0.013		Reject Ho	There is a significant difference
	Salitran	71.48				

Table 8 reveals the significant difference between the extent of application of ADR and the level of success of the ADR applied in the barangay as assessed by the Parties. The three barangays attained a similar evaluation of the extent of application of ADR. As shown in their p-value of 0.001 is less than or equal to alpha (0.05), hence, the null hypothesis is rejected. Therefore, there is significant difference in the extent of application of ADR in the three barangays.

The three barangays also attained a similar evaluation of the level of success of the ADR applied. As shown in their p-value of 0.013 is less than or equal to alpha (0.05), hence, the null hypothesis is rejected. Therefore, there is a significant difference in the level of success of the ADR applied in the three barangays.

The data and presentation presented above clearly shows that there is significant difference in the extent of application of ADR and in the level of success of the ADR applied in the three barangays as assessed by the parties. In the extent of application, the Barangay Salitran II had the highest mean rank at 75.85. Moreover, Brgy. Sabang had the lowest mean rank at 47.33 next to Brgy. Sampaloc I at 54.90. However, for the level of success Brgy. Salitran II also had the highest mean rank at 71.48. Furthermore, Brgy. Sampaloc I had the lowest mean rank at 49.69 next to Brgy. Sabang at 57.03.

## **DISCUSSION**

It is a general finding of the study that mediation is the most applied Alternative Dispute Resolution program applied in the barangay. It was consistent to the study of Wall (2018) that mediation appears to be the frontrunner for domestic resolutions. It is applied to a wide variety of conflicts, including labor-management negotiations, local community disputes, school conflicts, and marital problems.

Furthermore, the study also revealed that the application of the ADR in the barangay are highly applied and is consistent with the study of Gonzales (2022) that the Barangay Justice, specifically the Lupon Tagapamayapa are fully implementing their prescribed obligations, such as preserving case records, hearing or meeting minutes, records of cases, agreements with other agencies or higher courts, and using settlement approaches or strategies to speed up the mediation process within the framework of the barangay justice system. Also, the study of Agustin, C.P. et.al (2018) affirms the results of Gonzales (2022). It revealed that the Barangay Justice System, in particular the Lupon members, are confident in their ability to undertake their exceptional efforts, which are demonstrated by their awareness of and discipline with

regard to their assigned roles, functions, and responsibilities. That allows them to successfully carry out each conciliation proceeding through the observance of all relevant aspects of effectiveness. Additionally, the Lupon is accessible and flexible in performing its duty in conformity with the current legal provisions, ensuring that disputes must be compulsory and obligatory upon the parties subject to the conciliation process. Also, it is generally agreed upon that Lupon Tagapamayapa performs its responsibility of resolving disputes amicably to a high degree of effectiveness. It is their policy to adhere to all legal requirements as outlined by the Katarungang Pambarangay Law, the Local Government Code of 1991, and other comparable statutes. Last but not least, the Lupon members are diligently carrying out the step-by-step procedure in accordance with their constitutional requirement; they also conduct a deeper evaluation and investigation of the cases that have been brought before them in order to qualify for their mandatory duty to peacefully resolve disputes.

The study also revealed that the level of success of the ADR applied in the barangay is very successful. This data gathered corroborated the study of Mohammed, M. & Caingat, N. (2017) that the majority of the local disputes and conflicts were settled with the help of the barangay justice system. Additionally, the Katarungang Pambarangay or Barangay Justice System exercised a quasi-judicial function in which they have the power to settle the conflicts between members of the same community that helps the decongestion of court dockets (Katarungang Pambarangay Handbook, 2004). It also presented that the members of the Lupon in the three barangays are confident that the community believes that the essence of ADR in the barangay level to maintain peace and order between the barangays has been served properly as a majority of the conflicts were settled. Based on the findings assessed by the parties showed that the least mean result was the confidence in terms of fair and just adjudication of the community members towards the members of the Lupon and Barangay Justice System. The researchers speculated that the reason or primary concern of the respondent towards the Lupon Tagapamayapa was insufficient training or seminars related to the administration of the barangay justice system (Mohammed, M. & Caingat, N., 2017). Nevertheless, the results of the data gathered showed that the Lupon Tagapamayapa of the three barangays is properly enforcing the judicial process that resulted in the success of the application of



the “Katarungang Pambarangay Law.” In line with this is the study of Abubakar and Mohamed (2017) claimed that community engagement was the most successful tool for fostering peaceful cooperation between their organization and their local community.

In light of the findings of the study, there is no significant relationship between the extent of application of ADR and the level of success applied in the barangay as self-assessed by the members of the Lupon. This means that the members of Lupon are readily available and accommodating in providing greater performing its responsibility in accordance with the existing provisions of the law ensuring that disputes must be compulsory and obligatory upon the parties subject to the conciliation process; that Lupon Tagapamayapa is effective to a great extent in acting judiciously in their duty to amicably settle disputes; policy of it to follow the legal protocols with utmost diligence as stipulated (Katarungang Pambarangay Law, Local Government Code of 1991). On the other hand, as assessed by the parties the null hypothesis has been rejected therefore there is a significant relationship between the two variables. The findings of the study corroborate Guia & Mangubat (2021), that through the help of Katarungang Pambarangay, both parties involved in a conflict focus on effectively resolving their difference and reaching a bargaining agreement that works for all parties involved.

## **Conclusion**

Based on the data gathered from the survey questionnaire, the researchers were able to generate the following conclusions:

**Alternative Dispute Resolution Programs.** The overall finding of the study stated that mediation is the "most applied" program in all three (3) barangays then followed by conciliation and arbitration. This shows that the three barangays properly implemented the different ADR programs in the barangay.

**Extent of Application of ADR.** The findings of that study state that the extent of application of the ADR are “highly applied”. The results state that the Lupon Tagapamayapa highly applies the

ADR programs in the barangay level which provided proper service to the parties involved.

**Level of Success of the ADR.** The findings of the study state that the level of success of ADR applied in three barangays, are "very successful." This data presented that the essence of ADR in the barangay level to "maintain peace and order" has been practiced. Then, the data also indicated that the community has confidence in the Barangay Justice Service System through the judicious application of ADR programs in handling conflicts before going to court which is quite time-consuming and costly.

**Relationship between the extent of application of ADR and the level of success of the ADR applied in the barangay.** The overall findings of the study state that the parties implied that there is a significant relationship between the extent of application of ADR and the level of success of the ADR applied in the barangay. It shows that when the implementation of ADR is "highly applied" the ADR becomes "very successful." Findings of the study also state that Lupon Tagapamaya perception differs as regards to the extent of application of ADR and the level of success of the ADR applied in the three barangay has no significant relationship.

**Significant difference in the extent of application of ADR and the level of success of the ADR applied in the three barangays.** The overall findings of the study state that there is a significant difference between the extent of the application of ADR and the level of success of the ADR applied in barangay Sabang to Salitran II and Sampaloc I as perceived by the parties. However, the overall findings of the study as perceived by the Lupon Tagapamayapa states that there is no significant difference between the extent of application of ADR and the Level of Success of the ADR applied in the three Barangays. Their perception regarding the significance difference of the three barangay differs

## **Recommendations**

The researchers would like to recommend for the Lupon Tagapamayapa to study and have great extent of knowledge to look investigate, examine, and settle any disputes between the disputants, also they can use this study as a guide on how

effective and efficient their system is when it comes to solving local disputes. Since they are tasked in adjudicating cases where the disputants have agreed in advance to be bound by a third party's decision rather than a regular court process. The parties that will undergo, undergoing, or have undergone ADR programs may also put their full confidence to the Lupon Tagapamayapa since they are the experts in practicing the Katarungang Pambarangay Law which holds all the guidelines on ADR mechanism in the barangay level. Since Alternative Dispute Resolution is being practiced in the barangay level which is mandated under the Local Government Code, the LGUs may base on our study to reflect and gain knowledge on certain strategy to conduct in order to efficiently implement and improve ADR programs in their specific area. Lastly, this study can be used as a basis of future researchers studying the same research topic. Another point of consideration are the extent of application of ADR and level of success of the ADR. Such variables will enable the future researchers to further discuss in detail the relationship and differences between the two corresponding variables.

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# **Content and Language Integrated Learning (CLIL) as a Tool in Developing Students' Skill in Writing an Expository Essay**

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## **KEYWORDS:**

- **Educational Trend**
- **Writing Intervention**
- **Writing Skill Development**
- **Essay Writing**
- **Integration Across Curriculum**

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**Abstract.** Writing an expository essay requires a writer to generate factual ideas to be presented in the text. On the other hand, many students struggle in supplying enough information in writing an expository essay. This action research focused on developing Junior High School students' skills in writing an expository essay through the utilization of Content and Language Integrated Learning (CLIL) approach. The integration

of the students' Science lesson in discussing the standards of writing an expository essay enabled the students to generate enough factual ideas in their essay writing activity. The findings were analyzed through the use of Documentary Analysis for both students' Pre-CLIL and Post-CLIL expository essays. The developments focused on the students being able to hook the readers' interest, effectively introduce the topic in the introduction,



supply accurate information in the body with enough topic sentences, support the topic sentences with additional information and present a strong conclusion. In addition, the development of the students was reinforced through a Focus Group Discussion where the researchers found out that the CLIL approach helped students to describe the topic based on their learning in Science, provide information from their Science book, acquire prior knowledge about the topic and learn both English and Science in one activity. The utilization of CLIL approach in the teaching and learning process developed students' skill in writing an expository essay.

## **Content and Language Integrated Learning (CLIL) as a Tool in Developing Students' Skill in Writing an Expository Essay**

### **INTRODUCTION**

Writing is one of the four macro skills to be developed in language learning. Writing, as defined by Nordquist (2019), refers to the process of using graphic symbols in composing a clear and organized messages to convey meaning. In addition, writing plays a pivotal role in language learning. According to Zegada (2019), writing helps an individual to organize what he/she learned in a particular topic which also contributes to the refining process of his/her ideas. Based from the DepEd Order No. 31, s. 2020, also known as the Interim Guidelines for Assessment and Grading in light of the Basic Education Learning Continuity Plan, written output is one of the listed summative assessment tools that teachers may use in their classes (DepEd, 2020).

Written outputs under the language learning require students to write using the English language to develop their writing skills. Some of the listed written output activities are book review, essays, journals, letter writing, reflection papers and reports (DepEd, 2020). The DepEd Classroom Assessment Book (2018) specifically indicated the types of essay that Grade 7-10 students are expected to produce. One of these essay types is an Expository essay which conveys information based on factual evidence, rather than personal sentiments that focus on presenting accurate information (DepEd, 2018).

Like any other type of essay, an expository essay is composed of the Introduction, Body, and Conclusion. According the Caulfield (2020), this essay begins with the introduction, which aims to get the readers' interest, briefly introduce the topic, and present a thesis statement. Next, it follows the Body, which consists of the topic sentences that present an in-depth explanation of the thesis statement. After, it ends with the

conclusion, which only provides the overall idea of the essay. In this part, new information and evidence should not be presented.

The researchers have observed several writing issues in the essay submitted by the Grade 7 students of St. Clare of Immaculate Conception Academy - East Campus. The expository essay served as their performance task and was submitted on their Brightspace account. It was instructed to be composed individually. As a Performance Task assessment during the Fourth Quarter, the Grade 7 students were expected to show the proper steps in writing and provide factual pieces of evidence relevant to the topic given. On the other hand, upon the evaluation of these expository essays, the researchers have seen the students' inadequate skills on writing an expository essay with the following common errors as seen in their outputs: inappropriate writing format; insufficient factual pieces of evidence; irrelevance to the topic; inconsistent and disorganized ideas; improper use of language; incorrect use of grammar rules and conventions; ineffective conclusion; and poorly-written thesis statement.

The root of these problems centralized on the students' difficulty in supplying necessary information about the topic. In a study of Rizaldi et al. (2023), they found out that one of the major problems in writing an expository essay focused on the students' struggle in generating ideas. A student struggles to generate ideas in writing an expository essay because of several reasons such as the learners' area of interest; lack of knowledge in the topic and the irrelevance to the course material (Jack, 2020).

There are also numerous studies conducted centered on developing students' writing skills using the English Language. However, only a few focused on utilizing current educational trends. This study aims to bridge the gap using Content and Language Integrated Learning (CLIL) as a tool in developing the skills of Grade 7 – St. Clare students of Immaculate Conception Academy – East Campus in writing an expository essay as part of their assessment. CLIL refers to an approach focusing on learning a language and studying a certain subject or topic at the same (Zemach, 2021). Defining CLIL as an approach is broad since the integration may happen in many different ways. In this paper, the researchers utilized the use of a certain topic/subject in teaching English language to the students.

This study aimed to find out the development of Grade 7 St. Clare students' skills in writing an expository essay after utilizing Content and Language Integrated Learning approach. Specifically, this research sought to answer the following questions:

1. How did the Content and Language Integrated Learning (CLIL) approach develop students' skills in writing an expository essay?
2. What are the experiences of students in the utilization of Content and Language Integrated Learning approach?

## **METHODOLOGY**

This study adopted an action research design that involves conducting research and implementing solutions concurrently, with the goal of investigating and resolving a specific issue (George, 2023). The design was used to provide immediate solution to the issue that the researchers observed inside the classroom. Additionally, to dig deeper into the students' experiences during the intervention, the researchers utilized a qualitative method, a methodology that generates descriptive, non-numerical data, such as personal narratives, aiming to investigate diverse perspectives and individuals' subjective understanding of the world (APA Dictionary of Psychology, 2023). This method was used to specifically explore and understand the students' experiences during the implementation of the intervention.

### ***Proposed Innovation, Intervention and Strategy***

The intervention was implemented to address the formatting and content issues of Grade 7 students' expository essay through the utilization of CLIL approach. Students underwent another discussion of the same lesson about writing an expository essay that was already taught. On the other hand, the content of the whole discussion was altered and the students' lesson in Science about "Seasons in the Philippines" was integrated. The teacher used some points or information in their Science lesson as examples in discussing the lesson about writing an expository essay. At the end of the lesson, the students'

formative assessment focused on creating an expository essay about Eclipses. The expository essay of the students was submitted at their Brightspace accounts under the assignment tab.

The intervention conducted was comprised of three major phases. During the first phase, the students were re-taught how to write an introduction of an expository essay, using a CLIL approach. The main instructional material used for this phase was an example introduction of an essay which discussed the seasons in the Philippines. The example was also written by the researchers based from the students' Science book. After the discussion, the students were given the task of composing their own introduction about the topic of Eclipses.

On the second phase, the students were re-taught about the process of writing a body of an expository essay and the proper use of transitional words. In this phase, an example body about seasons in the Philippines was used as the main instructional material. Additionally, the students were also given an assignment to submit their own body of an expository essay about the topic of eclipses.

The third and final phase followed a similar process as the first and second phases, but with a focus on re-teaching the students how to write an effective conclusion. The main instructional material used for this phase was an example conclusion of an expository essay that discussed the seasons in the Philippines. Following the discussion, the students were tasked to submit a completed expository essay about the topic eclipses, which combine the introduction, body, and conclusion they had written in the previous phases.

### ***Participants and Other Sources of Data***

The target participants of the study were the students of Grade 7 – St. Clare in Immaculate Conception Academy – East Campus. The participants were selected using the Purposive Sampling technique. Students who scored ranging from 7-10 points in their Pre-CLIL Expository essay's coding sheets were selected. The higher the points in the coding sheets means that the students commit a higher number of mistakes in their essays. The selected students have also been participants of the re-

teaching process of the same lesson using Content and Language Integrated Learning approach to determine the students' development in writing an expository essay in terms of its content. Furthermore, the researchers used Documentary Analysis (Coding Sheets) and Focused Group Discussion to further determine the effectivity of the Writing Intervention.

### ***Data Gathering Methods***

There were several steps that the researchers followed in order to get the data needed for the study. First, the researchers wrote a letter to ask permission to the principal of ICA-East to conduct a research. Second, an activity about writing an expository essay was conducted with the said type of essay as the students' assessment to identify the problems in their writing skills. Third, the implementation of the CLIL approach was done through a re-teaching process of the same lesson with the integration of the Grade 7 students' Science lesson. Fourth, students made another expository essay with a content focused on the students' Science topic. Fifth, the descriptive process of Documentary Analysis and Focused Group Discussion was done in order to interpret and analyze the writing skills development of the students. Lastly, a presentation of the difference between students' expository essay before and after the implementation of the writing intervention was done.

### ***Data Analysis Plan***

The researchers used Documentary Analysis through Coding Sheets and Focused Group Discussion to analyze the content of the students' expository essay. The coding sheet contained 10 common errors that the researchers observed and identified in the students Pre-CLIL. Coding sheets were implemented for both the students' pre and post CLIL expository essays. The researchers utilized the coding sheet by identifying how many errors a student commit for both his/her pre-CLIL and post-CLIL expository essay. This coding sheet of a student for his/her pre-CLIL essay was compared to the coding sheet of his/her post-CLIL essay to determine if there was a development in his/her skill in writing an expository essay.

In addition, Focused Group Discussion was also done after the intervention of CLIL and after the students submitted their expository essays. A semi-structured interview was done consisting of four major questions for the participants. This was done in order to dig deeper to the participants' experiences with the CLIL approach intervention which also served as a validation to the evaluated analysis of their papers' content. Horizontalization was used to equally treat the participants' data in the interview wherein the researchers identified major themes related to the ideas or concepts presented in their answers. The formed themes based from the verbatim of the participants described the experiences of the students in the implementation of the CLIL approach.

### ***Ethical Consideration***

Ethical concerns were highly considered in this action research. Informed consent forms were given to the participants before they were scheduled for an interview. In addition, the participants have an option to not participate in the data gathering procedure. The participants' availability and willingness to participate was also prioritized in the data gathering procedure. Moreover, the confidentiality of the gathered data was applied in the whole research process. The data gathered was only used for this research and no name of the participants was mentioned in the research paper.

## **RESULTS**

A comparison between the coding sheets score of the students' Pre-CLIL Expository essay and Post-CLIL expository essay was done to determine the development of each selected student in terms of writing their expository essay.

Table 1

*Pre-CLIL and post-CLIL coding sheet of Participant 1*

CONTENT PROBLEMS IN WRITING	PRE CLIL	POST CLIL
Poorly Written Introduction	2	1
1. Failure to hook the reader's interest.		/
2. Failure to briefly introduce the topic.	/	
3. Failure to provide a strong and complete thesis statement.	/	
Insufficient Accurate Information in the Body	3	1
4. Failure to present enough topic sentences in the body.	/	
5. Failure to supplement additional information to support the topic sentences.		
6. Failure to give examples supporting the topic sentences.	/	
7. Failure to use appropriate transitional devices in the body.	/	/
Ineffective Conclusion	2	1
8. Failure to summarize the topic under discussion.	/	/
9. Presentation of new information or evidences.	/	
10. Failure to reinforce the points in the introduction and body.		
TOTAL ERRORS:	7	3

Participant 1 had a total of 7 errors in his Pre-CLIL expository essay which was reduced to three (3) errors in his Post-CLIL Expository Essay. His development was evident in terms of 4 major errors that he committed in his Pre-CLIL essay but were not present in his Post-CLIL essay. He was able to briefly introduce the topic and provide a complete thesis statement in his introduction. Moreover, he was also able to present enough sentences, supply additional information and give examples to



support the topic sentences in his essay's body. In terms of his conclusion, the presentation of new information or evidence was not present.

Table 2

*Pre-CLIL and post-CLIL coding sheet of Participant 2*

CONTENT PROBLEMS IN WRITING	PRE CLIL	POST CLIL
Poorly Written Introduction	3	0
1. Failure to hook the reader's interest.	/	
2. Failure to briefly introduce the topic.	/	
3. Failure to provide a strong and complete thesis statement.	/	
Insufficient Accurate Information in the Body	4	0
4. Failure to present enough topic sentences in the body.	/	
CONTENT PROBLEMS IN WRITING	PRE CLIL	POST CLIL
5. Failure to supplement additional information to support the topic sentences.	/	
6. Failure to give examples supporting the topic sentences.	/	
7. Failure to use appropriate transitional devices in the body.	/	
Ineffective Conclusion	3	3
8. Failure to summarize the topic under discussion.	/	/
9. Presentation of new information or evidences.	/	/
10. Failure to reinforce the points in the introduction and body.	/	/
TOTAL ERRORS:	10	3

Participant 2 had a total of ten (10) errors in her Pre-CLIL expository essay, which was reduced to three (3) in her Post-CLIL expository essay. Her development was noticeable because of the big difference in the mistakes made. She was able to hook the reader's interest, show a brief explanation of the topic, and provide a concrete thesis statement in her expository essay's introduction. In the body, there was a development because she was able to correct the mistakes she had done in her Pre-CLIL expository essay. She was able to present different topic sentences, which were supported with additional information and concrete examples, along with the presence of different transitional devices. In the conclusion part, there was no development as she made the same mistakes she had in her Pre-CLIL expository essay.

Table 3

*Pre-CLIL and post-CLIL coding sheet of Participant 3*

CONTENT PROBLEMS IN WRITING	PRE CLIL	POST CLIL
Poorly Written Introduction	3	0
1. Failure to hook the reader's interest.	/	
2. Failure to briefly introduce the topic.	/	
3. Failure to provide a strong and complete thesis statement.	/	
Insufficient Accurate Information in the Body	3	1
4. Failure to present enough topic sentences in the body.		
5. Failure to supplement additional information to support the topic sentences.	/	
6. Failure to give examples supporting the topic sentences.	/	
7. Failure to use appropriate transitional devices in the body.	/	/
Ineffective Conclusion	1	0
8. Failure to summarize the topic under discussion.		
9. Presentation of new information or evidences.	/	
10. Failure to reinforce the points in the introduction and body.		
TOTAL ERRORS:	7	1

Participant 3 had a total of 7 errors in her Pre-CLIL expository essay, which was reduced to 1 after her Post-CLIL expository essay. The development in her composition was evident because she was able to provide the necessary information in her Post-CLIL expository essay. There was a big difference in the introduction part of her essay as she was able to hook the reader's interest, briefly introduce the topic, and provide

a complete thesis statement. In terms of the body, she was able to present enough topic sentences, which were also supported with additional information and examples. Although she had a mistake in providing new information and evidence in the conclusion part of her expository essay, she was able to summarize her paper and successfully reinforce the points she presented in the introduction and body.

Table 4

*Pre-CLIL and post-CLIL coding sheet of Participant 4*

CONTENT PROBLEMS IN WRITING	PRE CLIL	POST CLIL
Poorly Written Introduction	3	0
1. Failure to hook the reader's interest.	/	
2. Failure to briefly introduce the topic.	/	
3. Failure to provide a strong and complete thesis statement.	/	
Insufficient Accurate Information in the Body	3	1
4. Failure to present enough topic sentences in the body.		
5. Failure to supplement additional information to support the topic sentences.	/	
6. Failure to give examples supporting the topic sentences.	/	
7. Failure to use appropriate transitional devices in the body.	/	/
Ineffective Conclusion	1	0
8. Failure to summarize the topic under discussion.		
9. Presentation of new information or evidences.	/	
10. Failure to reinforce the points in the introduction and body.		
TOTAL ERRORS:	7	1

Participant 4 made a total of 7 errors in her initial expository essay, which significantly decreased to only 1 error in her Post-CLIL expository essay. She demonstrated clear improvement by briefly introducing her topic and providing a strong and complete thesis statement. Notably, her progress was particularly evident in the body and conclusion sections of the essay. In the body, Participant D successfully eliminated all the major errors she committed by including ample supplementary information to support her topic sentence, incorporating relevant examples, and appropriately using transitional words. Lastly, her conclusion effectively summarized the main points discussed in the essay's body and reinforced her arguments.

Table 5

*Pre-CLIL and post-CLIL coding sheet of Participant 5*

CONTENT PROBLEMS IN WRITING	PRE CLIL	POST CLIL
Poorly Written Introduction	2	0
1. Failure to hook the reader's interest.	/	
2. Failure to briefly introduce the topic.		
3. Failure to provide a strong and complete thesis statement.	/	
Insufficient Accurate Information in the Body	4	0
4. Failure to present enough topic sentences in the body.	/	
5. Failure to supplement additional information to support the topic sentences.	/	
6. Failure to give examples supporting the topic sentences.	/	
7. Failure to use appropriate transitional devices in the body.	/	
Ineffective Conclusion	3	3
8. Failure to summarize the topic under discussion.	/	/
9. Presentation of new information or evidences.	/	/
10. Failure to reinforce the points in the introduction and body.	/	/
TOTAL ERRORS:	9	3

Participant 5 committed a total of 9 errors which was lowered to 3 in his Post-CLIL Expository Essay. Particularly, Participant E corrected 6 major errors in his Pre-CLIL essay. In his Post-CLIL essay, he was able to hook the reader's interest and provide a complete thesis statement in his introduction. Furthermore, in the body of his expository essay, he was able to present enough sentences, supply additional information, give

relevant examples to support the topic sentence and use transitional words appropriately.

Furthermore, specific statements from the transcriptions of the participants were chosen to determine the experiences of students in the utilization of Content and Language Integrated Learning approach. These statements were clustered and analyzed with Thematic Analysis, which included Textual and Structural Analysis.

Table 6

*Textural and structural themes for the experiences of students in the utilization of Content and Language Integrated Learning approach*

Themes	Example Quotes
Textural Themes <sup>a</sup>	
Describing the Topic based on their Learnings in Science	<p>“since it was in Science class, I took inspiration from that” (Participant 5)</p> <p>“naglagay po ako ng meaning ng eclipse po sa Science” I included the meaning of eclipse based from our Science lectures (Participant 2)</p> <p>“nagbase den po ako sa book ng Science about eclipse” I based in our Science book about eclipse (Participant 2)</p>
Providing Information from their Science Book	<p>“naghanap den po ako sa book tas yung nahanap ko po doon ay yung mga types of solar eclipse and lunar eclipse tsaka po yung cause and</p>

effect” I searched in  
our book and then  
the information I  
found focused on the  
types on solar eclipse  
and lunar eclipse,  
and its cause and  
effect (Participant 3)

“yung about po sa solar  
eclipse natutunan ko  
lang den po sa  
Science” I learned  
the information about  
solar eclipse in our  
Science class  
(Participant2)

“marami po yung mga sagot  
ko from book about  
sa solar eclipses”  
many of my answers  
about solar eclipses  
are from our book  
(Participant 4)

Structural Themes <sup>b</sup>  
Acquiring Prior Knowledge  
about the Topic

“yung mga di ko lang po  
naintindihan sa  
Science book  
sinearch ko po” I only  
searched about the  
information in our  
book that were  
confusing to me  
(Participant 4)

“yung naintindihan ko sa  
Science, nagsearch  
po



Table 6 (*continued*)

Themes	Example Quotes
Learning both English and Science in One Activity	ako para mapalawak po yun" I did a further research to the information I learned in our Science lesson to widen my knowledge about it (Participant 3)
	"there was a basis and we didn't have to search much because I really have the information and presentation in Science" (Participant 1)
	"hindi na naming kailangang magsearch nang magsearch" it was not necessary for us to search more (Participant 2)
	"it was perfect timing since we are studying about the topic" (Participant 5)
	"when you study one thing, it's like you are studying another thing at the same time" (Participant 1)
	"when you are studying about science, it feels like you are studying another one" (Participant 5)

The researchers identified two textural themes and two structural themes from the in vivo statements of the participants during the focused group discussion. The two textural themes are Describing their Topic based on their Learnings in Science and Providing Information from their Science book. In addition, the two structural themes are Acquiring Prior Knowledge about the Topic and Learning both English and Science in One. These themes explain and confirm that students were able to supply enough information in their expository essays through the help of their learnings in their Science class.

## **DISCUSSION**

The data analyzed through the Pre-CLIL and Post-CLIL coding sheets of the participants was able to answer the question *how did the Content and Language Integrated Learning (CLIL) approach develop students' skills in writing an expository essay?* The participants in the study displayed varying levels of development in their expository essays following the implementation of Content and Language Integrated Learning (CLIL). Participant 1 effectively reduced his errors from 7 to 3 and addressed 4 major errors present in his Pre-CLIL version. Similarly, Participant 2 demonstrated noticeable improvement by reducing her errors from 10 to 3. Additionally, Participant 3 exhibited evident development by decreasing her errors from 7 to 1 and showing improvement across the introduction, body, and conclusion sections. Furthermore, Participant 4 made notable progress by reducing her errors from 7 in the Pre-CLIL expository essay to just only 1 in her Post-CLIL expository essay. Finally, Participant 5 successfully lowered his errors from 9 to 3, correcting 6 major errors he had committed in his Pre-CLIL expository essay.

Furthermore, the textural and structural themes were examined to answer the question *What are the experiences of students in the utilization of Content and Language Integrated Learning approach?*

### ***Theme #1: Describing the Topic based on their Learnings in Science***

In writing an essay, one of the ways to introduce the topic is to describe or give a description about it. During the interview, the participants were asked about their experiences in writing an introduction. Some of the participant's answers are:

"since it was in Science class, I took inspiration from that."

"naglagay po ako ng meaning ng eclipse po sa Science."

*English Translation:* "I included the meaning of eclipse based from our Science lectures."

"nagbase den po ako sa book ng Science about eclipse"

*English Translation:* "I based in our Science book about eclipse"

The introduction part of an essay is crucial. According to Ghenaïet (2022), an introduction provides the readers a brief overview about the topic. The students were able to effectively introduce the topic of their essays through using their learnings in their Science class about Eclipses. In line with the way the students introduced the topic in the essay, Setyowati (2018) also found out that most students use general background information about a certain topic in writing the introduction of their expository essay.

### ***Theme #2: Providing Information from their Science Book***

Books often provide comprehensive and in-depth information about a particular topic. It can also serve as valuable resources for gathering detailed knowledge and facts that support an expository essay's body. During the interview, students were asked to share about their experiences in writing the body of their

expository essay. Here are some of the verbatim of the participants:

“naghanap den po ako sa book tas yung nahanap ko po doon ay yung mga types of solar eclipse and lunar eclipse tsaka po yung cause and effect”

*English Translation:* “I searched in our book and then the information I found focused on the types on solar eclipse and lunar eclipse, and its cause and effect.”

“yung about po sa solar eclipse natutunan ko lang den po sa Science”

*English Translation:* “I learned the information about solar eclipse in our Science class”

“marami po yung mga sagot ko from book about sa solar eclipses”

*English Translation:* “many of my answers about solar eclipses are from our book”

These highlighted the significant contribution of their Science book in writing their expository essay. Experts recommend various activities to enhance the students' development of informative text writing skills and one of them is utilizing suitable resources like books (Cifci & Sasmaz, 2023).

### ***Theme #3: Acquiring Prior Knowledge about the Topic***

In writing an expository essay, a writer does not only acquire information from the Internet or their teachers alone, but they can also acquire with the help of their prior knowledge. During the interview, the participants were asked to share how they acquired their prior knowledge about the topic. Some of the verbatim of the participants are as follows:

“yung mga di ko lang po naintindihan sa Science book sinearch ko po”

*English Translation:* “I only searched about the information in our book that were confusing to me”

“yung naintindihan ko sa Science, nagsearch po ako para mapalawak po yun.”

*English Translation:* “I did a further research to the information I learned in our Science lesson to widen my knowledge about it”

“hindi na naming kailangang magsearch nang magsearch”

*English Translation:* “it was not necessary for us to search more”

“there was a basis and we didn’t have to search much because I really have the information and presentation in Science.”

Building prior knowledge and activating it has a pivotal role in enhancing and enriching the students’ academic writing. Harvey (2021) stated that prior knowledge has a pivotal role in writing, because students who know limited amount of information assigned to them have a difficulty writing about the topic.

#### ***Theme #4: Learning both English and Science in One Activity***

Integration across the curriculum helps students to learn a certain subject matter by also learning another subject matter at the same time. Participants were asked about their overall experience in writing an expository essay about Eclipses. Some of the verbatim of the participants are:

“it was perfect timing since we are studying about the topic”

“when you study one thing, it’s like you are studying another thing at the same time”

“when you are studying about science, it feels like you are studying another one”

Students were able to learn how to properly write an expository essay as well as dig deeper in the Science lesson about eclipses. This supports the findings of Deswila et al. (2020) in their study that the integration of language learning across the curriculum is an effective strategy to develop both students use and learning of the English language.

## **Conclusion**

The findings presented the development of students' writing skills as well as their experiences upon the implementation of Content and Language Integrated Learning (CLIL) approach. First, a decrease from the students' post-CLIL expository essays errors was observed comparing to their pre-CLIL expository essays errors. Students' development focused on the errors they were able to avoid in writing their post-CLIL expository essays. Majority of the students were able to write their expository essays according to the standard rules of writing such as providing a complete and interesting introduction; supplying accurate information in the body with the use of transitions; and effectively summarizing all the details presented through the essay's conclusion. Moreover, the students were able to write efficiently with the help of their discussion in their Science lesson. Students acquired prior knowledge about the essays' topic in their science class resulting to them getting information from their Science lesson. This information was used both for their expository essay's introduction, body and conclusion. The students reiterated that they felt like they were studying and learning both Science and English in one activity.

## **Recommendations**

In order to further develop the students' writing skills in English language teaching, the researchers encourage English High School Teachers to utilize the Content and Language

Integrated Learning (CLIL) approach in terms of teaching the students about writing. Teachers may integrate different lesson in the students' other subjects in accordance to the curriculum. The integration is advised to happen both in the writing discussion and activity of the students. In addition, future researchers are encouraged to conduct further studies centralized on other possible interventions that will help students in terms of developing their skill in writing an expository essay.

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# COVID-19 Vaccine Literacy on Persons with Comorbidities in Bacoar, Cavite: A Quantitative Study

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## KEYWORDS:

- Pharmacy
- Health literacy
- Immunization
- Infodemic
- Global Health

**Abstract.** Vaccine literacy is an individual's capacity to acquire, process, and comprehend basic health information and services to make proper health decisions. The study examined the understanding and knowledge of COVID-19 vaccines among individuals with comorbidities in Bacoar, Cavite. The researchers used a questionnaire to collect data on participants' demographics, vaccine literacy skills, opinions about vaccination, and attitudes toward COVID-19

vaccines. The survey was conducted between April and May 2022, with 100 participants participating online and in person. The results showed that participants' educational level significantly impacted their vaccine literacy. Those with higher education demonstrated better functional skills and interactive/critical skills and had more positive opinions about vaccination and COVID-19 vaccines. The presence of comorbidities was found to be associated with lower levels of interactive/critical skills. Additionally, as age increased, participants had lower functional skills and less favorable opinions about vaccination. Furthermore, the study found that sex and employment status were only significantly related to attitudes toward COVID-19 and current vaccine attitudes. Their socio-demographic characteristics influenced Participants' vaccine literacy, particularly their educational attainment. Comorbidities were associated with lower interactive/critical skills and attitudes toward COVID-19 vaccines. Age affected functional skills and opinions about vaccination. Lastly, sex and employment status impacted attitudes toward COVID-19 vaccines.

## **COVID-19 Vaccine Literacy on Persons with Comorbidities in Bacoor, Cavite: A Quantitative Study**

### **INTRODUCTION**

In 2019, the World Health Organization identified vaccine hesitancy as one of the ten threats to global health in 2019. This refers to the unwillingness or refusal to vaccinate despite the availability of vaccines, which threatens progress in combating vaccine-preventable illnesses. Health literacy is critical in achieving positive health outcomes, and the United Nations has emphasized the importance of creating suitable action plans to promote health literacy. Persons with comorbidities are in the A3 category of priority groups for the COVID-19 vaccine, and the Department of Health (DOH) has been working to increase vaccination coverage and promote a life-course approach to vaccination.

The Essential Programme on Immunization (EPI) and the WHO have established programs to address vaccine hesitancy, such as the Essential Programme on Immunization and evidence-based and behaviorally informed strategies. However, only a few studies have been conducted on vaccine literacy in the Philippines, and none have been specifically for persons with comorbidities. Low HL leads to increased COVID-19 vaccine hesitancy, as low HL leads to uncertainty and refusal to get vaccinated.

The study addresses the gaps by evaluating vaccine literacy, functional and critical skills, attitudes, and opinions about the COVID-19 vaccine among persons with comorbidities in Bacoor, Cavite. The study aims to determine the relationship between the vaccine literacy level and the participants' demographic characteristics.

## **METHODOLOGY**

This research employed a quantitative approach called descriptive-correlational design. The descriptive design aimed to describe a sample of people or variables without manipulating them, while the correlational design focused on exploring the relationship between two variables. The researchers selected Bacoor, Cavite, as the research location due to its feasibility and the high number of recorded COVID-19 cases in the area during the pandemic.

The study included individuals aged 18 to 59 with controlled comorbidities residing in Bacoor, Cavite. The inclusion criteria specified that participants should not have any symptoms, stable vital signs, recent attacks or admissions, changes in medication, or current hospitalization. The exclusion criteria excluded individuals who fell into the A1 category (frontline workers in health facilities) or A2 category (senior citizens) of the COVID-19 Vaccination Program.

Quota sampling was used to select 100 participants who represented the entire community. The researchers utilized various methods, such as online postings on Facebook, direct messaging, and in- person searching in Bacoor, to find qualified participants. The participants were given printed copies or online forms of the modified questionnaires and an informed consent form.

The main questionnaire consisted of six sections: the socio-demographic profile, vaccine literacy functional skills, vaccine literacy interactive/critical skills, opinions, COVID-19 vaccine attitude, and attitudes about other vaccines. The socio-demographic profile collected information on age, sex, highest educational attainment, employment status, and comorbidities. Likert scales assessed vaccine literacy skills and opinions, while nominal questions assessed attitudes toward COVID-19 and other vaccines.

To ensure the quality of the research, a pilot study was conducted to test the reliability of the questionnaire. Cronbach's Alpha, a measure of internal consistency, was used to determine reliability. The overall result showed that the survey was strong and consistent.

The data analysis included the sociodemographic profile's proportion, frequency, and percentage distribution tables. Pearson's Correlation Coefficient was used to assess the relationship between vaccine literacy skills and opinions, while the Chi-square Test was used to analyze attitudes toward

## COVID-19

vaccination and other vaccines. Weighted mean tables and percentage tables were used to present the results.

### ***Ethical Consideration***

The research study underwent ethical evaluation and approval from Institutional Ethics Review Board with a clearance number of 2022-01-025.

Once the approval for the study implementation was available, the researcher commenced the recruitment of research subjects. The respondents' participation in this study was entirely voluntary, and failure to volunteer did not result in any penalty or loss of benefit. Furthermore, the respondents could withdraw from the study at any time. During the implementation of the study, there were no risks involved in the study for the participating respondents. The researchers were to assume responsibilities and liabilities for any breach of confidentiality during the research.

To ensure the confidentiality of the information gathered, only the researchers, research adviser, and statistician had access to the collected data. All information stored within the drive obtained from the study was to be considered confidential and used for research purposes only. The identity of the research subjects was kept confidential, as the Data Privacy Act of 2012 allows, by assigning numbers to each research subject to anonymize the individuals. The data was secured in an encrypted file in the researchers' drive. All encrypted and unencrypted data were to be deleted after the hard-bound form of the research output was submitted and published in the library.

## RESULTS

Table 1  
*Frequency and Percentage Distribution According to their Comorbidity*

Comorbidity	Frequency	Percentage
Chronic Respiratory Disease	29	18.13%
Cardiovascular Disease	33	20.63%
Neurologic Disease	5	3.13%
Chronic Respiratory Tract Infection	4	2.50%
Chronic Kidney Disease	10	6.25%
Immunodeficiency State	5	3.13%
Cerebrovascular Disease	3	1.88%
Obesity	12	7.50%
Malignancy	3	1.88%
Chronic Liver Disease	2	1.25%
Diabetes	12	7.50%
Others	42	26.25%
<b>Total</b>	<b>160</b>	<b>100.00%</b>

Among the respondents, 29 individuals (18.13%) have chronic respiratory disease, 33 (20.63%) have cardiovascular disease, and 5 (3.13%) have neurologic disease. The lowest number of respondents is 2 (1.25%) with chronic liver disease.

**Table 2**  
*Weighted Mean of Vaccine Literacy Functional Skill*

Functional Skill	Weighted Mean	Interpretation
1. I don't encounter unfamiliar words.	2.60	Slightly High Vaccine Literacy Level
2. I find that the texts were not difficult to understand.	2.87	Slightly High Vaccine Literacy Level
3. I don't need a lot of time to understand them.	2.81	Slightly High Vaccine Literacy Level
4. I don't need someone to help you understand them.	2.93	Slightly High Vaccine Literacy Level
<b>General Assessment</b>	<b>2.80</b>	<b>Slightly High Vaccine Literacy Level</b>

The table shows the weighted mean of vaccine literacy functional skill. The first statement has a mean of 2.60, the second statement has a mean of 2.87, the third statement has a mean of 2.81, and the last statement has a mean of 2.93. Overall, the general assessment is 2.80, indicating a slightly high level of vaccine literacy.

Table 3  
*Weighted Mean of Vaccine Literacy Interactive/Critical Skill*

Interactive/Critical Skill	Weighted Mean	Interpretation
1. I have consulted more than one source of Information.	2.71	Slightly High Vaccine Literacy Level
2. I found the information I was looking for (e.g. Internet, TV, Radio, Bulletin, Flyer, etc.).	3.27	High Vaccine Literacy Level
3. I have had the opportunity to use the information	3.08	Slightly High Vaccine Literacy Level
4. I discussed what I understood about vaccinations with other people.	3.00	Slightly High Vaccine Literacy Level
5. I considered whether the information collected was about my condition.	3.11	Slightly High Vaccine Literacy Level
6. I have considered the credibility of the sources.	3.18	Slightly High Vaccine Literacy Level
7. I checked whether the information was correct.	3.40	High Vaccine Literacy Level
8. I found some useful information to make a decision on whether or not to get vaccinated.	3.29	High Vaccine Literacy Level
<b>General Assessment</b>	<b>3.13</b>	<b>Slightly High Vaccine Literacy Level</b>

The table displays the weighted mean of vaccine literacy interactive/critical skill. The first statement has a mean of 2.71, the second statement has a mean of 3.27, and the lowest statement has a mean of 3.00. Overall, the general assessment is 3.13, indicating a slightly high level of vaccine literacy regarding interactive/critical skills.



Table 4  
*Weighted Mean of Opinions about Vaccination*

Opinions about Vaccination	Weighted Mean	Interpretation
1. 'I am favorable to vaccines because they are safe.'	3.37	High Vaccine Literacy Level
2. 'We need to get vaccinated because our natural immunity cannot fight the virus on its own.'	3.41	High Vaccine Literacy Level
<b>General Assessment</b>	<b>3.39</b>	<b>High Vaccine Literacy Level</b>

This table illustrates the weighted mean of opinions about vaccination. The first statement has a mean of 3.37, and the second statement has a mean of 3.41. Overall, the general assessment is 3.39, indicating a high level of vaccine literacy in terms of opinions about vaccination.

Table 5  
*COVID-19 Vaccine Attitude*

	YES	NO
1. Do you think the vaccines developed so far are safe?	86%	14%
2. Do you think they are efficacious?	88%	12%
3. Do you think they overlap, regardless of the production technique used?	49%	51%
4. Do you intend to get vaccinated against COVID-19?	87%	11%
5. If you could, would you choose which vaccine to take?	67%	33%
6. Would you pay a fee to be vaccinated?	27%	73%
7. Should vaccination against COVID-19 be made mandatory for everyone?	52%	48%
8. Should vaccination against COVID-19 be made compulsory for the most at-risk groups?	39%	61%
9. Do you think children should be vaccinated too?	61%	39%

This table shows that 86% of participants believe COVID-19 vaccines are safe and effective. 51% believe vaccine characteristics do not overlap, and 87% are willing to get vaccinated. 67% would choose a vaccine, but 73% wouldn't pay for it. 52% support mandatory vaccination for everyone, while 61% believe it should not be compulsory for at-risk groups.

Table 6  
*Current Vaccine Attitude*

Current Vaccine Attitude	YES	NO
1. Have you been vaccinated against seasonal flu?	29%	71%
2. Did you want to be vaccinated against the flu, but you couldn't?	53%	47%
3. Have you been recently vaccinated and/or do you intend to be vaccinated soon against other infectious diseases, in addition to seasonal influenza and COVID-19?	63%	37%

The table shows that 71% of participants are not vaccinated against seasonal flu, 53% have not received other vaccines, and 63% plan to get vaccinated against seasonal influenza and COVID-19.

Table 7

*Correlation between sociodemographic characteristics and Level of Vaccine Literacy Functional Skill, Interactive/Critical Skill, and Opinions about Vaccination*

Variables	p-level	Interpretation
<b>Age</b>		
Functional Skills	-.232*	Significant negative relationship
Opinions about Vaccination	-.202*	Significant negative relationship
<b>Highest Educational Attainment</b>		
Functional Skills	.269**	Significant positive relationship
Interactive/ Critical Skills	.359**	Significant positive relationship
Opinions about Vaccination	.258**	Significant positive relationship
<b>Comorbidity</b>		
Interactive/ Critical Skills	-.203*	Significant negative relationship

Note: \* =  $p < 0.05$

\*\* =  $p < 0.01$   
relationship

n.s = no significant

The correlation between demographic factors and the level of vaccine literacy was examined. The analysis using Pearson's correlation coefficient revealed the following findings:

1. Age: There was a significant negative relationship between age and vaccine literacy, including functional skills and vaccination opinions. This implies that as individuals age, their vaccine literacy, functional skills, and opinions about vaccination

tend to decrease.

2. Highest educational attainment: There was a significant positive relationship between the highest educational attainment and vaccine literacy, including functional skills, interactive/critical skills, and opinions about vaccination. This indicates that as individuals achieve higher levels of education, their vaccine literacy, functional skills, interactive/critical skills, and opinions about vaccination tend to increase.

3. Comorbidity: Comorbidity and vaccine literacy interactive/critical skills had a significant negative correlation. This means that vaccine literacy interactive/critical skills tend to decrease as comorbidities increase.

Understanding these correlations can help develop targeted interventions to improve vaccine literacy among different demographic groups.

## **DISCUSSION**

This study assessed COVID-19 vaccine literacy among persons with comorbidities in Bacoar, Cavite. One hundred respondents were interviewed from April to May 2022, with the majority aged between 24 and 35. The majority of respondents are female, with 76.2% of them being female. Women are more likely to view the COVID-19 pandemic as a severe health problem. Over half of the respondents are high school graduates, with 26.9% of those with lower secondary education not continuing their education. The majority of respondents are non-government employees, with 62.5% of them being employed.

Vaccine literacy is essential for making informed health decisions based on vaccine information. Functional skills, such as functioning well in real-life situations with proficient reading abilities, are crucial for health literacy. The study found that most respondents have a slightly high vaccine literacy level, with a general weighted mean of 2.80. However, almost half of the respondents have encountered unfamiliar words when reading

information about COVID-19 Vaccine Literacy.

A second online survey in Italy found an increase in the ability of respondents to comprehend COVID-19 information, with a higher functional skills score in their second survey in January 2021 compared to their first survey in June 2020. This suggests that the infodemic contributed to an increase in the ability of respondents to comprehend COVID-19 information.

In Vaccine Literacy Interactive/Critical Skill, all eight questions garnered a total weighted mean of 3.13, interpreting a slightly high vaccine literacy level. Three questions about finding available information, checking the correctness of the information, and finding some helpful information to decide whether or not to get vaccinated were the highest weighted mean among the rest (weighted mean of 3.27, 3.40, and 3.29, respectively). The result shows that most of the respondents have a slightly high ability to gather COVID-19 information and use it to interact with society and apply it to situations requiring problem-solving skills. Promotion of the COVID-19 vaccine in the Philippines and abroad has been prominently done in almost all forms of media to reach the public in the best way possible. Notably, the DOH has been putting efforts into raising vaccine awareness through a continuous campaign to reassure the public about vaccine safety and coordination with healthcare professionals in leading the promotion of vaccines (DOH, 2021).

Pharmacists also play an essential role in the fight against COVID-19. When the COVID-19 vaccine was released, they gave patients education and counseling via online consultation (La Gatta & Ghidinelli, 2021). These positive results highlight the need to maintain and increase awareness of COVID-19 information. Scientific proof, clear and consistent communication, and other measures can combat the COVID-19 infodemic and increase health literacy among people who need information and those who provide it (Biasio et al., 2020).

On Opinions about Vaccination, the first statement got a weighted mean of 3.37, indicating that most respondents favor and perceive vaccines as safe. According to Biasio et al. (2021), one of the most critical findings in their study about Italian adults' likelihood of receiving the COVID-19 Vaccine was that most thoughts about vaccination were positive. The second statement garnered a weighted mean of 3.41, which shows that most of the opinions agree that there is a need to vaccinate, although natural

immunity exists. Respondents who believed in the protective nature of vaccines were less likely to report vaccine hesitancy and were nine times less likely to refuse vaccination for their children because of negative media exposure (Migriño et al., 2020). In addition, a study, "Knowledge and preventive actions toward COVID-19, vaccination intent, and health literacy among Educators in Japan: An online survey," stated that getting immunization right away was preferable to doing nothing (Fukuda et al., 2021).

The COVID-19 Vaccine Attitude survey found that 86% of respondents agreed that COVID-19 vaccines are safe and effective, with 87% willing to get vaccinated. Most respondents were willing to make the vaccine mandatory for everyone, with 61% believing that children should also be vaccinated. The vaccination rollout for the A3 category in the Philippines increased significantly in May 2021, with only around 12,000 complete doses administered and zero booster doses administered. However, 51% believed that the characteristics of different vaccines did not overlap, similar to a study in Italy.

Sixty-seven percent of respondents would choose a different vaccine, with 73% unwilling to pay. This suggests that most individuals prefer a free vaccine, which may push for more cost-free vaccines in the future. However, 61% disagreed with making the vaccine compulsory for the most at-risk groups, possibly due to limited studies on vaccination for people with comorbidities. The DOH requires the A3 group to provide a medical certificate before receiving the vaccine.

The Current Vaccines Attitude survey found that 71% of respondents still need to be vaccinated against seasonal flu, and 63% intend to get vaccinated in addition to flu and COVID-19. This is similar to a study in Italy where 38% had been vaccinated against the flu and 65% intended to be immunized. However, 53% of respondents did not receive other available vaccines. The study found a significant negative relationship between age and vaccine literacy, with functional skills and opinions declining as people age. Higher educational attainment is crucial for obtaining literacy, as widespread dissemination of information about COVID-19 vaccination requires complete comprehension and absorption.

The Correlation between Comorbidity and Level of

Vaccine Literacy Functional Skill, Interactive/Critical Skill, and Opinions about Vaccination reveals that comorbidity has a significant negative relationship with interactive/critical skills. This suggests that vaccination literacy interactive/critical skills decrease as the comorbidity increases. This indicates their inability to enhance their health and vaccination literacy by taking necessary steps, such as looking up information about the COVID-19 vaccine and basic knowledge about their diseases. In a study done in the United States, researchers observed that persons with comorbid diseases needed a fundamental understanding of COVID-19 and, despite their concerns, kept their routines and plans the same (Wolf et al., 2020). Nearly one in five individuals with severe comorbid conditions harbor COVID-19 hesitancy (Tsai et al., 2021).

Thus, a global public health effort is required to increase awareness about minimizing the burden of these comorbid conditions that cause fatalities in COVID-19-infected people (Sanyaolu et al., 2020).

The correlation between age and COVID-19 vaccine attitude is significant. Age is linked to statements about vaccine safety, efficacy, intention to vaccinate, freedom to choose vaccine brand, willingness to pay, vaccine compulsory for the most at-risk group, and child vaccination. Studies have shown that age and high awareness of the COVID-19 vaccine are linked to attitude, as reported in Ethiopia and New York. Additionally, a study in New York found that the perceived higher chance of infection is likely linked with increasing age. A study on COVID-19 vaccination perception and attitude among mothers found that most respondents viewed the COVID-19 vaccine positively. At the same time, those who were more favorable about self-vaccination were more likely to be optimistic about COVID-19 immunization for children.

For the Correlation between Highest Educational Attainment and COVID-19 vaccine attitude, the results show that there is a significant relationship between Highest Educational Attainment and questions about vaccine safety, vaccine efficacy, intention to vaccinate, freedom to choose which brand of vaccine to take, willingness to pay, vaccine compulsory for the most at-risk group, and child vaccination. According to the study, a high educational level and a high perception of the severity of COVID-19 among patients were observed to have less vaccine hesitancy



(Mejri et al., 2021).

The study found a significant relationship between employment status and COVID-19 vaccine attitude, with individuals with higher incomes having a more positive attitude toward the vaccine's effectiveness. Interventions to establish enabling conditions and support during the process may be helpful.

Comorbidity also played a role in vaccine attitudes, with individuals with chronic conditions having lower acceptance rates than healthy individuals. Age also played a role, with older individuals having more COVID-19 vaccine hesitancy than those aged 16-64. Sex also played a role in vaccine attitudes, with strong confidence in vaccine safety being linked to readiness to receive a COVID-19 vaccine. However, women and older participants were less likely to declare willingness to vaccinate than males and younger subjects (Danabal et al., 2021).

Highest educational attainment also played a role in vaccine attitudes, with people with skeptical attitudes toward vaccination being those with lower levels of education and those who had not had a flu vaccine in the previous year. Low vaccine effectiveness confidence was prevalent among low-income individuals, particularly laborers, in an Indian study (Paul et al., 2020).

Comorbidity also significantly impacted vaccine attitudes, with low influenza vaccine uptake rates among 503 participants in Saudi Arabia. Health education and initiatives aimed at disseminating vaccine facts can overcome the most prevalent hurdles identified by participants (Mohamed et al., 2021). Understanding these factors is crucial for ensuring a healthy and effective vaccination program (Barry et al., 2020).

## Conclusion

In conclusion, high COVID-19 vaccine literacy was observed among individuals with comorbidities in Bacoar, Cavite. Results showed that sociodemographic factors, such as age, educational attainment, and comorbidity, significantly influenced vaccine literacy.

## Recommendations

The study recommends strategies and interventions to improve vaccine literacy in Bacoar, Cavite, focusing on persons with comorbidities and promoting vaccination. The community should coordinate with the local government to increase vaccine compliance and accept the importance of COVID-19 vaccines.

Social Health Workers in every City Health Office of Bacoar must lead the work in improving public trust in vaccine uptake, especially among the elderly, persons with multiple comorbidities, and those with lower educational attainment. Future research should consider other groups and variables to understand the underlying issue better. Further investigation into the posed problem and comparing results from different studies is necessary.

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## Effects of Different Post-Curing Methods on the Flexural Strength of Direct Composite Resin Used As An Alternative to Laboratory Processed Indirect Restorations

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### KEYWORDS:

- Post-curing method
- Flexural strength
- Direct composite resin
- Indirect composite resin

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**Abstract.** This study was conducted to determine the flexural strength of direct composite resin after additional post-curing methods such as improvised light cure box, boiling water, autoclaving and using a convection oven. Given the need for direct composite resins to have better clinical properties additional post-curing methods are done to improve its wear resistance,

flexural strength, and hardness. Results showed that other post-curing methods like light cure box and convection oven, somewhat matched the strength of the untreated composite. Autoclaving results showed the least effect on the direct composites. The study concluded that the new method using a light cure box can be effective to improve the flexural strength of direct composite resins.

## **Effects of Different Post-Curing Methods on the Flexural Strength of Direct Composite Resin Used As An Alternative to Laboratory Processed Indirect Restorations**

### **INTRODUCTION**

Resin composites are used as restorative materials for anterior and posterior restoration due to its aesthetic value. Nowadays, people tend to have aesthetically made teeth rather than functional teeth.

There are great improvements needed in the mechanical properties of direct resin composites.

According to Esteves et.al 2018, reconstructing dental elements with a significant loss of dental structure continue to be a challenge in oral rehabilitation of the patient, because absence of much of the crown structure may contraindicate performing direct procedures. Therefore, there is a need to use restorative composite that can reconstruct such structures that are biocompatible and have satisfactory aesthetics and biomechanical properties, especially for use in areas under large masticatory forces like in the posterior tooth (Esteves, 2018)

Given the need for the DCR to have excellent clinical properties, some studies suggested additional post-curing thermal treatment such as autoclave, oven and boiling it in water, can improve its physical and mechanical properties. The post-curing process of direct composites may improve properties such as wear resistance, flexural strength, and hardness. (Vaishnavi, 2010).

Due to the lack of strength of Direct composite resins, it is best to test effective post-curing methods to improve the flexural strength of DCR as an alternative to Indirect Composite Resin (ICR).



### Objectives of the Study

General Objectives: To evaluate the influence of post curing treatment on the degree of flexural strength of direct composites.

Specific Objectives: (1) To determine the flexural strength of DCR when subjected to additional post-curing methods such as improvised light curing box, boiling water, autoclaving and convection oven, (2) To determine if there is a significant difference in the flexural strength of composites when subjected to improvised light curing box, boiling water, autoclaving and convection oven.

## METHODOLOGY

### Study Design

An experimental design was used to determine the effects of additional post curing treatment on direct composite restoration. Methods such as the use of improvised light curing box, boiling water, autoclaving and using a convection oven are used in additional post-curing of direct composite.

### Study Setting

The process of making the specimens was done at the dental laboratory facility of the School of Dental Medicine in Emilio Aguinaldo College-Cavite and the facility of University of the Philippines-Manila, a universal testing machine (AGS-10kNXD, Shimadzu, Japan) was used to determine the strength of the direct composite restorative material, after post-curing methods.

### Data Gathering Procedure

Data gathering and methodology is based on ISO 4049: Dentistry – Polymer based filling, restorative and luting materials. Data gathering was done at the facility of the University of the Philippines-Manila using a Universal Testing Machine to measure the flexural strength of treated composites (n=50).

The needed instruments and materials that have been used are the test specimen mold (metallic mold, 2mm x 2mm x 25mm in size) was procured at the University of the Philippines-Manila, digital caliper for measurement, light cure machine (AGS-10kNXD, Shimadzu, Japan), light cure meter machine (Vinmax, China) for determination of UV light wavelength, celluloid strip, microscope slide, two C-Clamps (small size), direct composite resin (Xs-FiL Nano-hybrid composite, Korea) and 320 grit abrasive paper for polishing of direct composite to comply with required dimensions. Electric stove (for boiling), Convection Oven (Sharp Convection-Electric Oven), thermometer, autoclave machine, materials needed for the improvised light-cure box: foil and box for additional post-curing treatment.

The first day of the experiment started with the fabrication of test specimens scheduled to start at 7:00 am. Preparation of materials and preliminary testing of light cure unit intensities are done at 6:00am using a light cure meter machine (Vinmax, China). Light cure unit A, B and C had intensities ranging from 960 to 990mW/cm<sup>2</sup>. Room temperature was maintained at around 22°C.

Test specimens are created using a 2mm x 2mm x 25mm metallic mold. On one side, a celluloid strip and a microscope glass slide cover the metallic mold. For easy removal of test specimens, a thin layer of separating medium is added to the inner surface of the mold. DCR is inserted into the mold using a Teflon-coated woodson and then covered with a celluloid strip and a microscope glass slide. The DCR is compressed into the mold with two c-clamps and was cured with light cure machines that were tested prior to curing. Each test specimen is cured per section, the tip of light cure unit A is placed on the center and light cure unit B and C, placed both on each end to achieve recommended exposure time (60 seconds). Pre-cured specimens are submerged in a beaker with 37°C distilled water bath for 15 minutes before polishing with a 320 grit sandpaper until the specimen size of 2mm x 2mm x 25mm is achieved. Fifty specimens were prepared and measured with a digital caliper.

Preparation of additional post-curing materials and equipment is done by one member of the group. Improvised light cure box was made of a black box, aluminum foil and masking tape. The inside of the box was covered with 2 layers of aluminum foil and taped from inside to outside. A hole was made to fit the light curing machine tip.

Test specimens are divided into five groups, each with ten specimens before additional post-curing method is done. Group 1 Untreated Composite was directly submerged in a beaker with 37°C distilled water for  $\pm$  24 hours before the flexural strength test and was done at 9:00am. Group 2 Improvised Light Curing Box, 10 specimen pre-cured composite blocks were placed into the Improve Light Curing Box and post-cured for 3 minutes. Group 3 Boiling water, ten pre-cured composite blocks were soaked into 99°C water for ten minutes. Group 4 Autoclave group, ten pieces of pre-cured composite blocks were placed into a small sterilization box and were placed inside the autoclave machine and ran for 30 minutes at 15 PSI. The last group, Group 5 is post cured with a convection oven, 10 specimens are placed inside a pre-heated 150°C oven for 10 minutes. After post-curing, specimens were submerged in a beaker with 37°C distilled water for  $\pm$  24 hours before the flexural strength test.

The second day of the experiment began at 9:00 a.m. with flexural strength testing. In preparation for a 3-point bending test, test specimens were dried. A universal testing machine (AGS-10kNXD, Shimadzu, Japan) was used to test for flexural strength using a 3-point bending test where each block was loaded until fracture. The results were recorded and analyzed using the computer that was attached to the machine. Prior to use, the apparatus was calibrated to provide a constant cross head speed of 1 mm/min. The apparatus consists essentially of two rods (2mm in diameter), mounted parallel with 20mm between centers, and a third rod (2mm in diameter) centered between, and parallel to, the

other two, so that the three rods in combination can be used to give a three-point loading to the specimen.

#### **Statistical Treatment of Data**

The one-way ANOVA or Analysis of Variance, was used in this study in analyzing the differences among group means. It is used to compare whether the flexural strength of composite resin from standard light curing increases by doing additional post curing methods such as boiling of water, autoclaving, oven and light curing box. ANOVA was also used to determine whether the study is considered a null hypothesis or alternative hypothesis.

#### ***Ethical Consideration***

The researchers have no affiliation with any company and brands used in this research. This is in partial fulfillment of the Degree of Doctor of Dental Medicine.

## RESULTS

Table 1. Summary result of significant difference in the flexural strength between the Untreated Group, Improvised Light Cure Box Group, Boiling Water Group, Autoclave Group and Convection Oven Group.

	<i>Specimen</i>	<i>Min. Flexural Strength (MPa)</i>	<i>Max. Flexural Strength (MPa)</i>	<i>Mean Average Flexural Strength (MPa)</i>
<i>1 Untreated</i>	10	89.17	204.88	157.78
<i>2 Improvised Light Cure Box</i>	10	80.97	201.99	140.70
<i>3 Boiling Water</i>	10	35.99	176.21	116.49
<i>4 Autoclave</i>	10	31.91	126.97	89.91
<i>5 Convection Oven</i>	10	93.90	185.78	139.17

The study was conducted to determine whether there is a significant difference in flexural strength of uncontrolled composite, improvised light cure box, boiling water, autoclave and convection oven specimens.

The untreated composite group used in this study shows the mean average flexural strength of 157.78 MPa and has the highest value among the groups, followed by a group of composite subjected to improvised light cure box with a flexural strength of

140.70 MPa, followed by composite subjected to convection oven with a flexural strength of 139.17 MPa, followed by composite subjected to boiling water with a flexural strength of 116.49 MPa and the least value was the group of composite subjected to autoclave with a flexural strength of 89.91 MPa.

The ISO 4049 standard with minimum flexural strength for polymer-based filling and restorative materials is at 80 MPa. All groups have mean averages above the minimum standard of flexural strength.

## **DISCUSSION**

This study was conducted to determine the flexural strength of direct composite restorative material after the additional post-curing treatment such as boiling in water, autoclaving, using a convection oven and improvised light cured box. This was done to provide a basis for the possibility of generating alternative methods in increasing the strength of composites, for it to be long lasting. The preparation of specimens, all the direct resin composites used were measured to make sure that all the specimens have the same size, using a digital caliper.

The mean flexural strength of the composite subjected to improvised light cure box is at 140.70 MPa, the composite subjected in boiling water is 116.49 MPa, composite subjected to autoclaving is 89.9095MPa, and composite subjected to convection oven is 139.17 MPa. However, the control group has the highest flexural strength of 157.78 MPa. Analysis of the data shows that the average means of composite subjected to improvised light cure box and convection oven were insignificant. In contrast, the mean averages of composites subjected to boiling water and autoclave significantly decreased its flexural strength.

The data gathered shows that there is no significant difference in the flexural strength of untreated composite when compared to the samples subjected to improvised light cure box and the samples subjected to the convection oven. In boiling water and autoclave, it shows that there is a significant difference in the flexural strength of untreated composite against the composite

subjected to boiling water, and the composite subjected to autoclave, wherein there is a significant decrease in flexural strength using those methods.

The primary disadvantage of composite resin is that it has potential for gap formation and it is more technique sensitive because the operating site must be appropriately isolated, and the placement of adhesive on the tooth structure (enamel and dentin) demands proper technique (Ritter, et al., 2019). Exposing it to moisture will affect its flexural strength, and by absorbing a high quantity of water, it will result in dramatically decreasing its strength, it is the main reason why the post-curing methods that involve moisture have significantly decreased flexural strengths.

The present study contradicts the previous literature (Poskus, 2009) because the results showed that autoclaving has the least mean average among all the groups tested.

## **Conclusion**

Based on the results, the untreated composite has higher flexural strength than other groups with additional post-curing treatment.

## **Recommendations**

Based on the study's findings, the following recommendations are made: additional research is needed to examine more methods for increasing the flexural strength of direct resin composites, other methods, proper techniques, and materials should be used, and the new ISO 4049 (2019) guidelines should be strictly followed for better results.

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# **In Vitro Activity of Biologically Synthesized Silver Nanoparticles by *Escherichia coli* Against Multidrug Resistant Biofilm Consortium Isolated from Sewage**

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## **KEYWORDS:**

- **Wastewater Coliform**
- **Most Probable Number (MPN)**
- **Scanning Electron Microscopy (SEM)**
- **Microtiter Plate ELISA Reader**

**Abstract.** Knowing the presence of numerous pathogens in sewage and their ability to form biofilms, it is a concern to preserve water quality. Therefore, the present study was designed to compare the in vitro activity of biologically synthesized silver nanoparticles by *Escherichia coli* against formation of multidrug resistant biofilm consortium isolated from sewage. The experimentation involved the analysis of a sewage sample collected from a Higher Educational Institution which was inoculated in Lauryl Tryptose Broth (LTB), in triplicate, and in Violet Red Bile Agar with Lactose (VRBL). The isolate

purified in Brain Heart Infusion (BHI) broth was analyzed using VITEK® 2 COMPACT. Subsequently, a culture of *Escherichia coli* was cultivated in Luria Bertani (LB) broth to produce biomass. The pellet from the biomass mixed with 0.001 M silver nitrate was prepared for the biological synthesis of silver nanoparticles and was characterized through Scanning Electron Microscopy (SEM). Meanwhile, the effect of biosynthesized silver nanoparticles on biofilm formation was evaluated through in vitro biofilm inhibition in a microtiter plate which was performed in triplicate. The analysis was done by ELISA reader and One- Way ANOVA was used for statistical analysis. The Most Probable Number (MPN) Index showed an infinite value of coliforms. VITEK® 2 COMPACT detected the presence of *Escherichia coli*, *Pseudomonas aeruginosa*, *Klebsiella pneumoniae* ssp. *pneumoniae*, and *Morganella morganii* ssp. *morganii*. It also determined that the isolates were resistant to some standard antibiotics. Regarding silver nanoparticles, the SEM images showed that the diameter ranged from 33.61-263.20 nm and was 132.54 nm in average. Fundamentally, the readings on microtiter plate showed significant difference in the optical densities of biofilm without treatment (0.312) and biofilm treated with 60% and 80% silver nanoparticles (0.190 and 0.210, respectively),  $p = 0.001$ . The silver nanoparticles biologically synthesized by *Escherichia coli*, at a concentration of 60% and 80%, can inhibit the formation of multidrug resistant biofilm consortium in vitro.

# **In Vitro Activity of Biologically Synthesized Silver Nanoparticles by *Escherichia coli* Against Formation of Multidrug Resistant Biofilm Consortium Isolated from Sewage**

## **INTRODUCTION**

Biofilms are growing communities of bacteria embedded in the extracellular polymeric substance (EPS), also known as the extracellular matrix (ECM), which is an essential structure of the bacterial community (Ma et al., 2009). According to the National Institutes of Health (NIH), 65% of all microbial infections and 80% of chronic infections are associated with biofilm formation (Jamal et al., 2017). Indeed, as highlighted by Srivastava & Bhargava (2016), biofilms play a significant role in the transmission of human disease especially those associated with still surfaces. Significantly, Mahapatra et al., (2015) mentioned that biofilms are the main mode of microbial growth within water distribution systems which can be affected by worsened pollution of water resources due to disposal of untreated or insufficiently treated wastewater. The occurrence of biofilm is attributed with multidrug resistant bacteria. Based on Börjesson (2002), antibiotic resistant bacteria are commonly detected at higher rates and concentrations in wastewater. Apart from this, coliforms are groups of bacteria considered as one of the important indicators of water resource pollution because their presence in drinking water sources is an indication that water has been in contact with soil, plants, septic tanks or sewerage lines (Mashiatullah et al., 1993). Martin et al. (2016) also stated that the detection of coliform bacteria often signifies the quality of sanitation in consumer products, most notably water.

As highlighted by UNESCO (2018), it is very alarming that there is 90% of untreated sewage being released directly into water bodies. In connection with one of the Sustainable Development Goals (SDGs) by the United Nations Development Programme (UNDP) which is Goal 6: Clean Water and Sanitation, there is a significant challenge to improve water quality through proper wastewater

treatment plant and to reduce water pollution as water supply is interconnected with wastewater disposal (Moges et al., 2014). The presence of coliforms, multidrug resistant organisms, and biofilm former organisms should not be overlooked since these may be vital to the safety and public health of the community.

Nanotechnology for water and wastewater treatment is recently developing and advancing globally (Qu et al., 2013). According to Moustafa (2017), compared to the conventional technologies, nanotechnology became more efficient to use in water treatment providing the safety use of unconventional water supply sources. Bruna et al. (2021) cited that nanomaterials such as silver nanoparticles have shown greater capacity due to their small size that gives them a larger surface-to-volume ratio enabling them to become more effective, unlike with the bulk form of silver ions which was historically known for having antimicrobial properties. Due to the antimicrobial mechanism of silver nanoparticles, it can be used to combat a variety of microorganisms, including multidrug resistant bacteria. Additionally, Srivastava & Bhargava (2016) agreed that recent advances in nanotechnology have offered new strategies to prevent and combat biofilm related infections.

Furthermore, this study sought to determine the Most Probable Number (MPN) Index of isolated bacteria from sewage; to speciate isolated bacteria from sewage; to determine the susceptibility of isolated bacteria to standard antibiotics; to describe the *Escherichia coli*'s biologically synthesized silver nanoparticles; and ultimately, to compare the in vitro inhibition of multidrug resistant biofilm consortium isolated from sewage using the following concentrations of treatment: a) 0% silver nanoparticles, b) 60% silver nanoparticles, and c) 80% silver nanoparticles.

## **METHODOLOGY**

### **Collection of Sewage Sample**

In a sterile container, 200 mL of untreated wastewater was collected from a Higher Educational Institution.

### **Presumptive Identification of Coliforms**

To detect the presence of coliforms in the sewage sample, 300 ml of Lauryl Tryptose Broth (LTB) was prepared for Multiple Tube Fermentation Technique. In triplicate, 20 mL of broth was poured into five sterile fermentation tubes containing inverted Durhams tubes then 20 mL of water sample was aseptically dispensed into each tube. These were incubated at 37°C for 48 hours and then examined for turbidity, acid, and gas formation after incubation. After a positive presumptive test, the result is statistically expressed in terms of Most Probable Number (MPN). Additionally, 1 mL of water sample was dispensed aseptically in a sterile petri dish. Then, Violet Red Bile Agar with Lactose (VRBL), another selective medium for the detection of coliform, was prepared and cooled down to lukewarm temperature before pouring it into the petri dish. The agar with the water sample was allowed to solidify at room temperature and was then incubated at 37°C for 24 hours.

### **Identification of Bacteria Using VITEK® 2 COMPACT**

The dark pink colonies were isolated from VRBL and purified into two Brain Heart Infusion (BHI) broths. Then, the purified isolate was subjected for automated bacterial identification and antimicrobial susceptibility testing using the VITEK® 2 COMPACT, an automated and efficient instrument for microbial identification (ID) and antibiotic susceptibility testing (AST). A standardized inoculum from BHI broth was placed into the VITEK® 2 cassette together with the VITEK® 2 ID and AST cards. After the cassette was loaded in the instrument wherein the incubation and reading were performed.

## **Biosynthesis of Silver Nanoparticles**

A dry agar slant culture of *Escherichia coli*, requested from University of the Philippines Manila, was cultivated in Luria Broth (LB) and was incubated at 37°C for 24 hours. After incubation, the produced biomass of *E. coli* was centrifuged at 6,000 rpm for 10 minutes in order to separate the supernatant and pellet. An equal amount of pellet collected from the biomass of *E. coli* and 0.001 M of silver nitrate aqueous solution were mixed in a sterile test tube and agitated in the vortex. A negative control was prepared using silver nitrate aqueous solution only. The solutions were incubated at 37°C for 24 hours. The color change from yellow to brown solution indicated that *E. coli* was able to biologically synthesize silver nanoparticles. This procedure was modified based on the study of Kushwaha et al. (2015).

## **Characterization of Silver Nanoparticles**

The solution, evident with color change from yellow to brown, was sent to NASAT Labs in order to further characterize the silver nanoparticles using Hitachi Scanning Electron Microscope SU3800. Scanning electron microscopy plate was prepared by adding silver nitrate on the slide to make a smear of the solution. By making a thin film of Gold Palladium to coat the slide, conductivity was included in the system. After the slide was prepared, it was scanned at 10 kV accelerating voltage and the images were captured. This was a modified procedure based on the study of Galatage et al. (2021).

### **Microtiter Plate Reading Using ELISA Reader**

The isolate purified in BHI broth was subcultured in LB and was incubated at 37°C for 48 hours. After incubation, the negative control was prepared by adding only 200 µL of inocula from LB to one well of the microtiter plate. Two different concentrations of biosynthesized silver nanoparticles were used for the treatment of biofilm. For 60% silver nanoparticles treatment, 80 µL of inocula from LB and 120 µL of silver nanoparticles were added to another well. For 80% silver nanoparticles treatment, 40 µL of inocula from LB and 160 µL of silver nanoparticles were added to another well. This procedure was done in triplicate. Then, the plate was sealed and incubated at 37°C for 24 hours. The succeeding procedures were demonstrated in the study of Salcedo, D. E. et al. (2014). The optical density of biofilm biomass was initially measured using ELISA reader at a wavelength of 620 nm prior to staining and fixation. Afterwards, the liquid medium was aspirated from the wells and the wells were then washed with sterile distilled water without disturbing the adhered biofilm. Staining with 200 µL of 3% crystal violet was performed on the formed biofilms on each well and the plate was incubated at room temperature for 20 minutes. The stain was rinsed thrice with sterile distilled water and air dried for 10 minutes. Later on, the crystal violet stain was solubilized by adding 200 µL of 99.9% ethanol on it. Finally, the biofilm formation was determined by measuring the optical density using ELISA reader at a wavelength of 692 nm. The results were averaged and One-Way ANOVA was used for statistical analysis.



**RESULTS**

**Presumptive Identification of Coliforms**

Table 1

*Analysis of total coliforms count in Lauryl Tryptose Broth (LTB)*

Replicates	Number of Positive Tubes	MPN Index
1	5/5	Infinite
2	5/5	Infinite
3	5/5	Infinite

Among the three replicates, a total of 15 tubes were positive for the presence of coliforms and all of the tubes resulted with an infinite value of Most Probable Number (MPN) Index.



*Figure 1. Lauryl Tryptose Broth (LTB) after 48 hours of incubation*

The presence of turbidity, acid and gas formation determine the presence of coliforms in the sewage sample.

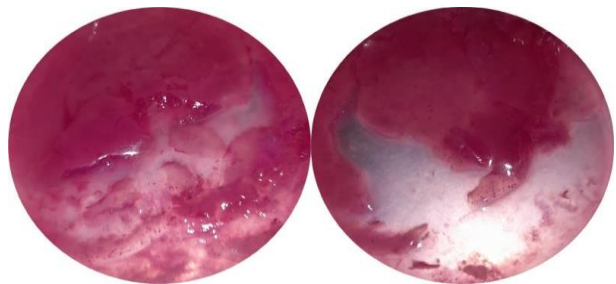


Figure 2. Violet Red Bile Agar with Lactose (VRBL) after 24 hours of incubation

The growth of multiple dark pink colonies indicates the detection of coliforms in the sewage sample.

**Identification of Bacteria and Antimicrobial Susceptibility  
Testing Using VITEK® 2 COMPACT**

Table 2

*Isolated Species of Bacteria Identified from Sewage Using VITEK®  
2 COMPACT*

Isolate Number	Identified Species
1	<i>Morganella morganii</i> ssp. <i>morganii</i>
2	<i>Klebsiella pneumoniae</i> ssp. <i>pneumoniae</i>
3	<i>Escherichia coli</i>
4	<i>Klebsiella pneumoniae</i> ssp. <i>pneumoniae</i>
5	<i>Escherichia coli</i>
6	<i>Pseudomonas aeruginosa</i>

The following species of bacteria were identified from the purified isolate in Brain Heart Infusion (BHI) broth namely, *Morganella morganii* ssp. *morganii*, *Klebsiella pneumoniae* ssp. *pneumoniae*, *Escherichia coli*, and *Pseudomonas aeruginosa*.

Table 3

*Minimum Inhibitory Concentration (MIC) of isolated bacteria to  
standard antibiotics*

	Bacterial Isolate					
	<i>M. morganii</i> ssp. <i>morganii</i>	<i>K. pneumoniae</i> ssp. <i>pneumoniae</i>	<i>E. coli</i>	<i>K. pneumoniae</i> ssp. <i>pneumoniae</i>	<i>E. coli</i>	<i>P. aeruginosa</i>
Antimicrobial	Minimum Inhibitory Concentration (MIC) (µg/mL)					
ESBL		NE G	NE G	NE G	NE G	
Ampicillin	≥ 32*	≥ 32*	≤ 2	≥ 32*	4	
Amoxicillin/ Clavulanic Acid	≥ 32*	≤ 2	≤ 2	≤ 2	≤ 2	
Piperacillin/ Tazobactam	≤ 4	≤ 4	≤ 4	≤ 4	≤ 4	8
Cefuroxime	≥ 64*	≤ 1	4	≤ 1	4	
Cefuroxime Axetil	≤ 64*	≤ 1	4	≤ 1	4	
Cefoxitin	16	≤ 4	≤ 4	≤ 4	≤ 4	
Ceftazidime	≤ 1	≤ 1	≤ 1	≤ 1	≤ 1	
Ceftriaxone	≤ 1	≤ 1	≤ 1	≤ 1	≤ 1	4
Cefepime	≤ 1	≤ 1	≤ 1	≤ 1	≤ 1	2
Ertapenem	≤ 0.5	≤ 0.5	≤ 0.5	≤ 0.5	≤ 0.5	
Imipenem	2	≤ 0.25	≤ 0.25	≤ 0.25	≤ 0.25	2
Meropenem	≤	≤	≤	≤	≤	0.5

*In Vitro Activity of Biologically Synthesized Silver Nanoparticles by Escherichia coli  
Against Multidrug Resistant Biofilm Consortium Isolated From Sewage*

	0.2 5	0.25	0.25	0.25	0.25	
Amikacin	≤ 2	≤ 2	≤ 2	≤ 2	≤ 2	≤ 2
Gentamicin	≤ 1	≤ 1	≤ 1	≤ 1	≤ 1	≤ 1
Ciprofloxacin	≤ 0.2 5	1*	≤ 0.25	≤ 0.25	≤ 0.25	≤ 0.25
Colistin	≥ 16*	≤ 0.5	≤ 0.5	≤ 0.5	≤ 0.5	2
Trimethoprim/ Sulfamethoxazole	≤ 20	≤ 20	≤ 20	≤ 20	≤ 20	

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\*Resistant

Table 3 demonstrated the MIC of the identified isolates against various antimicrobials. Based on MIC, *Morganella morganii* ssp. *morganii* was found to be resistant to Ampicillin (≥32), Amoxicillin/Clavulanic Acid (≥32), Cefuroxime (≥64), Cefuroxime Axetil (≥64), and Colistin (≥16). *Klebsiella pneumoniae* ssp. *pneumoniae* was found to be resistant to Ampicillin (≥32) and Ciprofloxacin (1).

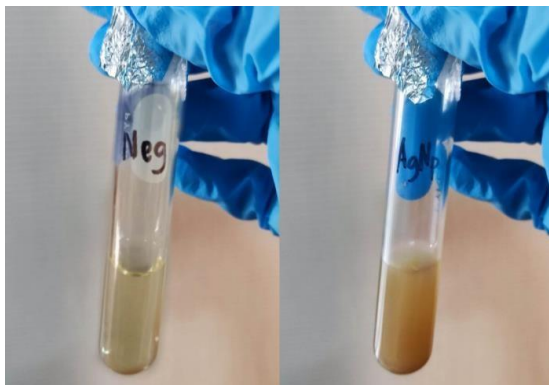
Table 4

*Susceptibility information of isolated bacteria to standard antibiotics*

Bacterial Isolate	Susceptible	Intermediate	Resistant
<i>Morganella morganii</i> ssp. <i>morganii</i>	10 (59%)	2 (12%)	5 (29%)
<i>Klebsiella pneumoniae</i> ssp. <i>pneumoniae</i>	14 (82%)	1 (6%)	2 (12%)
<i>Escherichia coli</i>	16 (94%)	1 (6%)	0
<i>Klebsiella pneumoniae</i> ssp. <i>pneumoniae</i>	16 (94%)	1 (6%)	0
<i>Escherichia coli</i>	16 (94%)	1 (6%)	0
<i>Pseudomonas aeruginosa</i>	8 (89%)	1 (11%)	0

Table 4 showed the susceptibility information of the isolated bacteria. Through the use of 17 antibiotics, *M. morganii* ssp. *morganii* was found to be susceptible to 10 antibiotics (59%), intermediate to 2 antibiotics (12%), and resistant to 5 antibiotics (29%). *K. pneumoniae* ssp. *pneumoniae* was susceptible to 14 antibiotics (82%), intermediate to 1 antibiotic (6%), and resistant to 2 antibiotics (12%). Two isolated *E. coli* and another one isolated *K. pneumoniae* ssp. *pneumoniae* were susceptible to 16 antibiotics (94%) and intermediate to 1 antibiotic (6%). On the other hand, only nine antibiotics were used against *P. aeruginosa* as shown in Table 3 and it was found to be susceptible to 8 antibiotics (89%) and intermediate to 1 antibiotic (11%).

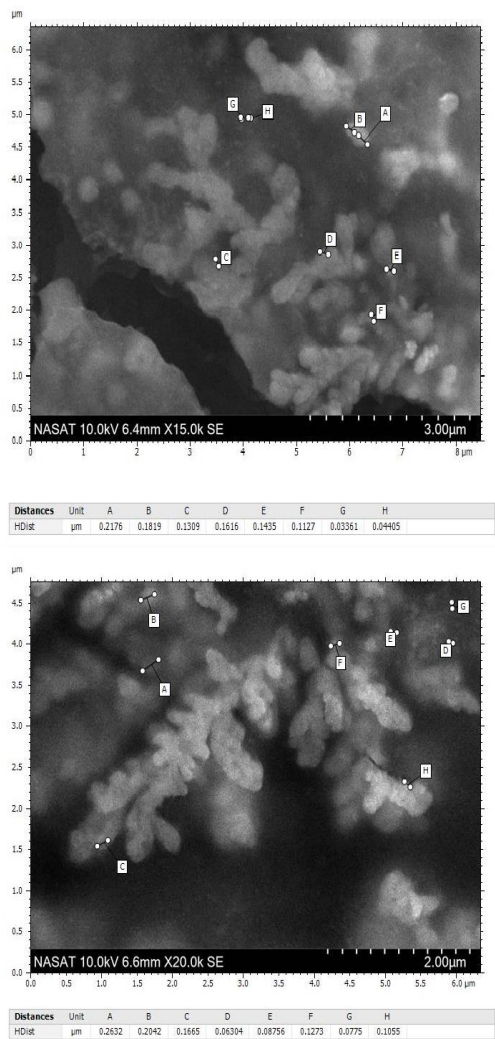
## **Biosynthesis of Silver Nanoparticles**



*Figure 3. Biologically synthesized silver nanoparticles before (left) and after (right)*

The brown colored solution (right) means that there is biosynthesis of silver nanoparticles unlike with the yellow-colored solution (left) which is the negative control.

**Characterization of Silver Nanoparticles**



*Figure 4. Biologically synthesized silver nanoparticles under Scanning Electron Microscope*

Figure 4 showed the diameter of silver nanoparticles measured in nanoscale. The diameter sizes ranged from 33.61-263.20 nm and the average size of the silver nanoparticle was 132.54 nm.

## Microtiter Plate Reading Using ELISA Reader

Table 5

*Optical Density (OD) of biomass with various treatment concentration of silver nanoparticles*

Treatment		Optical Density	
No Treatment (0%)	0.708	0.742	0.771
60% Silver Nanoparticles	1.369	1.381	1.340
80% Silver Nanoparticles	1.407	1.455	1.609

Based on ELISA reading, the mean optical density value of biofilm biomass without treatment was 0.740 while the mean optical density values of silver nanoparticles treated biofilm biomass at 60% and 80% concentrations were 1.363 and 1.490, respectively.

Table 6

*Optical Density (OD) of biofilm with various treatment concentration of silver nanoparticles*

Treatment		Optical Density	
No Treatment (0%)	0.312	0.312	0.312
60% Silver Nanoparticles	0.178	0.202	0.192
80% Silver Nanoparticles	0.190	0.246	0.194

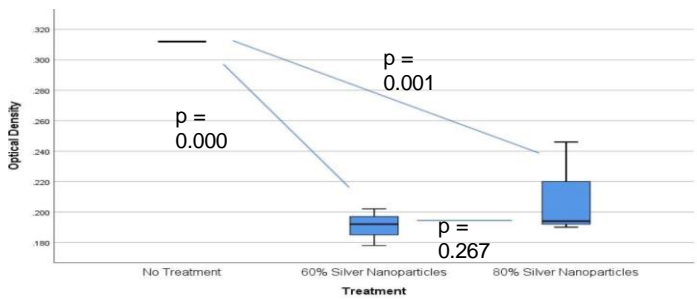
Based on ELISA reading, the mean optical density value of biofilm without treatment was 0.312 while the mean optical density value of silver nanoparticles treated biofilm at 60% and 80% concentrations were 0.191 and 0.210, respectively.



Table 7

*Mean comparison of Optical Density (OD) with various treatment concentration against biofilm*

Treatment	Mean OD	dF	F Statistics	p Value	Interpretation
No Treatment	0.312	2,6	34.111	0.001	Significant
60% Silver Nanoparticles	0.190				
80% Silver Nanoparticles	0.210				



Based on the results on One-Way ANOVA in Table 7 there is a significant difference in the optical densities of silver nanoparticles treated biofilm when compared to untreated biofilm  $F(2,6) = 34.111$ ,  $p = 0.001$ . This is indicative of the ability of 60% and 80% silver nanoparticles to inhibit biofilm in vitro. Moreover, based on Post-Hoc analysis using Least Significant Difference (LSD), each of the group is significantly different from one another as shown in Figure 5. No treatment is significantly different from 60% silver nanoparticles ( $p = 0.000$ ) and 80% silver nanoparticles ( $p = 0.001$ ). However, both treatment concentrations of 60% and 80% are not significantly different ( $p = 0.267$ ).

## DISCUSSION

Our findings on the presumptive identification of coliforms are similar to the study of Fathurohman et al. (2020) wherein their positive results for coliforms are characterized by the presence of turbidity, acid, and gas in Durham tubes. In order to obtain the value of Most Probable Number (MPN) or the estimated number of coliforms in the water waste sample, this presumptive test is performed to support the growth of coliform. However, after subjecting their sample to the confirmatory test, the result shows an MPN value of 350 cells/100mL indicating that the number of coliform bacteria is still safe. Unlike with their results, the MPN Index of all positive tubes in our study have an infinite value which is critical as it can be a public health risk. The presence of coliforms in sewage affects the entire water distribution system, leading to possible contamination of drinking water systems. Indeed, it is indicating that there are pathogens or disease-causing organisms that might be afflicting the water quality.

In fact, there were multidrug resistant bacteria isolated from a sewage sample using VITEK® 2 COMPACT specifically, *Morganella morganii* ssp. *morganii*, *Klebsiella pneumoniae* ssp. *pneumoniae* which was identified twice, *Escherichia coli* which was also identified twice, and *Pseudomonas aeruginosa*. Some of these isolates were found to be resistant to some standard antibiotics such as *Morganella morganii* ssp. *morganii* resistant to Ampicillin, Amoxicillin/Clavulanic Acid, Cefuroxime, Cefuroxime Axetil, and Colistin and for *Klebsiella pneumoniae* ssp. *pneumoniae*, two isolates were resistant to Ampicillin and one isolate was resistant to Ciprofloxacin. This finding is consistent with the study of Hauhnar et al. (2018) wherein the isolated *Morganella morganii* from wastewater is resistant to ampicillin. Additionally, the study of Moges et al. (2014) demonstrated that *Klebsiella* spp. isolates from wastewater in hospital and non-hospital environments are resistant to Ampicillin and Ciprofloxacin. However, some inconsistencies were found with their study because *Escherichia coli* and

*Pseudomonas aeruginosa* are found to be multidrug resistant as well, unlike with our findings showing the sensitivity of the mentioned isolates to most antibiotics as shown in Table 4. A total of 17 antibiotics were used in the testing and *M. morganii* ssp. *morganii* showed the highest resistance among the six isolates. It was found to be 59% susceptible, 12% intermediate, and 29% resistant to those antibiotics. On the other hand, *K. pneumoniae* ssp. *pneumoniae* was 82% susceptible, 6% intermediate, and 12% resistant to antibiotics. Two isolated *E. coli* and another one isolated *K. pneumoniae* ssp. *pneumoniae* were 94% susceptible and 6% intermediate to antibiotics. However, only nine antibiotics were used against *P. aeruginosa* and it was found to be 89% susceptible and 11% intermediate to antibiotics.

As listed by Samrot et al. (2021), some of the biofilm-forming microorganisms are *Klebsiella pneumoniae*, *Escherichia coli*, and *Pseudomonas aeruginosa*. Likewise, the biofilm formation of *Morganella morganii* is also mentioned in the study of Guzman et al. (2020). Given the fact that there are multidrug resistant organisms present in the sewage, their ability to aggregate and form biofilm consortium is a more crucial matter because it is a significant virulence factor contributing to the difficulty in eradicating biofilm mediated infections. Concerning the biofilm formation ability of the isolated bacteria in this study, silver nanoparticles biologically synthesized by *Escherichia coli* were utilized to inhibit biofilm formation in vitro. of multidrug resistant biofilm consortium isolated from sewage. Through microtiter plate assay, the untreated and treated biofilm growth stained with crystal violet was measured by ELISA reader. The optical density (OD) at 620 nm was determined on the plate before the removal of biomass and the OD result of all wells were greater than 1, except for the negative controls having a mean OD of 0.312. After removing the biomass of biofilm, the positive control without silver nanoparticles treatment exhibited biofilm formation at an OD of 0.312. On the other hand, the biofilm formation treated with 60% and 80% silver nanoparticles resulted with an OD of 0.190 and 0.210, respectively. The significant

inhibition of biofilm growth was demonstrated by the decrease of OD. As similarly reported by Seo et al. (2021), the untreated biofilm has an OD of 1.88 while upon the addition of greatest concentration (20 µg/ml) and smallest concentration (1.25 µg/ml) of silver nanoparticles, the OD values declines to 0.7 and 1.61, respectively. In their previous study, it has been observed that there is significant dose-dependent activity of silver nanoparticles against biofilm. In opposition, there was no significant difference with 60% and 80% concentrations of silver nanoparticles used in our study ( $p = 0.267$ ). This implies that silver nanoparticles have successfully demonstrated an antibiofilm activity in vitro at concentrations of 60% and 80% ( $p = 0.000$  and  $0.001$ ). Therefore, the focus of this research which is to reduce microbial consortium and biofilm formation has been proven through the use of silver nanoparticles.

As discussed by Seo et al. (2021), the action of silver nanoparticles leading to biofilm inhibition is caused by increased bacterial membrane permeability, oxidative damage, interrupted phosphate residues in DNA as well as the disrupted membrane and intracellular proteins, and by quorum quenching which interrupts bacterial communication, hence inhibiting the formation of biofilm. It was also revealed in their study that the clusters of bacteria and the assembly of extracellular polymeric substances (EPS) were almost completely inhibited. Rajeshkumar & Bharath (2017) added that the membrane of a bacterial cell has a negative charge while silver nanoparticles have a positive charge. This makes the silver nanoparticles stick to the membrane, changing its shape and helping make it more susceptible to silver nanoparticles. And as reported by Singh et al. (2021), it was confirmed that there is significant morphological alteration in

biofilms treated with silver nanoparticles. It is proven by SEM micrographs showing the damaged cell membrane of bacterial cells resulting with visible membrane pores and the lysis of bacterial cells causing the leakage of intracellular content in both *Escherichia coli* and *Pseudomonas aeruginosa* biofilms. Similarly, the microscopic evaluation in the study of Ansari et al. (2014) shows successful inhibition made by the silver nanoparticles against biofilm formation and bacterial colonization on the surface of the glass slide used in

their experiment. However, as mentioned by Dos Santos et al. (2014), the extent of activity of silver nanoparticles against biofilm still depends on the concentration, size, shape, and surface of silver nanoparticles.

Given that biofilms are difficult to remove, multidrug resistant biofilm former microorganisms must also be considered as they are more challenging to deal with. For that reason, the use of silver nanoparticles may address this problem such as in sewage or wastewater. Silver nanoparticles may be applied as an alternative approach in wastewater management due to their antibacterial properties and their enhanced adsorption capacities to remove contaminants or pathogens from wastewater systems (Ganguly et al., 2021). However, our study had several limitations. As explained by Seo et al. (2021), the inocula of purified isolates from LB are not sufficient to represent the biofilm formation of identified bacterial species from sewage individually. Moreover, only the reduction of early biofilm formation after 24 hours was confirmed in this experiment. The complete inhibition and destruction of mature biofilms, however, was not evaluated in this study.

## **Conclusion**

After gathering the following data and results, the researchers were able to find out that there was an infinite value for Most Probable Number (MPN) Index of isolated bacteria from sewage in all replicates of positive tubes. In actuality, the following bacterial isolates were identified in the sewage sample: *Escherichia coli*, *Pseudomonas aeruginosa*, *Klebsiella pneumoniae* ssp. *pneumoniae*, and *Morganella morganii* ssp. *morganii*. It was also determined that *Morganella morganii* ssp. *morganii* was resistant to Ampicillin, Amoxicillin/Clavulanic Acid, Cefuroxime, Cefuroxime Axetil, and Colistin while *Klebsiella pneumoniae* ssp. *pneumoniae* was resistant to Ampicillin and Ciprofloxacin. Meanwhile, *Escherichia coli*'s biologically synthesized silver nanoparticles have shown diameter sizes ranging from 33.61-263.20 nm and averagely,

132.54 nm. In the final analysis, the researchers were able to conclude that 60% and 80% concentrations of silver nanoparticles are evident in antibiofilm activity. Therefore, the silver nanoparticles biologically synthesized by *Escherichia coli* can inhibit the formation of multidrug resistant biofilm consortium in vitro. These conclusions can contribute to the knowledge of applying nanotechnology, specifically silver nanoparticles, to address the deadly effects of water pollution caused by sewage and wastewater.

## **Recommendations**

Based on the results of the study, the researchers would like to suggest the following: biologically synthesize silver nanoparticles using different microorganisms and compare their activity against biofilm formation; individually assess the activity of silver nanoparticles against the biofilm formation of each identified bacterial isolate; further discover the activity of silver nanoparticles against mature biofilm; examine the surface of biofilm treated with silver nanoparticles through Electron Microscopy; and further study the viability of biologically synthesized silver nanoparticles.

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## **MEASUREMENT OF HEALTH-RELATED FITNESS COMPONENTS OF PHYSICAL FITNESS OF PHYSICAL AND RESPIRATORY THERAPY STUDENTS FROM EMILIO AGUINALDO COLLEGE CAVITE AFTER THE TWO-YEAR ONLINE LEARNING PERIOD: A DESCRIPTIVE CROSS-SECTIONAL STUDY**

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### **KEYWORDS:**

- Body composition
- Cardiorespiratory fitness
- Flexibility
- Muscle endurance
- Muscle strength
- Online learning
- Physical activity, Sedentary lifestyle

**Abstract.** The sudden shift from face to face classes to online learning set up has limited the amount of physical activity engagement of the students for 2 years. As face to face classes become available in the country, the research sets on documenting the deleterious effects of online classes to the health related components of physical fitness. Therefore, the study aims to measure the current health related components of fitness of Emilio Aguinaldo College Cavite students after the two year online learning period using descriptive cross-sectional study. The researchers included 79 participants in the study from the School of Physical Therapy

and Respiratory Therapy of Emilio Aguinaldo College — Cavite using

stratified random sampling. The researchers utilized a physical fitness testing protocol that aims to measure the health-related fitness components that includes BMI, Cardiorespiratory Endurance, Flexibility, Muscle Strength, and Muscle Endurance in order to provide descriptive statistics. The results of the research showed the current level of health related fitness components of SPTRE students from EAC-C. In body composition, the majority of the participants were found to have normal BMI. Meanwhile, in flexibility of the left and right upper extremity, most of the participants were found to have poor zipper test scores. For the flexibility of the lower extremity, the majority of participants were graded as good in the sit and reach test. Most of the participants scored very poorly in the cardiorespiratory fitness in the 3 min step test. In terms of muscle strength, the majority of the participants need improvement in the push up test. Lastly, in muscle endurance most of the participants scored excellent in the plank test.

# **MEASUREMENT OF HEALTH-RELATED FITNESS COMPONENTS OF PHYSICAL FITNESS OF PHYSICAL AND RESPIRATORY THERAPY STUDENTS FROM EMILIO AGUINALDO COLLEGE CAVITE AFTER THE TWO-YEAR ONLINE LEARNING PERIOD: A DESCRIPTIVE CROSS-SECTIONAL STUDY**

## **INTRODUCTION**

This chapter includes a brief introduction to health-related components of physical fitness namely, cardiorespiratory fitness, body composition, flexibility, muscular strength, and muscular endurance followed by the statement of the problem, objectives of the study, conceptual framework, significance of the study, scope and limitations, definition of terms, and review of related literature.

Physical fitness is defined as an individual's capacity to perform daily activities with optimal quality, strength and endurance with the ability to control complications of diseases, exhaustion, stress and reduced physical inactivity (Campbell et al., 2013). Physical activity, on the other hand, refers to any movement produced by skeletal muscles, requiring energy expenditure. Regular physical activity helps prevent and manage non-communicable diseases, maintain healthy body weight, and improve the quality of life and well-being (World Health Organization [WHO], 2020).

Globally, 1.4 billion adults lack sufficient exercise. Since 2001, there has been no development in the world's levels of physical activity; around 1 in 3 women and 1 in 4 men lives a sedentary lifestyle; they do not meet the global recommendations of at least 150 minutes of moderate-intensity physical activity, or vigorous-intensity for 75 minutes per week (World Health Organization [WHO], 2020).

Global progress of increasing physical activity has been slow even prior to the coronavirus disease 2019 (COVID-19) pandemic (Amini, 2021).

The COVID-19 pandemic has caused considerable morbidity and mortality, affecting the people and health care systems globally; it was pronounced as a Public Health Emergency of International Concern (PHEIC) (Garry et al., 2020; Inter-agency Task Force [IATF], 2020). The remarkable rate of transmission has hampered the access to essential services and has restrained movement of vulnerable sectors that include education, healthcare and the economy (IATF, 2020). Most countries enforced restrictive measures such as home confinement, and lockdown to contain the COVID-19 outbreak which restrained residents from accessing even the essential goods and services. (Lippi et al., 2021; IATF, 2020). Locally, the IATF (2020) has enforced the 3C's (Closed, Crowded, and Close Contact) to curb the further spread of COVID-19. Most parts of the Philippines have been placed under community quarantines as mass transportation systems were suspended and regulated and skeletal workforce were observed (National Disaster Risk Reduction Management Council [NDRRMC], 2020; IATF, 2020). Any individuals younger than 21 and older than 60 years old, those identified to have comorbidities, and pregnant women, including those who reside with the said people, were not allowed to go out of their respected homes (IATF, 2020). This has also led to educational institutions being closed, and online education was implemented (Commission on Higher Education [CHED], 2020).

The lack of weight management activities and unhealthy dietary practices were already prevalent among students even prior to the pandemic (Dunton, et al., 2020). The Philippines has shown limited to no progress towards achieving the target for reduction of obesity rate for ages 18 years old or older, with an estimated number of 8.8% of adult women and 6.4% of adult men living with higher BMI ( $\geq 30$ ) (Global Nutrition Report, 2021). Recently, due to the COVID-19 restrictions which led to closure of schools and parks, and termination of youth sports and activities, children in the United States have failed to reach the recommended levels of physical activity (Dunton et al., 2020). Prolonged homestay due to COVID-19 lockdown have been associated with potential side effects and has led to an alarming increase in obesity rate in Saudi Arabia. This

phenomenon jeopardizes people's health and thus must be recognized and mitigated in a way without violating local ordinances (Jalal et al., 2021).

In Taiwan, students who are more active and have regular physical activity were found to have greater levels of cardiorespiratory fitness than those who engage in irregular physical activity, proving that children with obesity have presumably insufficient cardiorespiratory capacity (Hsieh et al, 2014). Additionally, in Spain, long periods of free-movement restrictions caused by the lockdowns during COVID-19 pandemic negatively influenced the cardiorespiratory fitness and health (Lopez-Bueno et al., 2021).

In Saudi Arabia, lack of physical activity and poor lifestyle choices have led to increased body mass index of students (Jalal et al., 2021). A recent study in Bangladesh noted increased weight status of their participants after the pandemic's onset (Akter et al., 2022).

Sedentary lifestyle was also found to be related with compromise of other health determinants such as muscular strength (Vainshelboim et al., 2019). The increase in muscular strength and endurance is associated with the decline in the risks for morbidity and mortality which is crucial for an individual's quality of life. On the otherhand, a decrease in muscular strength and endurance may result in cardiometabolic and general morbidity risk factors, as well as the likelihood of acquiring skeletal or soft tissue injury (Pate et al., 2012).

Additionally, a decrease in muscle strength may be a result of prolonged sitting, along with other musculoskeletal disorders like fatigue and muscle stiffness (Kett et al., 2021). In the United Kingdom, studies have shown that students who sit for long periods of time and are inactive have stiffer core and leg muscles. Also, it has been reported that prolonged sitting may be associated with chronic musculoskeletal pain (Boukabache et al., 2021).

Locally, there is a lack of available studies that investigate the deleterious impacts of online classes on the health related components of fitness that may be existing in the Philippines. Therefore, this study aims to establish baseline data for the current health related fitness components level of School Physical and Respiratory Therapy (SPTRE) from Emilio Aguinaldo College - Cavite (EAC-C) after the two-year online learning period. This will



be attained through measuring the cardiorespiratory fitness, body composition, flexibility, muscular strength, and muscular endurance of the college students of EAC-C; and determining subgroups within the SPTRE would need recommendations for specific preventive strategies relating to the results of their health related fitness components.

It is necessary to establish baseline data that may identify the need to propose specific preventive strategies for particular populations based on the trends considering the participants' demographic profile and health related fitness components. This would facilitate educational professionals to develop effective health promotion programs on the wellness of students enrolled in EAC-C after the online learning set-up. The researchers do not intend to establish the relationship amongst all the health related fitness components.

## **METHODOLOGY**

### ***Research Design***

This research study utilized a descriptive cross-sectional study to establish baseline data for the current health related fitness components level of SPTRE students of EAC-C after the two-year online learning period. This was attained through measuring the cardiorespiratory fitness, body composition, flexibility, muscular strength, and muscular endurance of the college students of EAC-C after the two-year online learning period. A cross-sectional study is a cost- and time-effective approach which allows researchers to evaluate variables with large sample sizes and show higher statistical power (Prentice-Dunn & Prentice-Dunn, 2012; Setia, 2016). On the otherhand, descriptive research refers to a study that describes, organizes, and tabulates the gathered data through reduction of data to a manageable degree (Association for Educational Communications and Technology [AECT], 2021)

### ***Research Participants***

The inclusion criteria consisted of: (1) College students currently enrolled under BS Physical Therapy and Respiratory Therapy program; (2) experienced the transition from physical classes to

online classes; and (3) have undergone the two-year online learning period in EAC-C.

The exclusion criteria was inclusive of: (1) existing unresolved upper extremity conditions such as cervical disc disease, myelopathy, rotator cuff disease, lateral and medial epicondylitis, carpal tunnel syndrome, osteoarthritis, and myofascial pain syndrome; (2) lower extremity conditions like ankle sprain, plantar fasciitis, and tibial stress syndrome; and (3) pulmonary conditions namely, asthma, pneumonia, and post-COVID complications will be excluded. This ensures that the participants had no history of any major conditions and injuries prior to the test which may affect the accuracy of the gathered data (Bagchi et al., 2019). Upper extremity conditions are excluded as it may lead to decrease in shoulder mobility and muscle strength which may influence activities negatively (Moon et al., 2018). Lower extremity injuries were found to be related with a reduction in aerobic exercise capacity and higher fatigue index (Ko et al., 2017). Meanwhile, the etiology and pathophysiology of pulmonary conditions may impose additional risks of adverse effects such as exercise-induced bronchoconstriction and triggering of symptoms. Evidence has recognized that the majority of adverse effects in individuals with pulmonary conditions were musculoskeletal and/or cardiovascular in nature (Eves & Davidson, 2011).

Demographic characteristics of the participants

Demographics	Frequency	Percentage
Program		
PT	67	84.8%
RT	12	15.2%

Demographics	Frequency	Percentage
Year Level		
1st year	37	46.8%
2nd year	20	25.3%

Demographics	Frequency	Percentage
3rd year	10	12.7%
4th year	12	15.2%

Table 1 (continued)

<b>Age</b>		
18 to 19 years old	41	51.9%
20 to 21 years old	34	43.0%
22 to 23 years old	4	5.1%
24 years and above	0	0%
<b>Sex</b>		
Male	32	40.5%
Female	47	59.5%
<b>Household Income Level</b>		
Less than ₱10,957	8	10.1%
Between ₱9,520 to ₱21,194	12	15.2%

Table 1 (*continued*)

Demographics		Frequency	Percentage
Between ₱21,194 to ₱43,828		34	43.0%
Between ₱43,828 to ₱76,669		11	13.9%
Between ₱76,669 to ₱131,484		9	11.4%
Between ₱131,484 to ₱219,140		2	2.5%
<b>Environmental Condition</b>			
Living in a dorm/apartment on your own		0	0%
Living in a dorm/apartment with an aide or helper		0	0%
Living in a house with family member		79	100%
<b>Body Type</b>			
Ectomorph		23	29.1%
Mesomorph		26	32.9%
Endomorph		30	38.0%

**Table 1** shows that most of the participants are from the BS Physical Therapy program (84.8%), which are mostly 18-19 years old (51.9%) and majority are 1st year students (46.8%). Most of the

participants were females (59.5%) and were found to live in a house with family members (100%). Majority of the participants were endomorph (38.0%) with an average household income level of ₱21,194 to ₱43,828 (43.0%).

### **Sampling Technique**

The calculated sample size of 150 students was based on the gathered data upon requesting the total list of enrolled students from the office of the registrar. The researchers applied a stratified random sampling method in gathering the participants for the study. Proportional sampling was utilized to the SPTRE population that is made up of multiple subgroups with significant differences in number. The amount of participants per subgroup was determined by their proportion in the overall population. The researchers divided a defined population into subgroups, then used random sampling techniques to select a participant from each subgroup (Salkind, 2010).

Table 2

*Proportional sampling with 80% confidence interval and 5 degrees of margin of error*

Year Level	PT	Sample	Percentage	RT	Sample	Percentage
1st year	64	34	43%	6	3	4%
2nd year	29	15	19%	10	5	6%
3rd year	15	8	10%	4	2	3%
4th year	18	10	12%	4	2	3%

**Table 2** presents the number of participants per program and year level calculated through Microsoft Excel using proportional sampling with 80% confidence interval and 5 degrees of margin of error; with a formula of  $n/N * x1$  wherein n = computed sample

size,  $N$  = total population &  $x_1$  = total population of a group of samples. Percentage was calculated with the formula of  $x_1 / N * 100$ .

### **Data Gathering Procedure**

#### *Pre recruitment Phase*

In preparation for the implementation of testing, the researchers hired one (1) licensed Physical Therapist to facilitate the assessment procedure per station. The researchers and the hired rater underwent a pilot testing for one (1) day to ensure that the implementation process was clear with the researchers and the rater. Pilot testing was implemented for the rater to be fully equipped with the relevant knowledge and skills in assessing the health related fitness components. This was to ensure that the implementation of the testing process was clear with researchers and the raters. Also, this served as an opportunity for them to experience the implementation procedures prior to the actual testing and be able to identify possible risks that they may encounter (Doody & Doody, 2015).

The pilot testing was conducted on the 26th of November 2022; five (5) EAC-C college students who fitted with the inclusion criteria set by the researchers were tested for the pilot testing. The participants were asked to sign up with the consent form along with the screening tool via google forms prior to the day of assessment. The researchers decided that they must be divided per station to assist the rater in terms of facilitating the traffic of participants and to be available for some unforeseen or unwanted incidents.

#### *Recruitment of Participants*

The researchers requested from the SPTRE for a copy of the master list of enrolled PT and RE students. The researchers also provided publication materials that were posted on an online platform to encourage the participation of the prospects. Then, the researchers compute the sample size through a stratified random sampling method drawn from the master list provided.

Consequently, an email was sent to the SPTRE to formally inform them that students from their schools are humbly encouraged to

join the data gathering of this study. Once the School Deans have approved the implementation of the testing, the consent form along with the screening tool was distributed to the target participants prior to the day of assessment.

### *Implementation of the Testing*

A formal letter addressed to the Office of Vice President of Academic Affairs (VPAA) was sent via email to ask for permission regarding the use of the EAC-C Social Hall.

The implementation process of testing took three (3) days to complete the target sample size. During the first day of testing, held on the 28th of November 2022, only 42 students presented themselves and participated in the study. The second testing day was held on the 20th Day of December 2022; an additional of 21 students were tested. However, the total number of participants in the first and second implementation days were still not enough to reach the total number of target sample size; hence, a third implementation day was executed. The third testing day was conducted on the 13th day of January 2023 wherein 16 students had presented themselves and participated in the study, completing the target sample size.

Across all testing days, researchers screened the participants' vital signs that consist of blood pressure, heart rate, respiratory rate, temperature and oxygen saturation. This was executed for precautionary purposes and to avoid unintended incidents. The instruments were provided in six stations. The order of the six stations for testing the health related fitness components is proposed and evaluated by the Revised Physical Fitness Test Manual (DepEd order no. 034, s. 2019).

*Station 1: Measurement of BMI*

*Station 2: Flexibility Testing (zipper test)*

*Station 3: Flexibility Testing (sit and reach test)*

*Station 4: 3 min step test*

*Station 5: 90° Push Up Testing*

*Station 6: Plank Test*



All of the testing in each station was only performed once by the participants to prevent having delayed onset of muscle soreness (DOMS) which may affect their performance in the aforementioned testing. However, flexibility measures namely, zipper test and sit and reach test, were performed twice by the participants; their average scores were acquired in order to determine a more accurate test result.

Participants were allowed to take a ten-minute break and drink water provided by the researchers after their batch had finished the implementation of the plank test. Following the given break time, one researcher conducted a post-testing vital signs taking to monitor if there were any adverse effects present to the participants.

Before leaving the testing facility, participants were given some refreshments as a gesture of gratitude by the researchers for presenting themselves and participating in the testing procedures.

The latter two (2) days of the testing, the designated venue was modified subject to the availability of the Social Hall. Likewise, an email was forwarded to the Office of the VPAA to ask for permission regarding the use of one of the SPTRE classrooms. The researchers utilized the available room in the first building of the EAC-C, Room 1519; all participants were informed about the said changes with the help of their respective Year-Level Representatives. Additionally, publication materials for announcement of the said changes were posted in the SPTRE Facebook page. The latter two (2) days of the testing ran through similarly with the first day of implementation.

## ***Research Instrument***

### ***Body composition***

The body mass index (BMI) is the most widely used metric for determining the anthropometric height and weight characteristics in adults and categorizing them into groups. Commonly, it is interpreted as a representation of an individual's body fat percentage (Nuttal, 2015). Both of its test-retest and Pearson

correlation coefficient reliability are found to be very high ( $r = .99$ ). The inter class reliability of this metric was considered to be highly reliable as well ( $r = .99$ ). In addition, the BMI was reported to be the most accurate and reliable in estimating the body fat percentage of young adults (Karchynskaya et al., 2020).

### *Zipper Test*

The zipper test, also known as back scratch test, was implemented to assess the upper extremity flexibility of SPTRE students. Participants were asked to reach behind their back and down along their spine with one hand and bring their opposite hand behind their back and towards the top hand. Participants were asked to reach their hands as much as they can; a ruler was used to measure how close their hands are with each other.

The zipper test was found to be a reliable and valid test in measuring overall shoulder range of motion of adults (ICCs: 0.96, 95 % CI: 0.94 to 0.98) (Lohne-Seiler et al., 2016).

### *Sit and Reach Test*

The researchers implemented a sit-and-reach test to assess hamstring and lumbar flexibility. Prior to performing sit and reach testing, the participants were asked to remove their shoes. A tape measure was placed on the floor, with both of its ends taped. Additionally, there was a tape placed across the tape measure to form a right angle at the 15-inch mark. The participant sat with the tape measure between the legs, with the legs extended and the heels reaching the taped line on the floor. Then, the participants were asked to slowly reach forward with both hands as far as possible; this position should be maintained for ~2 seconds. It is important to ensure that the participant's hands are parallel and does not lead with one hand; although the fingertips may be overlapped and should be in contact with the tape measure. The value of the farthest point reached with the participant's fingertips was considered a score. This procedure was repeated twice and the best of two trials will be recorded (American College of Sports Medicine [ACSM], 2010). The sit and reach test may be a useful alternative for estimating the extensibility of hamstring muscle if angular tests are not available in a school setting or in large scale studies.

Assessment of an individual's flexibility using the sit-and-reach test is recommended because of its moderate criterion-related validity in terms of estimating the extensibility of hamstring muscle ( $r_p = 0.46-0.67$ ) (Mayorga-Vega et al., 2014).

### *Cardiorespiratory Fitness*

The researchers utilized the 3-minute step test to evaluate the cardiorespiratory fitness of the participants. It is simple, easy to administer, requires minimal equipment, and can test a large number of participants concurrently; this test incorporates stepping up and down on a 12 inch stool at a pace that is comfortable for the participants for 3 minutes. The testing will be terminated once the timer reaches 0, then the participants will be allowed to rest for 10 seconds before taking the pulse rate.

The 3-minute step test was found to have a significant relationship in predicting  $\dot{V}O_2$  max with the result of  $\dot{V}O_2$  max measured via Treadmill test ( $r = 0.80$ ). This suggests that the 3-minute step test is a good tool with good validity and practicality in determining the aerobic fitness of adults (Kieu et al., 2020).

### *Push Up Test*

A push up test was used by the researchers to assess the dynamic muscle strength of an individual's upper body and ability to stabilize their trunk. The participants were asked to initiate the push up from the lowest face-down position while keeping their hands at shoulder-wide level. While performing the push up, the participants were required to fully extend their arms while maintaining a straight body with tensed trunk muscles. From there, the participants lowered their bodies to the down position with  $90^\circ$  elbow flexion. The number of repetitions completed within 60 seconds was used (Taanila et al., 2015).

The use of push ups to test the upper body's muscular strength and endurance is recommended because its inter-rater validity was found to be high ( $r = 0.99$ ). Also, it has been discovered that the  $90^\circ$

push up test protocol has a high test-retest reliability for both male and female students ( $r = 0.93$ ) (Hashim et al., 2018).

### ***Plank Test***

Participants were asked to maintain a plank position on a yoga mat for as long as they can keeping their face down while elbows are directly under their shoulders and forearms are facing forward without arching the back and sagging their hips. Tabletop plank was implemented as a modification for women who cannot assume the usual plank position wherein both knees were planted on the yoga mat instead of being extended and only bearing weight on the forefoot.

Plank test was recommended to be used as a fitness test to measure muscle endurance as it a valid, reliable, and practical way to establish normative values of muscle strength; it was also found to have a strong test-retest reliability ( $R = 0.966$ ) (O'Keeffe et al., 2020; Tong et al., 2014)

### ***Data Analysis***

Values of health related components of physical fitness and the demographics of the PT and RT students will be expressed as descriptive data statistics in order to provide basic information regarding the current status of health related components of physical fitness. The researchers hired a statistician for the data treatment. Continuous variables taken from the computation of BMI and the measurement of Zipper Test, Sit and Reach Test, 3 min Step Test, Push Up Test, and Plank Test; these were tabulated and computed for their frequency, mean, range and standard deviation of the health related components of physical fitness of the total population with regards to the trend and demographics of the participants.

### ***Ethical Considerations***

Prior to implementing the study, the researchers sought permission from the Ethical Review Committee of EAC-C. Additionally, all of the participants were asked to sign an informed consent form to ensure that they read and understand the foregoing information. The participants needed to answer the screening tool provided by the researchers, in order to sort out participants that are qualified

with the following criteria. They were also given the opportunity to ask questions about it and any questions that they have asked were answered to their satisfaction. Their participation was purely voluntary and they are free to withdraw at any point of the study if they wish to do so.

Upon answering the screening tool, the researchers were bound by the ethical principles of autonomy, confidentiality and non-maleficence that assured the participants that the responses and results were only used for the purpose of the study. In addition, this study conformed with the Data Privacy Act of 2012 to protect the participants' privacy and confidentiality. The researchers ensured that participants remained anonymous and any information disclosed were not made available to the public and were used for this study only (National Privacy Commission [NPC], 2012).

The participants of the study only experienced minimal health risks and impacts such as delayed onset of muscle soreness (DOMS) and shortness of breath. Simultaneously, the participants benefited by gaining consciousness regarding self-awareness of the body's physical health status. At the same time the participants' data will aid the future generation of researchers who would be interested to further investigate the field of study. Also, the findings of this research may indirectly benefit the participants as the results may be used to identify the need to propose specific preventive strategies and facilitate educational professionals in developing effective health promotion programs that will improve levels of wellness of EAC-C during the COVID-19 pandemic. As for compensation, the participants received a humble incentive such as refreshments and snacks, as a gesture of gratitude by the researchers for participating in the study.

## **RESULTS AND DISCUSSION**

This chapter includes the summary of the gathered data from the SPTRE students regarding their health-related physical fitness namely, cardiorespiratory fitness, body composition, flexibility, muscular strength, and muscular endurance. The students' demographics namely, program, year level, age, sex, household

income level, environmental condition, and body type will also be discussed in this chapter.

Table 3

Current measurement of the participants' health-related physical fitness components with frequency and equivalent percentage

Health-Related Physical Fitness Component	Frequency	Percentage
<b>Body Composition</b>		
Underweight	16	20.3%
Normal	37	46.8%
<b>Health-Related Physical Fitness Component</b>		
	<b>Frequency</b>	<b>Percentage</b>
Overweight	17	21.5%
Obese	9	11.4%
<b>Flexibility of Left Upper Extremity</b>		
Excellent	16	20.3%
Very Good	0	0%
Good	0	0%
Fair	0	0%
Needs Improvement	5	6.3%
Poor	58	73.4%

**Flexibility of Right Upper Extremity**

Excellent	4	5.1%
Table 3 (continued)		
Very Good	0	0%
Table 3 (continued)		
Good	0	0%
Fair	0	0%
Needs Improvement	1	1.3%
Poor	74	93.7%

**Flexibility of Lower Extremity**

Excellent	8	10.1%
Very Good	24	30.4%
Good	27	34.2%
Fair	19	24.1%
Needs Improvement	1	1.3%

**Cardiorespiratory Fitness**

Excellent	0	0%
Good	0	0%
Above Average	1	1.3%

*Measurement Of Health Related Components Of Physical Fitness Of Physical And Respiratory Therapy Students From Emilio Aguinaldo College - Cavite After The Two-Year Online Learning Period: A Descriptive Cross-Sectional Study*

	4	5.1%
Average		
Below Average	6	7.6%
	12	15.2%
Poor		
	56	70.9%
Very Poor		

**Muscle Strength**

Excellent	6	7.6%
Very Good	9	11.4%
Good	11	13.9%
Fair	19	24.1%
Needs Improvement	27	34.2%
Poor	7	8.9%

**Muscle Endurance**

	46	58.2%
Excellent		
Very Good	5	6.3%
Good	13	16.5%
Fair	10	12.7%
Needs Improvement	5	6.3%



**Table 3** presents the descriptive statistics that shows the current level of health related fitness components of SPTRE students from EAC-C. These components, namely, cardiorespiratory fitness, body composition, flexibility, muscular strength, and muscular endurance. In body composition, the majority of the participants were found to have normal (46.8%) BMI. Meanwhile, in flexibility of the left (73.4%) and right (93.7%) upper extremity, most of the participants were found to have poor zipper test scores. For the flexibility of the lower extremity, the majority of participants were graded as good (34.2%) in the sit and reach test. Most of the participants scored very poorly in the cardiorespiratory fitness (70.9%) in the 3 min step test. In terms of muscle strength, the majority of the participants need improvement (34.2%) in the push up test. Lastly, in muscle endurance most of the participants scored excellent (58.2%) in the plank test.

**Table 4** presents the summary of participants' who did not meet the cutoff score in the tests to measure health-related fitness components. Most of the PT students did not meet the cutoff score in the upper extremity (left: 82.1%; right: 97%) and lower extremity (59.7%) flexibility, cardiorespiratory fitness (98.5%), and muscle strength (77.6%). Majority of them did not meet the cutoff score in body composition (49.3%) and muscle endurance (26.9%). Meanwhile, Most of the RT students did not meet the cutoff score in all the health-related fitness components.

Most of the first year participants did not meet the cutoff score in five (5) of the health-related fitness tests namely, body composition, upper and lower extremity flexibility, cardiorespiratory fitness, and muscle strength. Majority of them did not meet the cutoff score in the muscle endurance. Similarly with the first year participants, the second year students did not meet the cutoff score in five (5) of the health-related fitness tests namely, body composition, upper and lower extremity flexibility, cardiorespiratory fitness, and muscle strength; while majority of of them did not meet the cutoff score in the muscle endurance. Half of the participants from the third year did not meet the cutoff score in body composition while most of them did not meet the cutoff score in the right upper extremity flexibility, lower extremity flexibility, cardiorespiratory fitness, and muscle strength. However, only the majority of them did not meet the cutoff score in left upper extremity flexibility and muscle endurance. Most of the participants from the fourth year did not meet the cutoff score of the upper and lower extremity flexibility, cardiorespiratory fitness, and muscle

strength; while the majority of them did not meet the cutoff score in the body composition and muscle endurance.

Most of the participants ages from 18 to 19 years old did not meet the cutoff scores in all of the health-related fitness components except for muscle endurance in which only the majority of them did not meet the cutoff score. Meanwhile, the majority of the students ages from 20 to 21 years old did not meet the cutoff score in body composition and muscle endurance, while most of them did not meet the cutoff score in all the other health-related fitness components. Only half of the participants ages from 22 to 23 years old did not meet the cutoff score in muscle endurance while most of them did not meet the cutoff score in all the other health-related fitness components.

Majority of the male participants did not meet the cutoff score in body composition and in muscle endurance. However, most of them did not meet the cutoff score in the rest of the health-related fitness components. Female participants mostly did not meet the cutoff score in all of the health-related fitness components except for the muscle endurance, in which only the majority of them did not meet the cutoff score.

Participants with an ectomorph body type mostly did not meet the cutoff score in all of the health-related fitness components except for the body composition and muscle endurance. Concurrently, only the majority of the participants with mesomorph body type did not meet the cutoff score in body composition, lower extremity flexibility, and muscle endurance; while most of them did not meet the cutoff score in the rest of the health-related fitness components. Participants with endomorph body type mostly did not meet the cutoff score in all of the health-related fitness components except for the lower extremity flexibility and muscle endurance.

**Table 4**

*Summary of participants' who did not meet the cutoff score in the tests to measure health-related fitness components*

	<b>Body Composition</b>	<b>Left Upper Extremity Flexibility</b>	<b>Right Upper Extremity Flexibility</b>	<b>Lower Extremity Flexibility</b>	<b>Cardio-respiratory Fitness</b>	<b>Muscle Strength</b>	<b>Muscle Endurance</b>
<b>Program</b>							
PT	49.3%	82.1%	97%	59.7%	98.5%	77.6%	26.9%
RT	75%	66.7%	83.3%	58.3%	100%	100%	83.3%
<b>Year Level</b>							
1st Year	59.5%	91.9%	94.6%	54.1%	97.3%	78.4%	29.7%
2nd Year	55%	75%	95%	65%	100%	80%	45%
3rd Year	50%	30%	100%	60%	100%	80. %	30%
4th Year	33.3%	91.7%	91.7%	66.7%	100%	91.7%	41.7%
<b>Age</b>							
18 to 19 years old	61%	87.8%	97.6%	53.7%	100%	80.5%	29.3%
20 to 21 years old	38.2%	67.65	91.2%	67.7%	100%	79.4%	41.2%
22 to 23 years old	100%	100%	100%	50%	75%	100%	50%

*Measurement Of Health Related Components Of Physical Fitness Of Physical And Respiratory Therapy Students From Emilio Aguinaldo College - Cavite After The Two-Year Online Learning Period: A Descriptive Cross-Sectional Study*

Table 4 (continued)

	<b>Body Composition</b>	<b>Left Upper Extremity Flexibility</b>	<b>Right Upper Extremity Flexibility</b>	<b>Lower Extremity Flexibility</b>	<b>Cardio-respiratory Fitness</b>	<b>Muscle Strength</b>	<b>Muscle Endurance</b>
24 years old and above	0%	0%	0%	0%	0%	0%	0%
Sex							
Male	40.6%	84.4%	93.8%	53.1%	100%	56.3%	12.5%
Female	61.7%	67.6%	95.8%	63.8%	97.9%	97.9%	51.1%
Body Type							
Ectomorph	47.8%	100%	100%	78.3%	95.7%	69.57%	17.4%
Mesomorph	42.3%	65.4%	92.3%	46.2%	100%	76.92%	30.8%
Endomorph	66.7%	76.7%	93.3%	59.5%	100%	93.33%	35.4%

Table 4 (continued)

	<b>Body Composition</b>	<b>Left Upper Extremity Flexibility</b>	<b>Right Upper Extremity Flexibility</b>	<b>Lower Extremity Flexibility</b>	<b>Cardio-respiratory Fitness</b>	<b>Muscle Strength</b>	<b>Muscle Endurance</b>
Program							
PT	49.3%	82.1%	97%	59.7%	98.5%	77.6%	26.9%
RT	75%	66.7%	83.3%	58.3%	100%	100%	83.3%
Year Level							
1st Year	59.5%	91.9%	94.6%	54.1%	97.3%	78.4%	29.7%
2nd Year	55%	75%	95%	65%	100%	80%	45%
3rd Year	50%	30%	100%	60%	100%	80.0%	30%
4th Year	33.3%	91.7%	91.7%	66.7%	100%	91.7%	41.7%
Age							
18 to 19 years old	61%	87.8%	97.6%	53.7%	100%	80.5%	29.3%
20 to 21 years old	38.2%	67.65	91.2%	67.7%	100%	79.4%	41.2%
22 to 23 years old	100%	100%	100%	50%	75%	100%	50%

Table 4 (continued)

	<b>Body Composition</b>	<b>Left Upper Extremity Flexibility</b>	<b>Right Upper Extremity Flexibility</b>	<b>Lower Extremity Flexibility</b>	<b>Cardio-respiratory Fitness</b>	<b>Muscle Strength</b>	<b>Muscle Endurance</b>
24 years old and above	0%	0%	0%	0%	0%	0%	0%
Sex							
Male	40.6%	84.4%	93.8%	53.1%	100%	56.3%	12.5%
Female	61.7%	67.6%	95.8%	63.8%	97.9%	97.9%	51.1%
Body Type							
Ectomorph	47.8%	100%	100%	78.3%	95.7%	69.57%	17.4%
Mesomorph	42.3%	65.4%	92.3%	46.2%	100%	76.92%	30.8%
Endomorph	66.7%	76.7%	93.3%	59.5%	100%	93.33%	35.4%

## DISCUSSION, CONCLUSION, AND RECOMMENDATION

This chapter presents the summary of findings, the conclusion, and recommendations relative to the health-related components of physical fitness of SPTRE students from EAC-C after the two-year online learning period.

### **Discussion**

As a consequence of the abrupt implementation of lockdown restrictions, people experienced significant disruption in their regular lifestyle that caused decline in physical activity (Giuntella, 2021). This led to an increase in sedentary time, changes in proper diet, and the adaptation of other unhealthy behavior (Romero-Blanco, 2020). Until now, the majority of studies has focused on highlighting the deleterious effects of COVID-19 on physical activity. However, there is a limited amount of evidence available that examines the potential consequences of reduced physical activity on changes in physical fitness. Physical inactivity

results in overall deconditioning which may present as reduced cardiorespiratory health, flexibility, and muscle strength (Pinho et al., 2020).

The participants in this study were 79 male and female students from 1st year to 4th year from the SPTRE, who are from ages 18 to 23 years old. The household income level of the participants ranges from less than ₱10,957 to ₱219,140 who currently live in a house with family members and with body types that vary from ectomorph, mesomorph, and endomorph. In comparison to a study conducted by Yu et al. (2022), the demographic aspect of the participants had similar characteristics particularly in the inclusion criteria used. All participants are aged 18 and above, who are relatively healthy, and were able to experience both face-to-face classes and online learning. As locally, there is no literature that tackles the measurements of health-related fitness components on any colleges or any universities.

With the transition to online learning students were compelled to adapt to home-based learning set up, the gathered data showed that most of the participants were found to have poor zipper test scores. Inadequate ergonomic arrangements such as limited workspace, unavailability of ergonomic equipment, and insufficient rest breaks were big contributors to musculoskeletal imbalance and reduced flexibility (Chim & Chen, 2023). Also, prolonged seating without pressure relief or proper stretching routines was a common factor that further exacerbated the problem (Langen, 2020).

Cardiovascular fitness, which refers to the ability of the heart, lungs, and circulatory system to supply oxygen to the muscles during prolonged physical activity, plays a vital role in maintaining overall health (Cheng et al., 2019). Regular cardiovascular exercise, such as jogging, cycling, or swimming, helps strengthen the heart, improve lung capacity, and enhance the body's ability to utilize oxygen efficiently (Sheff, 2016). However, the limited access to outdoor spaces and exercise facilities during the pandemic has significantly hindered individuals' ability to engage in these beneficial activities, thereby contributing to a decline in cardiovascular fitness; relative to the results of this study in which most of the participants scored very poorly in the 3 min step test (Kaur, 2020).

The pandemic has forced individuals to adapt to restricted movement and limited access to fitness facilities that resulted in a decrease in physical activity and exercise programs that led to muscle deconditioning and reduced muscle strength (Woods et al., 2020). The sedentary lifestyle adapted during lockdown have further contributed to the apparent weakening of muscle; with the statistics provided in Table 2, it is clear that the majority of the participants needs to improve their muscle strength.

The lockdown has introduced various factors that have influenced the body weight and BMI during the pandemic (Alshahrani et al., 2022). Factors such as increased sedentary behaviors, limited access to physical activity facilities, changes in eating habits, stress, and emotional eating have contributed to weight gain or loss in individuals that have made it challenging to maintain the normal BMI during this period of confinement (Melamed et al., 2022).

Despite the fact that numerous countries reported decreased levels of physical activity, contrary to initial expectations, not all indicators of physical fitness were negatively influenced by the sudden implementation of lockdown restrictions (Zhou, et al., 2022). Gathered data presented on the previous chapter showed that the majority of participants were graded as good in the sit and reach test indicating good flexibility level of the lower extremity and excellent scores in the plank test suggesting an excellent overall muscle endurance level.

Objective and accurate measurement of health-related physical fitness can be achieved in laboratory settings by trained technicians using advanced equipment. However, as mentioned by España-Romero et al. (2020), implementing such tests on a large scale within the population is not practical. Field-based tests offer a viable alternative as they are time-efficient, cost-effective, and easily administered to a large number of individuals simultaneously. There is a growing demand for the development of simple, accurate, and affordable methods to assess fitness levels in young people; however, it is crucial to employ high-quality measurement techniques to ensure reliable results regardless of the testing environment (Ruiz et al., 2019).

## **Conclusion**

In conclusion, the COVID-19 pandemic had indirect repercussions that surpassed the impact of the virus itself. Measures implemented to combat the pandemic, such as social isolation and school closures, have significantly disrupted the individual's healthy lifestyle. Recognizing the consequence of lockdown restrictions is an initial step towards implementing preventive strategies.

This study presents baseline data on the impact of the COVID-19 lockdown on the health-related physical fitness components of SPTRE students of EAC-C. Up to this date, it is one of the first to measure and investigate the deleterious changes of online classes within the context of the pandemic that may be existing in the Philippines.

The results of this study indicated that most of the students from SPTRE scored less than the cut-off points to be considered physically fit in terms of the health-related fitness components except for body composition, lower extremity flexibility, and muscle endurance. The data gathered through the implementation of testing serves as a baseline which suggests that there is a need to propose specific preventive strategies for particular populations who exhibit the deleterious impacts of online class on health related components of physical fitness. The implications of this study are expected to contribute to the development of evidence-based programs and strategies aimed at enhancing the health and well-being of young adults.

## **Recommendations**

The researchers considered that the lockdown restrictions due to the COVID-19 has negatively influenced the health of college students through comparing the outcomes of available literature (Zhou et al., 2022). This study has been implemented to measure the health-related fitness of the students of SPTRE students by utilizing the following fitness tests: BMI, zipper test, sit and reach test, 3 min step test, push up test, and plank test. Fitness battery developers should determine age- and sex-specific cutoff scores in order to identify those people who are at risk to have negative fitness-related health consequences. Optimal cutoff score should be established on the criterion values when there is an available



population-based evidence on the relationship between the level of performance on a fitness test and a health outcome. However, if criterion values are not available, then a population-based percentile value should be considered; these values should be derived either from adults on tests taking the same component or from young adults on tests for a different or the same component (Pate et al., 2012).

The findings of this study may serve as a valuable reference for HEIs in formulating targeted interventions to mitigate the negative impacts of pandemic-related measures on the physical fitness of the students. HEIs and policymakers should prioritize the holistic development of students through integration of wellness activities into the school curriculum that goes beyond academics, focusing on fostering physical health and well-being of the students. The schools should also tailor wellness activities to accommodate varying fitness levels, demographic backgrounds, and abilities of students (Ha et al., 2019). In addition, involving their main stakeholders in the planning and decision-making process regarding these programs can foster a sense of ownership and encourage active participation. Enforcement of specific preventive strategies must be done to address the concerns present in the results of the gathered data (Institute of Medicine [IOM], 2013). Implementation of static and dynamic stretching routines that focuses on major muscle groups and affected areas. Ensuring that the students have proper ergonomic settings at home or at school can minimize and prevent musculoskeletal tension and stiffness (Hibino et al., 2023). Also, incorporating breaks in between activities and ergonomic equipment such as adjustable chairs with proper back support, movable monitor, and appropriate desk height can aid in maintaining flexibility (Janneck et al., 2017).

Through incorporation of body weight exercise or resistance training with available home equipment, integration of simple physical activities into daily living such as brisk walking, jogging, and cycling, and adequate integration of protein in diet, muscle endurance, muscle strength, and cardiorespiratory fitness may be improved while maintaining a normal body composition may be easier (Mileva & Zaidell, 2022; Yuniana et al., 2023). In addition, recognizing the factors contributing to the problem and enforcing strategies to address the issue is a vital component to regain and maintain optimal physical fitness.

In order to gain a more comprehensive understanding of the deleterious impacts of online classes on the health related components of fitness, it can be essential to tackle and consider the perspectives and experiences of participants from other schools who had mixed or negative experiences. Additionally, further investigation should be conducted to explore the correlation of the baseline health-related components with the demographics provided by the researchers. Through this qualitative approach, future studies will contribute to understanding and improve the insights into designing specific programs within the research process.

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## **“Modern Integration of Non-internet General Queueing System (MIONG.qs): The Ticket Queue Dispensing Robot”.**

*(An experimental research that aims to develop a ticket queue dispensing robot that is able to provide a queueing ticket with sequential instructions for the required business of college students and parents or guardians with on-site college-related transactions with Emilio Aguinaldo College – Cavite (EAC-C).)*

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### **KEYWORDS:**

- **Queueing System**
- **Kiosk**
- **Robotic Arm**
- **Self-service**
- **Queueing Ticket**

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**Abstract.** Considering the increase in student enrollment and the growing replacement of the manual queueing procedure, educational institutions must modernize their services. This research designed and developed a ticket queue dispensing robot and a kiosk-based automated queueing system at Emilio Aguinaldo College – Cavite (EAC-C) to help students and

visitors in reducing the inconvenience of waiting in line and establishing a fair queueing line by. It utilized experimental research

that contains descriptive developmental form and employed convenience sampling – a total of one hundred thirty-five (135) college student respondents from the Bachelor of Science in Computer Engineering program at EAC–C during the second semester of the academic year 2022–2023 participated; the robotic arm testing occurred for two (2) days, eight (8) hours each day. Evaluation of the respondents' answers on the Software Product Quality of ISO/IEC 25010:2011 yielded mean scores of 5.54, 5.40, and 5.44 for Functional Suitability, Performance Efficiency, and Usability, respectively, with an overall mean score of 5.46. The proponents' observation of the robotic arm's performance, outlined in NISTIR 8177 Robot Performance Key Performance Indicator, with mean scores of 0.9944 and 0.9950 for Position Accuracy and Position Repeatability, respectively, with an overall mean score of 0.9947, and the average ticket distribution process took 25.28 seconds. MIONG.qs: The Ticket Queue Dispensing Robot has been successfully designed and developed by the proponents, encompassing the web application, database, robotic arm, and hardware. It underwent comprehensive evaluation through survey questionnaires and robotic arm testing, adhering to ISO 25010:2011 and NISTIR 8177 guidelines.

# **MIONG.qs: The Ticket Queue Dispensing Robot**

## **INTRODUCTION**

People encounter a variety of queues, some of which move quickly, while others appear to linger indefinitely and disrupt the entire day. What distinguishes a decent waiting experience from a horrible one is not simply the pace of the queue. How the wait affects our emotions, and the fairness of the line, may have a significant influence on our impression of a line than the duration of the wait (Prisco, 2019). Anyone who has stood in a long line only to be informed that there is a procedure to be completed before proceeding and instructed to wait in another line and then return to the initial line will be frustrated. Management whose queueing system is inefficient will be unable to provide a satisfactory experience for their customers.

As a result of social distancing procedures and nationwide lockdowns, the COVID-19 pandemic has given birth to a considerable usage of digital technology, according to study by De' et al. (2020). People and organizations around the world have had to adapt to new ways of living and conducting business. The pandemic has had a significant impact on the development and innovation of digital technologies in a variety of industries over the past few years. However, there are still other industries stuck in providing a traditional service, for example queueing.

The digitalization of this procedure – queueing, should make the overall experience simpler and easier for the customers (Malapo, 2022). A ticket queue distribution with concise instructions and complete information will assist customers in carrying out their duties with minimal difficulty. The ability to attend to other needs without standing in line will improve the customer experience of management.

Traditional queueing is inefficient in a lot of ways, especially when the line is long. Standing in a long queue is tedious and will consume a considerable amount of time depending on the length of the transactions being made. However, it is not always about how long and fast a queue is, instead it is about the psychology of the customers and line fairness as stated by Prisco (2019). It is further

affirmed by Kuzu et al. (2019) in their study customers use dynamic updating to foresee and make judgments over time, and they alter their patience depending on the waiting situation. They added that the literature underpredicted the inefficiency of ticket lines.

An effective queueing system should reduce walkaways and reduce wait times inside the facility. Additionally, it increases employee productivity by freeing them of the responsibility of overseeing lengthy lines (Tšernov, 2022). There are various queueing management systems, including the conventional and others that use tickets, the internet, or kiosks. For the proponent's study, they will be utilizing a kiosk machine and a ticket queue.

During this ongoing Coronavirus disease 2019 (COVID-19) pandemic, kiosk machines can be commonly seen being utilized in establishments. According to Vailshery (2022), sales are expected to triple between 2021 and 2028, demonstrating the market's enormous potential and the fact that owning these kiosks will soon be essential for any successful company. Businesses place kiosks, which are digital screens, in busy locations to provide information or self-service alternatives. It is frequently interactive so that users can interact with it (Brophy & Hodge, 2022). Sy et al. (2021) found that a kiosk machine is the best way to place an order at a certain McDonald's fast-food chain. 54.6% of the survey's 242 respondents preferred using the kiosk machines. Kiosks can be regarded as a flexible and reliable technology that can be modified based on the requirements of the establishment. Additionally, the benefits of self-service technology (SST) include technological innovation, a better customer experience, and a decrease in employee expenditure costs (De Leon et al., 2020).

Previous studies and literature aided the researchers in developing an automated queueing system that would assist with the management of queueing lines. The researchers decided to develop a centralized modern queueing system with a kiosk for user interface using an Apache HTTP server, XAMPP, a thermal printer, and a robotic arm utilizing Arduino-based servo motors in order to provide

service to college students at Emilio Aguinaldo College – Cavite and their parents or guardians having on-site college-related business with the educational institution.

Presently, the students are going to their educational institution to process their academic needs and most likely they are the ones who fall in line and are waiting for their time to be called. Nonetheless, the study entitled “MIONG.qs: The Ticket Queue Dispensing Robot” could be used to prevent these dilemmas stated above by implementing a new and modern way of queueing in line. In order to acquire all necessary knowledge, data, and information of this study, the researchers aim to answer the following questions: How will the automated queueing design be developed based on the existing on-site college transactions (continuing college enrollment and school document request)? How will the automated queueing design be integrated into an interactive system for the institution’s stakeholders? How will the functional suitability, performance efficiency and usability of the automated queueing system be evaluated in accordance with the Software Product Quality of ISO/IEC 25010:2011? How will the position accuracy, position repeatability, and job execution time of the robotic arm be evaluated in accordance with the NISTIR 8177 Robot Performance Key Performance Indicator? What are the advantages and disadvantages of the automated queueing system?

The main objective of this research entitled “MIONG.qs: The Ticket Queue Dispensing Robot” is to develop a ticket queue dispensing robot that is able to provide a queueing ticket and sequential instructions for the required business of college students and parents or guardians with on-site college-related transactions with Emilio Aguinaldo College – Cavite (EAC–C).

The specific objectives of the study on the other hand are the following: Design an automated queueing system by incorporating the existing on-site procedures of continuing college student enrollment and school document request of Emilio Aguinaldo College – Cavite (EAC–C), develop a kiosk-based automated queueing system for the institution’s stakeholders, evaluate the automated queueing system in accordance with the Software Product Quality of ISO/IEC 25010:2011 in terms of: Functional Suitability, Performance Efficiency, and Usability, evaluate the robotic arm in accordance with the NISTIR 8177 Robot Performance Key Performance Indicator: Position Accuracy, Position Repeatability, and Job Execution Time, and identify the advantages and disadvantages of using an automated queueing system through the use of a word cloud.

The conceptual framework utilized by the study is in the form of

Input, Process, and Output (IPO), all of which are focused on the declared statement of the problem and objectives of the study.

For the Input Section, these are the data that would be fed into the system. First, is the Nature of Business which are Continuing College Student Enrollment and School Document Request. Next is the Basic Information of the college student at EAC-C, his student number, and an option for the user to be in a non-priority queue or priority queue reserved for the senior citizen, Person with Disability (PWD), or pregnant woman.

To be followed by the Process Section, this is where all the college student or user's entered data would be processed by the system. This is also where the technicalities would take place. Prior to starting this section, the researchers would strictly implement that the clients who would use the services of the Cashier's Office or Office of the Registrar are required to go through MIONG.qs for the initial procedures to be put in queue as a requirement to have transactions to the said offices. The first process is the Collection of Data of the college student or user's nature of business and basic information. The second part of the process would be the developed Web Application that specifically uses Apache HTTP Server including Hypertext Pre-processor, Cascading Style Sheets, JavaScript, and SQLite as the database. Next would be the Connection wherein the researchers would utilize a local server using the XAMPP Control Panel. After the internal process took place, the system would be processing the fourth part which would be the Distribution of Queue Lists employing the queueing system web application, from the kiosk's input to the client side, in accordance with the Hybrid First Come, First Serve (FCFS) + Priority Queue (PQ) algorithm. Senior citizens, Persons with Disabilities (PWD), and pregnant women users are given priority, in accordance with s. 4. m of the Expanded Senior Citizens Act of 2003 or the Republic Act (RA) No. 9257 and s.1. e of the An Act Expanding the Benefits and Privileges of Persons with Disability (PWD) or the Republic Act (RA) No. 10754. Continuing with the process would be the Integration of Touch Sensor together with the collected data of the college student or user. Integration of Servo Motors using an Arduino-based board for the robot functionality of the queueing system that dispenses the queueing ticket to the users. Lastly would be the Prototype Testing and Evaluation in which the entire system will be tested and evaluated if it is ready for deployment.

For the Output Section, this is where the result of the prototype testing and evaluation and integration of the entered data together

with the technicalities of the process would take place. First would be the Centralized Queueing System itself, that has the features of: Thermal Printer (printing of the queueing ticket) Printing of Queueing Ticket Using Thermal Printer (which has the school name, school logo, school address, college student's student number, nature of business, guided steps for the desired process, queue timestamp, kiosk reference number, and footer credits), Robotic Arm (dispensing of queueing ticket to the user), TTS Technology (notifying the next queued client to proceed to the counter) and lastly would be the Functional User-friendly MIONG.qs Kiosk and Interface.

## METHODOLOGY

### Research Design

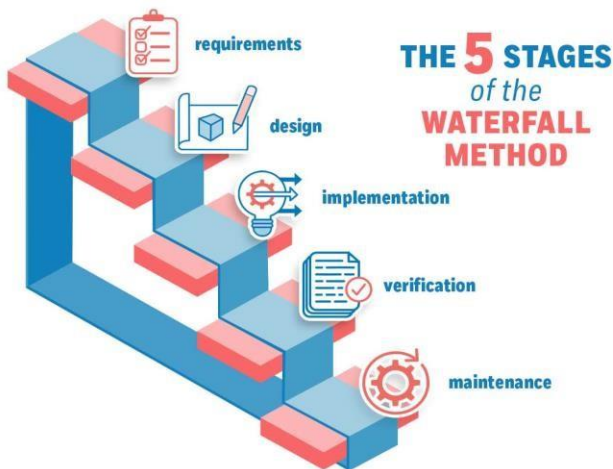


Figure 1. Visual representation of the Waterfall Method adapted by the study

Figure 1 presents the visual representation of the process of the Waterfall Methodology or also known as the Waterfall Method, which is adopted by the study "MIONG.qs: The Ticket Queue Dispensing Robot". It is a sequential development process that flows like a waterfall through all phases of a project (analysis, design, development, and testing), with each phase entirely wrapping up before the next one begins (Adobe Communications Team, 2022).

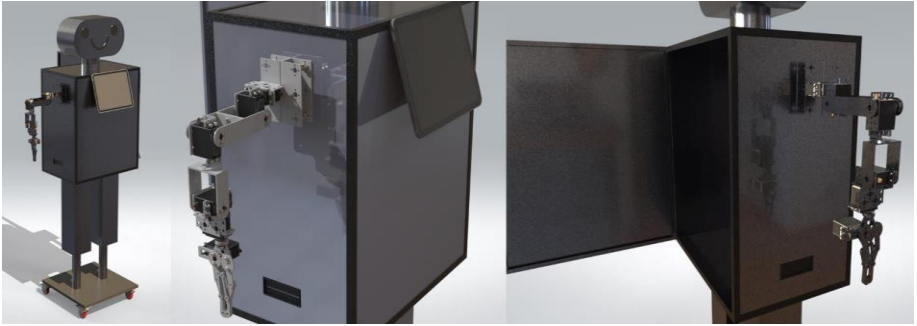


The waterfall method has five (5) stages – requirements, design, implementation, verification, and maintenance. The following stages will be discussed below:

**Requirements.** It collects information from the developing projects regarding their needs and the outcomes they expect from the software or product. The following requirements from the study are the hardware used, including a personal computer (PC), touchscreen monitor, thermal printer, servo motors, Arduino-based board, and network cables. For the software, it required an installation of XAMPP Control Panel to start the service of Apache and SQLite. The duration of the project would be finished within four (4) months. Based on the initial setup, the project cost only has an estimated price of eighty thousand pesos (₱80,000.00). The risks are minimal since the queueing system would run on a non-internet server or through a localhost. The assumption of the program is to provide faster on-site service for collegiate students at Emilio Aguinaldo College – Cavite (EAC-C) in their school administration needs. Lastly, the software's dependency relies on the user's input in an educational institution – EAC-C; all other users not mentioned are not qualified to be part of the dependency.

**Design.** It is reviewing the requirements and developing a design to meet them. The research team determines the path to produce a solution and the relevant specifications. The researchers would design a queueing system like a robotic kiosk in this study. For the external hardware used, the kiosk, specifically an Eyoyo® DYL0028 - 10.1-inch capacitive touchscreen monitor with a built-in speaker. An

Xprinter® XP-Q90EC 58mm Auto-Cut Thermal Receipt Printer (16.5 cm x 12 cm x 11.5 cm) that releases a thermal paper (58mm x 40mm, specifically, 15 m long per roll, projected to manage at least one hundred (100) transactions) that will be dispensed to the user through a robotic arm. In the back-end design, the program will solely run through Apache, which would be connected from the user interface to the client and SQLite for the database. Then it will go through the said offices (Cashier's Office and Office of the Registrar). Moreover, the front-end design is expected to be simple but eye-catching to users.



*Figure 2. Rendered prototype design of the study*

Figure 2 shows the rendered prototype design of MIONG.qs. It shows the desired shape, compartment, robotic arm, mount, and base. This design guided the researchers in designing the actual prototype design of the study.



*Figure 3. Actual prototype design of the study*

Figure 3 is the actual design of the MIONG.qs kiosk, the dimensions would be as follows: height is 4.11 feet with length and width approximately 1 meter. As for the primary material from the head and body (excluding the right arm), the researchers would use galvanized iron as the primary material of the robot. According to AdvanTec (2022), galvanized steel is a cost-effective material due to its many benefits at a lower cost. Some advantages of galvanized steel that contribute to its cost-effectiveness include the low cost of

raw materials, longer lifespan, reduced maintenance costs, ease of installation, and recyclability. AdvanTec noted that galvanized steel has a lower initial cost and maintenance and repair costs over time due to its high durability and resistance to corrosion. As per the material on the robotic arm, the researchers used an aluminum servo plate mount or extension and rubberized aluminum gripper. Aluminum is commonly used for robotic arms due to its strength, lightweight nature, and corrosion resistance (Rohilla, 2021). According to Matthews (2019), aluminum is especially suitable for robotic arms in industrial environments where precision and high-speed movements are necessary. She further stated that aluminum's high strength-to-weight ratio allows for faster and more precise movements, while its corrosion resistance makes it well-suited for harsh environments.

For the gripper, according to (Yamada et al., 2021), robotic grippers that gently handle objects of various shapes are required for a variety of applications these days. Traditional finger-shaped grippers are multifunctional and can grip various objects; however, grasping an item without slippage necessitates planning the positioning of the fingers at appropriate locations on the item. As a result, a ring-shaped soft gripper that coils itself around objects like a rubber band is proposed. This research used a double-sided strong glue-gel grip tape (width: 30 mm, thickness: 2 mm) and a black-rubber skid protector attached gripper that coils itself around objects like a rubber band for an effective grip. Lastly, for the specific function of the robotic arm. The number of movable joints on a robot is typically called Degrees of Freedom (DOF).

The study employed six (6) DOF using six (6) MG996R motors; MG996R is a popular servo motor widely used in robotics and hobbyist projects. It is known for its high torque and reliable performance. Its basic specifications are as follows:

- **Operating Voltage:** 4.8 – 7.2 V DC
- **Stall Torque:** 9.4  $\frac{kg}{cm}$  (at 4.8 V), 11  $\frac{kg}{cm}$  (at 6 V)
- **Speed:** 0.17  $\frac{sec}{60^\circ}$  (at 4.8 V), 0.14  $\frac{sec}{60^\circ}$  (at 6 V)
- **Operating Temperature:** 0° C – 55° C
- **Dimensions:** 40.7 mm x 19.7 mm x 42.9 mm
- **Weight:** 55 g
- **Gear Type:** Metal
- **Rotation:**  $\approx 180^\circ$  (may vary based on

implementation and programming)

Moreover, due to their high-power consumption, six (6) MG996R servo motors require a 6 V 8 A DC power supply, which is safer than taking power from the Arduino Uno R3 USB connection. High-torque, high-power MG996R servo motors need electricity to work efficiently. Under load, each motor can draw 2 A of electricity. Therefore, six (6) motors would need at least 12 A to run. Thus, a 6 V 8 A DC power supply would power all six motors. For several reasons, an external power supply is better than the Arduino Uno R3 USB port for motor power. First, the Arduino board's USB port can only produce 500 mA, insufficient to power even one (1) MG996R motor. Overloading the USB port can harm the board, making it inoperable.

Second, an external power supply provides more motor power control. This is critical when the motor load varies, or precise motor speed control is needed. Dedicated power supplies allow voltage and current adjustments to maximize motor performance. Six (6) high-power MG996R servo motors require a 6 V 8 A DC power supply. An external power supply protects the Arduino Uno R3 USB port and gives more control over motor power.

The six (6) motors were then labeled (A – F) with their initial placement angle where all the motor's maximum rotation was at 180°. These are:

1. **Shoulder Pitch (A)** – The shoulder with a vertical movement, -40° initial angle or placement.
2. **Shoulder Yaw (B)** – The shoulder with a horizontal movement, -40° initial angle or placement.
3. **Elbow (C)** – The elbow with horizontal movement, +80° initial angle or placement.
4. **Wrist yaw (D)** – The wrist with horizontal movement, +45° initial angle or placement.
5. **Wrist Rotation (E)** – The wrist with a circular movement, +95° initial angle or placement.

6. **Gripper (F)** – The gripper with close and open movement,  $+130^\circ$  initial angle or placement.

## Circuit Design

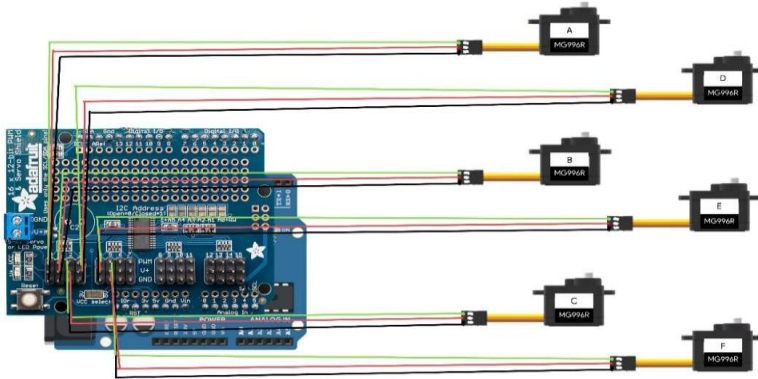


Figure 4. Circuit design of the study

Figure 4 presents the circuit design of the study. An Arduino Uno R3 is the principal component, acting as the main controller. The Arduino Uno R3 is connected to a 16-channel 12-bit Pulse Width Modulation (PWM) Servo Shield I2C, which provides additional capabilities for controlling the servo motors. The power is supplied to the servo shield through a USB port and a 6 V 8 A DC external power source.

There are six (6) MG996R motors, namely, A, B, C, D, E, and F in this circuit, and each servo motor is connected to the PWM Motor Shield. The connection between the Arduino Uno R3 and the PWM Servo Shield is established using specific pins.

Table 1

*Components utilized by the circuit in the study and its connections*

Component	Connection
Arduino Uno R3	Main
16-channel 12-bit PWM Servo Shield I2C	USB port and 6 V 8 A DC external power supply
A - MG996R motor	A0 (Arduino Uno R3) to A0 (PWM Servo Shield)
B - MG996R motor	A1 (Arduino Uno R3) to A1 (PWM Servo Shield)
C - MG996R motor	A2 (Arduino Uno R3) to A2 (PWM Servo Shield)
D - MG996R motor	A3 (Arduino Uno R3) to A3 (PWM Servo Shield)
E - MG996R motor	A4 (Arduino Uno R3) to A4 (PWM Servo Shield)
F - MG996R motor	A5 (Arduino Uno R3) to A5 (PWM Servo Shield)

Table 1 presents the components utilized by the circuit and its connections. The Arduino Uno R3 serves as the main connection of the circuit. The 16-channel 12-bit PWM Servo Shield I2C is connected through the USB port and the 6 V 8 A DC external power supply. While the servo motors, servo motor A is connected from the A0 pin on the Arduino Uno R3 to the A0 pin on the PWM Servo Shield. Similarly, servo motor B is connected from A1 pin on the Arduino Uno R3 to A1 pin on the PWM Servo Shield, servomotor C from A2 pin on the Arduino Uno R3 to A2 pin on the PWM Servo Shield, servo motor D from A3 pin on the Arduino Uno R3 to A3 pin on the PWM Servo Shield, servo motor E from A4 pin on the Arduino Uno R3 to A4 pin on the PWM Servo Shield, and servo motor F from A5 pin on the Arduino Uno R3 to A5 pin on the PWM Servo Shield. This circuit setup allows the Arduino Uno R3 to control the six (6) MG996R motors using the PWM Servo Shield. The Arduino Uno R3 can send signals to the servo motors through the PWM shield, enabling precise and adjustable control over the motor's speed and position.

**Implementation.** This is where the building or coding takes place. The software would be programmed using Hypertext Preprocessor (PHP), which also integrates the HyperText Markup Language (HTML), Cascading Style Sheets (CSS), JavaScript (JS), and SQLite for the database. Lastly, the servo motors would be connected to Arduino Uno R3 while the thermal printer would be directly connected to the personal computer (PC) through a Universal Serial Bus (USB) integration.

The queueing system would follow the Hybrid First Come, First Serve (FCFS) + Priority Queue (PQ) algorithm. It is the most appropriate queueing system algorithm in the Philippines as people can choose between the regular lane and priority lane provided that the user is classified as Senior Citizen (SC) under Republic Act No. 9257 or Persons with Disability (PWD) under Republic Act No. 10754, or pregnant women.

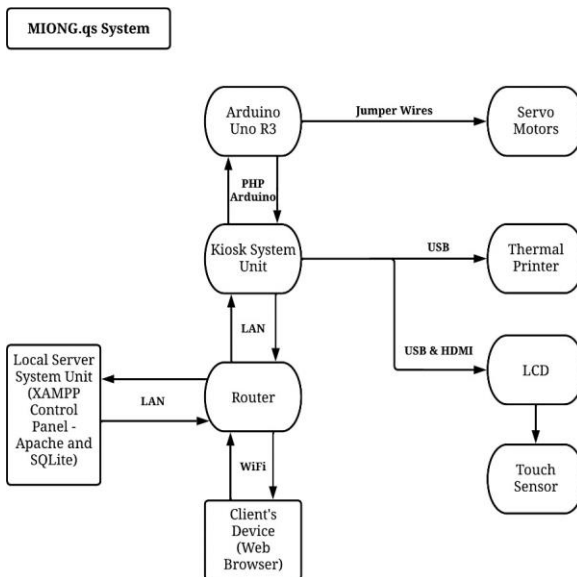


Figure 5. Block diagram for the entire MIONG.qs system

Figure 5 shows the block diagram for the entire connections of the MIONG.qs system:

1. The Arduino Uno R3 would control the servo motors using jumper wires for the functionality of the robotic arm.

2. The Arduino Uno R3 would communicate bidirectionally to the Kiosk System Unit through PHP Arduino, and it is an integration of Arduino to PHP using a serial port.
3. The Kiosk System Unit would be connected bidirectionally to the Router through an Ethernet cable (LAN cable) for accessing the local server.
4. The Local Server System Unit is bidirectionally connected to the Router through an Ethernet cable (LAN cable).
5. The Client's device is bidirectionally connected to the Router to allow access to the web browser.
6. The Kiosk System Unit would transmit data to the Thermal Printer through a USB connection to print the thermal receipt.
7. The Touch Sensor is already integrated into the Liquid Crystal Display (LCD) screen and is directly connected to the System Unit using a USB and High-Definition Multimedia Interface (HDMI) cables to display the kiosk web application.

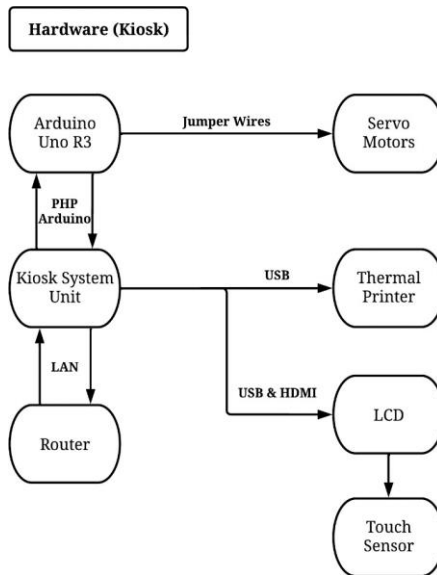


Figure 6 presents the block diagram of the hardware connections for the kiosk:

1. The Arduino Uno R3 would control the servo motors using jumper wires for the functionality of the robotic arm.
2. The Arduino Uno R3 would communicate bidirectionally to the



Kiosk System Unit through PHP Arduino, and it is an integration of Arduino to PHP using a serial port.

3. The Kiosk System Unit would be connected bidirectionally to the Router through an Ethernet cable (LAN cable) for accessing the local server.
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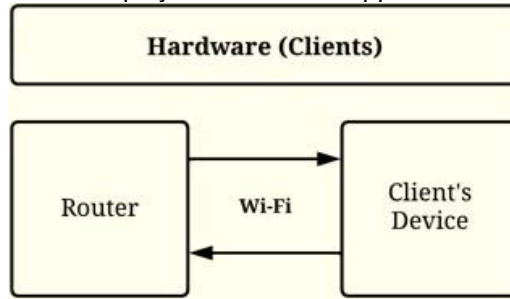


Figure 7. Block diagram for the hardware connections of the clients

Figure 7 shows the block diagram of the connections of hardware for clients. The Router would be bidirectionally connected through Wi-Fi connection for the communication of the local server to the client's device.

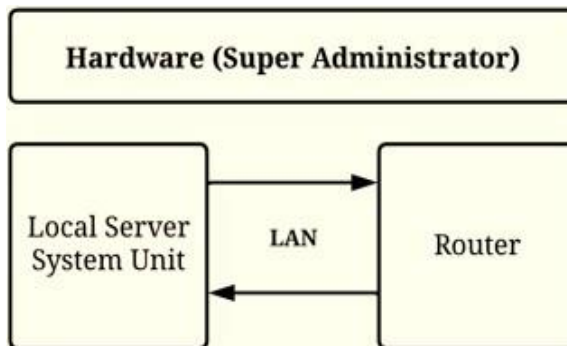


Figure 8. Block diagram for the connections of the super administrator

Figure 8 presents the block diagram of the hardware connections for the super administrator. The super administrator would function as the local server of the “MIONG.qs: The Ticket Queue Dispensing Robot,” it is the primary control of the entire system. In addition, the Local Server System Unit would be directionally connected to the Router using an Ethernet cable (LAN cable).

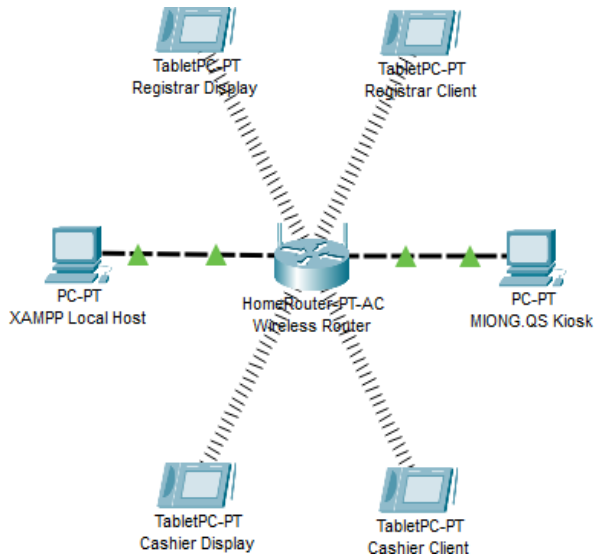


Figure 9. Network architecture of MIONG.qs

Figure 9 shows the network architecture of “MIONG.qs: The Ticket Queue Dispensing Robot” which consists of one (1) wireless router, two (2) personal computers (PCs), and four (4) tablet PCs. With that, the first PC would serve as the local host of the queueing system, and it is the central control where the XAMPP control panel would be enabled, and it would be connected to a router using an Ethernet cable (LAN cable). The second PC is the kiosk of the queueing system, and it would be connected to the router using an Ethernet cable (LAN cable). The four (4) tablet PCs, including the Registrar Display, Registrar Client, Cashier Display, and Cashier Client, would be connected to the router using Wi-Fi connection. In the network topology, the Internet Protocol (IP) address would use the Class C type with 192.168.0.0 – 192.168.255.255 with 254 hosts. Since the six (6) connected devices or hosts are already

sufficient for the said class type. Moreover, the wireless router would deploy IP addresses to each device using a Dynamic Host Configuration Protocol (DHCP) with restricted IP address ranges and a maximum number of connected devices to prevent unauthorized access to the network.

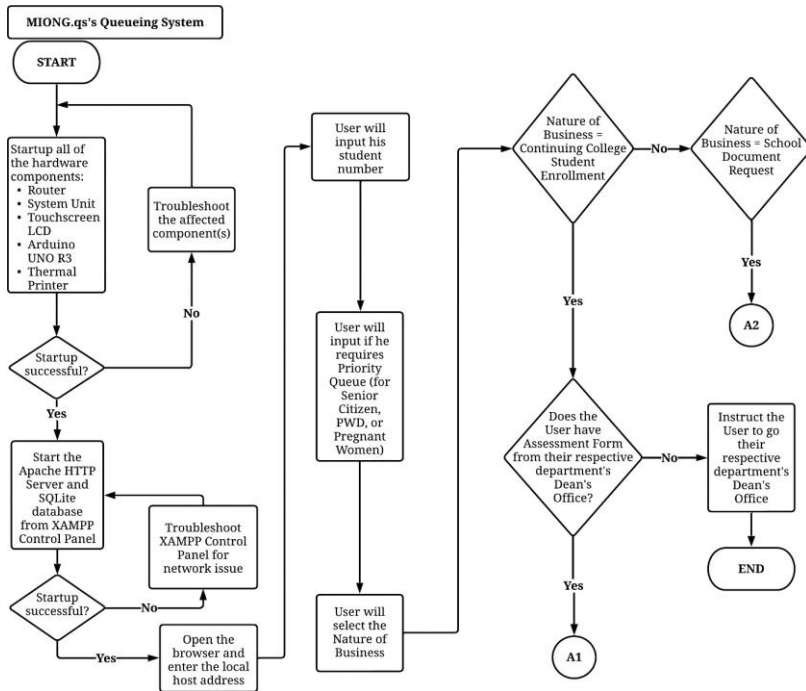


Figure 10. Flowchart for the entire queueing system process

Figure 10 presents the flowchart for the entire queueing process of “MIONG.qs: The Ticket Queue Dispensing Robot”. First, startup all the hardware components, including the Router, System Unit, Touchscreen LCD, Arduino Uno R3, and Thermal Printer; if the startup is successful, then proceed to the next step; otherwise, troubleshoot the affected component(s) and proceed with the hardware startup again. Second, startup the Apache HTTP Server and SQLite database from the XAMPP Control Panel; if the startup is successful, proceed to the next step; otherwise, troubleshoot the XAMPP Control Panel for network issues and proceed with the startup of the XAMPP again.

Third, the user would input his student number. Sixth, the user would input if he required a priority queueing reserved for Senior Citizens, PWDs, or pregnant women; otherwise, proceed with the next step. Seventh, the user would select his nature of business, whether (A1) Continuing College Enrollment or (A2) School Document Request.

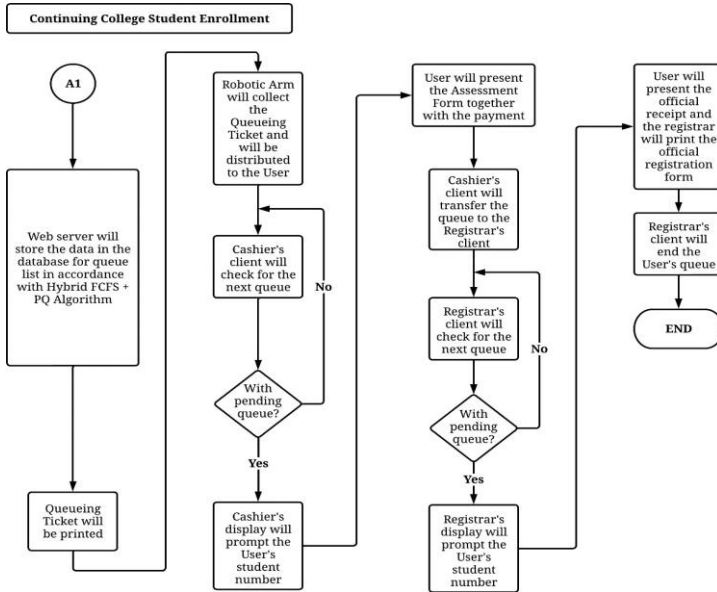


Figure 11. Flowchart for continuing college enrollment process

Figure 11 shows the flowchart for the Continuing College Student Enrollment process if the user selected A1. For the first subpart of it, it will ask the user if he already has an Assessment Form from their respective department's Dean's office; if yes, it would proceed to the next step; otherwise, the kiosk will instruct the user to go to their respective department's Dean's office first and terminate the user's transaction. Next, the web server would store the data in the queue under Hybrid FCFS + PQ Algorithm, a queueing ticket would be printed, and the robotic arm would collect the queueing ticket and distribute it to the user. Next, the Cashier's client would check for the next queue; if there is a pending queue, proceed; otherwise, Cashier's client would check again for the pending queue. Next, the Cashier's display would prompt the user's student number, and the user would proceed to the Cashier's office to present the Assessment Form and the payment. After the transaction, the Cashier's client would transfer the queue to the Registrar's client

and check for the next queue; if there is a pending queue, proceed; otherwise, the Registrar's client would check again for the pending queue. Next, the Registrar's display would prompt the user's student number, and the user would proceed to the Registrar's office to present the official receipt. The registrar will print the official Registration Form. Lastly, the Registrar's client would end the user's queue to terminate the transaction.

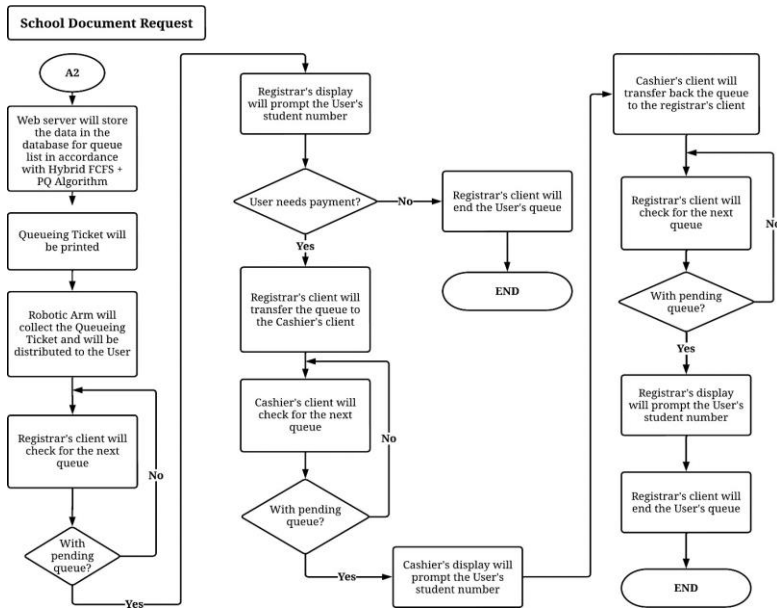


Figure 12. Flowchart for school document request

Figure 12 presents the flowchart for the process of School Document Request if the user selected A2. For the first subpart, the web server would store the data in the queue under Hybrid FCFS + PQ Algorithm, a queueing ticket would be printed, and the robotic arm would collect the queueing ticket and distribute it to the user. Next, the Registrar's client would check for the next queue; if there is a pending queue, proceed; otherwise, Registrar's client would check again for the pending queue. Next, the Registrar's display would prompt the user's student number, and the user would proceed to the Registrar's office to request the document needed. If the user needs payment, the Registrar will provide the request form and proceed to the next step; otherwise, the Registrar will

provide the requested document, ending the user's queue. Next, the Registrar's client would transfer the queue to the Cashier's client and check for the next queue; if there is a pending queue, proceed; otherwise, Cashier's client would check again for the pending queue. Next, the Cashier's display would prompt the user's student number, and the user would present their request form and settle the payment. After the transaction, the Cashier's client would transfer back the queue to the Registrar's client. Next, the Registrar's client would check for the next queue; if there is a pending queue, proceed; otherwise, the Registrar's client would check again for the pending queue. Finally, the Registrar would provide the requested document and end the user's queue.

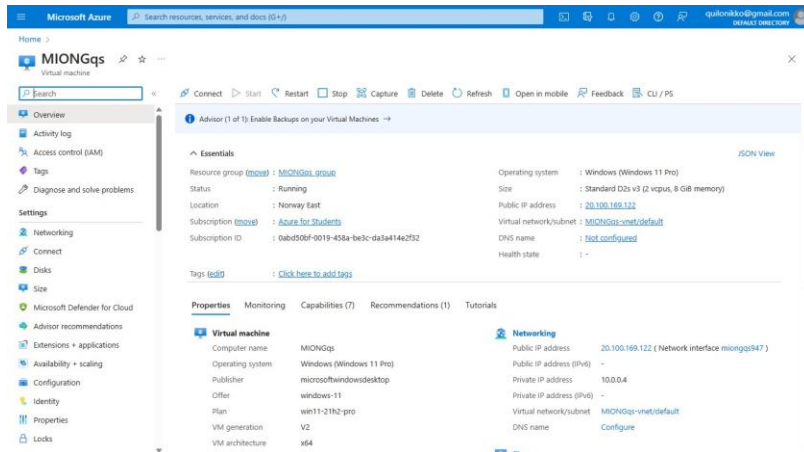


Figure 13. Microsoft® Azure virtual machine dashboard

Figure 13 shows the screen capture of the Microsoft® Azure virtual machine (VM) dashboard. The researchers used Microsoft Azure to collaborate remotely in creating the software side of “MIONG.qs: The Ticket Queue Dispensing Robot.” In the virtual machine, the researchers utilized a Windows 11 Pro 64-bit with Standard D2s v3 (2 virtual CPUs, 8GiB memory) under the Norway East server location. Also, the public IP address of the VM is 20.100.169.122. The server automatically shuts down every 1:00 AM to prevent unwanted charges.

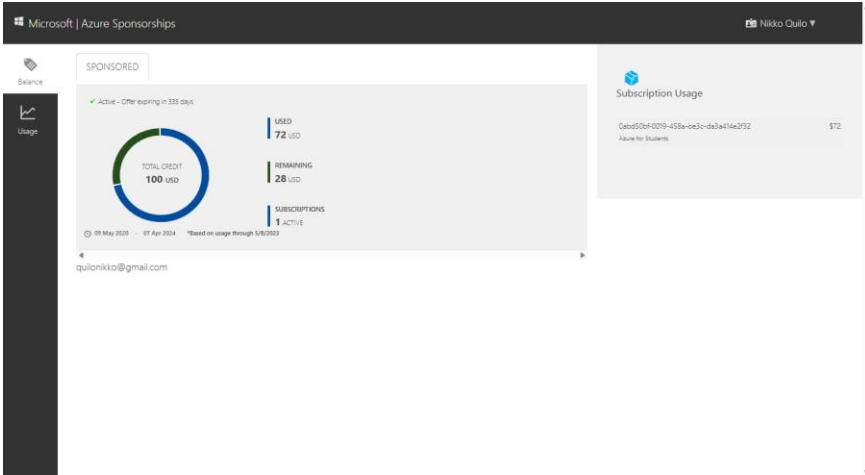


Figure 14. Microsoft® Azure sponsorships dashboard

Figure 14 presents the dashboard of Microsoft Azure Sponsorships. It is how the researchers use Microsoft Azure educationally, as they provide one hundred dollars (\$100.00) annual credits for each verified student. Upon using Microsoft Azure, the proponents only used below the provided one hundred dollars (\$100.00) credits showing that there is no actual cost billed to the researchers during the implementation of the automated queuing system.

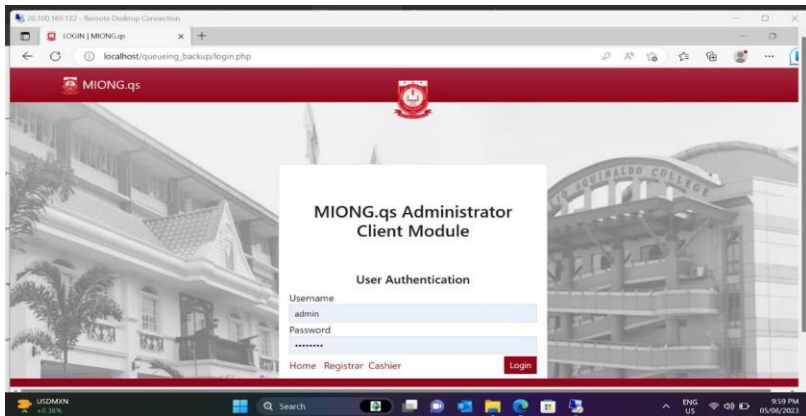


Figure 15. Usage of Microsoft® Azure virtual machine for collaboration

Figure 15 shows the screen capture of the Remote Desktop Connection (RDC) of the Microsoft® Azure virtual machine. The researchers used Microsoft Azure VM with a Public IP Address (20.100.169.122) to perform remote collaboration in creating the software side of MIONG.qs: The Ticket Queue Dispensing Robot.

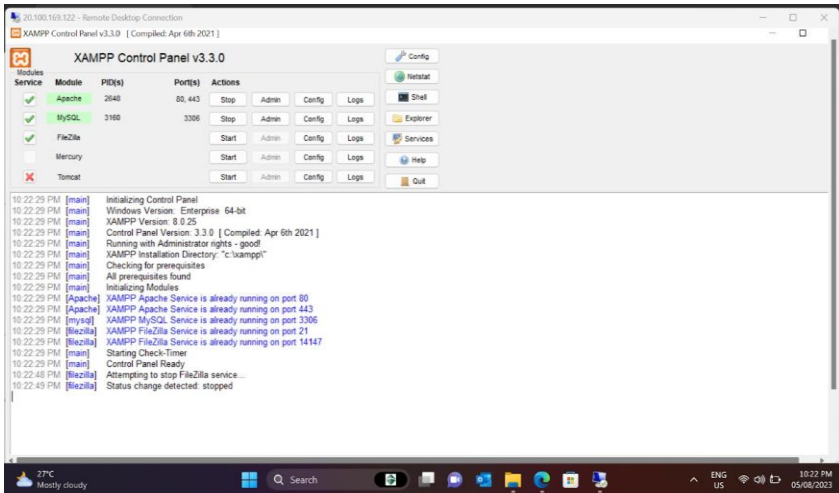


Figure 16. XAMPP Control Panel dashboard

Figure 16 presents the screen capture of XAMPP Control Panel v.3.3.0. It is an open-source program to run a web application. To ensure the smooth operation of MIONG.qs on the localhost, both Apache and MySQL should be started. Thus, the queuing system is functional. Without the XAMPP Control Panel, there are no open ports to perform Apache and MySQL. In the same device or server, the URL will start in the "localhost," while other devices that wish to connect with the server must be connected to the same Wi-Fi connection, and that user will input the private IP address of the said server and the URL will be the same as the private IP address.



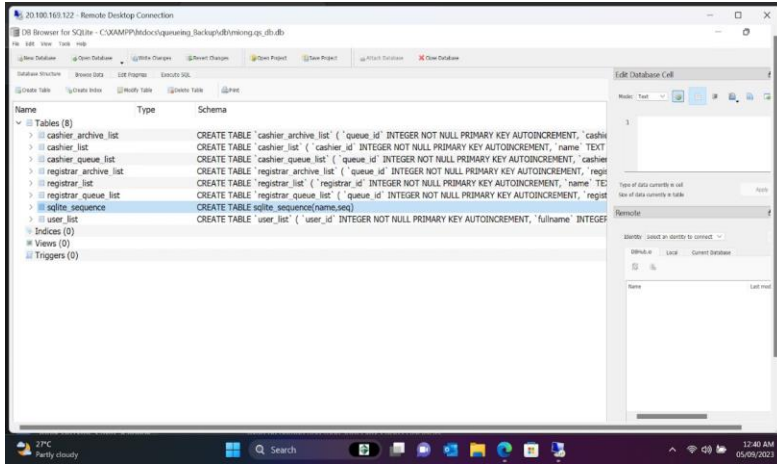


Figure 17. DB Browser for SQLite database

Figure 17 shows the screen capture of DB Browser for SQLite software. It is a high-quality, visual, open-source tool to create, design, and edit database files compatible with SQLite. This is where the researchers see the back end of the database if an override is needed. However, overall, it is not an independent software as the data, including the student's student number in the queue, is protected in DES-ECB encryption, and the passwords in the super administrator are protected in MD5. Data Encryption Standard – Electronic Code Book (DES-ECB) encryption is the fundamental DES encryption method for encrypting or decrypting an individual 8-byte DES\_cblock in ECB mode (OpenSSL, 2021). It is used in the study for student number values security in database storage; it uses a secret key for encoding and decoding values, and it is the easiest two-way algorithm that can encode and decode values. On the other hand, Message-Digest (MD5) algorithm is a cryptographic technique used for message authentication, content verification, and digital signatures. MD5 is a hash algorithm that confirms if a file you transmitted match the file acquired by the individual to whom you sent it (Freda, 2022). These encryptions can be decoded or authenticated only by using PHP functions in the queuing system. The database file for MIONG.qs is "miong.qs\_db.db". Upon opening the database file, there are seven (7) tables shown in the screen capture above, and it is all vital in the queuing system:

1. **user\_list** – this is the storage of super

administrator accounts. There are six (6) schemas under this table:

- a. **user\_id** – this is the auto-increment integer that will act as a primary key for the super administrator user.
  - b. **fullname** – this is the full name of the super administrator user.
  - c. **username** – this is the username of the super administrator user, and it will be used on the login page.
  - d. **password** – an MD5 encrypted string that stores the password, which will be used on the login page for authentication.
  - e. **status** – an integer of "1" for active and "0" for inactive to signify the status of the super administrator user.
  - f. **date\_created** – this is the timestamp of the creation of the super administrator user.
2. **registrar\_list** – this is the storage of registrar accounts. There are four (4) schemas under this table.
- a. **registrar\_id** – this is the auto-increment integer that will function as a primary key for the registrar user.
  - b. **name** – this is the name of the registrar user.
  - c. **log\_status** – an integer of "1" for logged in and "0" for logged out to prevent duplicate sessions in the registrar client.
  - d. **status** – an integer of "1" for active and "0" for inactive to signify the status of the registrar user.
3. **cashier\_list** – this is the storage of cashier accounts. There are four (4) schemas under this table.
- a. **cashier\_id** – this is the auto-increment integer that will function as a primary key for the cashier user.
  - b. **name** – this is the name of the cashier user.
  - c. **log\_status** – an integer of "1" for logged in and "0" for logged out to prevent duplicate sessions in the cashier client.
  - d. **status** – an integer of "1" for active and "0" for inactive to signify the status of the

cashier user.

4. **registrar\_queue\_list** – this is the storage of the active queue in the registrar department. There are eight (8) schemas under this table.
  - a. **queue\_id** – this is the auto-increment integer that will function as a primary key for the queue.
  - b. **registrar\_id** – this is the registrar ID that receives that specific queue. First, it is NULL as the queue has been initially placed yet, and there is no corresponding registrar yet.
  - c. **category** – this is to tag the queue where the transaction step was done.
  - d. **student\_number** – a DES-ECB encrypted string that stores the customer's name.
  - e. **priority** – this is to tag the queue whether it is a priority or not. "1" means priority, and "0" means non-priority.
  - f. **status** – this is an integer of "1," which means the queue has been called already and is still on the transaction, while "0" if the queue has not been called yet.
  - g. **notify** – this is an integer of "1," which means it requires to be notified and displayed on the monitoring page. While "0" means the queue has been notified already.
  - h. **date\_created** – this is the initial timestamp of the queue in place. The timestamp is based on the kiosk input if it is initial, or the timestamp of the transfer made by the cashier.
5. **cashier\_queue\_list** – this is the storage of the active queue in the cashier department. There are eight (8) schemas under this table.
  - a. **queue\_id** – this is the auto-increment integer that will function as a primary key for the queue.
  - b. **cashier\_id** – this is the cashier ID that receives that specific queue. First, it is NULL as the queue has been initially placed yet, and there is no corresponding registrar yet.
  - c. **category** – this is to tag the queue where the transaction step was done.

- d. **student\_number** – a DES-ECB encrypted string that stores the customer's name.
  - e. **priority**: This is to tag the queue whether it is a priority or not. "1" means priority, and "0" means non-priority.
  - f. **status** – this is an integer of "1," which means the queue has been called already and is still on the transaction, while "0" if the queue has not been called yet.
  - g. **notify** – this is an integer of "1," which means it requires to be notified and displayed on the monitoring page. While "0" means the queue has been notified already.
  - h. **date\_created** – this is the initial timestamp of the queue in place. The timestamp is based on the kiosk input if it is initial, or the timestamp of the transfer made by the registrar.
6. **cashier\_archive\_list** – this is the storage of past queues under the cashier department. There are seven (7) schemas under this table:
- a. **queue\_id** – this is the auto-increment integer that will function as a primary key for the queue.
  - b. **cashier\_id** – this is the cashier ID that receives that specific queue.
  - c. **category** – this is to tag the queue where the transaction step was done.
  - d. **student\_number** – a DES-ECB encrypted string that stores the customer's name.
  - e. **priority** – this is to tag the queue whether it is a priority or not. "1" means priority, and "0" means non-priority.
  - f. **timestamp\_created** – this is the initial timestamp based on the server time wherein the timestamp is based on the kiosk input if it is initial, or the timestamp of the transfer made by the cashier.
  - g. **timestamp\_finished** – this is the final timestamp based on the server time wherein the cashier terminates the queue or proceeds with the next queue.
7. **registrar\_archive\_list** – this is the storage of past



Figure 18. Usage of Visual Studio Code

Figure 18 presents the screen capture of Visual Studio Code software. Microsoft's Visual Studio Code (VSCode) is a free and open-source code editor. Programmers and developers use it for a variety of purposes, including writing, debugging, and testing code. The researchers used this software as the main tool for writing, debugging, and evaluating the software side of MIONG.qs. The programming language used in the queuing system is PHP made with HTML, CSS with Bootstrap, and JavaScript.

Table 2

*Queueing system categories*

Transaction	Category	Client
Continuing College	A	Cashier
Student Enrollment	B	Registrar
	C	Registrar
School Document	D	Cashier
Request	E	Registrar

Table 2 shows the categories used for the management of the queueing system. The database category schema for the queueing system is designed to manage and separate finished transactions for different stakeholders. It allows the clients to determine the current step of each stakeholder's transaction and provides services based on that information. The category schema prevents transaction misinterpretation and incorrect transfers such as paid transactions going back to the cashier.

For continuing college student enrollment, the process is as follows:

1. Category "A" is the initial step, where the student enrollment is initialized from the kiosk and added to the queue for the Cashier for payment.
2. After payment, the Cashier transfers the queue to the Registrar to claim the Registration Form, and the category is updated to "B."
3. When the Registrar receives the queue, the paid notification is displayed on the client side, notifying that the transaction is finished, and it cannot be transferred back to the Cashier.

For school document requests, the process is as follows:

1. Category "C" is the initial step, where the request for school documents is initialized from the kiosk and added to the queue for the Registrar for the initial inquiry.
2. The Registrar can terminate the queue if no payment is needed. If payment is required, the Registrar transfers the queue to the Cashier, and the category is updated to "D."
3. After payment, the Cashier transfers the queue to the Registrar, and the category is updated to "E."
4. The Registrar can now see that payment has been made and provide the requested document. Category "E" is the final step, preventing the transaction from being transferred back to the Cashier.

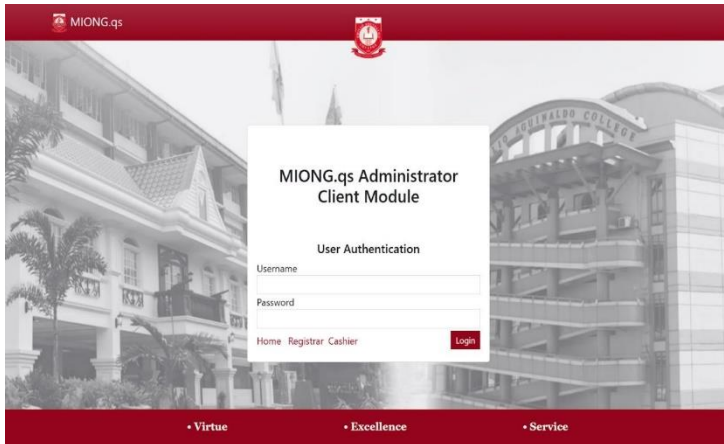


Figure 19. Super Administrator: Login Page

Figure 19 shows the screen capture of the login page of the super administrator side, wherein the super admin has complete access to the accounts of super administrators, registrars, and cashiers. Furthermore, the super admin can modify the video presented in the monitoring, view the archive from the registrar and cashier queue, and view the active queue for the day. It also has access to the direct link of the server status of the queuing system. The back-end development of this page uses a login form that will be requested by HTTP (Ajax) to be checked in the server and database. The password is protected by the database's message-digest algorithm (MD5). It is a one-way cryptographic function that only encodes and

authenticates the text values and cannot be decoded by any user. On the other hand, the front end of this page used a default hex color of #94041C or contained mainly red to follow the color of Emilio Aguinaldo College - Cavite; it also used the logo of the School of Engineering and Technology in the upper-left header, the official logo of Emilio Aguinaldo College - Cavite in the center header, the buildings of Cavite and Manila in the grayscale background image and core values of Emilio Aguinaldo College - Cavite in the footer. Most of the front-end development will be seen on all the mentioned pages.

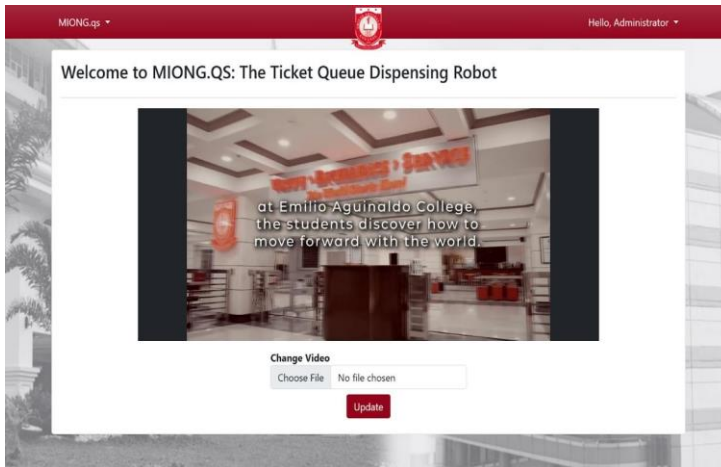


Figure 20. Super Administrator: Homepage

Figure 20 presents the screen capture of the homepage of the super administrator side after successfully logging in. It shows the existing video used in the monitoring, and it can be modified by uploading a new video file. The back-end development of this page used a PHP request to get the existing video on file. For updating of video, it uses an HTTP (Ajax) request to upload and update the video on the server. The front-end development was still matching the default development to be organized. In the upper-left header, MIONG.qs text used a clickable dropdown menu to toggle all the pages in super administrator, including home, users list, registrar list, cashier list, registrar archive, cashier archive, active queue, and server status. Lastly, the upper-right header shows the session super admin's name, and it is clickable dropdown menu to perform a logout.



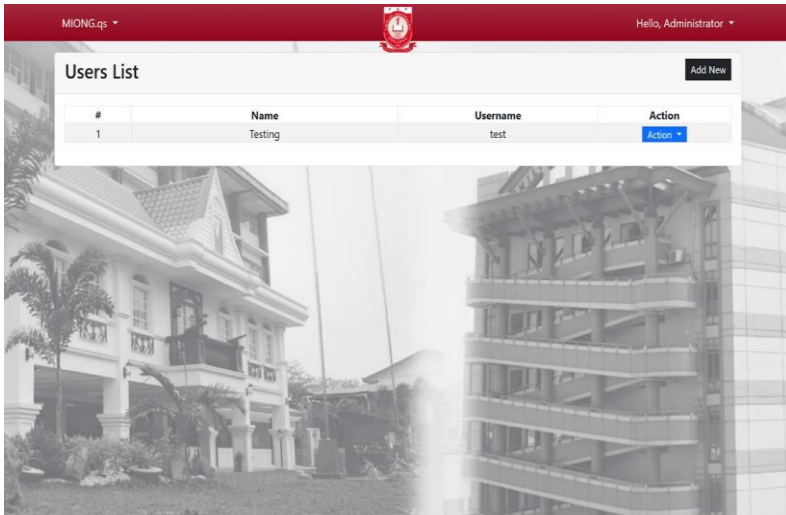
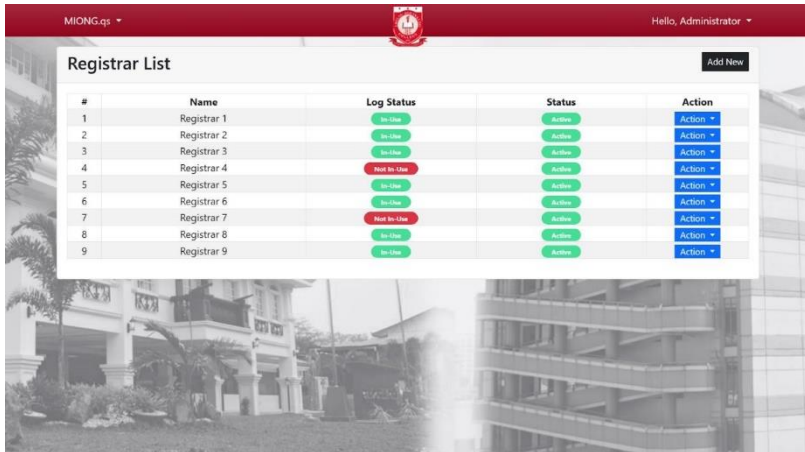


Figure 21. Super Administrator: Users List

Figure 21 shows the screen capture of the users list page of the super administrator side, wherein it displays all the active super administrator accounts in the system. The back-end development uses HTTP (Ajax) requests to add a new super administrator, modify the existing super administrator account, and delete. These requests will be transferred to the database to perform such actions. The front-end development was still matching the default development to be organized. Upon clicking the “Add New” button, a modal will appear to input the full name and username. On the other hand, upon clicking the “Edit” button on each user, two (2) options will appear – edit and delete. Upon clicking the “Edit” option, a modal will appear to modify the full name and username, while in the “Delete” option, a modal will also appear to confirm the deletion of the selected user.



#	Name	Log Status	Status	Action
1	Registrar 1	On Line	Online	Action
2	Registrar 2	On Line	Online	Action
3	Registrar 3	On Line	Online	Action
4	Registrar 4	Not On Line	Online	Action
5	Registrar 5	On Line	Online	Action
6	Registrar 6	On Line	Online	Action
7	Registrar 7	Not On Line	Online	Action
8	Registrar 8	On Line	Online	Action
9	Registrar 9	On Line	Online	Action

Figure 22. Super Administrator: Registrar List

Figure 22 presents the screen capture of the registrar list page of the super administrator side, wherein it displays all the registrar accounts in the system. The back-end development uses HTTP (Ajax) requests to add a new registrar, modify the existing registrar account, and delete. These requests will be transferred to the database to perform such actions. The front-end development was still matching the default development to be organized. Upon clicking the “Add New” button, a modal will appear to input the name and status. On the other hand, upon clicking the “Edit” button on each user, two (2) options will appear – edit and delete. Upon clicking the “Edit” option, a modal will appear to modify the name and status, while in the “Delete” option, a modal will also appear to confirm the deletion of the selected registrar.

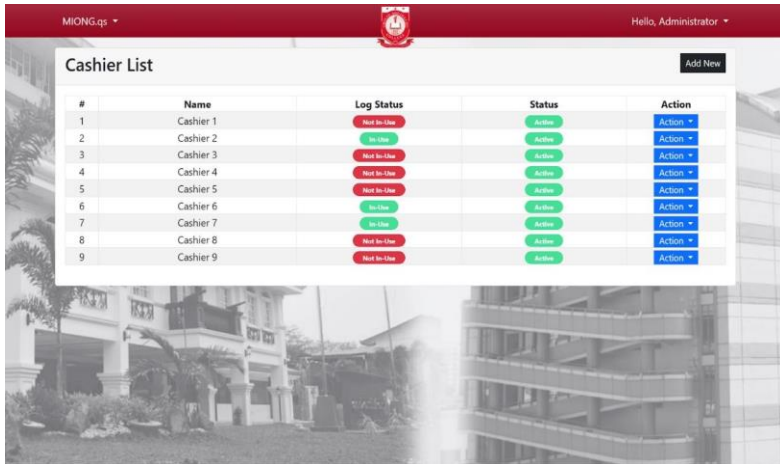
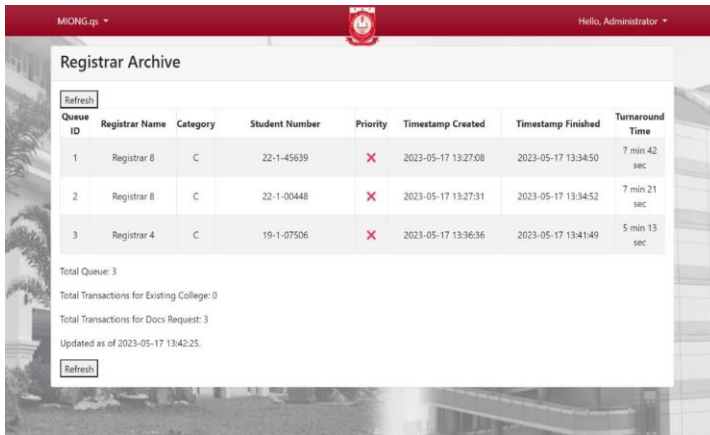


Figure 23. Super Administrator: Cashier List

Figure 23 shows the screen capture of the cashier list page of the super administrator side, wherein it displays all the cashier accounts in the system. The back-end development uses HTTP (Ajax) requests to add a new cashier, modify the existing cashier account, and delete. These requests will be transferred to the database to perform such actions. The front-end development was still matching the default development to be organized. Upon clicking the “Add New” button, a modal will appear to input the name and status. On the other hand, upon clicking the “Edit” button on each user, two (2) options will appear – edit and delete. Upon clicking the “Edit” option, a modal will appear to modify the name and status, while in the “Delete” option, a modal will also appear to confirm the deletion of the selected cashier.



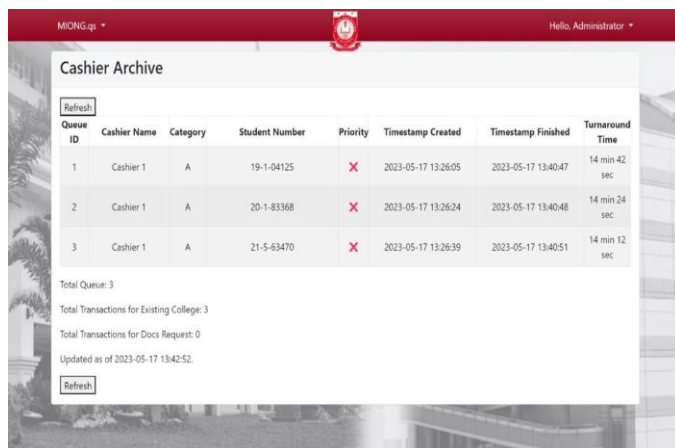
The screenshot shows a web interface titled "Registrar Archive". At the top, there is a red header bar with "MIONG.qs" on the left, a logo in the center, and "Hello, Administrator" on the right. Below the header, there is a "Refresh" button. The main content is a table with 8 columns: Queue ID, Registrar Name, Category, Student Number, Priority, Timestamp Created, Timestamp Finished, and Turnaround Time. The table contains 3 rows of data. Below the table, there are summary statistics: "Total Queue: 3", "Total Transactions for Existing College: 0", and "Total Transactions for Docs Request: 3". At the bottom, it says "Updated as of 2023-05-17 13:42:25" and has another "Refresh" button.

Queue ID	Registrar Name	Category	Student Number	Priority	Timestamp Created	Timestamp Finished	Turnaround Time
1	Registrar 6	C	22-1-45639	✗	2023-05-17 13:27:08	2023-05-17 13:34:50	7 min 42 sec
2	Registrar 6	C	22-1-00448	✗	2023-05-17 13:27:31	2023-05-17 13:34:52	7 min 21 sec
3	Registrar 4	C	19-1-07506	✗	2023-05-17 13:36:36	2023-05-17 13:41:49	5 min 13 sec

Total Queue: 3  
Total Transactions for Existing College: 0  
Total Transactions for Docs Request: 3  
Updated as of 2023-05-17 13:42:25

Figure 24. Super Administrator: Registrar Archive

Figure 24 presents the screen capture of the registrar archive of the super administrator side, wherein it displays all the past queues of the registrar department in the system. The back-end development used a PHP request to retrieve the registrar archive data in the database, and it will be collated in an array format to be distributed in the front end. For the front-end development, it extracts the array in looping and shows the data in table format. Furthermore, the table has eight (8) columns: queue id, registrar name, category, student number, priority, timestamp created, timestamp finished, and turnaround time. Lastly, below the archive list, it shows the total number of queues, total transactions for existing college enrollment, total transactions for school documents requests, timestamp of the last refresh, and refresh button.

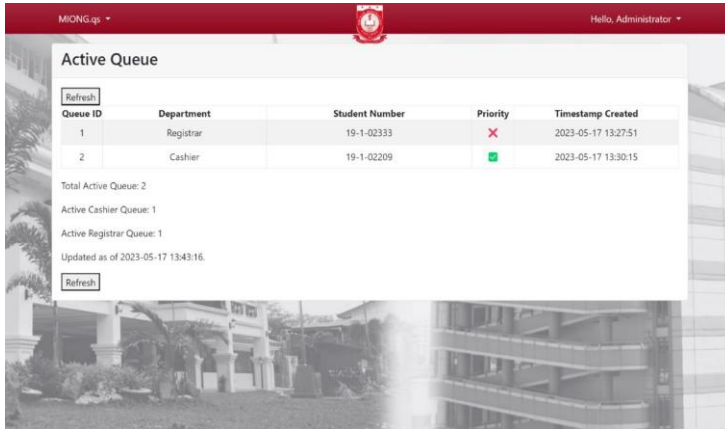


Queue ID	Cashier Name	Category	Student Number	Priority	Timestamp Created	Timestamp Finished	Turnaround Time
1	Cashier 1	A	19-1-04125	✖	2023-05-17 13:26:05	2023-05-17 13:40:47	14 min 42 sec
2	Cashier 1	A	20-1-83368	✖	2023-05-17 13:26:24	2023-05-17 13:40:48	14 min 24 sec
3	Cashier 1	A	21-5-63470	✖	2023-05-17 13:26:39	2023-05-17 13:40:51	14 min 12 sec

Total Queue: 3  
Total Transactions for Existing College: 3  
Total Transactions for Docs Request: 0  
Updated as of 2023-05-17 13:42:52.

Figure 25. Super Administrator: Cashier Archive

Figure 25 shows the screen capture of the cashier archive of the super administrator side, wherein it displays all the past queues of the cashier department in the system. The back-end development used a PHP request to retrieve the cashier archive data in the database, and it will be collated in an array format to be distributed in the front end. For the front-end development, it extracts the array in looping and shows the data in table format. Furthermore, the table has eight (8) columns: queue id, cashier name, category, student number, priority, timestamp created, timestamp finished, and turnaround time. Lastly, below the archive list, it shows the total number of queues, total transactions for existing college enrollment, total transactions for school documents requests, timestamp of the last refresh, and refresh button.



Queue ID	Department	Student Number	Priority	Timestamp Created
1	Registrar	19-1-02333	X	2023-05-17 13:27:51
2	Cashier	19-1-02209	■	2023-05-17 13:30:15

Total Active Queue: 2  
 Active Cashier Queue: 1  
 Active Registrar Queue: 1  
 Updated as of 2023-05-17 13:43:16.

Figure 26. Super Administrator: Active Queue

Figure 26 presents the screen capture of the active queue page of the super administrator side, wherein it displays the active queues of both registrar and cashier department in the system. The back-end development used a PHP request to retrieve the registrar and cashier active queue data in the database, and it will be collated in an array format to be distributed in the front end. For the front-end development, it extracts the array in looping and shows the data in table format. Furthermore, the table has five (5) columns: queue id, department, student number, priority, and timestamp created. Lastly, below the active queue list, it shows the total number of active queues, total active queues for cashier, total active queues for registrar, timestamp of the last refresh, and refresh button.

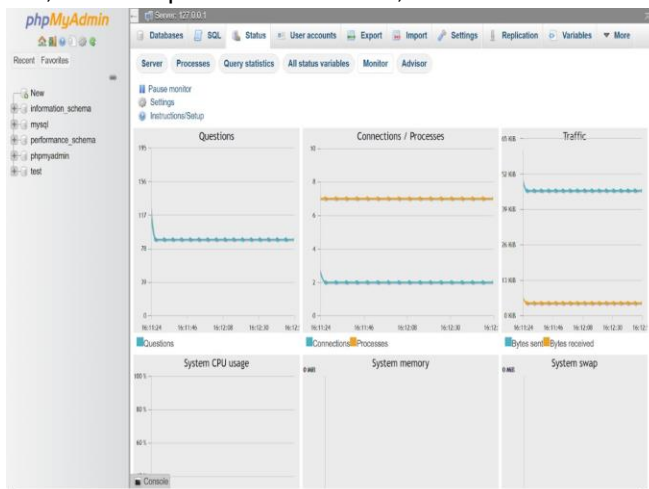


Figure 27. Super Administrator: Server Status

Figure 27 shows the screen capture of the server status page of the super administrator side, wherein it displays the current status of the system. The phpMyAdmin's status page provides a summary of the current status and configuration of the SQL server to which it is connected. This page displays various server-related details, such as its version and system information, uptime, threads, query statistics, traffic, system CPU usage, system memory, system swap, processes, and connections.

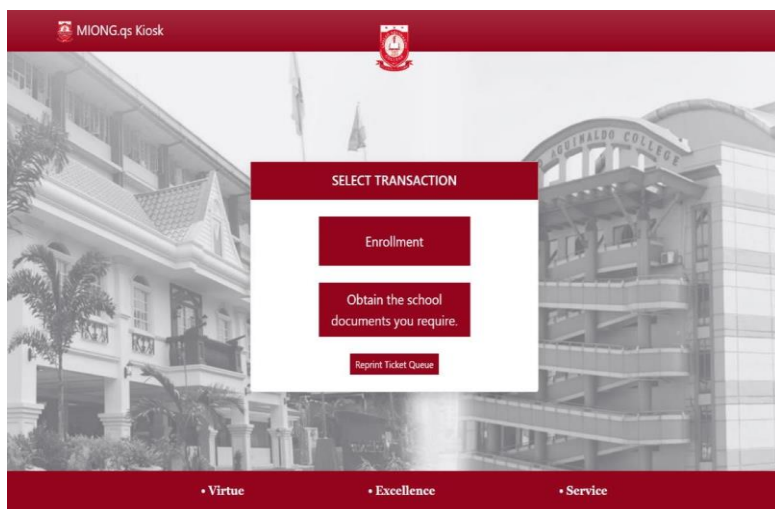


Figure 28. Kiosk: Homepage

Figure 28 presents the screen capture of the homepage of the kiosk side, wherein it displays the all-in-one kiosk page. The back-end development used multiple PHP pages to be displayed in a modal for the Enrollment and School Document Requests. On the other hand, the front-end development has a significant role in this page as it still matches the default development to be organized. There are three (3) buttons for selecting transactions: "Enrollment", "Request School Documents", and "Reprint Ticket Queue". Upon clicking the "Enrollment" button, a modal will prompt confirming if the respective Dean's office has already assessed the student; if the student clicks "Yes," the Enrollment Modal will appear, if "No," the other prompt will appear stating that the student should visit their respective Dean's office first before using the kiosk. On the other hand, upon clicking the "Request School Documents," the School Document Request Modal will appear. Lastly, for "Reprint Ticket

Queue”, a Reprint Ticket Queue Modal will appear.

MIONG.qs Kiosk

Continuing College Student

Enter your Student Number

1	2	3
4	5	6
7	8	9
0		Backspace

☐ PRIORITY
 ☒ NOT PRIORITY

Get Queue

Virtue

Excellence

Service

Figure 29. Kiosk: Enrollment Modal

Figure 29 shows the screen capture of the enrollment modal of the kiosk side, wherein it displays the kiosk's continuing college student enrollment modal. The user will enter his student number in the text field using the on-screen keypad, select if the user is a priority or non-priority, and click the "Get Queue" to get the queueing ticket. The back-end development on this page uses a form, which will be submitted to the database using an HTTP (Ajax) request. The system will not allow duplicate active student number in the queue to prevent multiple transactions at once. However, the user will be prompted to reprint the queueing ticket instead. After that, another modal will appear containing the queueing ticket print layout; it will be automatically printed and will call the robotic arm to grip the queueing ticket using a serial monitor under the PHPArduino function. For the front-end development, it is still matching the default development to be organized. The modal containing the print layout will be shown below.



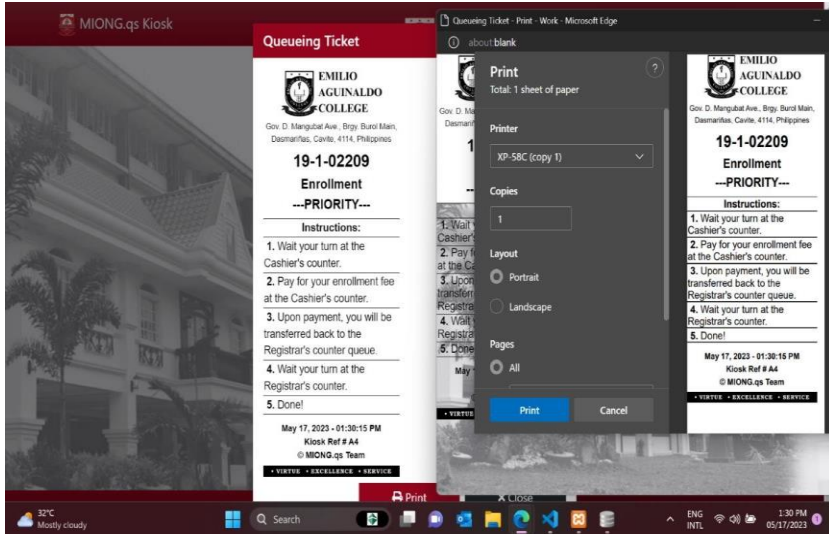


Figure 30. Kiosk: Enrollment Print Layout Modal

Figure 2.30 presents the screen capture of the enrollment print layout of the kiosk side, wherein it displays the print layout of the queueing ticket under continuing college students and is automatically printed in the thermal printer. In the back-end development, it used a PHP request to catch the queue ID from the queue on the previous screen capture, and it will fetch the array under that queue ID. There is also a function wherein it shows a blank window to print the content inside the modal. After automatic printing, the modal will close and return to the kiosk's homepage to process another queue transaction. For the front-end development, the print layout includes the logo and address of Emilio Aguinaldo College Cavite, the student number of the student, priority, guided instructions, queue timestamp, kiosk reference number, MIONG.qs team credits, and EAC-C core values.

Figure 31. Kiosk: School Document Request Modal

Figure 31 shows the screen capture of the school document requests modal of the kiosk side, wherein it displays the kiosk's request school documents page. The user will enter his student number in the text field using the on-screen keypad, select if the user is a priority or non-priority, and click the "Get Queue" to get the queueing ticket. The back-end development on this page uses a form, which will be submitted to the database using an HTTP (Ajax) request. The system will not allow duplicate active student number in the queue to prevent multiple transactions at once. However, the user will be prompted to reprint the queueing ticket instead. After that, another modal will appear containing the queueing ticket print layout; it will be automatically printed and will call the robotic arm to grip the ticket using a serial monitor under the PHPArduino function. For the front-end development, it is still matching the default development to be organized. The modal containing the print layout will be shown below.

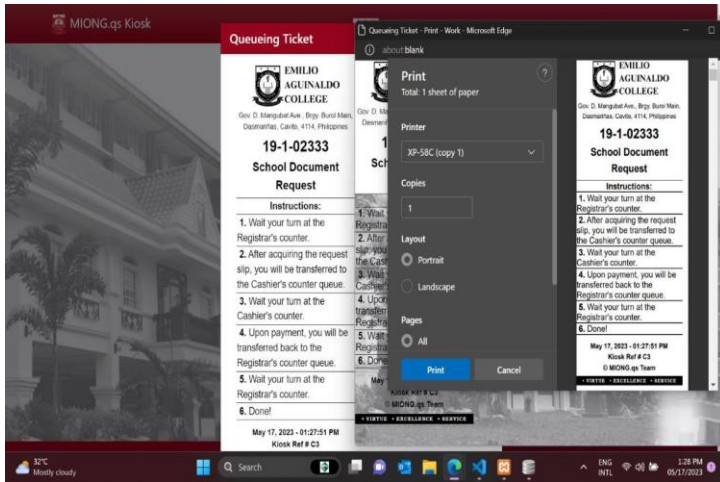


Figure 32. Kiosk: School Document Request Print Layout Modal

Figure 32 presents the screen capture of the school document request print layout of the kiosk side, wherein it displays the print layout of the queueing ticket under request school documents and automatically printed in the thermal printer. In the back-end development, it used a PHP request to catch the queue ID from the queue on the previous screen capture, and it will fetch the array under that queue ID. There is also a function wherein it shows a blank window to print the content inside the modal. After automatic printing, the modal will close and return to the kiosk's homepage to process another queue transaction. For the front-end development, the print layout includes the logo and address of Emilio Aguinaldo College - Cavite, the student number of the student, priority, guided instructions, queue timestamp, kiosk reference number, MIONG.qs team credits, and EAC-C core values.

MIONG.qs Kiosk

Reprint Ticket Queue

Enter your Student Number

1	2	3
4	5	6
7	8	9
0		Backspace

Reprint

• Virtue • Excellence • Service

Figure 33. Kiosk: Reprint Queueing Ticket Modal

Figure 33 shows the screen capture of the reprint queueing ticket modal of the kiosk side, wherein it displays the kiosk's reprint queueing ticket page. The user will enter his student number in the text field using the on-screen keypad and click the "Reprint" to reprint the queueing ticket. The back-end development on this page uses a form, which will be submitted to the database using an HTTP (Ajax) request. The system will not allow student numbers that do not have a queue yet. However, the student will be prompted to reprint the ticket queue instead. After that, another modal will appear containing the queueing ticket print layout; it will be automatically printed and will call the robotic arm to grip the ticket using a serial monitor under the PHPArduino function. For the front-end development, it was still matching the default development to be organized. The modal containing the print layout will be shown below.

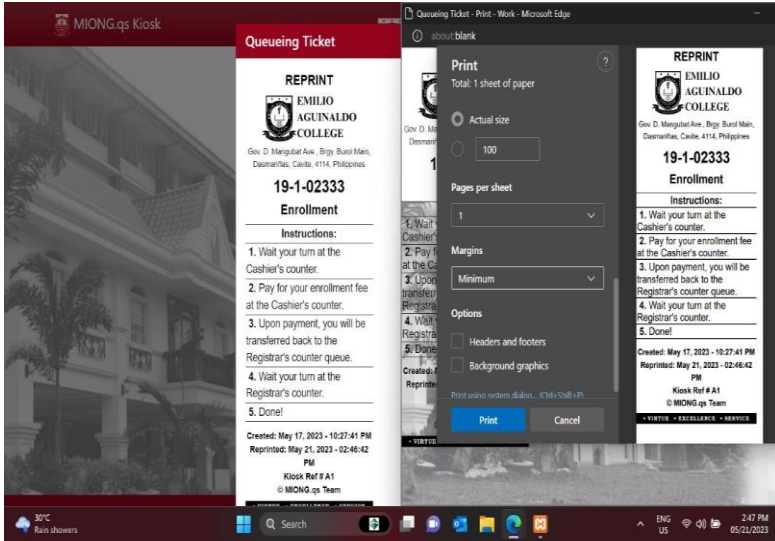


Figure 34. Kiosk: Reprint Queueing Ticker Print Layout Modal

Figure 34 presents the screen capture of the reprint queueing ticket print layout of the kiosk side, wherein it displays the reprint layout of the queueing ticket under both enrollment and registrar requests. Then, it will automatically be printed in the thermal printer. In the back-end development, it used a PHP request to catch the queue ID from the queue on the previous screen capture, and it will fetch the array under that queue ID. There is also a function wherein it shows a blank window to print the content inside the modal. After automatic printing, the modal will close and return to the kiosk's homepage to process another queue transaction. For the front-end development, the print layout includes the “REPRINT” text, logo, and address of Emilio Aguinaldo College - Cavite, the student number, priority, guided instructions, reprinted timestamp, created timestamp, kiosk reference number, MIONG.qs team credits, and EAC-C core values.



Figure 35. Registrar Client: Login Page

Figure 35 shows the screen capture of the login page of the registrar client side. The registrar has access to the existing queues under the registrar's department. The back-end development of this page uses a login form that will be requested by HTTP (Ajax) to be checked in the server and database. The registrar will select his designated name, and there is no password feature as it will not require complex tasks that can modify the entire system. On the other hand, the front-end development still matched the default development to be organized.

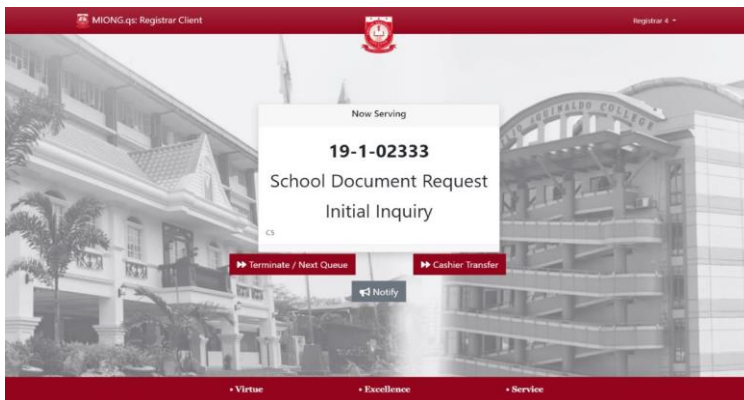


Figure 36. Registrar Client: Homepage

Figure 36 presents the screen capture of the homepage of the registrar client after successfully logging in. It is only a one-page and all-in tool for the registrar client, showing the details of the next

queue in line. The front-end development was still matching the default development to be organized. The session registrar's name will be displayed in the upper-right header, and it is clickable to perform a logout. It also has three buttons, including "Terminate/Next Queue" to get the next active queue, "Cashier Transfer" to transfer that current queue to the cashier department, and "Notify" to notify again of the current queue. The back-end development uses different HTTP (Ajax) requests to process a variety of button actions. For "Terminate/Next Queue," a prompt will appear to confirm termination, and the queue will be deleted from the registrar's active queue and stored in the registrar archive. For "Cashier Transfer," a prompt will appear to confirm the cashier transfer, the queue will be deleted to the active queue, stored in the registrar archive, and stored in the active cashier queue, and "Notify" to make the active queue notifiable in monitoring again.

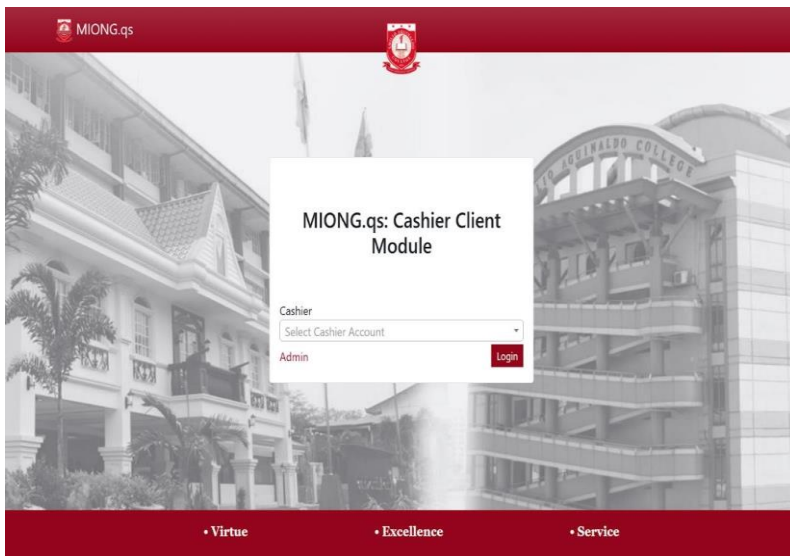


Figure 37. Cashier Client: Login Page

Figure 37 shows the screen capture of the login page of the cashier client side. The cashier created has access to the existing queues under the cashier department. The back-end development of this page uses a login form that will be requested by HTTP (Ajax) to be checked in the server and database. The cashier will select his designated name, and there is no password feature as it will not

require complex tasks that can modify the entire system. On the other hand, the front-end development still matched the default development to be organized.

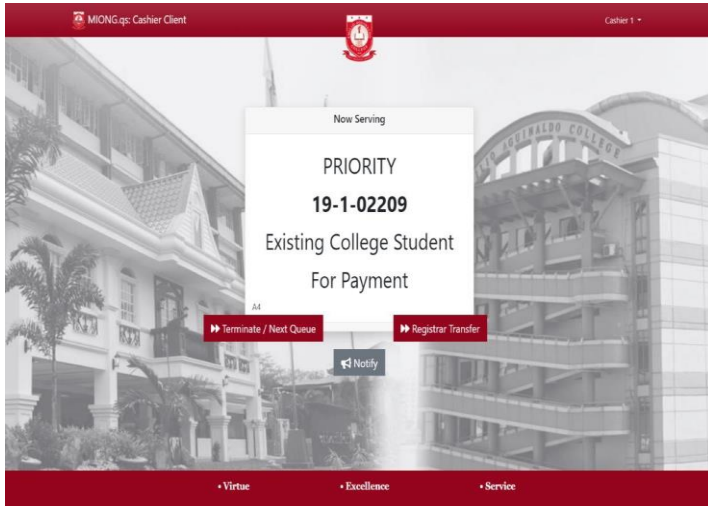


Figure 38. Cashier Client: Homepage

Figure 38 presents the screen capture of the homepage of the cashier client after successfully logging in. It is only a one-page and all-in tool for the cashier client, showing the details of the next queue in line. The front-end development was still matching the default development to be organized. The session cashier's name will be displayed in the upper-right header, and it is clickable to perform a logout. It also has three buttons, including "Terminate/Next Queue" to get the next active queue, "Registrar Transfer" to transfer that current queue to the registrar department, and "Notify" to notify again of the current queue. The back-end development uses different HTTP (Ajax) requests to process a variety of button actions. For "Terminate/Next Queue," a prompt will appear to confirm termination, and the queue will be deleted from the cashier's active queue and stored in the cashier archive. For "Registrar Transfer," a prompt will appear to confirm the registrar transfer, the queue will be deleted to the active queue, stored in the cashier archive, and stored in the active registrar queue, and "Notify" to make the active queue notifiable in monitoring again.



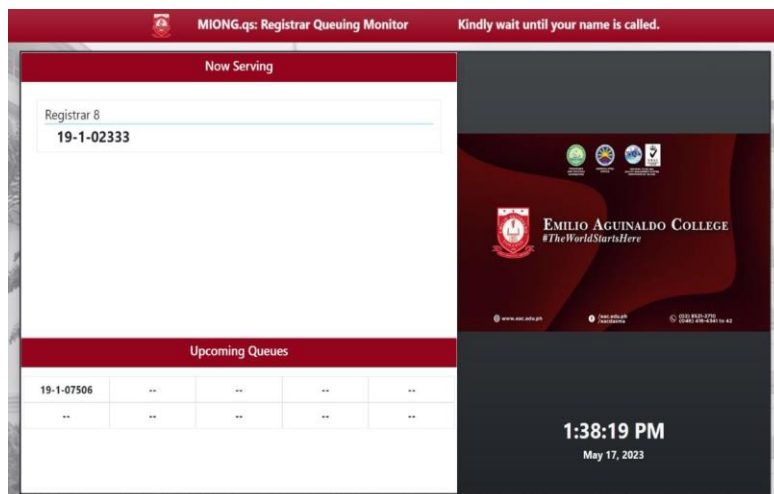


Figure 39. Registrar Queuing Monitor: Homepage

Figure 39 shows the screen capture of the registrar queuing monitor. It is only a one-page registrar monitoring, showing the details of the active queue. For back-end development, it uses an HTTP (Ajax) request every second to catch an active queue in the system and the ten (10) incoming queues; it will be appended to the left column class of the page. The request will also check if the queue is a priority and, therefore, a priority logo is behind the name. After that, there is a request to make the active queue notify schema "0" to signify that every queue has been notified already. Lastly, a text-to-speech (TTS) function will be played, "Calling the attention of {student number}, please proceed to {registrar name}." As the HTTP request is every second, it is the best way to have a real-time query for an active queue and incoming queues. The front-end development was still matching the default development to be organized. The header contains a moving text of the registrar queuing monitor; the video uploaded in the super admin is on the right column, and to the lower right is the current date and time.

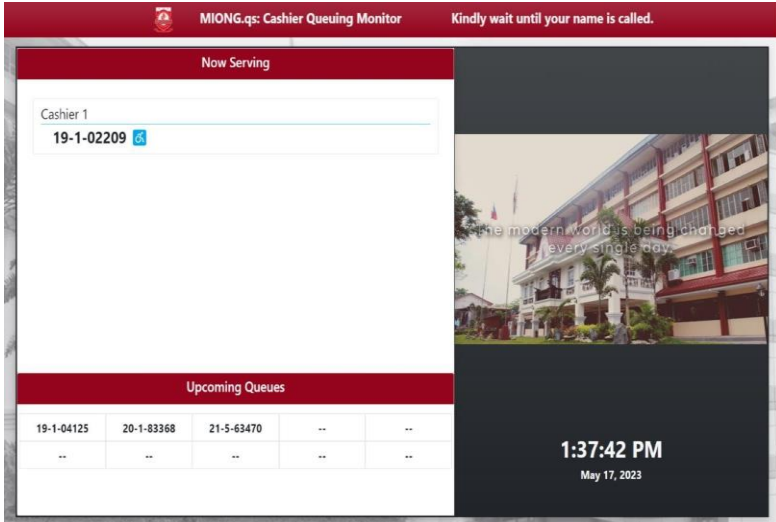


Figure 40. Cashier Queuing Monitor: Homepage

Figure 40 presents the screen capture of the cashier queuing monitor. It is only a one-page cashier monitoring, showing the details of the active queue. For back-end development, it uses an HTTP (Ajax) request every second to catch an active queue in the system; it will be appended to the left column class of the page. The request will also check if the queue is a priority and, therefore, a priority logo is behind the name. After that, there is a request to make the active queue notify schema "0" to signify that every queue has been notified already. Lastly, a text-to-speech (TTS) function will be played, "Calling the attention of {student number}, please proceed to {cashier name}." As the HTTP request is every second, it is the best way to have a real-time query for an active queue. The front-end development was still matching the default development to be organized. The header contains a moving text of the cashier queuing monitor; the video uploaded in the super admin is on the right column, and to the lower right is the current date and time.

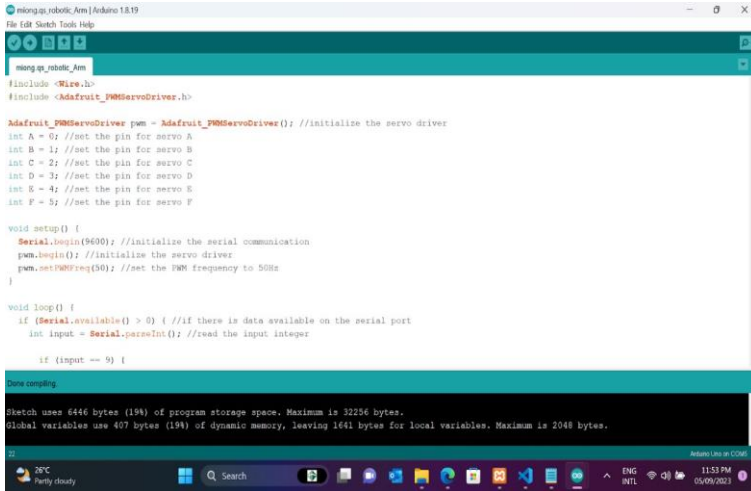


Figure 41. Usage of Arduino IDE for Robotic Arm Movements

Figure 41 shows the screen capture of the manipulation of robotic arm angles using Arduino 1.8.19. A robotic arm is employed in a queuing system to dispense tickets to stakeholders efficiently. The Arduino code governs the movement and coordination of the robotic arm in the queuing system.

The code begins by including necessary libraries: *Wire.h* for I2C communication and *Adafruit\_PWMServoDriver.h* to control the servo motors of the robotic arm. An instance of the *Adafruit\_PWMServoDriver* class is created as '*pwm*' to initialize the servo driver. Six servos are used in the robotic arm, labeled A through F, with their respective pin channels from 0 to 5.

In the '*setup*' function, serial communication is initialized at a baud rate of 9600, the servo driver is activated, and the PWM frequency is set to 50 Hz. These steps ensure the Arduino is prepared to receive and process commands for the robotic arm. The Arduino listens for incoming data on the serial port within the '*loop*' function. The incoming integer is parsed and stored as '*input*' if any data is available.

When the input value is '9', a series of actions are executed to manipulate the robotic arm. The '*pwm.setPWM()*' function is called multiple times to control each servo motor's position. The '*map()*' function translates the desired angle to an appropriate pulse length. After each servo movement, the '*delay()*' function allows the robotic arm to transition smoothly to the new position.

The sequence of actions includes moving the servos to specific positions and waiting for a predetermined duration, resulting in a

series of choreographed movements for the robotic arm. The final position of the servos causes the arm to dispense a ticket in the queuing system successfully. The robotic arm is programmed to follow a sequence of movements when the input value is '9'. The following narrative describes these movements step by step:

1. The robotic arm moves the gripper (servo F) to a +125° position, gripping the ticket. The system waits for 2 seconds to stabilize the gripper's movement.
2. Next, the wrist yaw (servo D) moves to a +45° position, adjusting the horizontal orientation of the wrist to grasp the ticket from the thermal printer. A 1 second delay follows this movement.
3. The shoulder pitch (servo A) shifts to a +20° position, raising the arm vertically. After waiting for 1 second, the arm settles in this position.
4. The elbow (servo C) is then directed to a +110° position, extending the arm's reach. The system pauses for 1 second to accommodate this movement.
5. The wrist rotation (servo E) moves to a +150° position, aligning the proper position of the gripper with the ticket to the user. The system waits for 2 seconds before proceeding.
6. Gripper (servo F) moves to a +95 ° position, the gripper will open, and the user will collect the ticket. The system then waits for 5 seconds to ensure the collection of the ticket queue.
7. Wrist rotation (servo E) moves back to a +95° position, repositioning the gripper for the next ticket. A 1 second delay follows this movement.
8. The elbow (servo C) adjusts to an +80° position, retracting the arm. After waiting for 2 seconds, the system continues.
9. Simultaneously, the shoulder yaw (servo B) moves to a -40° position while the shoulder pitch (servo A) returns to a 0° position, moving the arm horizontally opposed to the user. The system pauses for 1 second.
10. The shoulder pitch (servo A) then moves to a -40° position, lowering the arm to be ready for the initial position again. After a 2 second delay, the arm is ready to dispense the ticket.
11. Shoulder yaw (servo B) adjusts to a -20° position, positioning the arm again for the initial position. The system waits for 1 second before proceeding.
12. The elbow (servo C) returns to a +110° position, preparing

for the next ticket dispensing cycle. After a 1 second delay, the arm settles in this position.

13. Finally, the wrist yaw (servo D) moves to a  $+95^\circ$  position, completing the arm's retraction. The system pauses for 1 second, and the robotic arm is now ready to begin the next ticket dispensing operation after the serial input of "9" again.

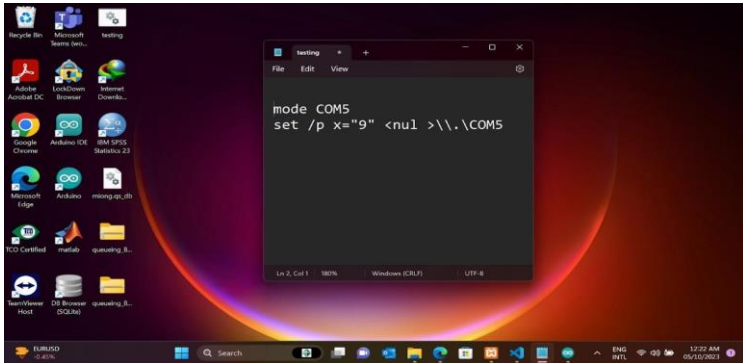


Figure 42. Usage of Batch File for PHPArduino Communication

Figure 42 presents the screen capture of the batch file used for PHPArduino communication. The queuing system with a PHP web application relies on a batch file to communicate with the robotic arm's Arduino controller. The batch file contains commands configuring the serial communication settings and sending specific data to the Arduino to trigger the robotic arm's movements.

Initially, the batch file configures the serial communication settings for the COM5 port to ensure proper data transmission to the Arduino controller. The default baud rate of 9600 matches the serial communication rate defined in the Arduino code. Once the communication settings are in place, the batch file sends the integer "9" over the COM5 port to the Arduino controller. This is achieved using the 'set /p' command for user input prompts. However, in this case, the need for manual intervention is eliminated by assigning the value "9" to a variable and redirecting the output directly to the COM5 port.

When the PHP web application triggers the execution of this batch file, particularly in the printing of the queue ticket function with a PHP code "`<?php shell_exec("batch file path");?>`", it is where the PHP executes a command via shell, a sequence of events unfolds. The batch file communicates with the robotic arm's Arduino controller and establishes the communication parameters. As the

integer "9" is sent over the COM5 port, the Arduino controller processes this input and orchestrates the robotic arm's movements, accordingly, as defined in the Arduino code above. The batch file is an essential communication link between the PHP web application and the robotic arm's Arduino controller. This connection allows the ticket dispensing process to be set in motion when the PHP web application calls the batch file.

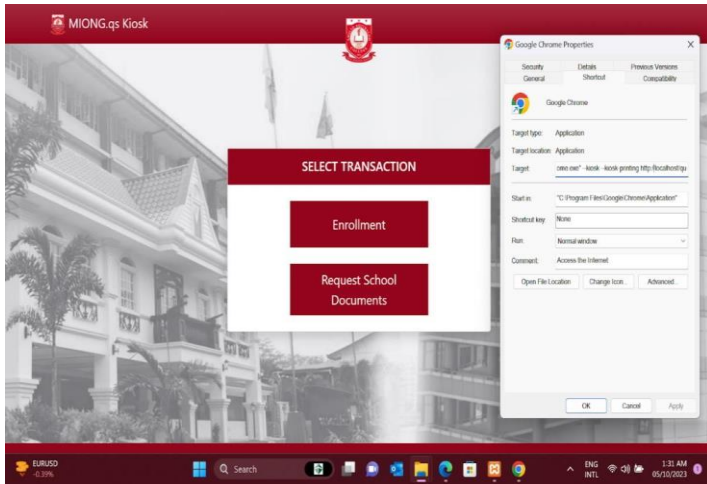


Figure 43. Usage of Kiosk Printing Feature by Google Chrome

Figure 43 shows the screen capture of Google Chrome Properties with modified target and in the background, the homepage of the queuing system. The target command under Google Chrome Properties "C:\Program Files\Google\Chrome\Application\chrome.exe --kiosk --kiosk-printing http://localhost/queueing/kiosk" is a method of customizing Google Chrome's settings to create a tailored user experience for a specific purpose. In this case, it enables full-screen kiosk mode, automatic printing, and a direct link to the localhost kiosk web application. By incorporating these modifications, the command creates a resolute, user-friendly interface well-suited for queuing systems and streamlining processes such as enrollment and document requests in educational institutions.

**Verification.** Following the completion of the implementation phase, the testing or verification step ensures that all criteria have been met and that the product does not require debugging. The research team extensively scans the product before it is deployed in the educational institution – EAC–C.

Furthermore, the proponents would become white hat hackers of the program, which aims to detect bugs and threats that can affect the entire program in the long run. This stage also gathers the response from the Alpha respondents, known as the Alpha Testing, which reviews the requirements and develops a design to meet them through survey questionnaires. After Alpha Testing and approval due to its reliability based on Cronbach's Alpha, the proponents would gather responses from the Beta respondents, known as Beta Testing. The researchers determine the path to produce a solution and the relevant specifications Table 7

*Alpha testing results for Performance Efficiency*

Performance Efficiency	$\Sigma x$	$\bar{x}$	Mean ( $\bar{x}$ ) Interval Interpretation
Time Behavior	Q1.1 108	5.40	<u>Strongly Agree</u> (5.15 – 6.00) <u>Agree</u> (4.32 – 5.14) <u>Slightly Agree</u> (3.49 – 4.31)
Resource Utilization and Capacity	Q1.2 106	5.30	<u>Slightly Disagree</u> (2.66 – 3.48) <u>Disagree</u> (1.83 – 2.65) <u>Strongly Disagree</u> (1.00 – 1.82)
Total and Interpretation	214	5.35	Strongly Agree

Table 7 presents the evaluation of the twenty (20) alpha testing respondents regarding the Performance Efficiency of ISO/IEC 25010:2011, along with the total score ( $\Sigma x$ ) and mean ( $\bar{x}$ ) scores of each question. The Performance Efficiency characteristic measures performance in relation to the quantity of resources consumed under certain conditions. A summation ( $\Sigma x$ ) score of 214 and a mean ( $\bar{x}$ ) score of 5.35 was evaluated by the respondents to these

two (2) questions under Performance Efficiency. A mean ( $\bar{x}$ ) score of 5.35 indicates that the respondents strongly agree that the study performs the systems' performance performs its tasks efficiently.

Table 8

*Alpha testing results for Usability*

Usability		$\Sigma x$	$\bar{x}$	Mean ( $\bar{x}$ ) Interval Interpretation
Appropriateness	Q1.1	107	5.35	<u>Strongly Agree</u> <u>(5.15 – 6.00)</u>
Recognizability				
Learnability	Q1.2	107	5.35	<u>Agree (4.32 –</u> <u>5.14)</u>
Operability	Q1.3	92	4.60	
User Error Protection	Q1.4	107	5.35	<u>Slightly Agree</u> <u>(3.49 – 4.31)</u>
User Interface	Q1.5	103	5.15	<u>Slightly</u> <u>Disagree (2.66</u> <u>– 3.48)</u>
Aesthetics				
Accessibility	Q1.6	113	5.65	<u>Disagree (1.83</u> <u>– 2.65)</u>
				<u>Strongly</u> <u>Disagree (1.00</u> <u>– 1.82)</u>
Total and Interpretation		629	5.24	Strongly Agree

Table 8 shows the evaluation of the twenty (20) alpha testing respondents regarding the Usability of ISO/IEC 25010:2011, along with the total score ( $\Sigma x$ ) and mean ( $\bar{x}$ ) scores of each question. The degree to which a product or system can be used by specific users to achieve particular objectives with effectiveness, efficiency, and satisfaction in certain circumstances of usage is referred to as Usability. A summation ( $\Sigma x$ ) score of 629 and a mean ( $\bar{x}$ ) score of 5.24 was evaluated by the respondents to these six (6) questions under Usability.

A mean ( $\bar{x}$ ) score of 5.24 indicates that the respondents strongly agree that the study's system user-friendly.



## Alpha Testing (Overall)

Table 9

*Alpha testing overall mean ( $\bar{x}$ ) score results*

Characteristics	$\bar{x}$	Mean ( $\bar{x}$ ) Interval Interpretation
Functional Suitability	5.43	<u>Strongly Agree</u> (5.15 – 6.00) <u>Agree (4.32 – 5.14)</u>
Performance Efficiency	5.35	<u>Slightly Agree (3.49 – 4.31)</u> <u>Slightly Disagree</u> (2.66 – 3.48)
Usability	5.24	<u>Disagree (1.83 – 2.65)</u> <u>Strongly Disagree</u> (1.00 – 1.82)
Total and Interpretation	5.31	Strongly Agree

Table 9 presents the overall evaluation of the twenty (20) alpha testing respondents regarding the software part of the survey questionnaire in accordance with ISO/IEC 25010:2011. The aggregated mean ( $\bar{x}$ ) score of the three (3) characteristics has a total 5.31. A mean ( $\bar{x}$ ) score of 5.31 indicates that the respondents strongly agree that the study's system is able to function properly, perform tasks efficiently, and is user-friendly.

## Cronbach's Alpha

Table 10

*Cronbach's alpha software results*

Cronbach's Alpha Software Results		Alpha Coefficient ( $\alpha$ ) Interpretation
Number of items ( $k$ )	11	<u>Excellent (<math>&gt; 0.90</math>)</u> <u>Good (<math>0.80 - 0.89</math>)</u> <u>Good and Acceptable (<math>0.70 - 0.79</math>)</u>
Sum of Item Variance ( $\sigma^2_{y_1}$ )	9.09	<u>Acceptable (<math>0.60 - 0.69</math>)</u>
Variance of the Total Score ( $\sigma^2_x$ )	21.05	<u>Poor (<math>0.50 - 0.59</math>)</u> <u>Unacceptable (<math>&lt; 0.49</math>)</u>
Total Alpha Coefficient ( $\alpha$ ) and Interpretation	0.62	Acceptable

Table 10 shows the software results of Cronbach's Alpha for the first part of the survey questionnaire based on ISO/IEC 25010:2011. The number of items ( $k$ ) for the software survey questionnaire is at 11, the sum of Item Variance ( $\sigma_{y1}^2$ ) is 9.09, and the variance of the total score ( $\sigma_x^2$ ) is 21.05. Therefore, the total alpha coefficient ( $\alpha$ ) is 0.62. An alpha coefficient ( $\alpha$ ) of 0.62 is deemed acceptable.

## Beta Testing (Software)

Table 11

*Beta testing results for the Functional Suitability*

Functional Suitability		$\Sigma x$	$\bar{x}$	Mean ( $\bar{x}$ ) Interval Interpretation
Functional Completeness	Q1.1	625	5.43	<u>Strongly Agree</u> <u>(5.15 – 6.00)</u>
Functional Correctness	Q1.2	645	5.61	<u>Agree (4.32 –</u> <u>5.14)</u>
Functional Appropriateness	Q1.3	643	5.59	<u>Slightly Agree</u> <u>(3.49 – 4.31)</u>
				<u>Slightly Disagree</u> <u>(2.66 – 3.48)</u>
				<u>Disagree (1.83 –</u> <u>2.65)</u>
				<u>Strongly Disagree</u> <u>(1.00 – 1.82)</u>
Total and Interpretation		1,913	5.54	Strongly Agree

Table 11 shows the evaluation of the one hundred fifteen (115) beta testing respondents regarding the Functional Suitability of ISO/IEC 25010:2011, along with the total score ( $\Sigma x$ ) and mean ( $\bar{x}$ ) scores of each question. When utilized under specific settings, the Functional Suitability characteristic indicates the extent to which a product or system performs functions that fulfill stated and inferred demands. A summation ( $\Sigma x$ ) score of 1,913 and a mean ( $\bar{x}$ ) score of 5.54 was evaluated by the respondents to these three (3) questions under Functional Suitability. A mean ( $\bar{x}$ ) score of 5.54 indicates that the respondents strongly agree that the study performs the required functions' objectives, produces the correct results, and accomplishes the task given.

Table 12

*Beta testing results for Performance Efficiency*

Performance Efficiency		$\Sigma x$	$\bar{x}$	Mean ( $\bar{x}$ ) Interval Interpretation
Time Behavior	Q1.1	613	5.33	<u>Strongly Agree</u> <u>(5.15 – 6.00)</u> <u>Agree (4.32 –</u> <u>5.14)</u> <u>Slightly Agree</u> <u>(3.49 – 4.31)</u>
Resource Utilization and Capacity	Q1.2	630	5.48	<u>Slightly Disagree</u> <u>(2.66 – 3.48)</u> <u>Disagree (1.83 –</u> <u>2.65)</u> <u>Strongly Disagree</u> <u>(1.00 – 1.82)</u>
Total and Interpretation		1,243	5.40	Strongly Agree

Table 12 presents the evaluation of the one hundred fifteen (115) beta testing respondents regarding the Performance Efficiency of ISO/IEC 25010:2011, along with the total score ( $\Sigma x$ ) and mean ( $\bar{x}$ ) scores of each question. The Performance Efficiency characteristic measures performance in relation to the quantity of resources consumed under certain conditions. A summation ( $\Sigma x$ ) score of 1,243 and a

mean ( $\bar{x}$ ) score of 5.40 was assessed by the respondents to these two (2) questions under Performance Efficiency. A mean ( $\bar{x}$ ) score of 5.40 indicates that the respondents strongly agree that the study performs the systems' performance performs its tasks efficiently.

Table 13

*Beta testing results for Usability*

Usability		$\Sigma x$	$\bar{x}$	Mean ( $\bar{x}$ ) Interval Interpretation
Appropriateness	Q1.1	640	5.57	<u>Strongly Agree</u> (5.15 – 6.00)
Recognizability				
Learnability	Q1.2	640	5.57	<u>Agree</u> (4.32 – 5.14)
Operability	Q1.3	637	5.54	
User Error Protection	Q1.4	629	5.47	<u>Slightly Agree</u> (3.49 – 4.31)
User Interface				
Aesthetics	Q1.5	592	5.15	<u>Slightly Disagree</u> (2.66 – 3.48)
Accessibility	Q1.6	617	5.37	<u>Disagree</u> (1.83 – 2.65)
				<u>Strongly Disagree</u> (1.00 – 1.82)
Total and Interpretation		3,755	5.44	Strongly Agree

Table 13 shows the evaluation of the one hundred fifteen (115) beta testing respondents regarding the Usability of ISO/IEC 25010:2011, along with the total score ( $\Sigma x$ ) and mean ( $\bar{x}$ ) scores of each question. The degree to which specific users can use a product or system to achieve particular objectives with effectiveness, efficiency, and satisfaction in certain circumstances of usage is referred to as Usability. A summation ( $\Sigma x$ ) score of 3,755 and a mean ( $\bar{x}$ ) score of 5.44 was evaluated by the respondents to these six (6) questions under Usability. A mean ( $\bar{x}$ ) score of 5.44 indicates that the respondents strongly agree that the study's system user-friendly.

## Beta Testing (Overall)

Table 14

*Beta testing overall mean ( $\bar{x}$ ) score results*

Characteristics	$\bar{x}$	Mean ( $\bar{x}$ ) Interval Interpretation
Functional Suitability	5.54	<u>Strongly Agree (5.15 – 6.00)</u> <u>Agree (4.32 – 5.14)</u>
Performance Efficiency	5.40	<u>Slightly Agree (3.49 – 4.31)</u> <u>Slightly Disagree (2.66 – 3.48)</u>
Usability	5.44	<u>Disagree (1.83 – 2.65)</u> <u>Strongly Disagree (1.00 – 1.82)</u>
Total and Interpretation	5.46	Strongly Agree

Table 14 presents the overall evaluation of the one hundred fifteen (115) beta testing respondents regarding the software part of the survey questionnaire in accordance with ISO/IEC 25010:2011. The combined mean ( $\bar{x}$ ) score of the three (3) characteristics has a total 5.46. A mean ( $\bar{x}$ ) score of 5.46 indicates that the respondents strongly agree that the study's system is able to function properly, perform tasks efficiently, and is user-friendly.

# Robotic Arm Testing (Overall)

Table 15

*Position Accuracy testing results of the robotic arm*

Characteristic		$\bar{x}$	Binary Interval Interpretation
Position Accuracy	A	1.0000	<u>Very High (0.81 – 1.00)</u>
	B	1.0000	
	C	1.0000	<u>High (0.61 – 0.80)</u>
	D	0.9967	<u>Moderate (0.41 – 0.60)</u>
	E	1.0000	
	F	0.9700	<u>Low (0.21 – 0.40)</u>
Total and Interpretation			<u>Very Low (0.00 – 0.20)</u> Very High

Table 15 shows the observation of the proponents on three hundred (300) tests, split into two (2) days, and performed for eight (8) hours each, regarding the Position Accuracy of the robotic arm's servo motors (A–F). Position Accuracy is defined as the difference between the commanded and measured positions. Through one hundred fifty (150) observations, the Position Accuracy garnered a total mean ( $\bar{x}$ ) score of 0.9944, which is in conformity with the range of the binary interval interpretation very high.

Table 16

*Position Repeatability testing results of the robotic arm*

Characteristics		$\bar{x}$	Binary Interval Interpretation
Position Repeatability	A	1.0000	
	B	1.0000	<u>Very High (0.81 – 1.00)</u>
	C	1.0000	<u>High (0.61 – 0.80)</u>
	D	0.9967	
	E	1.0000	<u>Moderate (0.41 – 0.60)</u>
	F	0.9733	<u>Low (0.21 – 0.40)</u>
			<u>Very Low (0.00 – 0.20)</u>
Total and Interpretation		0.9950	Very High

Table 16 presents the observation of the proponents on three hundred (300) tests, split into two (2) days, and performed for eight (8) hours each, regarding the Position Accuracy of the robotic arm's servo motors (A–F). Position repeatability is the level of consistency between the measured and commanded positions after  $n$  trips. Through one hundred fifty (150) observations, the Position Repeatability garnered a total mean ( $\bar{x}$ ) score of 0.9950, which is in line with the range of the binary interval interpretation very high.



Table 17

*Robotic arm testing overall results*

Characteristics	$\bar{x}$	Binary Interval Interpretation
Position Accuracy	0.9944	<u>Very High (0.81 – 1.00)</u>
		<u>High (0.61– 0.80)</u>
		<u>Moderate (0.41 – 0.60)</u>
Position Repeatability	0.9950	<u>Low (0.21 – 0.40)</u>
		<u>Very Low (0.00 – 0.20)</u>
Total and Interpretation	0.9947	Very High
Job Execution Time	25.28"	

Table 17 shows the overall evaluation of the researchers on three hundred (300) tests, split into two (2) days, and performed for eight (8) hours each, regarding the robotic arm's performance in accordance with NISTIR 8177 Robot Performance Key Performance Indicator. The Position Accuracy and Position Repeatability obtained a total mean ( $\bar{x}$ ) score of 0.9947, which according to the binary interpretation is very high. On the other hand, Job Execution Time is the period of time it takes a robotic arm to execute a task. The Job Execution Time has garnered an average of 25.28 seconds to complete the ticket dispensing task. The observations the proponents gathered show that the robotic arm is able to position itself accurately according to the programmed angles, as well as repeat its required positions without encountering a problem. Furthermore, the ticket dispensing process takes about an average of 25.28 seconds to distribute to the user.

## Descriptive Analysis of Comments and Suggestions

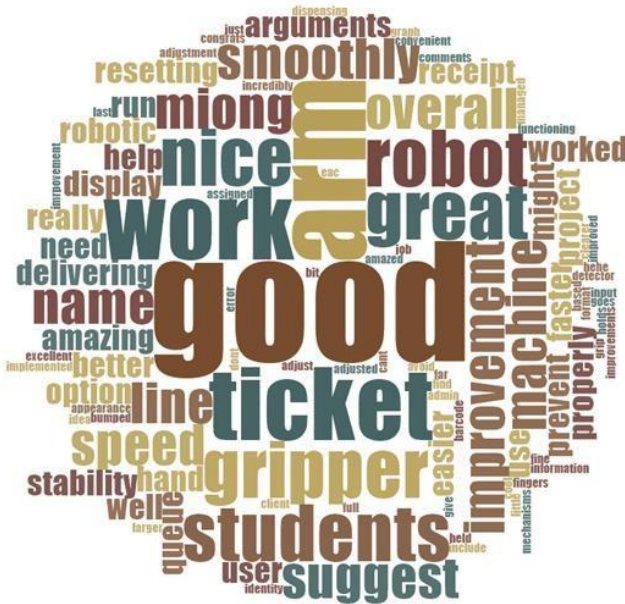


Figure 44. Word cloud for the advantages of the study

Figure 44 presents the positive comments and suggestions which stood out. It includes “good,” “line speed,” “improvement,” “speed,” “student,” “arm,” “better option,” “queue,” “gripper,” and “easier.” It is a good indication as the keywords are aligned with the general and specific objectives, and the beneficiaries of the study. Moreover, those recurring words indicate that the respondents have an overall positive impression towards the system. This suggests that MIONG.qs meets their expectations and successfully serves its intended purpose. While the word cloud primarily highlights the advantages of MIONG.qs, it also offers insight into potential areas for further development. Words like “adjust”, “need”, “option”, “prevent”, “properly”, “resetting”, and “suggest” indicating that respondents have constructive ideas for enhancing the system. These suggestions are related to functionality, user interface, or specific features that could be implemented or refined. The comments and suggestions can provide several advantages when incorporated into the design and development process of a prototype. By identifying potential issues and areas for improvement early on, comments and suggestions can lead to a higher quality

product. Client feedback enables you to take people-centric decisions that influence product and customer success. It provides you with immediate insight into the improvements that your clients want to see, and on how they use your product (Hotjar, 2022).



Figure 45. Word cloud for the disadvantages of the study

Figure 45 shows the negative comments and suggestions which stood out. It includes “ticket,” “wobbly,” “responsiveness,” “fell,” “uncertain” indicates that some issues might be related to the ticket dispensing process which could be further investigated to improve the system’s performance. The words “button,” “buttons,” “screen,” “size,” and “text” suggest that there might be issues with the user interface or display. These concerns could be related to the size of the buttons or text, which may be quite small for some users, particularly the elderly or those who have vision problems. Improving the visibility and accessibility of the interface could enhance the user experience for all demographics. Additionally, the

comments and suggestions can save time and money by avoiding costly redesigns or rework. Kuhnel et al. (2018) found that incorporating user feedback into the design process of a mobile application prototype reduced development time and costs. Furthermore, by incorporating feedback from users, comments and suggestions can help ensure that the final product meets their needs and preferences, resulting in increased user satisfaction.

## **DISCUSSION**

The evaluation of one hundred fifteen (115) beta testing respondents regarding the Software Product Quality of ISO/IEC 25010:2011's three (3) specific characteristics: Functional Suitability, Performance Efficiency and Usability. The three (3) characteristics have a mean ( $\bar{x}$ ) score of 5.54, 5.40, and 5.44 respectively, and garnered a total mean ( $\bar{x}$ ) score of 5.46. The result of the overall mean ( $\bar{x}$ ) score of 5.46 is a high indication. Mean ( $\bar{x}$ ) scores that ranges from 5.15 – 6.00 indicates that the respondents strongly agree that the study performed the required functions' objectives, produces the correct results, and accomplishes the provided task.

The observation of the proponents on three hundred (300) tests, split into two (2) days, and performed for eight (8) hours each, regarding the robotic arm's performance outlined in NISTIR 8177 Robot Performance Key Performance Indicator, which evaluates robotic arms based on three (3) specific characteristics: Position Accuracy, Position Repeatability, and Job Execution Time. The mean ( $\bar{x}$ ) scores for Position Accuracy and Position Repeatability were 0.9944, and 0.9950, respectively, resulting in an overall mean ( $\bar{x}$ ) score of 0.9947. According to the interpretation of binary scores, this overall mean ( $\bar{x}$ ) score indicates a very high level of performance, as mean ( $\bar{x}$ ) scores ranging from 0.81 – 1.00, indicates that the robotic arm can position itself accurately according to the specified angles and repeat its needed positions without issue. Furthermore, the ticket distribution procedure takes an average of 25.28 seconds to complete.

Based on the word analysis of all one hundred fifteen (115) respondents' comments or suggestions. The advantages and disadvantages of the study are as follows: it shows the positive feedback or comments and suggestions, the words that stood out includes "good", "line speed", "improvement", "speed", "student",

“arm”, “better option”, “queue”, “gripper”, and “easier”. On the other hand, the negative feedback or comments and suggestions, the words that stood out include “ticket”, “wobbly”, “responsiveness”, “fell”, and “uncertain”. Advantages and disadvantages cannot be computed but can be an indication, a descriptive analysis of this study’s research design.

## **Conclusion**

MIONG.qs: The Ticket Queue Dispensing Robot is successfully designed and developed by the proponents, from the web application, database, robotic arm, and hardware. It is also thoroughly evaluated through survey questionnaires and robotic arm testing, in accordance with the specific characteristics from ISO 25010:2011 and NISTIR 8177. The proponents deem that the prototype is functioning properly and is able to perform its tasks properly, in line with the General and Specific Objectives of the study.

## **Recommendations**

Future researchers may utilize a proximity sensor and a text-to-speech capability, along with speakers towards MIONG.qs as it would allow for interactive user-computer interaction. They may also integrate additional business transactions and administration offices to the system for it to be fully functional within the institution. They may also explore the possibility of integrating the automated queueing system with the school’s existing database system, which can allow for more streamlined data management. In addition, they may also enclose the robotic arm in a casing that is easy to access to perform maintenance, in order to hide the wires and servo motors to avoid unauthorized tampering of the hardware.

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# The Influence of Shopee's User Interface in the Purchasing Patterns of EACC Students

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## KEYWORDS:

- **Shopee**
- **User Interface**
- **Purchasing pattern**
- **EACC**

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**Abstract.** This study aims to know how Shopee's user interface influences students' purchasing behaviors. The study was a descriptive quantitative research design. Using stratified sampling, 116 Business Administration students from Emilio Aguinaldo

College-Cavite were selected, and their responses were collected using a modified questionnaire. The data were tabulated and analyzed using MS Excel 2016. For the descriptive statistics, the researchers utilized frequency table, percentages, weighted mean, and standard deviation. Regression analysis was used to determine the influence of the IU on the students' purchasing pattern. The study found that Shopee's Visual Appeal and Navigational Content directly influence the Frequency, Quantity, and Timing of Purchase, while Shopee's Data Modeling directly influences the Frequency, Quantity, Timing, and Method of purchase. Researchers suggest Shopee and Other related E-business Platforms to continue and increase their consistency in offering a simple, safe, and speedy online purchasing experience

because it affects the volume of purchases. Furthermore, more respondents from different demographics as well as other factors that were not mentioned in this study is recommended.

# **The Influence of Shopee's User Interface in the Purchasing Patterns of EACC Students**

## **INTRODUCTION**

The mobile app user interface (UI) plays a crucial role in shaping the purchasing patterns of users. It directly impacts the user experience (UX) and influences how users interact with the app, make decisions, and ultimately decide whether to complete a purchase. The UI is the first point of contact between the user and the app. A visually appealing, intuitive, and well-designed UI creates a positive first impression, capturing the user's attention and generating interest in exploring the app further. A cluttered or confusing UI, on the other hand, can discourage users and lead to abandonment.

Furthermore, the mobile app UI directly influences users' purchasing patterns by creating positive first impressions, facilitating easy navigation, highlighting key elements, building trust, enabling personalization, incorporating feedback, and providing a seamless checkout experience. A well-designed UI enhances the overall user experience, leading to increased engagement, satisfaction, and higher conversion rates.

Dedeke (2017) highlighted the importance of website design for determining consumer purchasing intentions through the user interface. The author also focused on a larger community arrangement with those who are used to or have made purchases through the MAP E-Mall website. Since Shopee's user interface is limited to the collegiate environment and no study has effectively addressed it, there is now a gap between the researcher's chosen respondents and the mobile application's user interface. Therefore, the goal of this study is to ascertain how Shopee's user interface affects students' purchase behaviors.

## **Background of the Study**

A user interface is a forum for communication between humans and technology. To put it another way, it is the point when a user can learn about machines. User interfaces (UI) are currently of utmost importance in cloud-based goods such as websites, apps, screens, and many more (Interaction Design Foundation, 2018). Wonjin (2017) asserts that "user interface" is "the very first impression that a user experienced," and that this element is probably one of the reasons why consumers utilize the products because they are inclined to notice customer reviews.

Consumers have long thought that a top-notch interface could affect their purchase habits, according to Yuom and Yu (2020). This includes visual design, micro-interaction, and design layout. When making a digital purchase, user interface design is far more important than it is when using a traditional retail service. According to Dedek (2017), app design elements from the user's perspective include: (1) the app's visual design; (2) its navigational content; and (3) its data modeling.

The app's visual design includes the visuals, colors, font styles, geometric patterns, motion graphics, and layout. It also refers to the uniformity, visual style, and aesthetic appeal of the app's appearance. According to Usability (2022), the visual design intentionally uses images, colors, typefaces, and other components to highlight the aesthetics of a site and the products that go with it. Effective visual design does not take away from the purpose or content of the page. Instead, it strengthens it by enticing people and promoting the growth of interest and confidence in the brand.

The framework and organization used to assess the app's pages and content are referred to as the navigation content. The objective of mobile navigation design, according to Just in Mind (2021), is to bring customers where they want to go with the least amount of interruption feasible. It describes the interactions that let users travel between, inside of, and outside of the various types of content in the app. It's how they'll become familiar with and involved with the design.

The data modeling of the app relates to its capacity to provide accurate, up-to-date, and understandable information. Data modeling is a technique for defining and managing corporate

activities, claims Science Logic (2022). By analyzing, interpreting, and outlining the data requirements and how they support the business operations, it enables users to create a visual depiction of the business. Data modeling aims to produce meaningful, coherent, structured data for the operation of business applications and the acquisition of precise outcomes. Data modeling harmonizes the formats of various data sources, maximizing their usefulness for the business processes to which they are applied. Although it is technical in nature, it also aims to be understandable and visually appealing. This suggests that they struck the ideal mix between complex technical jargon and straightforward ordinary lingo.

Considering frequency, amount, length, and timing, a buying pattern is the typical method that people buy products or get services. In other words, buying habits suggest or may predict how consumers would buy products or services, but they are incredibly susceptible to change (MBA Skool Team, 2021). Because they enable organizations to more fully comprehend and affordably widen their target audience, purchasing patterns are crucial to identify, analyze, and measure. Although they are more interested in the psychology and driving elements involved, buying habits follow the user's experience.

The traditional customer journey—awareness, consideration, and decision—is what shapes the majority of buying behaviors. When a pattern is established, the client no longer needs to completely understand their predicament and explore a solution; instead, they need only repeatedly go through the decision step, which establishes the pattern. The MBA Skool Team (2021) states that the following variables affect buying habits: frequency of purchases, number of purchases, timing of purchases, and mode of purchases.

According to Park et al. (2018), consumers typically seek extensive information before buying certain products that have sensory qualities including color, style, material, and fit. Therefore, whether users just navigate or look for information will depend on how well-designed an app is and whether it offers visually appealing product features (such as color, style, and appearance). User interface design has been demonstrated to positively improve perceived data access, navigation experience, and overall perception of an application, according to Park et al. (2018).

## **METHODOLOGY**

A quantitative descriptive research design was used for this investigation. Data and statistics are key components of quantitative research. The study was conducted via an online survey at Emilio Aguinaldo College located at Congressional East Ave, Burol Main, Dasmariñas, Cavite. There are 415 students enrolled in business administration courses such marketing management, financial management, operations management, and human resource and development management. The participants in this study were chosen using a technique called purposive sampling. To sample 415 Emilio Aguinaldo College-Cavite business administration students, a homogenous purposive sampling technique was used. The participants in this approach share the same criteria as those in the previous one: they are Shopee consumers. The researchers calculated a sample size of 415 students using Slovin's Formula, yielding a total of 113.5 or 114 pupils with a 0.08 margin of error. The researchers used Stratified Sample as their next sampling technique after using Purposive Sampling on 415 business administration students, who produced a total of 114 students. Business Administration contains four courses within its purview: Marketing Management has 46 students and a percentage of 40.35%; Financial Management has 42 students and a rate of 36.84%; Operations and Human Resource & Development Management have 13 students and a percentage of 11.40%, respectively.

The researchers used a self-made online questionnaire as the research instrument for the study. The survey questionnaire has three sections: I, II, and III: Section "I" was on the personal data of the respondents; Section "II" was on Shopee's user interface which consists of visual design, navigational content, and the app's data modeling; Section "III" was on the purchasing pattern of the students, focusing on the frequency of purchase, quantity of purchase, timing of purchase, and method of purchase.

Furthermore, Frequency and Percentage was used in the Statement of the Problem (1) which aims to gather the demographic profile of the respondents. Weighted Mean was used in the Statement of the Problem (2) and (3) which aims to gather the assessment of the respondents when it comes to

Shopee's user interface and their purchasing patterns. Finally, linear Regression was used in the Statement of the Problem (4) which aims to know the significant influence of Shopee's user interface and students purchasing patterns.

### ***Ethical Consideration***

The researchers got the consent of the participants of the study prior to answering the survey, which was included in the research instrument. The study was evaluated by a board before the researchers proceeded with the study.

## RESULTS

### Demographic Profile of the Respondents

The first statement of the problem focused on the demographic profile of the respondents in terms of age, year level and program. The researchers conducted an online survey questionnaire to 116 Business Administration student at Emilio Aguinaldo College – Cavite.

**Table 1.1**  
*Demographic Profile of the Respondents in terms of Age, Year Level & Program*

	<b>n</b>	<b>%</b>
Age		
19-24 years old	105	90.52
18 years old and below	7	6.03
25-30 years old	3	2.59
31 years old and above	1	0.86
Year Level		
3 <sup>rd</sup> Year	42	36.21
2 <sup>nd</sup> Year	28	24.14
4 <sup>th</sup> Year	24	20.69
1 <sup>st</sup> Year	22	18.96
Program		
Marketing Management	46	39.65
Financial Management	44	37.93
Operations Management	13	11.21
Human Resource & Development Management	13	11.21
<i>N = 116</i>		



## Shopee User Interface

The second statement of the problem focused on the how respondents assess Shopee user interface in terms of visual appeal, navigational content, and app's data modeling.

**Table 2.1**  
*Weighted Mean & Interpretation of Visual Appeal*

<b>Visual Appeal</b>	<b>M</b>	<b>D</b>	<b>Interpretation</b>
1.1.1 I found that the application has a satisfying color scheme.	.41	.63	Strongly Agree
1.1.2 I found that the application has pleasing font style.	.33	.59	Strongly Agree
1.1.3 I found that the application has readable font size.	.52	.58	Strongly Agree
1.1.4 I found that the application has well-balanced shapes.	.41	.59	Strongly Agree
1.1.5 The visual elements of Shopee's user interface complement each other.	.41	.66	Strongly Agree
<b>Grand Mean</b>	<b>.41</b>	<b>.61</b>	<b>Strongly Agree</b>

*Statistical limits: 3.25-4.00 Strongly Agree, 2.50-3.24 Agree, 1.75-2.49 Disagree, 1.00-1.74, Strongly Disagree*

Table 2.1 demonstrates data about the visual appeal of Shopee's user interface. In terms of the respondents' perceptions of Shopee's visual appeal, the color scheme, font styles, font size, and geometric shapes all received a high mean score.

**Table 2.2**  
*Weighted Mean & Interpretation of Navigational Content*

<b>Navigational Content</b>	<b>M</b>	<b>D</b>	<b>Interpretation</b>
1.2.1 It is smooth and easy to navigate through Shopee pages.	.49	.65	Strongly Agree
1.2.2 It is smooth and easy to navigate through Shopee tabs.	.40	.70	Strongly Agree
1.2.3 It is smooth and easy to navigate through Shopee control bars.	.40	.68	Strongly Agree
1.2.4 The application has a user-friendly interface.	.44	.65	Strongly Agree
<b>Grand Mean</b>	<b>.43</b>	<b>.67</b>	<b>Strongly Agree</b>

*Statistical limits: 3.25-4.00 Strongly Agree, 2.50-3.24 Agree, 1.75-2.49 Disagree, 1.00-1.74, Strongly Disagree*

Table 2.2 demonstrates data about the navigational content of Shopee's user interface. In terms of the respondents' perceptions of Shopee's navigational content, the pages, tabs, and control bars all received a high mean score.

**Table 2.3**  
*Weighted Mean & Interpretation of App's Data Modeling*

<b>App's Data Modeling</b>	<b>M</b>	<b>D</b>	<b>Interpretation</b>
1.3.1 The application provides an accurate date of shipping.	.05	.76	Agree
1.3.2 The application provides an accurate amount to pay.	.58	.61	Strongly Agree
1.3.3 The application provides an accurate date on when to receive the item/s.	.08	.81	Agree
1.3.4 The application has all the functions I expect to have.	.33	.67	Strongly Agree
<b>Grand Mean</b>	<b>.24</b>	<b>.71</b>	<b>Agree</b>

*Statistical limits: 3.25-4.00 Strongly Agree, 2.50-3.24 Agree, 1.75-2.49 Disagree, 1.00-1.74, Strongly Disagree*

Table 2.3 demonstrates data about the app's data modeling of Shopee's user interface. In terms of the respondents' perceptions of Shopee's app's data modeling, the Shopee providing an accurate amount to pay received a high mean score.

### **Purchasing Patterns**

The third statement of the problem focused on the respondents purchasing patterns in term of frequency of purchase, quantity of purchase, timing of purchase, and method of purchase.

**Table 3.1**  
*Weighted Mean & Interpretation of Frequency of Purchase*

<b>Frequency of Purchase</b>	<b>WM</b>	<b>SD</b>	<b>Interpretation</b>
2.1.1 I browse and shop on Shopee for less than an hour.	3.02	0.80	Agree
2.1.2 I browse and shop on Shopee for more than an hour.	2.78	0.96	Agree
2.1.3 I like random purchases on Shopee.	3.13	0.81	Agree
2.1.4 I only purchase on Shopee when they are on sale. (e.g. monthly sales like 3.3, payday sales, or holiday sales)	3.15	0.84	Agree
<b>Grand Mean</b>	<b>3.02</b>	<b>0.85</b>	<b>Agree</b>

*Statistical limits: 3.25-4.00 Strongly Agree, 2.50-3.24 Agree, 1.75-2.49 Disagree, 1.00-1.74, Strongly Disagree*

Table 3.1 displays information about the student's purchasing patterns in terms of frequency of purchase. Purchasing during the sales period had the highest mean, according to the data.

**Table 3.2**  
*Weighted Mean & Interpretation of Quantity of Purchase*

Quantity of Purchase	M	D	Interpretation
2.2.1 I prefer buying less than ten items per checkout.	.40	.77	Strongly Agree
2.2.2 I prefer buying more than ten items per checkout.	.03	.99	Disagree
2.2.3 The number of items I buy is based on my budget.	.66	.62	Strongly Agree
2.2.4 I tend to buy when stock's availability is high.	.80	.89	Agree
<b>Grand Mean</b>	<b>.97</b>	<b>.82</b>	<b>Agree</b>

*Statistical limits: 3.25-4.00 Strongly Agree, 2.50-3.24 Agree, 1.75-2.49 Disagree, 1.00-1.74, Strongly Disagree*

Table 3.2 displays information about the student's purchasing patterns in terms of quantity of purchase. Purchasing based on budget had the highest mean, according to the data.

**Table 3.3**  
*Weighted Mean & Interpretation of Timing of Purchase*

Timing of Purchase	WM	SD	Interpretation
2.3.1 I consider Shopee as my first choice in purchasing product/s.	3.23	0.77	Agree
2.3.2 I prefer to purchase on Shopee during sales period.	3.47	0.63	Strongly Agree
2.3.3 I buy products on Shopee because of the voucher and promo.	3.47	0.65	Strongly Agree
2.3.4 I purchased on Shopee when I got my monthly income / allowance.	3.07	0.83	Agree
2.3.5 I purchase on Shopee because of my needs in school / house.	3.21	0.75	Agree
2.3.6 I usually visit Shopee to check out new products.	3.24	0.79	Agree
<b>Grand Mean</b>	<b>3.28</b>	<b>0.74</b>	<b>Strongly Agree</b>

*Statistical limits: 3.25-4.00 Strongly Agree, 2.50-3.24 Agree, 1.75-2.49 Disagree, 1.00-1.74, Strongly Disagree*

Table 3.3 displays information about the student's purchasing patterns in terms of timing of purchase. Purchasing during a sales period and purchasing using promos and vouchers got the highest mean score.

**Table 3.4**  
*Weighted Mean & Interpretation of Method of Purchase*

<b>Method of Purchase</b>	<b>WM</b>	<b>SD</b>	<b>Interpretation</b>
2.4.1 I use Shopee voucher in purchasing a product.	3.54	0.69	Strongly Agree
2.4.2 I use Shopee coins in purchasing a product.	3.30	0.90	Strongly Agree
2.4.3 I prefer credit/ debit card as a payment method.	1.93	0.96	Disagree
2.4.4 I prefer cash on delivery as a payment method.	3.50	0.76	Strongly Agree
2.4.5 I prefer using e-wallet as a payment method.	2.92	1.07	Agree
2.4.6 I prefer over-the-counter as a payment method.	1.96	1.03	Disagree
2.4.7 I prefer online banking as a payment method.	2.05	1.08	Disagree
<b>Grand Mean</b>	<b>2.74</b>	<b>0.93</b>	<b>Agree</b>

*Statistical limits: 3.25-4.00 Strongly Agree, 2.50-3.24 Agree, 1.75-2.49 Disagree, 1.00-1.74, Strongly Disagree*

Table 3.4 displays information about the student's purchasing patterns in terms of method of purchase. Purchasing using vouchers and Shopee coins got the highest mean score.

### **Assumptions of Linear Regression**

Before the researchers used linear regression to test the hypothesis, the following assumptions were met:

1. Linear relationship: There exists a linear relationship between the independent variables (Visual Design, Navigational Content, App's Data Modeling) and the dependent variables (Frequency of Purchase, Quantity of Purchase, Timing of Purchase, and Method of Purchase).
2. Independence: The residuals are independent. There is no correlation between consecutive residuals in time series data.

3. Homoscedasticity: The residuals have constant variance at every level of x.
4. Normality: The residuals of the model are normally distributed.

### **Significant Influence of Shopee's User Interface and Purchasing Patterns**

The fourth statement of the problem focused on the significant of influence of the app's user interface and student's purchasing patterns.

**Table 4.1**  
*Influence of Shopee's User Interface and Purchasing Patterns*

<b>Null Hypotheses</b>	<b>Beta Coefficient</b>	<b>Standard Error</b>	<b>t-Stat</b>	<b>P-value</b>	<b>Decision</b>
H1: There is no significant influence between the app's visual appeal and the frequency of purchase.	0.39	0.86	4.54	0.00	<b>Rejected</b>
H2: There is no significant influence between the app's visual appeal and the quantity of purchase.	0.37	0.07	5.08	0.00	<b>Rejected</b>
H3: There is no significant influence between the app's visual appeal and the timing of purchase.	0.50	0.08	5.92	0.00	<b>Rejected</b>
H4: There is no significant influence between the app's visual appeal and the method of purchase.	0.20	0.09	2.24	0.03	<b>Accepted</b>
H5: There is no significant influence between the app's	0.25	0.08	3.38	0.00	<b>Rejected</b>

navigational content and the frequency of purchase.					
H6: There is no significant influence between the app's navigational content and the quantity of purchase.	0.26	0.06	4.05	0.00	<b>Rejected</b>
H7: There is no significant influence between the app's navigational content and the timing of purchase.	0.41	0.07	5.73	0.00	<b>Rejected</b>
H8: There is no significant influence between the app's navigational content and the method of purchase.	0.08	0.08	1.05	0.30	<b>Accepted</b>
H9: There is no significant influence between the app's data modeling and the frequency of purchase.	0.32	0.08	4.01	0.00	<b>Rejected</b>
H10: There is no significant influence between the app's data modeling and the quantity of purchase.	0.33	0.07	5.03	0.00	<b>Rejected</b>
H11: There is no significant influence between the app's data modeling and the timing of purchase.	0.37	0.08	4.74	0.00	<b>Rejected</b>
H12: There is no significant influence between the app's data modeling and the method of purchase.	0.23	0.08	2.83	0.00	<b>Rejected</b>

Table 4.1 shows that Null Hypotheses 1 to 12 was all rejected except Hypotheses 4 and 8.

## **DISCUSSION**

The first part of the statement of the problem, which focused on the respondent's demographic profile in terms of age, year level, and course, reveals that the population's proportion of people aged 19 to 24 was largest (90.52%), and that of people aged 31 and older was lowest (0.86%). According to the data, third-year students made up the biggest percentage of the population (36.21%), while first-year students made up the smallest percentage (18.96%). According to data, students studying marketing management scored the most, at 39.65%, while those studying operations and human resource development and management scored the lowest, at 11.21%.

The second problem statement asked respondents to rate the visual appeal, navigational information, and data modeling of the Shopee user interface. The respondents gave a high mean score to the color scheme, font styles, text size, and geometric forms when evaluating Shopee's visual attractiveness. This implies that these elements are crucial when students browse the application to make a purchase. The respondents gave Shopee's pages, tabs, and control bars a high mean score for their impressions of its navigational content. This implies that these elements are crucial when students browse the application to make a purchase. The Shopee delivering an accurate amount to pay obtained a high mean score in terms of the respondents' perceptions of the data modeling in the Shopee app. This demonstrates how crucial it is for financial transactions to be accurate to keep customers' trust and loyalty. The data also reveals that every respondent is unanimous in their opinion that the program contains all the features they anticipated.

The third problem statement concentrated on the respondents' purchasing patterns in terms of frequency, quantity, time, and mode of purchases. The frequency of purchases shows that students have a constrained budget for making bulk purchases at full price. When it comes to online purchasing, using monthly sales enables respondents to save a significant amount



of money while simultaneously satiating their wants and needs. The volume of purchases demonstrates that students have a constrained budget for buying numerous goods at once and at the original price. The respondents' use of their budget enables them to plan purchases without engaging in impulsive spending. The time of the purchase demonstrates that one of the many factors influencing student decisions to shop on Shopee is promotions, discounts, and vouchers. There is frequently the notion and theorem that using coupons will result in significant savings. Finally, the manner of payment demonstrates that people are gradually coming around to the concept of cashless purchases. They decide to study more about e-wallets and progressively develop confidence in cashless transactions.

The influence of the app's user experience and students' purchase habits was the subject of the fourth problem statement. Except for Hypotheses 4 and 8, all Null Hypotheses from 1 to 12 were rejected considering the findings.

H1 shows that the null hypothesis was rejected. Thus, there is a significant influence between the app's visual appeal and frequency of purchase. According to (F. Liu et al. 2017), Visual appeal is one issue that should be addressed. The intention of using visual appeal on online platforms is to engage, influence, and attract the consumer's choice. It's a consideration when determining how frequently consumers purchase throughout their engagement and according to (Indeed Editorial Team, 2021) one such indicator is the frequency of purchases. Businesses can use purchase frequency to gain insight into client behaviors and develop more targeted marketing plans.

H2 shows that the null hypothesis was rejected. Thus, there is a significant influence between the app's visual appeal and the quantity of purchases. According to Pooja et al. (2018), the more appealing the store is, the more likely consumers will make purchases. Visual appeal helps to attract consumers to purchase a quantity of products. According to (Shopee, 2022) purchase quantity limits protect sellers from potential fraud, It also contributes to a more equitable purchasing experience, as purchasers will have greater access to your products

H3 shows that the null hypothesis was rejected. Thus, there is a significant influence between the app's visual appeal and the timing of purchase. According to (Wuryandari, 2019) Consumers'

e-impulse buying was found to be influenced by user interface design and user experience while shopping online. According to (Noronha et al. 2017), The first impressions of users from the website are also influenced by its design. On the one hand, it represents the essential features or user interface that are related to the ability to access information and make purchases on the website.

H4 shows that the null hypothesis was accepted. Thus, there is no significant influence between the app's visual appeal and the method of purchase.

H5 shows that the null hypothesis was rejected. Thus, there is a significant influence between the app's navigational content and the quantity of purchases. According to Artem 2022, navigation of the application should provide the best experience to the user. In return, according to Pannaitescu (2021), a high frequency of purchases shows more efficient offers to the outstanding customer through a good experience that turns repeat customers into loyal customers.

H6 shows that the null hypothesis was rejected. Thus, there is a significant influence between the app's navigational content and the quantity of purchases. According to Artem (2022), the navigational content of the apps should provide intuitive interaction that works well with the app's functionality. According to Radu (2019), the quantity of items purchased is influenced by the unit of sales, price, and the number of consumers intended to buy which can be seen and controlled through the navigational content of the app.

H7 shows that the null hypothesis was rejected. Thus, there is a significant influence between the app's navigational content and the quantity of purchases. According to Just in Mind (2021), navigation design plays an important role in how users interact with and use your product.

H8 shows that the null hypothesis was accepted. Thus, there is no significant influence between the app's navigational content and the method of purchase.

H9 shows that the null hypothesis was rejected. Thus, there is a significant influence between the app's data modeling and the frequency of purchase. According to Ataburo et al. (2017), firms

that provide a higher quality of e-services are more likely to satisfy their customers, which would, in turn, influence their commitment to purchase and repurchase intent.

H10 shows that the null hypothesis was rejected. Thus, there is a significant influence between the app's data modeling and the quantity of purchases. According to Ayuni (2019), they expect e-commerce websites to deliver high quality, functionality, and trustworthiness in order for them to obtain e-satisfaction and e-loyalty.

H11 shows that the null hypothesis was rejected. Thus, there is a significant influence between the app's data modeling and the timing of purchases. According to Chen et al. (2020), visual appeal and website layout are crucial factors affecting consumers' online impulse buying.

H12 shows that the null hypothesis was rejected. Thus, there is a significant influence between the app's data modeling and the method of purchase. According to Vasic et al. (2019), cash on delivery is still the most popular method of payment, with 80 percent of customers preferring it. Only 5% of customers use PayPal and the same percentage benefits from e-banking. The same is true for global statistics. Lower rates, accurate shipping, and ease of purchase were discovered to be very significant considerations for e-buyers. Online shoppers also value accurate product descriptions, i.e., information accuracy. Potential customers can feel more secure knowing that they will not receive a product with incorrect characteristics if the information is accurate. By providing accurate information, a variety of possible pitfalls and product returns are prevented; online shopping becomes less volatile and more convenient, and consumers are much more impressed. Customer satisfaction, according to Vasic et al. (2019), is the result of the consumer experience throughout the different phases of the purchase. Because online consumers' experiences are merely based on data presented by online shops due to their inability to make physical contact with the product, it is evident that the data supplied can influence customer satisfaction, both during the information search stage and during the consumer purchase stage.

## **Conclusion**

The following are the conclusions made from this study paper about the influence of Shopee's User Interface on the purchasing patterns of selected Business Administration students of Emilio Aguinaldo College Cavite:

- Shopee's Visual Appeal and Navigational Content directly influence the Frequency, Quantity, and Timing of Purchase.
- Shopee's Data Modeling directly influences the Frequency, Quantity, Timing, and Method of purchase.

## **Recommendations**

This research study advises Shopee and Other E-business Platforms to continue and increase their consistency in offering a simple, safe, and speedy online purchasing experience because it affects the volume of purchases.

For Future Researchers, the researchers of this study wished to suggest conducting a larger sample size that might encompass other schools or departments to boost accuracy, support the findings of the prior research, and explore app elements that may affect the purchase intention of participants who are not included in this study. Additionally, the researchers advise determining the elements that directly and significantly affect students' purchase habits.

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# **The Relationship between Employees' Performance and Customer Satisfaction in Volet's Hotel and Resort**

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## **KEYWORDS:**

- **Service Quality**
- **Satisfaction**
- **Performance**
- **Customer Service**
- **Hotel and Resort Services**

**Abstract.** The aim of this study is to determine if there is a significant relationship between Employees' Performance and Customer Satisfaction in the hospitality industry. The participants were limited to customers and supervisors of Volet's Hotel and Resort in Dasmariñas City, Cavite, which were selected due to their perceived capacity to provide necessary information needed to meet the study's objectives. Findings



revealed a significant relationship between employee performance and customer satisfaction. Moreover, the resort is highly recommended by customers who want to relax, swim, and have a bonding experience with their families. This demonstrates that the majority of resort guests are satisfied with the accommodations, amenities, facilities, food, and beverages, and other services offered by the establishment. Alongside this satisfaction, the results of the employees' performance showed that employees' are outstanding according to their supervisors. Ultimately, the findings suggest that enhancing employees' performance in the hospitality industry can lead to increased customer satisfaction. Also, the high recommendation rate from satisfied customers highlights the resort's success in providing quality accommodations, amenities, and services, which can contribute to a positive guest experience.

# **The Relationship between Employees' Performance and Customer Satisfaction in Volet's Hotel and Resort**

## **INTRODUCTION**

This research seeks to delve into the intricate relationship between employees' performance and customer satisfaction within the unique setting of Volet's Hotel and Resort, situated in Dasmariñas City, Cavite. The significance of delivering outstanding services cannot be overstated, as it serves as a cornerstone for a successful business by not only attracting and retaining customers but also by fostering positive word-of-mouth referrals. In the highly competitive hotel industry, customer satisfaction plays a pivotal role in driving overall sales and revenue, as satisfied customers are more likely to become loyal patrons. Understanding the specific touch points that influence customer experiences is vital for the sustained success of any hotel establishment. By pinpointing the various interactions between guests and hotel staff, facilities, and amenities, this study aims to identify areas where Volet's Hotel and Resort can optimize their services to ensure maximum guest satisfaction. By examining the strategies and practices that contribute to customer satisfaction and gratification, the research endeavors to provide valuable insights into enhancing the overall guest experience.

Volet's Hotel and Resort, located in the bustling City of Dasmariñas in the Philippines, represents an intriguing case study in this research. Renowned for its commitment to excellence in customer service, this establishment serves as an exemplar for other hotels seeking to emulate their success. By exploring the unique approaches adopted by Volet's Hotel and Resort to elevate customer satisfaction, this study aims to uncover best practices that can be applied industry-wide, ultimately benefiting both hoteliers and guests alike. Through meticulous analysis of employees' performance evaluations and customer feedback, this research aims to shed light on the specific factors that contribute to customer satisfaction in the hospitality industry.

By examining the correlation between employee performance and customer satisfaction, valuable insights can be gained into the underlying dynamics and mechanisms that drive guest loyalty and positive experiences. Ultimately, this research aspires to provide practical recommendations that can help hotels elevate their service quality, exceed guest expectations, and foster long-term success in today's competitive market.

## **METHODOLOGY**

### **Research Design**

This study used correlational research design, using a statistical method to provide analysis and interpretation of data that will perform statistical analysis to treat responses from the participants to a survey questionnaire, therefore, the researcher utilized quantitative approach. In correlational studies, relationships between and among variables are explored and examined (Curtis, Comiskey, & Dempsey, 2017). In line with this, using correlation studies, researchers will be able to better understand the relationship between variables. On the other hand, quantitative research techniques are used to test hypotheses, evaluate findings, generalize findings to a population, and encourage replication of the findings (Park, & Park, 2017). However, quantitative methods were effective in gathering large amounts of data in a short period of time. (McCusker, & Gunaydin, 2018)

The research method used for this study is quantitative correlational research design to address the research problem and look for relationships between the chosen variables. A statistical analysis of data is required in analyzing and interpreting data, since the researchers are using survey questionnaires to determine the relationship between the employees' performance and customer satisfaction in this research.

### **Research Locale**

This study will be conducted in Dasmarina City, Cavite. The researchers selected this as the locale of the study since Volet's Hotel and Resort are located in this city. In addition, the chosen participants are the customers and supervisors of Volet's Hotel and Resort. The researchers find the appropriateness of this place for this study for the accessibility of the customers. The study has been conducted in the first semester of the 2022–2023 academic year.

## **Research Participants**

The population of the study is a group of individuals with same general characteristics that can be identified and studied by researchers (Creswell, 2018). The participants of this study are the customers and supervisors of Volet's Hotel and Resort located in Dasmariñas, Cavite, in order to determine the relationship between employee performance and customer satisfaction in the establishment. The researchers chose these respondents since the satisfaction can be achieved based on the services of Volet's Hotel and Resort that every customer desired to experience on a vacation. The gratification of the customers can be obtained based on how the employees perform the services to satisfy the customers. The researchers used the Slovin's formula to determine the sample size required to obtain a specific confidence interval while sampling a population. As a result, the overall sample size for this study is 100 respondents in order to obtain reliable data on customer satisfaction and 2 respondents in measuring employees since Volet's Hotel and Resort only has two supervisors in the entire department. Customers and Supervisors of Volet's Hotel and Resort of all genders aged 18 and up are eligible to participate. These people were willing to participate and agree to answer the questions provided in the questionnaire.

## **Sampling Technique**

Bhardwaj (2019) defined sampling as a procedure in selecting sample of individuals from a large group of population for certain kind of research purposes. The respondents of this research are the customers of Volet's Hotel and Resort. This study used probability sampling, which means that the researcher's selection of respondents depends on pure chance. The study used simple random sampling under probability sampling since the selection of participants in the survey questionnaire was based on pure chance. This method can help the research gather necessary information, which is useful for the research. In this study, every customer and supervisor in Volet's Hotel and Resort has an equal chance of being chosen that may help the researchers to select people that are willing to participate.

## **Data Gathering Procedure**

Researchers seek and look for necessary information that could help in creating research. The researchers search for information through books and mostly from the internet by researching. The

researchers also used the past researchers' studies as a basis that can serve as a guide in creating good research. This information can help the study come up with an idea on how to create necessary questions for the questionnaire that are helpful in gathering information until the research leads to conclusions. The questionnaire was validated by the subject professor before distributing to the participants. After the approval of the questionnaires, the researcher started conducting the study to the participants.

The researchers asked prior permission from the participants in this study and from the management of the establishment before gathering data. The respondents that are covered by data gathering are the customers and supervisors of Volet's Hotel and Resort, which tackles the connections between the employees' performance and the satisfaction of the customers. After answering the questionnaires, the researcher then started collecting and tallying data for interpretation. The researcher asked for the guidance of a statistician to determine the appropriate statistical tools in interpreting the data. Lastly, after the interpretation of the data, the researcher was able to make a conclusion and recommendations for this study. Getting an appropriate answer from the participants was helpful for the study to be successful.

## **Research Instrument**

The study used a researcher-made survey questionnaire to gather the needed data from the respondents. The draft of the survey questionnaires was design by the researchers based on was drawn out from the previous studies, literatures, published and unpublished thesis which is relevant to the study.

This study used a Likert Scale survey questionnaire to gather information in order to examine and determine the relationship between the employees' performance and customer satisfaction in Volet's Hotel and Resort. In measuring customer satisfaction, the scale was divided into four categories; very satisfied, satisfied, dissatisfied, and very dissatisfied. The questionnaire was divided into three sections, the first of which will collect participant data such as age, gender, occupation, and number of visits. The second section measures how satisfied customers are with all of the services provided by the Volet's Hotel and Resort in terms of accommodation, amenities, facilities and food and beverages. In measuring employees' performance, the scale was also divided into four categories; outstanding, very satisfactory, satisfactory and needs improvement. In this section, respondents were questioned about the employees at the hotel and resort in terms of learning and

growing ability, obligation and responsibility, communication skills and performance. This study encouraged survey questionnaires on the topic at hand, so that the instrument would be able to obtain valid responses from the respondents.

In addition to this, the instrument was validated by a few consultants and professors before being put into the study. The researchers are responsible for distributing the survey questionnaire and expecting answers to the questions based on the statement of the problem to gather necessary information for the study.

## **Data Analysis**

After gathering necessary information, the researchers started compiling and tabulating the data. To determine the validity and reliability of the data, the researcher used statistical formula in order to answer the problems on this study. This study aims to determine the relationship between the employees' performance and customer satisfaction in Volet's Hotel and Resort. Therefore, the researchers used the following statistical treatment in order to answer the questions proposed in the study.

For the first specific problem, frequency was used by the researchers to convert the numerical data gathered from the questionnaire to percentage. Only tallying and getting percentage were the methods needed to come up with a conclusion for this study. Correlational statistics, which include a basic summary of the data gathered, were used to explain further the result of the study. The correlational statistics used percentages.

**Percentage** - used to determine the ratio of respondents that have same answers with general number of respondents.

**Formula:  $\% = f/N \times 100$**

Wherein: % = percentage

f = number of respondents that answered the question

N = total number of respondents

On the second and third specific problem, the researchers used mean in order to compare different sets of data. Mean implies average and the sum of a set of data divided by the amount of data.

The mean formula will be used to calculate the respondents' responses in regards with the level of customer satisfaction and employees' performance.

$$\text{Formula: } \bar{x} = \frac{\sum x}{N}$$

Wherein:  $\bar{x}$  = mean

$\sum x$  = sum of all data values

N = number of values in the data set

For the last specific problem, the Pearson correlation coefficient (r) was used by the researchers to get the degree of relationship between the two variables used in this research. This formula is a very helpful statistical formula that measures the strength between variables and relationships. This will also determine if there is a correlation between employees' performance and customer satisfaction at Volet's Hotel and Resort.

$$\text{Formula: } r = \frac{n(\sum xy) - (\sum x)(\sum y)}{\sqrt{[n\sum x^2 - (\sum x)^2][n\sum y^2 - (\sum y)^2]}}$$

Wherein:

r = Pearson Correlation Coefficient N = total number of respondents

$\sum xy$  = sum of first and second variable x = sum of the first variable

y = sum of the second variable

## Objectives of the Study

The purpose of this study is to determine the relationship between employee performance and customer satisfaction. In this study, Volet hotel and resort's customer satisfaction and employees' performance were measured.

## RESULTS AND DISCUSSIONS

### Distribution of respondents based on profile

According to the sample collected through the distribution of questionnaires based on age, customers ages 18–27 account for 46% of resort respondents, followed by 28–37-year-olds (24%). Furthermore, customers aged 38–47 account for 16% of respondents,

while those age of 48-57 account for 7% and customers ages from 58 and above gained 7% of the respondents. The result shows that the ages 18–27 have the most customers, while the age 48–57 and 58 and above have the fewest. This indicates that the majority of the resort's visitors are young adults in a very active age group who are looking for leisure activities to unwind and enjoy. The younger generation is more likely to take advantage of hotel and resort amenities because they are still young and physically capable of exploring the water-based activities. Im (2018) argues that young people, or what are now referred to as millennials, prefer to spend money on travel and stays at hotels and resorts. Due to their early exposure to digital technology, youngsters are now beginning to engage in leisure and lodging activities that they were unable to do when they were younger. Respondents in terms of sex are 55% female, while 45% respondents are male. According to Sanchez (2018), even countries with strict laws prohibiting women from being seen on beaches are now adapting to changes in female behaviour. They are now a part of the male population that appreciates the natural beauty of water and coastal areas. Furthermore, females, who prefer the amenities provided by hotels and resorts, are becoming more interested in water-based activities. In terms of occupation, which is classified into four categories: employed, unemployed, self-employed, and retired, the employed respondents got the highest frequency, which is 57%, followed by the self-employed, who have 20%. Aside from that, the retired, who have 6% of the respondents, have far more than the unemployed, who have only 4%. The results show that most of the respondents visited the Volet's Hotel and Resort 2-4 times already, with a percentage of 45%, followed by those who were first-time visitors, with 42% of respondents. The resort has already been visited by 10% of repeat customers 5-7 times, while 2% of customers have visited the resort 8-10 times. Those who got the least had a 1% share of respondents who visited the resort more than 11 times.

### **Respondent's perspective on the level of customer satisfaction**

Results revealed that guests are satisfied with the accommodations at Volet's Hotel and Resorts with a composite mean of 2.7340. This demonstrates that the guests who have already experienced the resort's accommodation are satisfied with the price, cleanliness, comfortability, equipment, and safety indicators. Simarmata et al. (2017) define accommodation as everything that is offered to meet a person's needs while traveling, in contrast to this. A tourist can use accommodations as a place to sleep, relax, eat, drink, take a shower, and do other activities. This demonstrates that the Volet's Hotel and



Resort basically satisfies all hotel requirements and ensures that guests are satisfied with their accommodations. Meanwhile, the level of customer satisfaction with regard to amenities records a composite mean of 2.9620. It is abundantly clear that guests are satisfied with the amenities that Volet's Hotel and Resort offers in terms of operating hours, capacity, cleanliness and comfortability, safety and security, as well as accessibility. In accordance with this, hotel in-room amenities have become important cues for guests measuring their stay experience (Cobanoglu et al., 2017, Heo and Hyun, 2019), which means that customers of Volet's Hotel and Resorts exhibit a high standard for amenities in this section, which results in a satisfying stay. Moreover, guests are becoming more sophisticated, and they value innovative amenities that enhance their hotel stays. Data collection also revealed a composite mean of 2.9680 of customers' satisfaction in terms of facilities, indicating that previous visitors of Volet's Hotel and Resort were satisfied with the facilities they experienced in regards to cost, furnishings, cleanliness, security, and accessibility. Based on the Facilities Management Concept in the Hospitality Sector Report (2020), the concept of facilities management is important in the hospitality industry. It determines the level of service quality that a company provides to its customers. A thoughtful strategy enables the provision of high-quality services using settings that meet customers' expectations. According to the data gathered in relation to Volet's Hotel and Resort, customers use their experiences to inform their evaluations of the highest and lowest quality services, which leads to their satisfaction with the resort's facilities. Lastly, in terms of food and beverages, the composite mean of 2.8640 was revealed, which demonstrates that customers are satisfied with the food and beverages provided by the Volet's Hotel and Resort in terms of how they are prepared and served, the price, the quality of the food, the ambiance, and the menu options. Filipinos love to eat, so it was determined that Volet's Hotel and Resort provided high-quality food and beverages that made customers satisfied. According to the study *The Importance of Corporate Food & Beverage to a Hotel Group* (2019), it is well known that hotel food & beverage plays a significant role in how a hotel is positioned in its market. In correlation with the Volet's Hotel and Resort, F&B is able to make the resort stand out and attract customers. Moreover, promotions, menus, and concepts must be driven by food and beverage to ensure that the hotel is building a destination that both hotel guests and outside visitors want to visit.

## **Level of Employees' Performance**

It was determined that the level of employee performance in terms of learning and growing ability, is high with a composite mean of 3.8333. This measure the employees' performance in terms of their learning and growing ability in the indicators of opportunities, duties, and familiarity that show how outstanding the employees of the Volet's Hotel and Resort were as measured by their respective supervisors since one of the key components of the modern hotel industry is learning and development. As it enables employees to put their skills to better use and specialize in their work which employee training is an important responsibility. This also demonstrate that Volet's Hotel and Resort employees have the capacity to learn and develop through self-learning, participation in learning initiatives, stabilization and application of learning outcomes in decision-making processes, performance of duties even without direction or supervision from employers, and an ability, willingness, and aptitude to learn the skills required to advance goals and initiatives. In terms of obligation and responsibility, with a composite mean of 3.8333, the results demonstrate that employees are outstanding in their commitment and responsibility with regard to work schedules, issues, and solutions, as well as with regard to their responsibilities at work as providing quick and simple solutions to customer questions can help prevent further issues, escalation, or the need for more specialized resources. All employees must be capable of offering reactive support in a timely, accurate, and thorough manner. In response to the statements, their supervisors at Volet's Hotel and Resort evaluated the performance of their staff members resulted of being outstanding. It was also determined that employees of Volet's Hotel and Resort are outstanding in terms of communication skills, such as their ability to communicate, listen, pay attention, and demonstrate empathy and assurance, hence being very satisfactory in terms of communicating clearly and politely with a mean score of 3.3333. This is critical as effective communication can enhance the client relationship and possibly generate more leads for the company since it enables the hotel and resort to build trust with their customers and clearly express needs, expectations, and any challenges. Lastly, the results show that the employees' performance was outstanding in terms of their time and effort as well as multi-tasking with a mean score of 3.6666. However, employees who work without errors and provide high-quality service are considered very satisfactory by their supervisors wherein the employees' willingness to perform tasks in accordance with commitments, objectives, and problem guidelines fell short or was performed poorly. Everyone makes mistakes, as no one is perfect, but

repeatedly making the same error shows that you are not paying attention to the quality level of your work as an employee. At last, overall results continue to demonstrate that employees' performance is outstanding.

### **Relationship between customer satisfaction and employees' performance**

Following data collection and analysis, the researchers conclude that there is a significant relationship between employee performance and customer satisfaction at Volet's Hotel and Resort. Therefore, it was determined that employees are the key contributor to customer satisfaction and that employee performance determines whether a customer has a good or bad experience. Moreover, customer satisfaction has a correlation with the independent variables that is less than 0.05 or 5% significant, and thus employee performance has a correlation with the independent variables in terms of learning and growing ability and communication skills that is less than 0.05 or 5% significant which means they have a significant relationship and were able to seek growth opportunities and communicate with empathy. However, the two independent variables under the employees' performance, which are obligation and responsibility as well as performance, resulted in a greater than 0.05 or 5% level of significance. As a result, it was determined that there is no meaningful connection between obligation and responsibility and the employees' performance. When there is no statistically significant relationship, the null hypothesis is accepted since there is no correlation at all. Employees at Volet's Hotel and Resort were unable to carry out their responsibilities and occasionally neglected their jobs as they were occasionally unavailable during scheduled work hours. Additionally, it was found that there is no relationship between performance and employee performance, indicating that they are unable to complete the task with the least amount of time and effort required and even to deliver high-quality service. Hence, the overall results show that there is a significant relationship between the two dependent variables and the eight independent variables. In line with this, the purpose of correlating these two dependent variables was to examine the hypothesis that had been put forth. Findings indicate the differences between the two. It can be inferred from the results that the hypotheses were primarily found to be significant. The empirical data did not support Ho1 according to the data analysis. According to statistics, the null hypothesis can be rejected if/when the f-value is larger than the calculated f-statistic. Furthermore, the findings invalidate Ho1 by demonstrating a strong relationship between employee performance and customer satisfaction. These

findings are consistent with earlier relevant studies, wherein each employee's strong performance in providing services to customers ultimately results in customer satisfaction, which benefits both the customer and the business. According to research, the performance dimension has a significant impact on consumer satisfaction (Loekito et al., 2017). This is unquestionably useful information for business owners who want to assess their performance and the services they offer customers in order to attain company objectives. Additionally, since employees of the business can interact with customers, their performance in service delivery is crucial to its ability to successfully satisfy customers (Nursiti, 2019). Previous studies' findings support the rejection of the following claim hypotheses: Service quality and employee performance partially and concurrently have a positive and significant impact on customer satisfaction variables (Dintyani et al., 2017).

## **Conclusion**

This research has provided valuable insights into the relationship between employees' performance and customer satisfaction in Volet's Hotel and Resort. The findings have shed light on various aspects of customer demographics, preferences, and experiences, as well as the performance of the hotel's employees. The analysis of customer demographics revealed that the majority of the resort's visitors are young adults in the age range of 18-27. This demographic is actively seeking leisure activities and is more likely to engage in the water-based amenities offered by the hotel. This aligns with the preferences of the millennial generation, who prioritize travel experiences and resort stays. Furthermore, the study highlighted the increasing participation of women in water-based activities, even in regions with traditional restrictions. This shift in behavior presents an opportunity for hotels and resorts to cater to the changing needs and preferences of female customers. Occupation-wise, the study found that the majority of respondents were employed individuals, indicating that the resort attracts a working-class clientele. Understanding the occupation demographics can help the hotel tailor its services and offerings to better serve this specific segment of customers. The analysis of customer visit frequency revealed that a significant portion of the respondents had visited Volet's Hotel and Resort multiple times. This indicates a high level of customer loyalty and satisfaction, as they continue to choose the resort for their subsequent visits. It also suggests

that the resort has been successful in creating a positive and memorable experience for its guests.

Regarding specific aspects of the resort, the research highlighted customer satisfaction with accommodations, amenities, facilities, food, and beverages. Guests expressed their satisfaction with the price, cleanliness, comfort, equipment, and safety of the accommodations. They also appreciated the operating hours, capacity, cleanliness, safety, and accessibility of the amenities. The facilities and food and beverages offered by the resort were also rated highly by the guests. These findings underscore the resort's success in meeting customer expectations in these crucial areas. Turning to employee performance, the study revealed that the employees of Volet's Hotel and Resort were evaluated as outstanding by their supervisors. They demonstrated a high level of learning and growing ability, commitment and responsibility, communication skills, and time management. These positive evaluations indicate that the employees possess the necessary skills and qualities to provide exceptional service to the guests. Importantly, the research established a significant relationship between employee performance and customer satisfaction. The findings support previous studies that have emphasized the importance of employee performance in influencing customer satisfaction. The results indicate that employees play a pivotal role in shaping the guest experience and ultimately determining whether a customer has a positive or negative impression of the resort. However, it is worth noting that there was no significant relationship between employee performance and obligation and responsibility, as well as performance. This suggests that there may be areas where employees are falling short in fulfilling their responsibilities and delivering high-quality service. Addressing these gaps can further enhance the overall customer satisfaction and improve the performance of the resort.

In conclusion, this research contributes to the existing body of knowledge by providing insights into the relationship between employees' performance and customer satisfaction in the context of Volet's Hotel and Resort. The findings highlight the importance of employee performance in driving customer satisfaction and underscore the significance of various factors such as accommodations, amenities, facilities, and food and beverages in shaping the guest experience. The results offer valuable guidance for hotel and resort managers in optimizing their operations and enhancing customer satisfaction, ultimately leading to improved business outcomes.

## **Recommendations**

Employee performance greatly affects the company's contribution to the level of customer service quality. In the hotel industry, where the goal is to measure customer satisfaction, employee performance is one of the key assets that the business must own. Wherein, according to Pramulaso (2020), performance is essentially the actions or inactions of employees that have an impact on the contribution of the business, including the quality level of services provided. A job improvement strategy is a way for a business to raise employee performance in order to meet business objectives. The researchers hereby present the following recommendations:

### **Employees' Performance**

- **Employees' Performance Review.** When conducted properly, performance reviews can assist staff members in comprehending their strengths, areas for growth, how their work fits into the overall goals of the company, and expectations. Effective managers can more quickly identify high performers, address problems before they become intractable, communicate expectations, promote growth and development, and increase employee engagement.
- **Work Quality Inspection.** The accuracy and excellence of a person's work are evaluated by its quality. Although an employee may be very productive in the sense that they produce a lot of something, the quality of their work may not be satisfactory. Therefore, it is advised that management hold weekly quality assessments with employees to evaluate how well they are doing at work and ensure that customers are satisfied.
- **Encourage feedback.** By incorporating feedback opportunities into their daily tasks, employees will be better able to evaluate how well they are performing in comparison to your expectations. These opportunities for feedback ought to be frequent and reciprocal. Encourage your staff to provide you with feedback on how you can assist or guide them more effectively.
- **Coaching of employees.** Even if the employees have been with the company for almost a year, it is recommended that they have at least weekly coaching from management to make sure they are carrying out and doing everything correctly in accordance with the resort's rules and regulations.

- **Encourage Communication.** The effectiveness of employees' interactions with customers, coworkers, and vendors is all impacted by their communication skills. Give guidance on how this area can be improved if you have a worker who has trouble communicating. Always strive to conclude the appraisal on a positive note to avoid demoralizing the employees. Declare their confidence in their ability to rise to the occasion and pursue professional growth.
- **Encourage Team Spirit.** As a result of the collaborative nature of work, developing a sense of team is just as important as motivating the staff. Therefore, it's extremely important for coworkers to have a positive energy flow.
- **Promote Performance Expectations.** To perform well, employees must be aware of what is expected of them. As a result, an up-to-date job description that outlines the essential duties, responsibilities, and tasks of the employees, as well as the fundamental knowledge and abilities required for success in the workplace and the performance of duties, is recommended. High-quality on-the-job performance must take into account a variety of anticipated job outcomes, so it is extremely important to pay attention to this.
- **Incentivize and Recognize Employees.** Giving employees an incentive and showing them recognition is one of the best ways to encourage them to be more effective and efficient. Recognizing and rewarding employees for a job well done inspires team members to improve their overall performance further and encourages them to continue increasing their productivity. As a result, monetary incentives and consistent employee recognition are the best recommendations for high employee performance.
- **Acknowledge their responsibility.** Giving the team responsibility is the most straightforward way to encourage them to accept the obligation and responsibility for the work they produce. Give them work that forces them to learn how to do it; give them more input; and let them set their own standards at work to teach them how to be responsible. It is important that your team trusts you and that you believe in what they are doing. They need to believe you trust them in order to accept responsibility.

## **Customer Satisfaction**

- **Monthly customer satisfaction surveys.** Research on customer satisfaction should be conducted with the utmost care. Customer satisfaction evaluations must be conducted in a way that is reliable, timely, accurate, and consistently consistent. Customers can create value before making a purchase, during the actual transaction and/or during a direct experience, after making a purchase, and during use or experience. The methods used to develop customer satisfaction may occasionally change. As a result, it is recommended to conduct the survey on a monthly basis.
- **Offer Multi-Channel Support.** When purchasing something, consumers use a variety of platforms and tools. Due to this, it is recommended to be present across all platforms used by your customers.
- **Reply to All Feedback.** It's recommended to respond to customer feedback, whether it's favorable or unfavorable. You can benefit if a customer is satisfied. And if a customer is dissatisfied, you should try to determine why. After that, you can enhance your goods or services and lower the probability of churn.
- **Act on Complaints and Negative Reviews.** Consider negative feedback and complaints as an opportunity. It's a chance to learn more about your customers. It is also recommended to analyze them so that management can understand the needs and desires of the customers and inform them that you have heard and addressed their complaint.
- **Customer loyalty programs.** As a sign of gratitude to customers for continuing to patronize the resort, this is a great way to guarantee their satisfaction. These initiatives also constitute a proactive form of customer service on the part of the company, which extends and enriches the customer experience by way of offers and discounts.



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