PIEZOIRE (PIEZOELECTRICITY INTO RENEWABLE ENERGY) SEATS: UTILIZATION OF PUVs IN PRODUCING RENEWABLE ENERGY

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ABSTRACT

Title : PIEZOIRE (PIEZOELECTRICITY INTO RENEWABLE ENERGY) SEATS: UTILIZATION OF PUVs IN PRODUCING RENEWABLE ENERGY

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This research aims to utilize the congestion in Public Utility Vehicles by employing the Piezoire Seats to turn the kinetic energy harnessed inside PUVs into renewable energy through the usage of piezoelectric sensors. The study adopts a quantitative-experimental research method, utilizing the experimental observation framework to critically analyze the influence of the different states and conditions of vehicle capacity conditions on variables concerning energy generation. Approval from the Polytechnic University of the Philippines to conduct tests on the Piezoire Seats will be sought, ensuring strict compliance to the research protocols and standards of the institution.

Piezoire Seats employs an AC-DC motor to convert kinetic energy into electrical power, along with the utilization of The Piezoelectric Effect, Law of Conservation of Energy, and the Biomechanical Energy Conversion to provide a comprehensive insight to the field of Renewable Energy. Piezoelectric sensors are attached to the seats and floors of the PUVs, composed of metal and ceramic for safety, designed for sensing and harnessing kinetic energy from the motions of the vehicles. The captured energy is converted through the stripboard which includes a capacitor, resistor, and inverter. The energy will is then stored in a power station for usage and distribution.

The test will carefully study, monitor, and document the parameters of Amount of Energy per Weight or Mass of Each Person, Amount of Energy per Certain Number of People in the Vehicle, Ratio of Energy Converted to Weight or Mass of Each Person, and Ratio of Energy to the Amount of People in the Vehicle. Through this observation, the study will put an emphasis into the feasibility and effectiveness of kinetic energy from PUVs as a sustainable source of energy.

CHAPTER I

THE PROBLEM AND ITS BACKGROUND

This chapter establishes the basis, background, and purpose of the study. It delves into the primary objective the researchers seek to achieve as well as the different factors that will influence the result of the research. To add, this chapter presents the projected location and affected group of people in real life situations, while also emphasizing its importance in environmental conservation.

Introduction

With the rampant growth of urbanization, the Philippines is no exception from the influence of social media platforms sensationalizing various recreational infrastructures and local attractions at a fast pace through current cultural and economic trends. Although the virality that many businesses and attractions receive increases financial growth and consumer traffic, an underlying problem presents itself at hand: worsened public transportation systems and its harmful effects, on top of the country's decade old traffic jams and road congestion.

Fossil fuels are widely utilized for energy generation all over the world with 78% of it relied upon in the Philippines alone in 2023 (Fulghum, 2024). Even with their advantages making everyday life easier for people, pollution from their carbon emissions and their overall contribution to the distraction of the environment must be taken into consideration. The transportation sector contributes a significant amount to the air pollution and greenhouse gas emissions due to their reliance on fossil-fuel derived fuels, which is further

worsened by the use of conventional and private vehicles, lack of management framework, and lack of quality control from the government. With the existing issues of overpopulation and public congestion, the continued use of fossil fuel reliant vehicles for transportation poses greater environmental challenges and degradation.

This long-lived struggle can be reprimanded through renewable alternatives that are effective and environmentally healthy. By embracing and investing in renewable energy technologies, the Philippines can reduce its carbon footprint, protect its rich biodiversity, and enhance its energy independence. Transition to renewable energy should not be viewed as a compromise in quality or efficiency. On the contrary, it presents an opportunity to drive innovation and pave the way for a revolutionary future in energy generation.

The Philippines uses a mix of renewable energy sources including solar, wind, hydro, and geothermal energy (Droit, 2023). This research introduces an innovative approach apart from the common energy sources here—Piezoelectric Seats. This technology harnesses the pressure from humans to generate renewable energy by converting the potential/kinetic energy from sitting in Public Utility Vehicles and its movement on the road through piezoelectric materials embedded in the seats of public utility vehicles.

The researchers aim to embrace the modernization and trends by making such vehicles self-sustainable and generate renewable energy by utilizing the daily transportation of the masses. This novel method captures energy from simply commuting in public utility vehicles such as E-Jeepneys, Buses, and Utility Vehicle Express.

Piezoelectric Seats not only help people reach their destinations but also contribute to environmental restoration through the simple act of sitting.

Background of the Study

In the following months after the safety protocols for COVID-19 were lifted, every citizen was grappling for a semblance of familiarity after years of staying cooped up in the comfort of their homes. Malls, marketplaces, schools, and businesses were also adapting to the new environment to accommodate the masses. Now, even though there are still traces of the pandemic's effect on our economy and life, the streets are slowly getting filled by people, malls are becoming crowded, and schools are available for physical classes again. Consequently, the public transportation sector experienced a growth in consumer traffic as a big part of the country's population commute to their respective destinations.

In the Philippines, Public Utility Vehicles (PUVs) such as Jeepneys, Buses, Trains, and Utility Vehicle Express are the main transportation methods of millions of Filipinos on a daily basis—most of which are reliant on fossil fuels to operate. As we acknowledge the Renewable Energy Act of 2008, this research intends to utilize the consumer traffic of PUVs by enforcing Piezoire Seats as a means of converting the potential and kinetic energy of commuters into renewable energy. Furthermore, the objective of this research is to contribute to environmental causes by utilizing the congestion from such vehicles into a sustainable source of energy.

Piezoelectric energy, another name for electrokinetic energy, is produced when some materials undergo mechanical stress or deformation. Certain materials, like ceramics or crystals, generate an electrical charge when they are compressed or vibrate.

This idea can be used to harness the energy that is garnered by commuters sitting on PUVs. This study's main goal is to investigate whether potential/kinetic energy from sitting on PUVs can be used to produce renewable electricity in such transit hubs.

However, piezoelectric energy is still limited by various factors. With numerous researches about electrokinetic energy in the past, it continues to face multiple conflicts for complete application. Its number one problem is its sustainability since piezoelectric energy only produces small amounts of energy, which makes it inadequate for use, especially when it comes to high energy-consuming devices. It has a complex and sensitive system that must be meticulously observed to achieve efficiency. The results gathered from the past formed this study's additional yet main goal: to test whether piezoelectric energy can be really sustainable and what are the means for it to be possible.

Electrokinetic energy might be a strong candidate, but it’s important to consider both sides of the coin; its pros and cons. It remains faulty, which is why the researchers must consider if they can turn it into a fully environmentally sustainable and economically viable renewable energy source.

Theoretical Framework

The Piezoire Seats is supported by the studies: the Piezoelectric Effect, the Law of Conservation of Energy, and the Biomechanical Energy Conversion. The Piezoire Seats aims to produce power by converting the applied pressure or force – which mainly comes from motion – exerted by the human body into renewable energy. In the process of contributing to the environmental advocacies that seek to repair and strengthen the

ecosystem, the aforementioned studies are examined and tested for further improvements. The Piezoelectric Effect, the Law of Conservation of Energy, and the Biomechanical Energy Conversion assist in the process of experimenting with the Piezoire Seats for a sustainable environment.

The Piezoelectric Effect

The Piezoelectric Effect, discovered by Pierre Curie along with his brother, Jacques, came from the Greek word *"piezein"* which means *"squeeze"*, *"piezo"* which means *"pressure"* and many more. The main idea of piezoelectricity is its ability to produce electricity from mechanical stress of pressure; following studies have also confirmed that a *converse effect* can occur, which converts electrical energy into mechanical energy (Chakraborty et al., 2020). The produced electricity essentially comes from the pressure – tapping, squeezing, or holding – on the material. The pressure, in turn, changes the material's charge or its polarity; the charge, if exposed to an electric field, will result in the *converse effect*. This mechanic aids in succeeding studies regarding the conversion of mechanical energy into electrical energy which simultaneously provides a basis for studies that delve into the different ways to produce electricity without compromising the environment's health and safety.

Law of Conservation of Energy

The Law of Conservation of Energy, discovered by Julius Robert Mayer, is a fundamental principle in thermodynamics. Similar to the Law of Conservation of Mass proposed by Antoine Lavoisier, the validity of the conservation of energy is grounded in

experimental observations, making it an empirical law. The Law of Conservation of Energy states that energy cannot be created or destroyed, only converted from one form to another. According to this law, the total energy in a closed system remains constant; when a certain amount of energy is lost in one form, an equivalent amount of energy must appear in another form. In the context of Piezoire Seats, this law highlights the potential for harnessing mechanical energy from human movement and transforming it into usable electrical energy. When a person moves on this seat, their motion applies mechanical force to the seat. This kinetic energy is then converted into electrical energy through methods such as the piezoelectric effect, where certain materials generate an electric charge in response to mechanical stress.

Biomechanical Energy Conversion

The conversion of mechanical energy from human movement to electrical energy is known as biomechanical energy conversion. This process may be explained theoretically by combining ideas from human physiology, engineering, and physics. The foundational principle is the law of conservation of energy, which states that energy cannot be created or destroyed, only transformed. In the context of biomechanical energy conversion, mechanical energy generated by human movement is converted into electrical energy through various mechanisms, such as piezoelectric or electromagnetic transduction (Winter, 2009). The efficiency of this conversion is influenced by factors like the type of human movement, the design of the energy harvesting device, and the materials used. The biomechanics of the human body, which include muscle dynamics, joint kinematics,

and energy expenditure, are also important factors in determining the capacity for energy generation.

Conceptual Framework

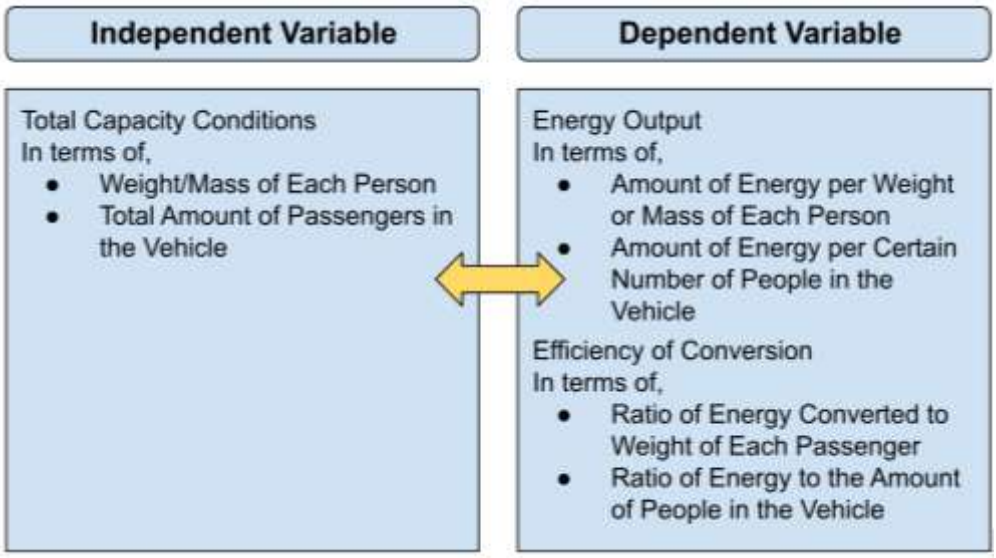


Figure 1: *Conceptual Framework of the Study*

The conceptual framework of the study encompasses the vital independent variables related to the conditions–which are namely the weight or mass of each person, as well as the amount of people in the PUV–that may affect the predicted effects on the dependent variable, energy output and efficiency of conversion/generation within the context of Piezoire Seats

The independent variables are expected to play a significant role in determining the amount of energy that can be generated. The contact with Piezoire Seats is assumed to estimate the potential energy that will be produced. The number of people in the PUV may lead to greater energy production, due to the presence of more energy sources which

are mainly the motions sensed by the Piezoire Seats inside the PUV. Evidently, similar to the former condition, the weight or mass leads to more pressure on the sensors, which can possibly generate more energy. The dependent variable is delineated by the amount of energy that can be produced with regards to these conditions.

By examining these relationships, the conceptual framework aims to deliver a comprehensive and complete study of the factors that can affect the energy generation and its efficiency, thereby forecasting the feasibility and optimization of the country's transport system in generating sustainable and renewable energy.

Statement of the Problem

The aim of this study is to explore the potential of Piezoire Seats for generating renewable energy by converting the kinetic energy received by the sensors from the motions inside PUVs. The researchers seek to assess its effectiveness.

The key questions this study will explore are:

1. What is the efficiency of Piezoire Seats in the conversion of motion into renewable energy in terms of:
    1.1 Ratio of Energy Converted to Weight or Mass of Each Person
    1.2 Ratio of Energy to the Amount of People in the Vehicle
2. What is the amount of energy output that can be produced in terms of:
    2.1 Amount of Energy per Weight or Mass of Each Person
    2.2 Amount of Energy per Certain Number of People in the Vehicle

Scope and Limitation of the Study

This study seeks to study the viability of Piezoire Seats in the Philippines environment. To properly bring out the max potential of the product, the study delves into its mechanisms and design while utilizing several theories that will support the product. In addition to this, the study will examine its impact both on the environment and the safety of Filipinos by searching for ways in which it can be implemented for its proper utilization without compromising the environment and the people.

Piezoire Seats is focused on the possible energy output that can be produced from converting the increased people that use the transport system in the Philippines into a renewable source of power. Acknowledging this, the research possesses limitations that may serve to be useful in developing future renewable energy advances. To start, the research mainly focuses on highly congested or transport-heavy areas in the Philippines such as highways, railroads, airports, etc. As the country's capital and home to a bustling culture, Manila, Philippines, will be a reference point in this study. Therefore, the study's findings in terms of the impact, functionality, and energy output will defer from the transport system trends in other areas that are less urbanized.

Despite the numerous strengths of electrokinetic energy, there are still several limitations that must be addressed to maintain a realistic research approach. Since piezoelectric energy conversion is dependent on transport system trends, a situation similar to the lockdown can possibly hinder the product's capability and efficiency. This means that the fewer people there are in an area, the less energy can be produced which limits the Piezoire Seats to places that are not rural.

Furthermore, the researchers are still limited to the previous knowledge and studies by other researchers, which restricts the other possibilities and inventions that may result into a more efficient or less costly product. Additionally, the product must possess the ability to withstand possible complications such as coming into contact with water and being on a bumpy ride to prove its durability.

In spite of the limitations, the research about piezoelectric energy can contribute a significant change in offering renewable energy solutions for the Philippines due to the ability of Piezoire Seats to contribute to environmental stability by utilizing mundane situations such as commuting. By addressing these challenges, the study not only aims to continuously develop the concept of electrokinetic energy harvesting, but also maintain and implement a realistic and feasible system in urban settings. An opportunity as big as developing a sustainable renewable energy source can save the country from its weakening environmental state.

Significance of the Study

The research offers vital benefits to different sectors and stakeholders, directly assisting them in tackling major concerns and possible opportunities that are encompassed and impacted by the study of Piezoire Seats

The following are the beneficiaries of this study:

The Energy Consumer. The proper acquisition and utilization of Piezoire Seats proposes substantial benefits to the consumers as it provides another alternative method in producing energy. The study harnesses great potential to contribute to generating

sustainable and renewable energy that could aid in lowering the cost for energy production and usage. Especially with the pressing issue of modernization and traffic congestion, making great use of the transport system trends in these places opens opportunities for innovative and cost-efficient approaches to energy consumption while avoiding environmental degradation.

The Energy Sector. As the leading sector in this field of research, it is vital that the energy sector is the head of this study as the findings directly tackle the topic of energy production and sustainability. The experimental study offers insight into the feasibility and efficiency of Piezoire Seats when implemented into PUVs. Beyond reducing reliance on traditional energy sources like fossil fuels, this innovative renewable energy solution aims to significantly enhance energy diversification and support the sector's objective of increasing the share of renewable energy in the overall energy supply mix.

Urban Planners. Responsible for designing and managing land use in urban environments, urban planners aim to promote a sustainable and systematic development. The incorporation of Piezoire Seats to PUVs initiates developmental change in the search for renewable energy sources. The products can also provide a better alternative for jeepney, tricycle, bus, and other drivers due to its ability to replace the common oil used in PUVs while simultaneously allowing these vehicles to lessen pollution.

Transportation. By integrating these pathways into existing infrastructure, the study aims to create a more sustainable, PUV-friendly, and energy-efficient urban environment. The product can contribute to reducing carbon emissions and the reliance on external energy sources while empowering the local drivers in the Philippine setting.

The Government. The research on integrating Piezoire Seats presents significant benefits to the government, particularly in fulfilling its responsibilities toward sustainable development. By aligning with sustainability foals, the government can use this to reduce carbon emissions and promote the use of renewable energy sources, which are critical in confronting environmental issues. This research also supports the formulation of policies that promote the adoption of renewable energy in various ways. Such a regulatory framework can stimulate investments and foster innovation in green technologies.

Future Researchers. It provides researchers with the opportunity to pioneer innovative approaches to energy harvesting and contribute to the establishment of knowledge and best practices. This research can foster collaboration between researchers from various fields, leading to more comprehensive and innovative solutions. Additionally, researchers can investigate the potential economic and social benefits of Piezoire Seats, informing policy decisions and promoting the adoption of sustainable energy technologies.

Definition of Terms

The following terms serve to provide an interpretation of the key topics that are discussed within the context of the research regarding Piezoire (Piezoelectricity Into Renewable Energy) Seats: Utilization of Foot Traffic in Producing Renewable Energy:

Dependence on Fossil Fuel

An environmental issue which makes use of fossil fuels–a known source of health and environmental issues such as greenhouse gasses and pollution–in the production of energy.

Transportation System

This refers to the combination of people and vehicles which allow the movement of bringing one thing to another location.

Piezoire Seats

The conceptualization of using the transportation system of the country to produce renewable energy by means of implementing piezoelectric sensors onto surfaces.

Piezoire Seats Compatibility

This refers to the possible effects of Piezoire Seats on the environment and the people. This involves investigation, analysis, and experimentation to evaluate potential risks and dependability of the research.

Piezoelectricity

The result of using biological and chemical materials which have been put under mechanical stress to produce electricity.

Piezoelectric Sensors

A new type of technology that is able to sense mechanical pressure, strain, and other types of force. This device can be used as an energy source, safety sensor, and is being studied for potential usage in pipeline health analysis.

Usage of Renewable Energy

This refers to the continuous research and projects regarding the potential sources of energy sources that will prove to be effective and harmless. This also refers to the need for traditional energy sources replacements in light of climate change and various health crises.

Research Viability

The assessment of the potential utility that Piezoire Pathways may provide in terms of its prospective energy output depending on various transport system trends as well as its possible contribution to the need for renewable energy.

CHAPTER II

REVIEW OF RELATED LITERATURE

This chapter offers a comprehensive overview of current research from both local and international sources. The studies included provide valuable insights into the fundamental aspects of the research, particularly focusing on the mechanisms and integration of electro-kinetic technology while referencing existing theories, statistics, and innovations. By synthesizing a variety of findings, this chapter seeks to establish a solid foundation for understanding the key themes and variables relevant to the study.

Review of Related Literature

The Philippines, like many other countries, is dealing with a complicated web of issues related to its quick development. According to Worldometer (2024), more over 113 million people living in the nation as of October 2024, overpopulation is a serious problem. Infrastructure and resources are being taxed by this fast population expansion, especially in cities like Manila and Cebu.

The Philippines is struggling with increased energy use in addition to overpopulation. The need for energy is growing as the economy expands. According to Low Carbon Power Org (2024), the Philippines mainly relies on fossil fuels to generate power, which contributes to environmental pollution and greenhouse gas emissions.

Significant human motion is evident in the transport systems of the Philippines, particularly in urban centers like Manila, where infrastructure often struggles under high demand. For instance, around 4 million commuters utilize major transit hubs, including stations such as Cubao and Baclaran, each day. This continuous movement highlights the

urgent need for innovative approaches to enhance the existing systems. By piezoelectric technologies into these transport infrastructures, the kinetic energy generated by human motion could be harnessed to power amenities and reduce reliance on conventional energy sources. Tailoring solutions to the unique challenges faced in the Philippines can significantly contribute to sustainable transportation development, ultimately lessening the environmental impacts associated with increasing energy demand and urban congestion.

Following the rapid urbanization and overpopulation in the country, the energy sector faces pressing issues as the demand for energy constantly rises while sources are depleting. Despite being the first Southeast Asian country to pass a law outlining, developing, utilizing, and commercializing Renewable Energy last 2008, the Philippine government is behind its ASEAN peers as according to the Department of Energy (2024), the current energy landscape of the nation poses a heavy reliance on imported fossil fuels, more specifically coal, accounting for 78% of the energy mix. Although the access to power has improved in the country, it faces many setbacks on a bigger scale. According to the Asia Development Bank, the Philippines continues to face an energy crisis due to the dependency on conventional sources and insufficiency of the country's energy supply in accommodating its ever-growing economy and population. Consequently, this approach towards the energy crisis has raised further concerns such as environmental issues, climate crisis, sustainability, and discrepancies in the electrification rate of urban and rural areas.

The matter of energy insecurity and energy production and its detrimental effects raises a vital need for the country to adapt and advance renewable energy sources and

alternatives. The Department of Energy acknowledges this issue through a two-fold agenda affirmed in the Philippine Energy Plan 2023-2050 (2023), striving to traverse to a more dynamic and sustainable energy future spearheaded by modern and clean methodologies that pave the way for evolving the energy landscape for sustainable development. It aims to provide every Filipino with access to electricity, while also shifting to low-carbon sources that do not further damage the planet. Furthermore, it commits to capitalizing the country's various resources such as biomass, solar, wind, geothermal, and hydropower in implementing renewable energy sources to enhance the Philippines' energy security and resilience through expansion and modernization efforts, accommodating the integration and long-term implementation of renewable energy.

Renewable energy, according to Belu (2019), is a type of energy that is harnessed from an infinitely replenishing source. It is a limitless, dependable, and clean source that contributes less negative impact on the environment than traditional energy sources as it does not produce and emit harmful gases. A major example of this is solar thermal energy. There is also hydrokinetic energy conversion, a transfer of kinetic energy through a river network.

Transportation plays a vital role in the Philippines, facilitating the mobility of people and goods across various destinations. The current transportation status in the country showcases its issue with the drastic increase in vehicle population and limited road capacity. Traffic in the Philippines can become highly severe and congested during peak hours, especially in major areas like Metro Manila (Montemor et al., 2023). During this period, typically in the morning and early evening, the surge of commuters significantly heightens traffic congestion.

The public transportation system of the country heavily relies on outdated and predominantly small-scale road-based vehicles, such as jeepneys due to its relatively affordable rates for the masses. However, vehicles, such as this, greatly cost the environment with their emissions of greenhouse gasses. In an attempt to address this, the government introduced the Public Utility Vehicle Modernization Program (PUVMP) in 2017. This program aimed to replace traditional jeepneys with modern, eco-friendly alternatives. Despite its goal, the program has faced significant hurdles, primarily due to the high cost of the units, ranging from Php 1.6 million to Php 2.4 million. For many drivers and operators, these costs are simply unaffordable, leaving traditional jeepneys to continue dominating the roads.

The commercial projects in the Philippines are a critical driver of economic development over the next decade. The commercial sector, which includes retail stores, office complexes, recreational and hospitality facilities, and outdoor recreation areas, is expected to grow (Ghodsian, 2024). These commercial places create demands for transportation in order for people to arrive in these distinct and attractive destinations. According to the LTO Portal (2023), PUVs bridge the gaps in accessibility, affordability, and connecting areas that may be out of reach for some people, especially for those who do not own private vehicles. Many Filipinos opt for the diversity of public utility vehicles because it’s more cost-effective and faster, as it connects different popular places people often visit.

Moreover, PUVs are considered to be the primary transport system of the Philippines, as the trip composition by mode in the Philippines from JICA in 2014, reports that percentage in total is 48, which indicates that most respondents travel using public

mode (Chuenyindee et al., 2022). Filipinos primarily choose public transportation because of the traffic congestion brought by high vehicle density. PUVs reduce traffic congestion by providing a shared mode of transportation. Additionally, the fewer usage of vehicles lessens the air pollution that destroys our environment.

Expanding the awareness of public transport may reduce the quantity of accidents, decrease energy consumption, protect the environment, and enhance personal satisfaction (Din et al., 2016, as cited in Abdulkareem et al., 2020). Furthermore, the untapped potential in the Filipinos' everyday practices can be utilized. The conversion of energy from everyday human movement in transport vehicles to viable electrical energy can bring great help to the country's energy crisis. Kemball-Cook (as cited by Sukel, 2024) says that there is an abundant source of energy anywhere that people come together in urban environments and there is an opportunity to utilize that energy. The unused energy source holds great potential to prevent environmental degradation.

In several studies, piezoelectricity is utilized in order to innovate a new system of renewable energy harvesting. The Piezoelectric effect – discovered by Pierre and Jacques Curie – is usually the main basis in their models. Piezoelectricity can inherently come from particles whose energy can be observed through its movements. Currently, piezoelectricity can be converted into renewable energy by incorporating energy floors which can generate energy by sensing human motions – these are achieved by using EM and DC generators, a PMS circuit alongside other essentials such as rectifiers, diodes, inductors, and more (Jintanawan et al., 2020). The energy output from a person's step can vary from 1-5 J or 2-20 W depending on the model used for such utilization; piezoelectric generators are most often used in its conversion due to its ability to store and

provide high voltages, however, electromagnetic generators are much more suitable in low-frequency rail transports (Cao et al., 2022) – despite its low energy output – in conversion due to its significantly lower cost and effectivity in sensing human motions based on its frequencies (Jintanawan et al., 2020).

Researches similar to Piezoire Seats rely on the abilities of the structure, its components, and the source or quality of the materials that comprise it. The force, speed, and impact are also crucial in the energy output of the studies; naturally, an increase in speed and force will result in an increase in the output (Li & Lee, 2021). This observation can prove to be effective in places people usually frequent such as cities, malls, and schools as these places provide a higher amount of kinetic energy needed for the conversion of renewable energy. In certain models, batteries and/or energy capacitors are used for better energy management, more usage (i.e charging ports and light bulbs) and for practical applications due to the possibility of the energy not being adequate due to its direct source of energy (Li & Lee, 2021). AC/DC power supplies are also utilized in energy distribution. By using a rectifier or inverter to convert AC and DC into each other, the energy output of a renewable energy source can be managed in order to maximize its capacity and consistency.

Piezoelectricity does not only serve to be a new renewable energy source. For engineering sectors, piezoelectricity can act as an energy source while simultaneously being a sensor for the structure's safety by sensing pressure, strain, and acceleration which can help in stabilizing a structure. In a study by Elvin et al. (2003), a piezoelectric energy harvester was tested alongside a strain sensor in examining the leakage and damage in pipelines. In the same study, the signals by the energy harvester proved to be

useful in pipeline health analysis. Similarly, healthcare and other sectors such as the military sector can make use of piezoelectric energy as it can generate energy from different kinds of motions like vibrations. Due to its ability to store energy through sensing motions, piezoelectricity contributes to energy crises and environmental issues by allowing it to be a source of renewable energy, lessening risks of environmental damage by refusing the usage of other harmful energy sources, noise and vibration reduction and others.

As the global population grows and dependence on technology increases across sectors such as work, education, transportation, and daily life, the demand for electricity continues to rise. In the Philippines, fossil fuels, particularly coal, have been the primary source of energy generation, accounting for approximately 80 percent of the country's energy needs. However, fossil fuels are finite resources and are the leading contributors to greenhouse gas emissions, which drive global warming and climate change (Valavanidis, 2022). This is due to the fact that fossil fuels must be burned to produce energy, and when these hydrocarbons are combusted in the presence of oxygen, they release carbon dioxide into the atmosphere. Aside from the environmental risks of heavy reliance on fossil fuels, it also poses a threat on people’s health. Hazardous substances such as Nitric Oxide and Sulfur Dioxide emissions from coal burning have been linked to health problems such as asthma, lung cancer, and heart disease (Mallari et al., 2024).

These issues not only threaten the nation’s environmental stability but also exaggerate social inequities, particularly for vulnerable communities. Therefore, transitioning from non-renewable to renewable energy sources is essential. According to ASEAN Briefing (2023), the Philippines boasts an estimated 246,000 megawatts of

untapped renewable energy potential, including geothermal, hydropower, wind, and solar energy. Another innovative avenue for power generation lies in electro-kinetic technology and biomechanical energy derived from human motion. Technologies that harness energy from movement—such as usage of piezoelectric materials that convert mechanical stress into electrical energy. The piezoelectric effect was already utilized in dance floors and revolving doors in the Netherlands, and tiles in a metro system in Japan to help supply energy in these places.

The utilization of these renewable energies is a cleaner approach to energy generation that minimizes disastrous environmental impact. At their core, renewables aim to phase out fossil fuel dependence while providing alternatives to meet the world's increasing energy demands. This study not only examines these research areas but also advocates for the Philippines to tap into its abundant renewable resources and explore innovative methods, such as piezoelectricity, to harness human motion for energy generation. If effectively developed and implemented, these approaches could significantly advance the country's transition to sustainable energy production.

Synthesis of the Reviewed Literature and Studies

The aim of the synthesis is to present the various studies and experiments made by several researchers in order to fully harness the potential of Piezoire Seats, its advantages, and its setbacks before implementation. By using former studies as a guide, the concept of converting human motion into renewable energy can be made possible, alongside a potential addition to environmental conservation.

The Philippines faces significant traffic congestion, particularly in Metro Manila, due to the increase in vehicles and limited road capacity. The current transportation system relies heavily on outdated vehicles, which contribute to environmental pollution, despite efforts like the Public Utility Vehicle Modernization Program (PUVMP). As public utility vehicles play a crucial role in providing affordable and accessible transport to commuters, a more sustainable alternative that harnesses energy from human movement could help address the country's energy crisis without compromising the safety and state of the environment.

With the aim of embracing the pressing issue of overpopulation and rapid modernization, by utilizing human motion garnered piezoelectric materials in the conversion of resources into renewable energy, a significantly huge amount of kinetic energy–which can then be converted into renewable energy–can be produced to supply the continuous demand of the country while also lessening our reliance on conventional energy sources like fossil fuel that are not only expensive but also harmful to the environment. Healthcare, military, engineering, and other sectors can also make use of piezoelectricity due to its ability to act as a sensor, energy generator, and noise reductor.

The growing population, urbanization, and technological advancements all contribute to the increasing demand for energy. Fossil fuels–the primary source of energy as of the moment–is also a factor that causes global warming and climate change due to greenhouse gas emissions; this does not only affect environmental health, but also poses a risk to the life of the normal citizens that have been exposed to the harmful chemicals that are being released in order to convert fossil fuels into energy.

ASEAN Briefing (2023) has stated that the Philippines has an untapped 246,000 megawatts of renewable energy that can be produced by different resources such as wind, solar energy, hydropower, and geothermal energy. Through research, experimentation, and proper implementation, renewable energy can replace fossil fuels and coal in energy production. By integrating piezoelectric seats into PUVs, the traffic congestion that people face in their day-to-day lives can be utilized to create an energy source that is both replenishable and environmentally safer than conventional sources. In conclusion, Piezoire Seats presents various opportunities and approaches in reaching sustainability goals by carrying out environmentally friendly engineering, sustainable energy practices, and proper modernization.

CHAPTER III

RESEARCH METHODOLOGY

This chapter seeks to present the intricacies of the study's data-gathering process, including the prerequisite conditions needed to conduct the study, the preferred methodologies, and its implementation. It will also present the components and machines necessary for building Piezoire Seats and the statistical techniques that will be utilized to find certain quantities.

Research Design

This study adopts a quantitative-experimental research method to examine the relationships between two variables. Specifically, the independent variable under investigation is the total capacity conditions. This variable is selected to assess its impact on four key factors that govern the energy output and efficiency of conversion of Piezoire Seats. According to Edmonds and Kennedy (2017), quantitative research methods involve applying the structured steps of the scientific method while using numerical data to examine the relationships and effects between specific variables. By manipulating the independent and dependent variables, the study aims to identify the appropriate circumstances for maximizing energy output. The use of this approach will facilitate a rigorous analysis of how the total capacity conditions directly affect the amount of energy generated, providing valuable insights into the practical application of Piezoire Seats for sustainable energy harvesting.

Description of the Area of the Study

Piezoelectric Seats are an innovative solution to harness kinetic energy from human movement and convert it into electricity. A promising application of this technology is in commuter-heavy transportation systems. By embedding piezoelectric materials in the floors and seats of vehicles such as trains, jeeps, buses, and tricycles, energy can be generated from passenger movement and vibrations during travel. This electricity can power onboard systems, such as lighting, ventilation, or charging stations, reducing reliance on traditional energy sources while promoting sustainability.

Strategically implementing this technology in densely populated urban areas and transit hubs, such as Cubao, Baclaran, and Recto, can maximize energy generation. These areas, characterized by high commuter activity, provide ample kinetic energy to be converted into usable power. Furthermore, applying piezoelectric technology across multiple public utility vehicles (PUVs) ensures a broader impact, making daily commutes more eco-friendly.

The efficiency of piezoelectric systems is influenced by factors such as the frequency and intensity of movement. Faster motions, stronger contact forces, and dynamic activities like vibrations and sudden shifts during transit can generate more energy. By analyzing these variables, engineers can maximize energy output and improve the overall performance of piezoelectric systems, paving the way for a more sustainable and innovative urban transportation network.

Research Instrument

The methodological framework of this research utilizes a meticulous structure of experimental observation—set as an instrument to properly and precisely collect vital data. With this data collection instrument, this research will methodically gather data from the Piezoelectric Seats through various states and conditions of Passenger Traffic and Vehicle Capacity received with the extensive objective of analyzing the efficacy and feasibility of Piezoire Seats.

The experimental observation framework covers four distinct and valuable variables carefully formulated to critically examine the results of the experimentation. These variables encompass the Amount of Energy per Weight or Mass of each person, the Amount of Energy per Certain Number of People in the Vehicle, the Ratio of Energy Converted to Weight of each Passenger, and the Ratio of Energy to the Amount of People in the Vehicle. Acquiring such vital data through the utilization of a measurement instrument linked to the Electro-Kinetic powered seats facilitates a data-driven assessment of the variables to a point of definitive and certain deduction.

Thoroughly examining these parameters within the structured measurement instrument framework aims to give an understanding of the functionality of Piezoelectric Seats, and extend insights on its possibilities and contributions to the energy sector and the field of Renewable Energy with its implementation and applications on various environments.

Experimental Protocol

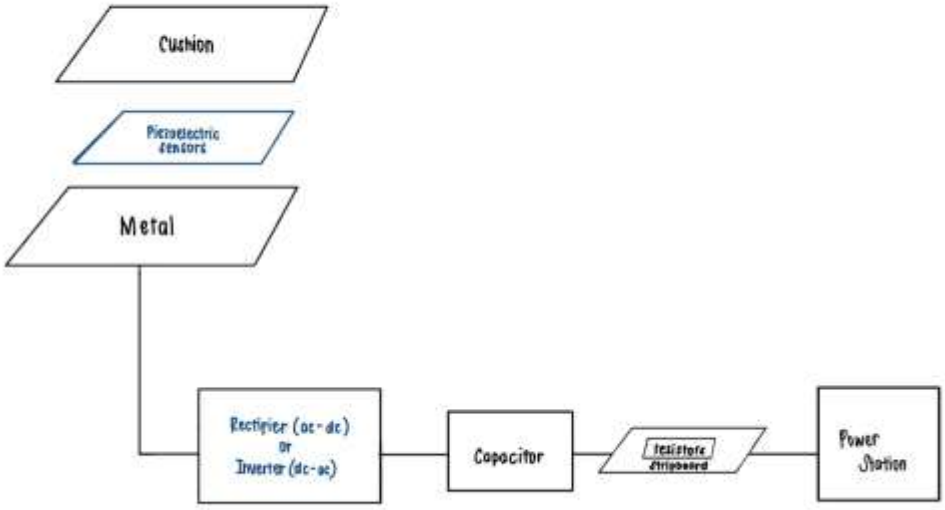


Figure 2. *Research Model of the Piezoire Seats*

Figure 2 showcases the research model, providing the structured framework that is vital in the research phase. It refines the relationships of the variables for a better interpretation of the whole product. A research model ensures clarity and focus of each constituent.

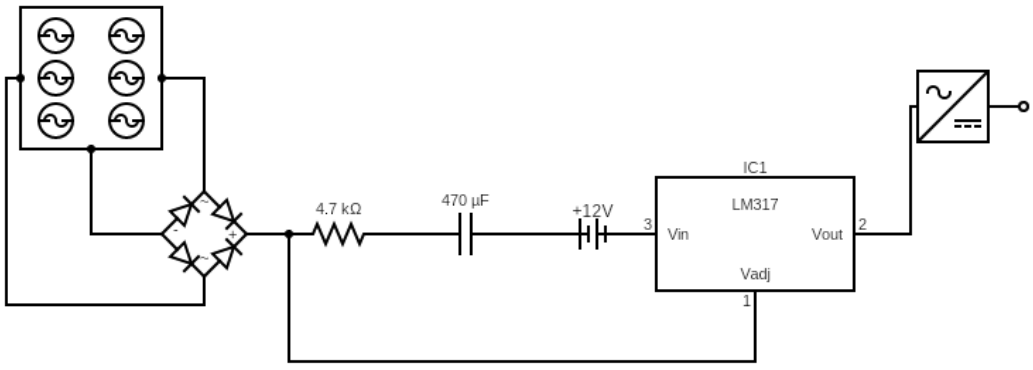


Figure 3. *Circuit Diagram of the Piezoire Seats*

Figure 3 highlights a circuit board that is an integral part of the designing phase, fulfilling its purpose of being a representational construct by utilizing symbols and diagrams, thereby aiding the comprehension of complex electrical systems and ensuring operational reliability.

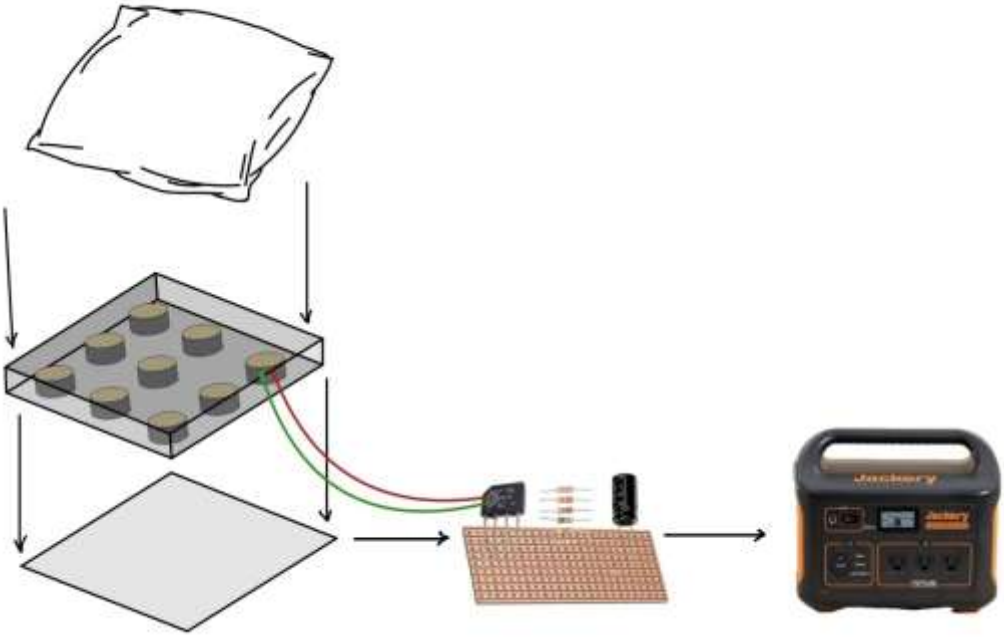


Figure 4. *Conceptual Model of the Piezoire Seats*

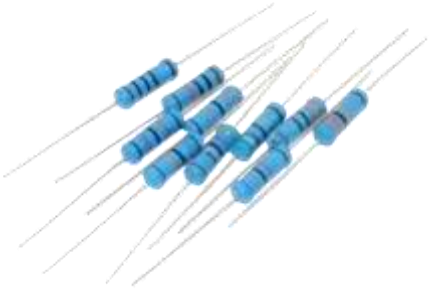
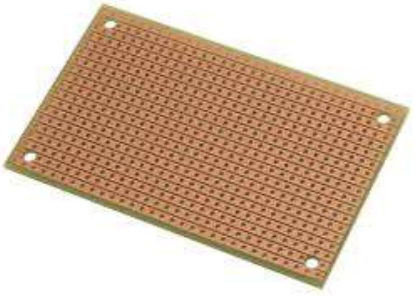
Figure 4 proposed the conceptual framework of Piezoire Seats that seeks to derive the kinetic energy from foot traffic into electrical power, presenting an innovative and renewable source of energy.

Figure 5. *Model of Electrokinetic Seats in Real Life Setting*

Figure 5 shows an example of the application and usage of Piezoelectric Seats in real life settings. In this illustration, it is applied to the seats of jeepneys. Piezoire will be very useful in places where kinetic energy is rampant such as in vehicle seats.

The experimentation will begin once the requisite approval is obtained from the research adviser, ensuring strict compliance to established ethical and research protocols. Subsequently, the researchers will seek approval from the administration of the Polytechnic University of the Philippines, where the testing of the Piezoire Seats will take place. Proper monitoring and assistance from the safety officers of the institution will be actively sought to ensure a safe and well-controlled testing environment. Following the endorsement and approval, the procurement of essential materials is poised to occur, encompassing crucial components, namely:

Materials/Components	
Zero Seven Electronics Piezo Transducer 35 mm Sensor • Converts physical forces such as pressure, vibration, and temperature into measurable electrical charge • PHP 97	
HUAECC Regulator Rectifier • Converts alternating current produced to direct current • Creates and maintains the fixed and consistent output voltage • PHP 898	
LYLI-PH Lithium Battery Inverter • Converts direct current to alternating current; it allows smooth and precise current conversion • PHP 1069	

Donskytech 150 uF, 18 mm x 35 mm Electrolytic Capacitor • Stores the electrical energy to ensure a steady voltage output • PHP 99	
50 pieces of 100 K BB Module Resistor • Regulates the flow of electric current in the electronic circuit; it manages the current flow • PHP 36	
JIADO 6.5cm x 14.45 cm Prototype Stripboard • Permanently assemble one-off circuits • Connects all the components • PHP 87	
Royu 5.5 x 75 M Electrical Wire • Medium used to connect all the components; it transports electricity • PHP 3,600	

Greenfield 400 W Power Station • Stores the energy collected • PHP 7,994	

Table 1. *Components of the Piezoire Seats*

The following table is the summary of estimated price per unit/tile:

Component	**Cost (PHP)**
Piezoelectric Sensors (9 units)	873
Regulator Rectifier	898
Battery Inverter	1,069
Capacitors (2 single units)	198
Resistors (5 units)	3.60
Stripboard	87
Electrical Wires (1 meter)	48
Power Station (per tile)	7,994
Total Estimated Cost	**11,170.6**

Table 2. *Total Estimated Cost per unit/tile of the Piezoire Pathways*

The primary objective is to employ piezoelectric sensors as the principal constituent for converting physical forces into electrical charges that can be measured. The alternating current

produced by the piezoelectric sensors is converted into direct current by the rectifier which periodically reverses direction. The capacitor temporarily stores and releases the electrical energy into circuits. Moreover, the resistor controls the flow of the electrical current within a circuit; it manages the current flow. The stripboard is where all the components are connected to assemble the circuits. The medium that connects all the components are the electrical wires. The energy generated by the system is then stored in the power station.

A simulated floor module will be made, utilizing tiles with piezoelectric sensors designed to emulate the floors commonly walked by crowds. Subsequently, official testing procedures will be conducted to evaluate the electrokinetic energy, focusing on the following parameters:

1. Ratio Depending on Condition
    1.1 Ratio of Energy Converted to Weight or Mass of Each Person
    1.2 Ratio of Energy to the Amount of People in the Vehicle
2. Energy Produced According to Condition
    2.1 Amount of Energy per Weight or Mass of Each Person
    2.2 Amount of Energy per Certain Number of People in the Vehicle

The succeeding step in the experiment will be the structured observational phase, focused on systematic collection of necessary data all throughout its duration. A measuring device will be utilized during this stage. The observational phase will be done through a continuous and systematic monitoring process, wherein an inclusive dataset pertaining to parameters such as the Amount of Energy per Weight or Mass of Each

Person, Amount of Energy per Certain number of People in the Vehicle, Ratio of Energy Converted to Weight or Mass of Each Person and Ratio of Energy to the Amount of People in the Vehicle documented and recorded. The outcomes of the statistical treatment will subsequently undergo meticulous and comprehensive interpretation, encompassing a complete assessment of the influence of independent variables on the dependent variables. This initiative, recognized by its methodical design and execution, guarantees to provide significant insights and results on the efficacy of employing Piezoire Seats within the bounds of Renewable Energy.

Statistical Treatment of Data

In conducting this research, the following computational techniques can evaluate the needed quantities that can aid in producing the desired conclusion for this study.

Amount of Energy per Contact in Regards to: Weight or Mass of Each Person, Certain Number of People in the Vehicle:

The amount of energy per contact includes the output that can be produced depending on the weight or mass of the person as well as the amount of people inside the vehicle. The amount of energy that can be produced depending on these outputs is crucial for the examination of the impact that these factors possess in acquiring the needed conclusion regarding the energy output. This quantity can be calculated by using the formula:

$$V = X \times Y$$

Where:

V: amount of voltage

X: The amount of translational kinetic energy produced by the motion

Y: The amount of pressure applied by the contact

Average Amount of Energy per Contact in Regards to: Weight or Mass of Each Person, Certain Number of People in the Vehicle:

This pertains to the total amount of renewable energy that can be produced by every type of contact that has been applied to the seats. This quantity can be calculated by using the formula:

$$X = V_1 + V_2 + V_3 + \ ... = \frac{\Sigma V}{N}$$

Where:

V: The amount of voltage

ΣV: The summation of the amount of voltages recorded

N: The recorded number of contact

Amount of Frequency per Contact in Regards to: Weight or Mass of Each Person, Certain Number of People in the Vehicle:

This pertains to the frequency produced during a certain amount of time with regards to different conditions such as the weight or mass as well as the number of people in the vehicle. For the analysis of the differences in the energy output depending on these conditions, the following formula is utilized:

$$\frac{V}{T} = F$$

Where:

V: The amount of voltage recorded with regards to a certain condition (Ex: Amount of voltage produced in consideration to the number of people in the vehicle)

T: The recorded time frame

Percentage per Contact in Regards to: Weight or Mass of Each Person, Certain Number of People in the Vehicle:

This pertains to the varying amounts of percentage the different conditions (number of people in the vehicle and weight or mass) may display. This quantity can be calculated by using the formula:

$$\frac{V}{TV} \times 100 = Percentage$$

Where:

V: The amount of voltage recorded with regards to a certain condition (Ex: Amount of voltage produced in consideration to the speed of foot traffic)

TV: The total amount of voltage during a certain period

Ratio of Energy Converted to Weight or Mass of the Person:

The ratio of energy converted to the weight, or the mass of the person includes the energy output that can be converted when it comes to the relationship between the energy produced per contact and the weight or the mass of the person. The ratio of the two factors

is derived to determine the influence of the person's weight or mass in producing energy. This quantity can be calculated by using the formula:

$$\frac{V}{A}$$

Where:

V: amount of voltage

A: The calculated mass or weight of the person

Ratio of Energy Converted to Certain Number of People in the Vehicle:

The ratio of energy converted to the number of people in the vehicle includes the energy output that can be converted by examining the relationship between the calculated number of people present in the vehicle and the energy output that was produced. The ratio of the two factors can be utilized for the perusal of the significance of the number of people in PUVs in producing the needed energy output. This quantity can be calculated by using the formula:

$$\frac{V}{B}$$

Where:

V: amount of voltage

B: The calculated number of people in the vehicle

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CURRICULUM VITAE

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Personal statement/objectives:

As a student aspiring to contribute to the STEM field, I persevere in learning, experiencing, and experimenting in order to gain more knowledge and insights regarding the outside world and the different factors that affect it. For this, I observe as well as try to involve myself in scientific research especially the processes that the researchers partake in such as data gathering, the procedures, the analyses, and its obtained results. Furthermore, I endeavor to watch and read scientific journals or research to push myself into improving so that I can aid and contribute to the betterment of society.

PERSONAL DATA:

Age: 17
Sex: Female
Date of Birth: July 27, 2007
Place of Birth: Manila
Religion: Roman Catholic
Civil Status: Single
Citizenship: Filipino
Height: 156 cm
Weight: 43 kg
Languages Spoken: Filipino and English

Mother: Jacqueline D. Paragas
Occupation: Housewife
Contact Number: 09282797919

Father: Eric N. Paragas
Occupation: Technical Officer
Contact Number: 09958331478

Educational Attainment

Elementary: Padre Burgos Elementary School (2013 – 2019)
586 Altura corner, Buenos Aires Street, Sampaloc, Metro Manila

Junior High School: Polytechnic University of the Philippines Laboratory High School (2019 – 2023)
1016 Anonas, Sta. Mesa, Maynila, Kalakhang Maynila

Senior High School: Polytechnic University of the Philippines Senior High School
(2023 – Present)
1016 Anonas, Sta. Mesa, Maynila, Kalakhang Maynila
Science, Technology, Engineering, Mathematics (STEM)

Achievements

- With high honors during Grade 11 (2023 – 2024)
- Conducted group research, "Through Grades and Beyond: The Correlation between Study Techniques and Academic Performance" in Grade 10 (2023).
- Completed 150 hours of on-the-job training at College of Business Administration, as part of the Office Procedures 10 course requirement (2023).
- Member of the Young Intellectual Property Advocates (YIPA) — PUPLHS (2022 – 2023).
- Member of the Young Entrepreneurs Society (YES) — PUPLHS (2022 – 2023).
- Member of Astronomy, Science and Technological Research Association (ASTRA) (2019 – 2023).
- Received medals and certificates from our local barangay for commendable academic performance (2016 – Present).
- Consistent top student in elementary (2013 – 2019)
- Part of the journalism club (News Writing, Sports Writing) and participated in 2 out-of-school competitions (2018 – 2019).
- Participated in Science Quiz Bees (2016 – 2019).

Skills

- Quantitative Research Skills
- Responsibility
- Adaptability
- Accountability
- Creativity
- Flexibility
- Work Ethic
- Problem-Solving
- Critical Thinking
- Interpersonal Skills
- Team Management Skills
- Communication Skills
- Project Management Skills

CURRICULUM VITAE

Name: Monica Joy O. Alfonso
Address: Magdalene Maries Village II Phase II, Mayamot, Antipolo City
Contact Number: 09064995717
Email Address: monicajoy501@gmail.com

Personal statement/objectives:

A dedicated and passionate student, I bring exceptional skills and determination when it comes to research and finding the answers behind the different kinds of mechanisms. I am striving towards being a competent part of the scientific field, particularly in the medicine field. Major strengths include meticulousness, adaptability, significant ability to work under pressure, competitive, disciplined, and possess strong work ethics. I am always ready to learn and aim to use this knowledge to make a significant contribution not just to the community, but to our environment as well.

PERSONAL DATA:

Age: 17
Sex: Female
Date of Birth: December 24, 2006
Place of Birth: San Juan City
Religion: Born Again Christian
Civil Status: Single
Citizenship: Filipino
Height: 152 cm
Weight: 46 kg
Languages Spoken: Filipino and English

Mother: Josephine O. Alfonso
Occupation: Government Employee
Contact Number: 09179571305

Father: Raymond L. Alfonso
Occupation: Government Employee
Contact Number: 09205474123

Educational Attainment

Elementary: La Consolacion College Manila (2013 - 2019)
8 Mendiola St, San Miguel Manila, 1005 Metro Manila

Junior High School: Polytechnic University of the Philippines Laboratory High School (2019 – 2023)
1016 Anonas, Sta. Mesa, Maynila, Kalakhang Maynila

Senior High School: Polytechnic University of the Philippines Senior High School (2023 – Present)
1016 Anonas, Sta. Mesa, Maynila, Kalakhang Maynila
Science, Technology, Engineering, Mathematics (STEM)

Achievements

- Completed Grade 11 with high honors (2023 – 2024).
- Completed Grade 10 as a merit awardee (2022 – 2023).
- Completed 150 hours of on-the-job training at Admission and Registration Services, as part of the Office Procedures 10 course requirement (2023).
- Conducted a group research paper entitled, “Through Grades and Beyond: The Correlation between Study Techniques and Academic Performance,” as part of the English 10 course requirement (2023).
- Internal Vice President of the Young Intellectual Property Advocates (YIPA) — PUPLHS (2022 – 2023).
- Secretary of the Young Entrepreneurs’ Society (YES) — PUPLHS (2022 – 2023).
- Grade 10 Leader of the Compaña De Danza (CDD) — PUPLHS (2022 – 2023).
- Member of Astronomy, Science and Technological Research Association (ASTRA) — PUPLHS (2022 – 2023).
- Graduated elementary with honors (2013 - 2019).
- Active Participant - Interschool Kulturang Pinoy Quiz Bee – Brown Movement – La Consolacion College Manila (2018 – 2019)
- Consecutive Champion of Quiz Bee Competition – La Consolacion College Manila (2016 – 2017).

Skills

- Communication
- Computer Literacy
- Problem-solving
- Critical Thinking
- Adaptability
- Creativity
- Strong Work Ethic
- Organization
- Quantitative Research Skills
- Attention to Detail

CURRICULUM VITAE

Name: Jeellian Kate L. Domingo
Address: De Dios St., Sta. Mesa, Manila
Contact Number: 09613544480
Email Address: jeellian0208@gmail.com

Personal statement/objectives:

As a current STEM student, I have come to value the impact this field has on every aspect of people's lives. Engaging in research, like the one we are currently conducting, has significant implications for creating a sustainable future. Over the years, I have developed adaptability, open-mindedness, and collaboration through various experiences. I am driven to expand my knowledge, particularly in psychology, which I aim to pursue in the future. By gaining a deeper understanding of the human behavior, I aspire to understand the world better and make a meaningful contribution to its improvement.

PERSONAL DATA:

Age: 17
Sex: Female
Date of Birth: February 8, 2007
Place of Birth: Sampaloc, Manila
Religion: Roman Catholic
Civil Status: Single
Citizenship: Filipino
Height: 150 cm
Weight: 45 kg
Languages Spoken: Filipino and English

Mother: Catalina L. Domingo
Occupation: Housewife
Contact Number: 09951212436

Father: John T. Domingo
Occupation: Government Employee
Contact Number: 09067653801

Educational Attainment

Elementary: Sacred Heart of Jesus Catholic School (2013 – 2019)
4324 Old Sta. Mesa St, Santa Mesa, Manila, 1016 Metro Manila

Junior High School: Polytechnic University of the Philippines Laboratory High School (2019 – 2023)
1016 Anonas, Sta. Mesa, Maynila, Kalakhang Maynila

Senior High School: Polytechnic University of the Philippines Senior High School
(2023 – Present)
1016 Anonas, Sta. Mesa, Maynila, Kalakhang Maynila
Science, Technology, Engineering, Mathematics (STEM)

Achievements

- Attended a seminar and workshop on the WISER project, renewable energy, and various engineering disciplines, organized by USAID (2024).
- Completed Grade 11 with high honors (2023 – 2024).
- Completed Grade 10 as a merit awardee (2022 – 2023).
- Champion of the group Space Quiz at Astroduction 2023: The Universe, Yours to Discover, organized by ASTRA and Quizzards (2023).
- Completed 150 hours of on-the-job training at the Research Management Office and Office of Scholarship and Financial Assistance, as part of the Office Procedures 10 course requirement (2023).
- Conducted a group research paper entitled, "Through Grades and Beyond: The Correlation between Study Techniques and Academic Performance," as part of the English 10 course requirement (2023).
- Member of the Young Intellectual Property Advocates (YIPA) — PUPLHS (2022 – 2023).
- Member of the Young Entrepreneurs Society (YES) — PUPLHS (2022 – 2023).
- Recipient of the Academic Excellence Award during elementary (2013 – 2019).
- Participant of multiple quiz bees in Math, English, Araling Panlipunan, Christian Living Education, and Health — Sacred Heart of Jesus Catholic School (2013 – 2019).
- Member of the Mathematics Club — Sacred Heart of Jesus Catholic School (2016–2018).

Skills

- Digital Literacy
- Quantitative Research Skills
- Organization
- Communication Skills
- Attention to Detail
- Problem-Solving
- Critical Thinking
- Teamwork and Collaboration
- Work Ethic
- Adaptability
- Creativity

CURRICULUM VITAE

Name: Zia Zuleika M. Romblon
Address: F. Manalo St., Brgy. Batis, San Juan City
Contact Number: 09541973942
Email Address: ziazuleikaromblon@gmail.com

Personal statement/objectives:

A dedicated student with a strong academic foundation. Eager to learn, grow, and contribute to a positive community. Seeking opportunities to apply my knowledge and skills in a challenging and rewarding environment.

PERSONAL DATA:

Age: 18
Sex: Female
Date of Birth: November 10, 2006
Place of Birth: Quezon City
Religion: Roman Catholic
Civil Status: Single
Citizenship: Filipino
Height: 158cm
Weight: 43 kg
Languages Spoken: Filipino and English

Mother: Prescious M. Romblon
Occupation: Laundry Staff
Contact Number: 09055146482

Father: Zener Leonidez D.C. Romblon
Occupation: N/A
Contact Number: 09760201385

Educational Attainment

Elementary: San Juan Elementary School
J24F+93J, N. Domingo, San Juan, Metro Manila

Junior High School: Polytechnic University of the Philippines Laboratory High School (2019 – 2023)
1016 Anonas, Sta. Mesa, Maynila, Kalakhang Maynila

Senior High School: Polytechnic University of the Philippines Senior High School (2023 – Present)
1016 Anonas, Sta. Mesa, Maynila, Kalakhang Maynila
Science, Technology, Engineering, Mathematics (STEM)

Achievements

- With high honors during Grade 11 (2023 – 2024)
- Fucheng Foreign Exchange Program (2023)
- Buklod Diwa Head Photojournalist (2023)
- Buklod Diwa Photojournalist (2019 – 2023)
- Completed 150 hours of on-the-job training at the Internal Audit Office, as part of the Office Procedures 10 course requirement (2023).
- Conducted a group research paper entitled, "Correlation of the Time Spent in Social Media Platforms to the Academic Performance of LHSians" as part of the English 10 course requirement (2023).
- Class Vice President (2020 – 2021)
- Batch Salutatorian (2019)
- Leadership Awardee (2019)
- Supreme Pupil's Government Federated President (2018 – 2019)
- DSPC Photojournalism Champion (2018)
- RSPC Photojournalism 6th Place (2018)
- Supreme Pupil's Government Vice President (2017 – 2018)
- Mathematics Trainer's Guild (2016 – 2018)
- MTG Young Mathematicians' In-House Intensive Training Program (YMIITP) (2017)

Skills

- Quantitative Research Skills
- Adaptability
- Creativity
- Communication Skills
- Documentation
- Teamwork
- Stress Management
- Problem-Solving
- Graphic Design Skills

CURRICULUM VITAE

Name: Dan Rodrick S. Soriano
Address: Leo Street, Sampaloc, Manila
Contact Number: 09454479668
Email Address: drssoriano07@gmail.com

Personal statement/objectives:

As an ambitious and goal-driven senior high school student, I aim to enhance my skills in research by continuously fostering new knowledge, lessons, and experiences in the Science, Technology, Engineering, and Mathematics field. I seek to engage in opportunities that build and strengthen abilities that will be vital in analyzing data, creating ideas, and offering great research insights. With perseverance, I strive to apply my learnings and contribute to creating sustainable solutions that address real world problems.

PERSONAL DATA:

Age: 17
Sex: Male
Date of Birth: January 18, 2007
Place of Birth: Santa Mesa, Manila
Religion: Christian
Civil Status: Single
Citizenship: Filipino
Height: 172 cm
Weight: 72 kg
Languages Spoken: Filipino and English

Mother: Raquel S. Soriano
Occupation: Accountant
Contact Number: 09352459922

Father: Ricardo S. Soriano
Occupation: Househusband
Contact Number: 09169911007

Educational Attainment

Elementary: Pedro Pelaez Elementary School (2013 – 2015)
3484 P Pelaez, Sampaloc, Maynila, 1008 Kalakhang Maynila

Holy Trinity Academy (2015 – 2019)
J263+842 Balic-Balic, Calabash Rd, Sampaloc, Maynila, 1008 Kalakhang Maynila

Junior High School: Polytechnic University of the Philippines Laboratory High School (2019 – 2023)

1016 Anonas, Sta. Mesa, Maynila, Kalakhang Maynila

Senior High School: Polytechnic University of the Philippines Senior High School (2023 – Present)
1016 Anonas, Sta. Mesa, Maynila, Kalakhang Maynila
Science, Technology, Engineering, Mathematics (STEM)

Achievements

- Completed Grade 11 with Highest Honors (A.Y. 2023 – 2024).
- Attended the GAD Seminar "Beyond the Binary: Embracing Diversity In Language and Careers" (October 2024).
- Attended the Consumer Care Webinar by DTI "PUP: Be Smart, Assert Your Consumer Rights!" (October 2024).
- Completed Grade 10 as a Merit Awardee (A.Y. 2022 – 2023).
- Completed 150 Hours as a Student Trainee at PUP University Legal Counsel Office with perfect evaluation score, as part of Office Procedures 10 course requirement (March – June 2023).
- Accomplished Junior High School Research "Learning 2.0: Understanding the Significance of the Digitalization of Learning Materials on the Literacy of LHSians in the Face-to-Face Setup", as part of the English 10 course requirement (A.Y. 2022 – 2023).
- Member of the Young Intellectual Property Advocates (YIPA) — PUPLHS (2022 – 2023).
- Member of the Young Entrepreneurship Society (YES) — PUPLHS (2022 – 2023).
- Member of Oratorical and Debate Society — PUPLHS (2019).
- Graduated Grade 6 With Honors (March 2019).
- Feature Writer for Holy Trinity Academy's Journalism Club (2018 – 2019).
- Placed 2nd runner up in an Essay Writing Competition in Holy Trinity Academy (2019).

Skills

- Efficient Writer
- Quantitative Research Skills
- Encoding, Editing, Documentation
- Analytical, Logical, Decision Making, and Critical Thinking Skills
- Adaptability
- Time Management
- Communication and Organizational Skills
- Responsibility
- Creativity
- Work Ethic