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Foreword

We are proud to publish the inaugural issue of The Rizalian Review. This journal welcomes a wide range of topics and relies on dedicated reviewers who conduct in-depth and rigorous review of several research submissions that present innovative ideas. This issue marks crossroads for many fields, where science and humanities intersect, theory is tested in practice, and emerging perspective challenge well-established ones. Named for Dr. Jose Rizal, a polymath, reformer, and writer, this journal is grounded in his belief that knowledge is both a tool for freedom and a responsibility to society.

This issue features articles that has passed the rigorous reviews of our dedicated editorial team. The journal values work that engages with the world, research that asks better questions, bridges divisions, and dares to imagine possibilities.

This first issue exemplifies that mission. We ensure that accepted articles are academically rigorous, socially relevant, and interdisciplinary. We encourage readers to reflect on this issue. Let The Rizalian Review be more than just a platform for publishing articles; let it be a space where people can engage in meaningful discourse, with a distinct purpose that is susceptible to change.

Dr. Ryan Manuel D. Guido

Editor-in-Chief

Foreword

With pride and excitement, I welcome the first issue of The Rizalian Review. It marks a tangible advancement in the University's ongoing endeavor to foster not only research excellence but also the exchange of knowledge is also a component of new ideas.

The journal reflects a research spirit that intensifies at Rizal Technological University. It gathers studies across the diversity of disciplinary fields ranging from management, social science, literature, engineering, space science, and applied physics, demonstration of the breadth and depth of Rizalian Review. Each article adds to the academic discourse and addresses current social requirements, technical advancements, and national development.

This inaugural issue comprises five papers that demonstrate the University's objective to reinforce research that crosses borders and conveys weight. One explores what motivates workers to stay, another redefining literary education in the context of Philippine culture, others assess the extent to which the environment inhibits light, map the chemistry of stars, or test plasma thrusters for small spacecraft. Collectively, they reveal the intellect and creativity that move our scholars.

I commend the Research Publication Unit, the editorial board, reviewers and contributing authors for their consistent efforts in transforming the plan into a printed journal. The Rizalian Review has evolved into an indispensable platform for academicians to convene, collaborate, and acquire knowledge. May it continue to cultivate a habit of sharp questioning, as well as high visibility on a global scale, standards both within and outside the University.

Although this is only the first issue, may The Rizalian Review provoke curiosity among scholars, instructors, and researchers, as well as members of Rizal Technological University and practitioners from other institutions. May the journal act as a bridge that carries shared effort, carries knowledge, or bears a commitment to advance research in order to advance the nation and the global store of scholarship grows.

Dr. Magno M. Quendangan

Vice President, OVPRIES

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The Rizalian
Ventures



The Correlation between Job Attitude and Employee Job Performance for Strategic Retention: A Moderating Motivating Factors

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Abstract— This study addresses the relationship between job attitudes and employee performance in the manufacturing sector, focusing on job satisfaction, organizational commitment, and job involvement which are highly relevant to manufacturing companies. Using a descriptive-correlation method, data from 429 respondents, including rank-and-file employees and managers, were analyzed. The findings highlight a predominantly young, male, and highly educated workforce with high levels of job satisfaction and commitment. Regression analysis shows that job attitudes and motivating factors significantly influence performance, with motivating factors having a slightly greater impact. The study emphasizes the importance of a positive work environment, professional growth opportunities, and employee recognition to enhance performance and retention. The proposed retention strategy includes robust recruitment, competitive compensation, and comprehensive career development practices. Prioritizing employee well-being and fostering a supportive organizational culture is key to improving job attitudes, boosting performance, and ensuring long-term success. This research provides practical implications for HR practitioners and manufacturing leaders through targeted job attitude improvements to develop effective strategies for employee retention and organizational excellence.

Keywords— Job Attitude, Employee Job Performance, Strategic Retention

INTRODUCTION

In the speed world of the competitive manufacturing industry, it is the capabilities and attitudes of the workforce that keep and propel organizations toward success. The employees have to keep abreast of the latest industry advancements and have to value their role at work to drive efficiency and effectiveness. Most probably, dissatisfaction with salary, work environment, and management dynamics are the major reasons for employees leaving. In the Philippines, the manufacturing sector held a negative labor turnover rate of -3.8% (Philippine Statistics Authority, 2021), indicating a shrinking workforce, hence compelling the organizations to work more towards developing job satisfaction, organizational commitment, and job involvement to be able to deliver better performance and a decrease in turnover.

Although there has been extensive research on job performance in manufacturing, little work examines the mediating impact of motivating constructs on job attitudes. Researchers have investigated individual constructs like job satisfaction (Garcia et al., 2020), commitment (Pakpahan et al., 2021), and involvement but few studies set causal relationships or suggest practical recommendations. This research bridges the gap by evaluating the demographic makeup, job attitude and performance levels, and the effects of motivating factors like recognition, achievement, training, and responsibility. It seeks to suggest a strategic retention model suited for Philippine manufacturing companies, where -3.8% labor turnover rate (Philippine Statistics Authority, 2021) points to the imperative for pragmatic solutions.

This paper aims to understand the employee job

attitude-job performance relationship with special emphasis on how elements of job satisfaction, organizational commitment, and job involvement contribute toward to quality, efficiency, and innovation in the manufacturing sector. It therefore presents research addressing gaps left in this extant literature mediating variable gap and the lack of targeted interventions an empirical attempt to provide insights useful for developing retention strategies in manufacturing firms and enhancing organizational success.

A. Theoretical Framework

This research founded its base on the Expectancy Theory of Motivation, which explains just how a person's job attitudes affect his or her performance. The Expectancy Theory postulates that individuals select behavior based on their perceived belief that said behavior will produce desired outcomes. In essence, the theory is built around three main elements: expectancy, instrumentality, and valence. Expectancy refers to the perception that hard work leads to good performance, instrumentality is the belief that good performance will bring rewards, and valence refers to the value placed on those rewards (Fang, 2023).



Figure 1 Theoretical Framework

As shown in Figure 1, performance is said to be influenced positively in the sense that workers would work harder in anticipation of better performance and tangible re-

wards resulting from their work. Job attitudes and motivating factors are interdependent, while employee job performance is dependent with the two, which means that understanding the relationship between the three will aid manufacturing organizations in making informed decisions that may enhance workforce management, extension, and increase productivity.

B. Conceptual Framework

This paper, utilize the IV-DV paradigm, studies the relationship between motivating factors that interact with job attitudes to affect an employee’s job performance as the dependent variable. The dependent variables include job attitude like job satisfaction, organizational commitment, and job involvement and motivating factor involving achievement, recognition, and training that affects job attitudes as well as performance.

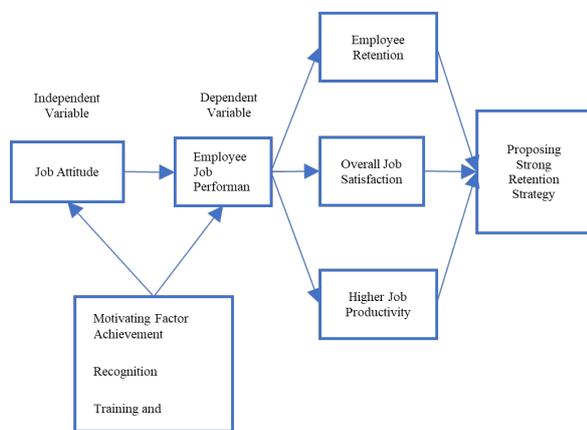


Figure 2 Conceptual Framework

As shown in figure 2, understanding how attitudes, motivation, and performance interplay within an organization can help the manufacturing organizations retain employees because motives are the drivers of employee performance, they may be improved by recognition, trainings, and opportunities for autonomy and even work environment can have a positive impact on employee’s retention (Wei et al., 2022). Organizations will motivate, enhance performance, and retain talent if there are explicit performance expectations, meaningful rewards, and a supportive work environment.

C. Statement of the Problem

The problem addressed in this study will provide valuable insights into the relationship between job attitude and employee job performance in the manufacturing industry. Specifically, this study shall attempt to answer the following research questions:

1. What is the demographic profile of the respondents in terms of:
 - 1.1 age
 - 1.2 gender, and;
 - 1.3 educational attainment?

2. What is the level of perception of job attitude of the respondents in terms of:
 - 2.1 job satisfaction
 - 2.2 organizational commitment, and;
 - 2.3 job involvement?
3. How may employee job performance be described in terms of:
 - 3.1 quality,
 - 3.2 efficiency
 - 3.3 productivity, and;
 - 3.4 innovation?
4. How do the following motivating factors influence the job attitude and job performance as perceived by respondents in terms of:
 - 4.1 achievement,
 - 4.2 recognition,
 - 4.3 training and development, and;
 - 4.4 responsibility?
5. Is there a significant impact of motivating factors on job Attitude and Employee Job Performance?
6. Is there a significant relationship between job attitude and employee job performance in the manufacturing industry?
7. What retention strategies model can be proposed as a result of the study to improve retention strategy and address the problem?

D. Hypothesis

This study tested the following hypotheses:

- H_{01} : There is no significant impact of motivating factors on the job attitudes to the employee job performance.
- H_{02} : There is no significant relationship between job attitude and employee job performance in the manufacturing industry.

LITERATURE REVIEW

A. Demographic Profile

Various studies have been conducted in order to investigate several dynamics that characterize manufacturing employees and considerable effects of demographic factors. According to Amegayibor (2021), age, education, and tenure considerably affect employee performance, absenteeism, and productivity in owner-manager manufacturing firms. In the Philippine context, Piatos et al. (2021) found that higher educational attainment and job satisfaction are very essential factors in reducing turnover intentions among manufacturing employees.

Wei et al. (2020) demonstrated that the improvement in employee welfare is accompanied by the improvement of innovation performance-in this case, for example, the quality of innovation results. Similarly, socio-economic factors among manufacturing workers in Cavite and Laguna are examined in terms of some demographic characteristics, such as educational attainment, income, and religion, of Dalugdog et al. (2022).



B. Perception of Job Attitude

Earlier, it was defined as an employee's judgment regarding his or her job, including job involvement, organizational commitment, and job satisfaction. Presently, it is viewed as work-life balance, job security, and a feeling of job fulfillment while working. As opined by Smith et al. (2017), the overall evaluation by an employee about the workplace to stay at the job performance is due to satisfaction, engagement, and commitment. In fact, studies agree that an unfavourable work environment is a reality that pushes out employees from organizations, which impacts their career development (Sunarno et al., 2022).

There is more research which supports the existence of a positive link between job attitude and performance. Leadership behavior, job satisfaction, and motivation positively affect performance in industries (Cabrera & Estacio, 2022; Debela et al., 2020). However, other research holds that the link between job satisfaction and performance is very weak (Wang & Machamp, 2019); on the contrary, meta-analysis testifies to the positive link existing between job satisfaction, engagement, and performance (U & Tankachan, 2021). The servant and transformational type of leadership plays an important role in forming job attitudes, work behaviors, and goal achievements, which in turn influence job performance (Steinmann et al., 2018; Widayastuti, 2022). The strict relationship of the job attitude relates with more career advancement opportunities. With the positive attitudes, promotion, and improved performance levels come (Abdalkrim & Elhalim, 2016; Rodriguez et al., 2024).

C. Job Satisfaction

Job satisfaction is defined as the greatest feeling of contentment with regard to one's work, prescribes a positive attitude toward one's job (Garcia et al., 2020). Satisfied employees are more committed, loyal, and productive and less likely to be absent or leave the organization (Rajni, 2022). Dissatisfaction, on the other hand, triggers higher turnover if the issues are not resolved. Job environment also has much to do with the level of satisfaction from the job, because many studies show that a positive work environment boosts satisfaction and the employees' performances too (Dhamjia et al., 2019; Fitriani et al., 2022).

The motivating factor for men and women is different at workplaces. These differences may lower overtime though (Andrade et al., 2019; Jasmineen et al., 2019). Payment and reward schemes are significant aspects as high wages and proper rewards enhance satisfaction (Nguyen & Tran, 2021). The remaining factors like workload, coworker relations, treatment by the manager, and working schedule are also likely to degrade the satisfaction level (Yien & Weng, 2020). Leadership style is a significant issue because the employment-oriented leadership, in turn, would enhance the job satisfaction of an employee (Nasution et al., 2023).

D. Organizational Commitment

Organizational commitment represents the engagement of an employee who, emotionally attached and "owns" the companies that hire him, is effectively the main driver of

motivation and engagement at work. This psychological connection plays a highly significant role in upgrading job performance because it increases job satisfaction, productivity, and overall organizational success (Pakpahan et al., 2021; Shehu, 2018). Employees who are highly aligned to organisational values will build strong work attributes, such as excellent skills and effort in their work (Suharto & Hendri, 2019). On the other hand, entrepreneurial orientation does not lead to employee performance directly (Soomro & Shah, 2019).

High commitment amongst employees was shown to be accompanied by outcomes like productivity, job satisfaction, work-life balance, and turnover decreases; there is also a result of high employee commitment being indicated by declines in turnover (Djawoto et al., 2022; Leah et al., 2021). Organisational commitment forms an essential determinant in the upgrading of the job performance of an employee, and such commitments can be offered by the companies through incentives for loyalty, regular proper training, and linking employee goals with those of the organization (Bangun et al., 2022; Parida et al., 2023). Transformational leadership indeed boosts organisational commitment but with limited mediation effect on performance based on leadership (Ausat et al., 2022). It catalyzes commitment and job satisfaction as well, which is effective human resource management.

E. Job Involvement

Job involvement, or job participation, refers to the extent of involvement and self-esteem that an individual derives from work. Such active participation tends to increase productivity and organizational performance, thereby affecting dimensions such as profitability and customer satisfaction (Gyawali, 2017; Muriithi et al., 2019). Job involvement develops the sense of responsibility of employees in manufacturing, along with improving the work quality and skills associated with jobs (Abraham, 2018).

The studies also demonstrate that job involvement is associated with innovative behaviors and further strengthened through career commitment (Huang et al., 2019). An organization that is focused on learning tends to have job involvement and then leads to increase job satisfaction as well (Varshney, 2019). Further, the impact of job involvement is also found to be varying context by context. It decreases job pressure and increases satisfaction although it doesn't always serve as a mediator in the relationship between skills and performance (Jaegal et al., 2019; Purba et al., 2021). However, despite the positive impacts of job involvement, it can exert a negative impact on the use of skills and does not always add to job satisfaction in some scenarios (Ogbeibu et al., 2020).

F. Employee Job Performance Overview

Employee job performance is one of the most important factors of organizations concerning the achievement of goals and objectives but not only these, their performance also determines their loyalty level towards the organization (Dewi et al., 2021). That is the level to which an employee

contributes towards organizational goals; therefore, performance is influenced by the quality of human resources, and the human resource impacts the employee's loyalty to the organization (Darmawan et al., 2020; Hsin & Ming, 2021). Thus, effective evaluation and appraisal are therefore significant keys to enhancing their performances. Indeed, job satisfaction, leadership styles, and compensation are the critical variables that will play a central role in triggering this process (Akter & Alam, 2016; Masyaryono et al., 2021).

Great performers have to be retained in a competitive manufacturing industry since productivity and quality are normally higher on the part of satisfied employees. Motivation, work-life balance, and psychological well-being are the other good factors contributing to job performance because psychological well-being is related with the balancing effect of work-life balance on performance (Haider et al., 2018). Therefore, high employee performance and retention, which result in the success and competitiveness of an organization, have to be managed efficiently by taking into consideration these factors of motivation, work-life balance, and psychological well-being.

G. *Quality of Job*

Quality in job performance is very essential to a firm's success because better employees who do quality work contribute directly to productivity and profitability. There is a significant relationship between job attitude and employee performance, especially among manufacturing workers. The factors that relate to the performance of jobs are education attainment, training, work ethic, motivation, and the physical and mental well-being of the employees themselves (Nuryanti et al., 2021).

Supportive factors include the work environment, employee welfare, and external factors such as government policies and industrial relation. All these factors contribute to performance. Job quality has been considered necessary in promoting the positive consequences of employees, and hence organizations must focus on human resource requirements to enhance the quality of service and performance (Humphries et al., 2019; Wadi'ah et al., 2021).

H. *Efficiency*

Efficiency is the efficiency with which a worker performs jobs: effectively, to an adequate degree of accuracy, and with least possible use of resources. It is therefore vital for the manufacturing sector. Job performance contributes, directly, to the profitability of an organization and service quality (Najar, 2020; Saraih et al., 2018). Job security is essential in building efficiency and enhancing rate of retention especially for newer generations of employees (Wang et al., 2021).

In generally, efficiency is measured as a ratio of outcomes achieved to costs incurred, but it will not be limited to profitability; it is also correlated with customer service, especially in high-contact services such as healthcare (Yavna, 2023). Employees who display high efficiency are more likely to deliver superior service experiences both for the organization and its customers.

I. *Productivity*

Productivity refers to the effectiveness and efficiency through which employees or teams can complete work, and is one of the most widely applied success factors in measuring the performance of any organization across varied industries (Owolabi & Adeosun, 2021). Factors that improve productivity include job satisfaction, compensations, working conditions, good relationships with fellow colleagues, and leadership (Tung et al., 2019). Studies on the manufacturing industry show that a good workplace has a direct impact on job satisfaction and productivity, while unhealthy ones lead to adverse behaviors such as absence and disobedience (Radwan & Zhu, 2017; Yusuf et al., 2016).

Productivity by employees requires a proper mixture of skills, knowledge, and experience, often acquired through the guidance of seniors (Esione & Okeke, 2019). An enjoyable and healthful working place creates productivity while the behavior of unethical management practice decreases productivity (Channarika & Serey, 2024; Udofot et al., 2023). Hence, designing a positive working environment with healthy relationships with subordinates is vital for adding value to productivity.

J. *Innovation*

Innovation means that employees are able to carry out creative activity and to propose any improvement on standard processes. In its emergence, such behavior appears under the influence of an intrinsic and extrinsic motivation toward the employees, along with efficient use and acquisition of knowledge. Today, most organizations realize that innovation in their employees is the way to competition since the process of innovation development influences the performance of the organization directly (Zhang, 2022). In this respect, it will be particularly important for employee engagement in order to foster innovative behavior because such employees tend to seek ways of improving the outcomes of the organization. In the manufacturing industry, in terms of job attitude, there is also a huge aspect exerted on the capacity of innovation of the employee because it puts forward a position to job performance.

K. *Relationship of Job Attitude and Employee Job Performance*

The job attitude and its performance has been widely studied by many researchers with mixed results. While some findings confirm that there is a positive relationship between job satisfaction and performance, saying that satisfied employees are good performers (Rahim et al., 2022), others postulate other influences on performance that may include motivation or organizational commitment (Tworek, 2023). Job satisfaction does high-performance improvement, but it is hampered by job stress and overload (Suhail & Aziz, 2022). Even job involvement and proper governance within an organization boost performance. However, a feeling of belonging essentially drives organizational commitment, that fosters an emotional attachment (Mohammadi, 2018; Sacramento, 2023).

The research has found out that most of the upgrading



towards job performance is achieved by job satisfaction, involvement, and commitment to the organization (Kucuk & Bridan, 2021). Good working conditions, fair compensation, job security, and a collaborative atmosphere further upgrade performance (Fatawu et al., 2020). Positive attitudinal employees contribute to better performance and also prepare oneself for upward mobility (Rodriguez et al., 2024).

L. Influence of Motivating Factors

Work performance is driven by proper motivation; recognition, rewards for achievements, engaging work and a culture that supports workers are crucial to enhance performance (Abebe, 2022; Dewi & Sukarno, 2021). A decline in performance levels should be avoided as much as possible and at the same time maximize long-term productivity by maintaining high performance if the organization is to offer career growth and competitive remuneration (Leman & Gustomo, 2023). Moreover, organizational performance depends much on the quality of supervision. Besides aspects of motivation offered by work environment like job security, fair compensation and performance-based rewards, it is huge matter about it according to Chmielewska et al. (2020) and Rahaman et al. (2020).

Motivated employees work more productively, have less turnover, and play a larger role in organizational success (Appelbaum et al., 2018). Understanding motivational factors and their manner of implementation becomes important for the development of effective retention strategies and the long-run success of an organization (Ganta, 2014). An organization can achieve such a fit workforce and maintain them satisfied.

M. Achievement

The high performance of employee jobs would be ideal for organizational success. Studies have shown that achievement motivation plays a major role in the nexus of job attitude-performance, Mutiara and Nurhayati (2023) assert that managing achievement motivation sets knowledge-sharing and engaging workforce environments that boost employee performance. Individuals who are high in motivation to achieve are good in performance; achievement can only be realized when IQ, EQ, and SQ converge by particularly (Kusumah & Sulistyandari, 2024; Solfema et al., 2020).

Achievement motivation is the push from employees to their goal in addition to boosting job performance as postulated by Chang et al. (2022). Based on job satisfaction, positive job attitudes also positively affect a high level of motivation, engagement, and productivity (Debela et al., 2020; Khan et al., 2022). It has been reported that supervisor and coworker support plays a crucial role in determining the performance of jobs by sharing knowledge and striving for achievement. Organizations maintain sustained success only through achievement motivation, satisfaction for jobs, and proper retention measures. These are important factors that influence employee efficiency and development in the organization (Al-Suraihi et al., 2021).

N. Recognition

Employee recognition is a formal or informal of an element in contemporary employee retention policies. More likely to remain with the organization and improve their job satisfaction and commitment to when they feel valued for their contributions (Johari et al., 2013; Rathore & Chouhan, 2021). Recognition not only motivates employees but also encourages a positive attitude to work and enhanced performance (Hussain et al., 2019). The regular acknowledgment of achievements will give someone a good feeling and can also influence more productivity and involvement in different activities (Amin, 2018).

Recognition and reward systems at an organizational level tend to reduce the intentions of turnover; thus, a friendly and productive work environment results in the retention of productive employees in the organization (Khan & Qadir, 2016). Rewards programs, including promotions and pay, are considered to be an important source of job satisfaction and motivation for employees (Asaari et al., 2019; Tumi et al., 2022).

Finally, ensuring that workers experience fair treatment is also an important factor in developing a motivated and satisfied labor force that results in the performance of the organization (Gorde, 2019).

O. Training and Development

Training and development are practices that empowering employee to have the skills and knowledge to serve as leaders in enhancing job performance within the organization. The businesses invest in these activities to improve performance and employees' motivation (Ketabchi & Vallès, 2018; Ozkeser, 2019). Besides boosting their skill, training and development also imply that the organization is devoted to furthering the employees' improvement, which will work towards enhancing retention, job satisfaction, and engagement (Hashem et al., 2022).

Employees are aligned to the organizations' goals through consistent training that impacts motivation and performance efficiency (Afroz, 2021; Niati et al., 2021). Career planning and training in an organization have more impacts on employee involvement and performance (Pradhan & Shrestha, 2022). Training in an organization may be seen to offer recognition, career development, and competitive remuneration to the employees; therefore, this reduces the rates of employee turn-over and builds a loyal workforce, though some challenges such as resource constraint and management support may emerge (Andrews & Mohammed, 2020; Halawi & Haydar, 2018).

P. Strategic Retention

Strategic retention revolves around planned management efforts toward the reduction of turnover, attrition, and improvement of employee retention. For an organization to be effective, a comprehensive human resource management approach is required (Abdullaev, 2023). Employees tend to stay with an organization when it is actively involved in efforts toward retention (Niazi et al., 2023). The SHRM, backed with selection through a proper and rigorous recruit-

ment process, sufficient compensation as compared to other firms, as well as developmental opportunities, also helps retain the talent (Ogedengbe et al., 2024).

Some of the key factors that influence retention are recruitment, remuneration, and career management practices. Effective communication, job security, and strong talent management also enhance the retention level. The same is reflected by authors like Prasetyo et al. (2022), as well as Adderley and Xiongying (2021). Motivation is also essential and will be determined through training, rewards, and recognition to retain quality employees. Skilled employees need to be retained in an organization for the advancement of that organization; therefore, there must be a retention plan that is clearly defined and implemented.

METHODOLOGY

This study was used descriptive-correlational research. Descriptive research describes the characteristics of a population or phenomenon by focusing solely on the current situation, not explaining why it exists. It is frequently applied in observational studies, surveys, and case studies with the aim of gathering information without changing the variables such as demographics, behaviors, attitudes, and opinions (Ghanad, 2023).

The correlational design tried to examine the relationship between variables, hence deducing the relationship in which one variable will change as the other changes. It queried and researched the scope where two or more variables were correlated in an attempt to ascertain whether and how those variables were correlated (Ghanad, 2023). No variable was manipulated; instead, it was only measured to see how they are interrelated.

A. Participants

This population for the study comprised 429 employees of a manufacturing company. Yamane Formula was applied in estimating the optimal sample size with a confidence level of 95% and margin of error of 5% to ensure obtaining an adequate sample size for the measurement of continuous and categorical variables (Adam, 2020).

Purposive sampling technique was employed, where participants were selected based on a few characteristics relevant to the study instead of a random selection. The approach ensures that the data gathered goes directly with the research objectives, thereby enhancing the focus and depth of study outcomes (Andrade, 2020).

The sample included various hierarchical levels within an organization such as rank-and-file levels up to managerial positions thereby ensuring a wider and varied experience across job attitudes and strategies concerned with performance and retention. In this regard, the idea behind incorporating probational and regular employees in the study offers an overall view of job attitudes and motivation with regards to their performance impact across different roles in the organization.

B. Materials

A researcher-made survey questionnaire was the research instrument for this study where variables were tailored for every research question. This questionnaire is divided into four parts:

Part 1: Demographic profile of respondents. This consists of name, age, gender, position, educational background, and salary.

Part 2: Job attitude. This includes components that cover job satisfaction, organizational commitment, and job involvement.

Part 3: What motivates him/her. This mainly deals and analyses factors such as the achievement, recognition, training and development, and responsibility.

Part 4: Aspects that concern the performance of employees at work, quality, efficiency, productivity, and innovation.

Each part uses an average weighted mean to express responses and weigh variables. To test the reliability of the questionnaire, it went through pre-testing and the result was analyzed using Cronbach's alpha, while the content validity was analyzed using Lawshe Validity. It was refined by a small group from the target population selected randomly to get feedback regarding clarity, relevance, and appropriateness of each item. Necessary adjustments were made based on the results.

The reliability analysis of the questionnaire, using Cronbach's Alpha, indicates excellent internal consistency and reliability, with a Cronbach's Alpha value of 0.941. The Cronbach's Alpha based on standardized items is 0.946, further confirming the high correlation among the items. With 55 items, the questionnaire demonstrates robust reliability, making it a highly effective tool for data collection.

Reliability of the instrument was established by a Cronbach's Alpha of 0.941, reflecting high internal consistency (Altman & Krzywinski, 2015). This surpasses the minimum acceptable figure of 0.7 required in social science studies. Also, Lawshe's Content Validity Ratio (CVR) was used through expert judgment to validate items to be relevant and clear. Those that failed the minimum CVR score were amended or eliminated and helped to back construct validity as well as relevance of the questionnaire.

C. Procedures

In gathering data, the researcher had to send formal request letters to the Human Resources (HR) departments of selected manufacturing companies as a request secure permission regarding the distribution of questionnaires. Once the permission was secured, the researcher tasked the HR departments with the responsibility of helping to distribute physical questionnaires or making use of an online source when appropriate. Instructive guidelines were given for full transparency and comprehension by the respondent.

Systematic collection was ensured for completed questionnaires. Furthermore, the data was properly encoded in a digital form. Moreover, the response was coded to ensure anonymity. There was further utilization of correlation analysis to have an idea about how well the relationships



exist between job attitudes and the performance of the employees. Ethical standards were further taken throughout the process as regards confidentiality integrity.

Employing different statistical tools like frequency for the demographic profile, weighted mean for the assessment of the respondents per variables, spearman rho for testing the relationship of independent and dependent variables, regression analysis for analyzing the impact of moderators which is the motivating factors, and Structural Equation Model (SEM) for modeling of the proposed retention strategy.

Table 1 Satisfaction Scale

Score	Mean	Verbal Interpretation
4	3.26–4.00	Very Satisfied (VS)
3	2.51–3.25	Satisfied (S)
2	1.76–2.50	Dissatisfied (D)
1	1.00–1.75	Strongly Dissatisfied (SD)

Table 2 Performance Scale

Score	Mean	Verbal Interpretation
4	3.26–4.00	Very Good (VG)
3	2.51–3.25	Good (G)
2	1.76–2.50	Poor (P)
1	1.00–1.75	Very Poor (VP)

Table 3 Agreement Scale

Score	Mean	Verbal Interpretation
4	3.26–4.00	Strongly Agree (SA)
3	2.51–3.25	Agree (A)
2	1.76–2.50	Disagree (D)
1	1.00–1.75	Strongly Disagree (SD)

RESULTS AND DISCUSSION

This part contains a detailed presentation and discussion of data analysis and the results of this study. The results are presented under the following: demographic profile, job attitudes, employee job performance, motivating factors, impact of motivating factors on job attitudes and employee job performance, and the relationship between job attitudes and employee job performance.

A. The Demographics Profile of the Respondents

The age distribution by the 429 respondents indicates the population is mostly comprised of early to mid-career workforce at 75.1% in the age range of 26-32 while 22.1% fell in the age range 33-39. This is in relation to findings by Amegayibor (2021) that age is one significant influence on performance and absenteeism at manufacturing

Table 4 Reliability Pre-Test of the Questionnaires Using Cronbach’s Alpha

Cronbach’s Alpha	Cronbach’s Alpha Based on Standardized Items	N of Items
.941	.946	55

Legend: Below 0.5 – *Unacceptable*, 0.5 to 0.6 – *Poor*, 0.6 to 0.7 – *Questionable*, 0.7 to 0.8 – *Acceptable*, 0.8 to 0.9 – *Good*, and Above 0.9 – *Excellent*

firms. According to gender, the workforce was predominantly male at 76.9% indicative of the usual gender composition of the manufacturing sector. This imbalance calls for gender-specific strategies to enhance job satisfaction and performance, as postulated by Piatos et al. (2021), mainly in a male-oriented environment.

Table 5 Demographic Profile

Age	N	Percentage
18-25 years old	10	2.3%
26-32 years old	322	75.1%
33-39 years old	95	22.1%
40-46 years old	2	0.5%
Total	429	100.0%

Gender	N	Percentage
Female	99	23.1%
Male	330	76.9%
Total	429	100.0%

Educational Attainment	N	Percentage
College Graduate	388	90.4%
Vocational	41	9.6%
Total	429	100.0%

In educational attainment, 90.4% of the respondents are college graduates, which means the workforce is well educated. This positive aspect of education ensures a high education level, which supports other results indicated by Piatos et al. (2021), showing that education has a positive effect on job satisfaction and minimizes turnover. According to Dalugdog et al. (2022), proving that retention and motivational strategies must be tailored to consider the masculinity of the workforce and the high educational level for maximum performance and retention in manufacturing companies.

B. The Level of Perception of Job Attitude and Respondents

The table 6 shows that the employees have high job satisfaction, organizational commitment, and job involvement have an organizational factors with a greater influence on job performance and the success of an organization. The job is satisfaction by work-life balance with a mean of 3.8858



Table 6 Level of Perception of Job Attitude

Job Satisfaction			
Indicators	SD	Mean	Verbal Interpretation
1. I am satisfied with the nature of my work.	0.44055	3.7739	Very Satisfied
2. The work I perform meets or exceeds my manager's expectations for job satisfaction	0.41816	3.7832	Very Satisfied
3. I feel contented with the balance between my job duties and my personal life	0.31845	3.8858	Very Satisfied
4. I am satisfied with the work environment and facilities provided	0.29111	3.9068	Very Satisfied
5. I am satisfied with the level of support I receive from management	0.32292	3.8881	Very Satisfied
AVERAGE		3.8476	Very Satisfied
Organizational Commitment			
Indicators	SD	Mean	Verbal Interpretation
1. I am committed to the goals and values of my organization.	0.23454	3.9417	Very Satisfied
2. I feel a strong sense of loyalty to my organization	0.27045	3.9207	Very Satisfied
3. I see myself working with the organization for a long time	0.36796	3.8718	Very Satisfied
4. I participate and contribute to company events and initiatives	0.47427	3.7599	Very Satisfied
5. I am willing to put in extra effort for the organization's benefit	0.4022	3.8275	Very Satisfied
AVERAGE		3.8643	Very Satisfied
Job Involvement			
Indicators	SD	Mean	Verbal Interpretation
1. I am committed to the goals and values of my organization.	0.23454	3.9417	Very Satisfied
2. I feel a strong sense of loyalty to my organization	0.27045	3.9207	Very Satisfied
3. I see myself working with the organization for a long time	0.36796	3.8718	Very Satisfied
4. I participate and contribute to company events and initiatives	0.47427	3.7599	Very Satisfied
5. I am willing to put in extra effort for the organization's benefit	0.4022	3.8275	Very Satisfied
AVERAGE		3.8643	Very Satisfied

Legend: "1.00-1.75 – *Strongly Dissatisfied*", "1.76-2.50 – *Dissatisfied*", "2.51-3.25 – *Satisfied*", "3.26-4.00 – *Very Satisfied*"

and the work environment with a mean of 3.9068. It can be deduced that employees are satisfied with their jobs and the management supporting them (Garcia et al., 2020; Syamala, 2023). Higher job satisfaction will lead to more engagement, less turnover, and a higher commitment towards organizational goals (Nguyen & Tran, 2021; Rajni, 2022).

Organizational commitment also featured highly, with employees heavily aligned with company values with a mean of 3.9417 and having a high intention to stay with the organisation with a mean score of 3.8718. The deep emotional bond of such commitment increases productivity and performance, promotes loyalty, and decreases recruitment costs (Pakpahan et al., 2021; Shehu, 2018). Transformational leadership and effective HR practices, therefore, play significant roles in fortifying this commitment (Ausat et al., 2022).

The job involvement gets an average score of 3.8555, thus reaffirming that employees are attached to their jobs, along with a personal attachment towards the work with deep involvement in it (Gyawali, 2017). There is a strong positive association between high job involvement and productivity, innovation, and organisational success performance outcomes (Muriithi et al., 2019). Although job involvement is a strong influencer of performance, it may not fully mediate every aspect of employee performance. Hence, always, there is always scope to manage other influencing factors that will likely affect employee performance, as suggested by Purba et al. (2021).

Therefore, the organization enjoys the benefits of all employees being maximum engaged, satisfied, and committed to their work; hence, poised for successive success and productivity. The positive culture of the workplace, as well

as supportive management practices, are essential maintaining these high levels of job satisfaction, commitment, and involvement.

C. How Employee Job Performance May Be Described

The table 7 which included in these are job quality, efficiency, productivity, and innovation. These, too, are on the list of critical aspects of organizational success and where high performance can contribute significantly towards positive outputs. Employees, for instance, always have good job quality with a mean score of 3.5450 as they work taking account of each activity and keep up standards. Recognition by immediate supervisors promotes the culture for the continuous improvement (Nuryanti et al., 2021).

Efficiency at work is as powerful with employees who meet their deadlines and constantly find ways to enhance business processes, which eventually enhances productivity and sustains a specific organization's standards (Yavna, 2023). Productivity scores, mean = 3.8308 reflect the multi-tasking capacity of the employees while they can effectively and productively carry out a range of tasks by working in a positive atmosphere, which eventually enhances team success and high output.

While the innovation flourishes in an innovative and solution-finding culture initiated by employees with innovative ideas and solutions and, therefore starts delivering improvements, keeping the organization competitive (Zhang, 2022).

Therefore, the organization has achieved these very high job quality levels, efficiency, productivity, and innovation levels that will make it successful in the long term. This



Table 7 Employee Job Performance

Quality			
Indicators	SD	Mean	Verbal Interpretation
1. I produce work that meets or exceeds quality standards.	0.49973	3.5291	Very Good
2. I pay close attention to detail in my work, ensuring high-quality outcomes.	0.50425	3.5315	Very Good
3. The quality of my work is frequently commended by peers and supervisors.	0.52808	3.5664	Very Good
4. I review and refine my work to maintain high standards.	0.51381	3.5245	Very Good
5. My work serves as model of excellence for others in the organization.	0.49516	3.5734	Very Good
AVERAGE		3.8476	Very Good
Efficiency			
Indicators	SD	Mean	Verbal Interpretation
1. I complete tasks in a timely manner, making effective use of my time and resources.	0.37815	3.8741	Very Good
2. I look for ways to improve efficiency in my work processes.	0.31122	3.9091	Very Good
3. The organization recognizes my effort.	0.30833	3.8998	Very Good
4. I prioritize tasks to maximize productivity and minimize delays.	0.3542	3.8788	Very Good
5. I demonstrate adaptability in streamlining work processes under changing conditions.	0.29111	3.9068	Very Good
AVERAGE		3.8937	Very Good
Productivity			
Indicators	SD	Mean	Verbal Interpretation
1. I meet or surpass productivity targets set by the organization.	0.43154	3.8112	Very Good
2. I manage my workload effectively, producing a high volume of work without compromising quality.	0.41845	3.8065	Very Good
3. My level of productivity is viewed as a benchmark within my team or department.	0.38831	3.8438	Very Good
4. I balance multiple tasks and projects without losing focus.	0.40608	3.8298	Very Good
5. My output contributes significantly to the team's or department's overall achievements.	0.35152	3.8625	Very Good
AVERAGE		3.8308	Very Good
Innovation			
Indicators	SD	Mean	Verbal Interpretation
1. I contribute new and innovative ideas to projects or tasks.	0.42264	3.8508	Very Good
2. I am proactive in implementing creative solutions to challenges in my work.	0.38806	3.8508	Very Good
3. The organization values my innovative approach to problem-solving and task management.	0.35669	3.8508	Very Good
4. I engage in brainstorming sessions and I am open to exploring unconventional approaches.	0.4357	3.8345	Very Good
5. My innovative efforts have led to improvements or advancements in my department or the organization.	0.36074	3.8788	Very Good
AVERAGE		3.8531	Very Good

Legend: "1.00-1.75 – Very Poor", "1.76-2.50 – Poor", "2.51-3.25 – Good", "3.26-4.00 – Very Good"

means keeping these factors at the right level and developing them as much as possible to maintain performances at the highest level and improve further.

D. How Motivating Factors Influence Job Attitude and Employee Job Performance

Organizational success is believed to be achieved through high levels of employee job performance. The employees must be aligned with the set objectives and feel the accomplishment as well with a mean of 3.8541. Empowerment and appreciation of their contributions are likely to increase motivation and performance to a great extent (Solfema et al., 2020). On-time formal or informal recognition of the efforts creates job satisfaction, loyalty, and engagement because the employees feel that there is great appreciation at hand with a mean of 3.951, and it further fosters positive behaviors, and retention as well (Rathore & Chouhan, 2021).

Training and development play a primary role in acquiring relevant competencies by employees to face promotion, and the organization strongly supports professional growth with a mean of 3.9021. This act of continuous learning and development promotes job satisfaction, performance, and retention (SUG, 2022).

Responsibility is also essential because employees have

to carry out major tasks and are trusted to take ownership in order to achieve higher performance with a mean of 3.8564. Empowerment in decision-making motivates employees for better accountability and improved output.

Therefore, it drives for high employee performance and places an organization on the right track for long-term success is strong recognition, development opportunities, and an employee sense of responsibility.

Before undergoing the regression analysis, we will test the variables for the normality test, the result of the Shapiro-Wilk normality test is not normally distributed. Therefore, apply the Spearman rho for non-parametric methods. The findings of regression analysis in Table 10 and 11 show the influence of job attitude and motivating factors on performance: indeed, both relations were found significant. In other words, the positive moderate association of attitude with the job is at Beta = 0.389, p < 0.001, while motivating factors are at Beta = 0.442, p < 0.001. This implies that motivating factors comprise aspects of recognition, growth opportunities, and a supportive work environment, factors that contribute much more to the improvement of performance than job attitude.

The results validate that motivating factors strongly enhance job attitude and performance, which means better organizational outcomes. Organizations needs an urgency of



Table 8 Influence of Motivating Factors

Achievement			
Indicators	SD	Mean	Verbal Interpretation
1. I am able to achieve significant milestones in my role.	0.35746	3.8695	Strongly Agree
2. My work contributes meaningfully to the organization's goals.	0.4066	3.7995	Strongly Agree
3. I accomplish challenging tasks successfully.	0.40204	3.8205	Strongly Agree
4. My efforts lead to tangible results within the organization.	0.32675	3.8788	Strongly Agree
5. I see a clear link between my efforts and the overall success of the team or department.	0.32744	3.9021	Strongly Agree
AVERAGE		3.8541	Strongly Agree
Training and Development			
Indicators	SD	Mean	Verbal Interpretation
1. I have access to adequate training and development opportunities to improve my skills.	0.29753	3.9021	Strongly Agree
2. The organization invests in our professional growth and learning.	0.36155	3.8718	Strongly Agree
3. The training and development programs I participate in are relevant and beneficial to my job role.	0.40255	3.7972	Strongly Agree
4. I am supported by the organization in pursuing professional development opportunities.	0.34394	3.8881	Strongly Agree
5. The training and development initiatives provided by the organization are regularly updated and aligned with industry standards.	0.35323	3.8858	Strongly Agree
AVERAGE		3.8690	Strongly Agree
Responsibility			
Indicators	SD	Mean	Verbal Interpretation
1. I am entrusted with significant responsibilities in my job role.	0.41144	3.8159	Strongly Agree
2. My responsibilities challenge me and contribute to my professional growth	0.37394	3.8462	Strongly Agree
3. The organization provides me with adequate autonomy to make decisions in my area of work.	0.44421	3.8159	Strongly Agree
4. I have a sense of ownership and accountability for the projects I am involved in.	0.29753	3.9021	Strongly Agree
5. The level of responsibility I hold is appropriate for my role and expertise	0.29753	3.9021	Strongly Agree
AVERAGE		3.8564	Strongly Agree

Legend: "1.00-1.75 – Strongly Disagree", "1.76-2.50 – Disagree", "2.51-3.25 – Agree", "3.26-4.00 – Strongly Agree"

Table 9 Normality Test (Shapiro-Wilk)

Statistic	p
0.942	<.001

Table 10 Regression Analysis

Model	R	R ²	Adjusted R ²	RMSE
M ₀	0.000	0.000	0.000	0.219
M ₁	0.751	0.564	0.562	0.145

Note: M₁ includes MOTIVATING FACTORS, JOB ATTITUDE

investment in motivational strategies such as career development and a good work culture for job satisfaction and performance. Integrated approaches that address both job attitude and motivation can actually maximize employee engagement and productivity.

E. *The Significant Relationship between Job Attitude and Employee Job Performance in the Manufacturing Industry*

Based on the Pearson correlation analysis, there is a significant positive relationship between job attitude and employee job performance. The correlation coefficient was 0.358 (p < 0.01). To some extent, this outcome of the analysis demonstrates that an increase in job attitude directly increases employee performance. So, the null hypothesis will be strongly rejected, and high associates found between job

attitude and performance in the manufacturing industry.

This outcome emphasizes the fact that positive attitudes toward work should be built by recognition, incentives, and career development. Job satisfaction, involvement, and organizational commitment have been essential factors for stronger performance outcomes. The HR strategies ought to promote an environment of support and provide growth opportunities towards optimum productivity. The connection though robust is of itself worthy of further study to trace possible causal links. However, the impact is more significant on employee performance and on the organization's success in its endeavors as a whole to improve job attitudes.

F. *The Proposed Retention Strategy Model to Improve Retention Strategy and Address the Problem*

Along with that improvement in job attitude, effective work setting, incentives, motivating factors, and recognition have to be given. Strategic retention from practical and effective HR practices enables strong recruitment, competitive remunerations, and professional development, and thereby lessens attrition for retaining talent (Abdullaev, 2023; Niazi et al., 2023).

Current HRM emphasis is on well-being and job attitudes, namely work-life balance, job security, and fulfillment, which enhance performance and loyalty (Adhikari, 2022). Good communication, job security, recognition, and leadership improve retention (Prasetyo et al., 2022).

It goes without saying that most organizations would search for engagement with workers once they design strategic retention plans in order to assist in fostering a positive work environment where employee wellbeing receives



Table 11 Regression Analysis

Model		Unstandardized	Standard Error	Standardized	T	p	Decision on H_o	Interpretation
M_0	(Intercept)	3.862	0.011	—	365.895	<.001	Reject	There is a significant impact of motivating factors on the job attitudes to the employee job performance.
M_1	(Intercept)	0.504	0.145	—	3.482	<.001		
	JOB ATTITUDE	0.421	0.048	0.377	8.802	<.001		
	MOTIVATING FACTORS	0.459	0.044	0.446	10.410	<.001		

Table 12 Spearman’s Rho Correlation

	Spearman’s rho	p	Decision on H_o	Interpretation
Job Attitude - Employee Job Performance	0.358	<.001	Reject	There is a significant relationship between job attitude and employee job performance in the manufacturing industry.

LEGEND INTERPRETATION: 0 or Below - No Relationship (NR); 0.01-0.25 - Low Relationship (LR); 0.26-0.50 - Moderate Relationship (MR); 0.51-0.75-High Relationship (HR); 0.76-0.99-Very High Relationship (VHR); 1.00 - Perfect Relationship

attention. This way, an organization can achieve long-term success and competitiveness.

The demographic profile of respondents is clear that a major part of the workforce is young, male, and well-educated. Therefore, proper retention strategies at the manufacturing industry level are quite in demand. Job satisfaction and organizational commitment result in productivity, quality, and low turnover. Employees always meet the performance expectations of the organization, and the management of time is also very effective, combined with attention to detail, and innovative thinking, putting the organization on the way to becoming sustainable.

Recognition and career development motivate people towards a more responsive job attitude and performance though regression analysis portrays that even the motivating factors influence the job attitude more than the job attitude influences it. There is a very strong positive correlation between job attitude and performance. In this case, there is an implication of a need for HR strategies to facilitate a healthy work environment, incentives to do well, and support in terms of professional growth. The proposed retention model is the action on supportive conditions along with competitive pay and opportunities for growth which is believed to increase employee engagement, retention, and overall success of the organization.

These findings highlight the need to have differentiated HR strategies that involve motivating factors such as recognition and training opportunities. For example, regular feedback and goal congruence with the organizational mission will enhance job attitudes toward work and productivity. Building a culture that focuses on employee well-being and innovation will be key to the retention of talent in a highly competitive manufacturing environment.

CONCLUSION

This research has concluded that job attitudes, influenced heavily by motivating factors, play an essential role in improving the performance of the workforce in the manufacturing sector. While job attitudes improve performance, motivating factors like recognition, career development,

and a friendly work environment have more of an impact. The overall retention strategy needs to be executed for these factors by the organizations to ensure a healthy workplace and success.

RECOMMENDATION

Findings indicate that organizations will need to implement sound motivational strategies—such as recognition programs, professional development, and supportive leadership—to improve job attitudes and worker performance. Managers can foster greater commitment and engagement by encouraging work-life balance and aligning job roles with employee competencies. Employees are motivated to pursue development opportunities and give management feedback, promoting an inclusive high-performance work environment. HR departments must integrate motivational interventions in their retention efforts, especially in highly male, educated workforces typical of Philippine manufacturing sectors.

For Future Researchers, investigate causal relationships between job attitude, motivating factors, and performance, explore the long-run retention effect of HRM on employees, analyze demographic effects on job satisfaction, or analyze how technological advancements/telecommuting affect a person’s job performance and levels of engagement.

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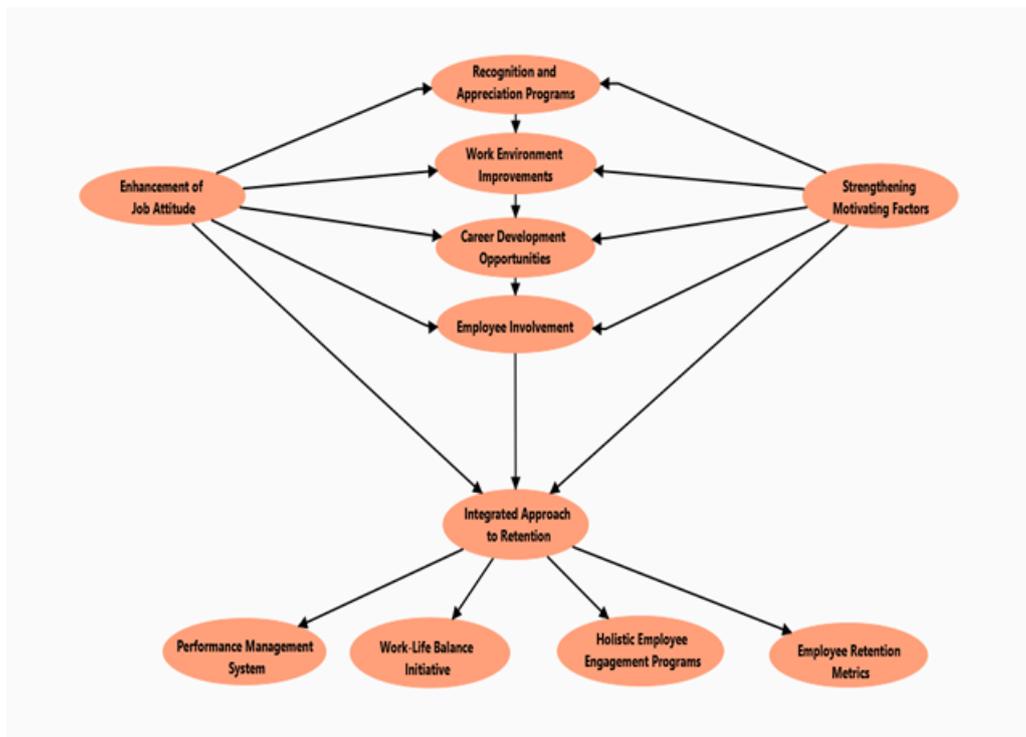


Figure 3 The Retention Strategy Model

CONFLICT OF INTEREST

The authors declare that there is no conflict of interest for this study.

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Pagsasakonteksto sa Kasalukuyang Suliraning Panlipunan sa Noli Me Tangere Tungo sa Pagbuo ng Mungkahing Materyal sa Pagtuturo

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Abstract– Ang pag-aaral na ito ay pagsasakonteksto sa mga suliraning panlipunan sa nobela ni Dr. Jose Rizal na Noli Me Tangere tungo sa pagbuo ng mungkahing materyal sa pagtuturo nito. Binigyang-diin ng mga mananaliksik sa pag-aaral na ito ang iba't ibang representasyong panlipunan ng mga tauhan sa kasalukuyan, mga halagahang Pilipino sa kasalukuyan na tinalakay sa nobela, suliraning panlipunan sa lokal at global na komunidad na sinasalamin ng nobela, at mungkahing materyal sa pagtuturo nito bilang mga suliranin na tinugunan. Ang pananaliksik na ito ay isang kuwalitatibong pag-aaral na ginamitan ng deskriptibong metodolohiya. Gumamit ng content analysis na instrumento ang mga mananaliksik na naging pangunahing gabay sa pagsusuri ng nobela gamit ang paraang close readings. Sa naisagawang pag-aaral natuklasan ng mga mananaliksik na may ilan sa mga tauhan na nagpapakita ng positibo at negatibong representasyong panlipunan na makikita pa rin sa kasalukuyan, nakita rin dito ang ilang mga halagahang Pilipino na naging parte na ng kultura at tradisyon ng mga Pilipino at ang mga suliraning lokal at global na makikita pa rin hanggang sa kasalukuyan na kakikitaan ng malaking epekto sa kabuuang lipunang Pilipino. Sa isinagawang pag-aaral nakita ng mga mananaliksik ang kaangkupan ng offline module likha gamit ang Kotobee Author Application bilang mungkahing materyal sa pagtuturo ng suliraning panlipunan na makikita sa Noli Me Tangere. Naipakita na ang mga tauhan at halagahang Pilipino sa nobelang Noli Me Tangere ay mayroong positibo at negatibong pagrerepresenta sa lipunan, at naipakita sa pagsusuri na mayroon itong kaugnayan sa pagkakakilanlan ng mga Pilipino dahil nararanasan pa rin ito sa kasalukuyan. Kabahagi naman nito ay ang kahalagahang Pilipino na hindi nawala at patuloy na isinasabuhay ng mga Pilipino ang mga gawi, paniniwala, aral, at iba pa. Sa bahagi ng suliraning lokat at global, malaki ang epekto at kaugnayan nito sa bawat isa gayon din sa lipunang Pilipino. Ang mga suliraning lokal at global tulad ng pang-aabuso sa kapangyarihan at sa kabataan at kababaihan at kawalan ng hustisya ay ilan lamang sa mga suliraning lokal at global na tinalakay sa nobela na siyang dapat matutuhan at maunawaan ng mga mag-aaral na ang mga suliraning mayroon sa nobela at sa tunay na lipunan. Dagdag pa, tunay ngang angkop ang paggamit ng Kotobee Author Application sa paglikha ng kagamitang panturo para sa mga guro at mag-aaral sa pagtalakay ng nobelang Noli Me Tangere. Ito ay upang maging makabago at makabuluhan ang pag-aaral ng mga mag-aaral at nang sa gayon ay mapukaw ang kanilang interes sa pag-aaral ng nobela ni Rizal na Noli Me Tangere.

Keywords– pagsasakonteksto, noli me tangere, offline module, kotobee author application

INTRODUCTION

Ang panitikan ang humubog ng kamalayan ng mga mamamayan sa kasaysayan, at ang nagtatala ng mga mahahalagang pangyayari sa lipunan. Sa kilalang kasabihan, “ang panitikan ay salamin ng buhay” ito ay nagsisilbing representasyon sa tunay na kaganapan sa lipunan partikular na ang iba't ibang kalagayan ng mga mamamayan. Ayon kay Nibalvos (2019), malaki ang tungkuling nagagawa ng panitikan upang hubugin ang kamalayan at pagkakakilanlan ng identidad ng mga mamamayan, sapagkat nakatutulong ito upang pukawin ang kaisipan ng mga mamamayan partikular na sa larangan ng edukasyon.

Isa sa pinakamatagumpay na nobela na naglahad ng karanasan ng mga Pilipino sa panahon ng pananakop ay ang Noli Me Tangere ni Dr. Jose Rizal; na isa sa naging hudyat upang maisakatuparan ang rebolusyon sa pagitan ng mga Pilipino at Espanyol. Ayon kay Clarisse (2019), ang nobelang Noli Me Tangere ni Dr. Jose Rizal ay hango sa

totoong buhay na nagbukas sa mga mata ng mga Pilipino noong panahon ng pananakop ng mga Kastila upang simulan ang rebolusyon at ibagsak ang mga mananakop na Espanyol. Ang mga isyung panlipunan na isiniwalat sa nobela ay umiiral hanggang sa kasalukuyan na nakaapekto sa ating lipunan katulad ng katiwalian, kawalang-katarungan, kahirapan, at pang-aabuso. Kaya naman, nararapat na mabasa ng mga mag-aaral ang nobelang ito upang pagnilayan ang mga kilos at paniniwala para sa bansa bilang mga Filipino. Inilahad naman sa pananaliksik ni Nibalvos (2019) ang ganito:

Dito niya inilahad ang pagmamalupit ng mga mananakop sa mga kababaihan at kabataan tulad nina Sisa, Crispin, at Basilio; kung paano minaliit ng mga puti at angat sa lipunan tulad nina Doña Victorina, Doña Consolacion, at mga prayle, ang mga Indio o mga Pilipino; at kung paano hinamak ng kanyang mga pan-



garap at pag-ibig si Crisostomo Ibarra (p. 100-101).

Sa nobela, makikita sa ilang tauhan ang mga karanasan ng mga Pilipino at kalagayan sa ilalim ng pamamahala ng mga Espanyol. Ipinaliwanag din na si Rizal ay nana-tiling may kaugnayan kahit sa ika-21 na siglo, maraming sakit sa lipunan ang kaniyang nilabanan at patuloy na hindi pantay na pagtrato sa mga kolonisadong bansa, sapagkat nangingibabaw pa rin ang pagiging neokolonyalismo. Sa kabilang banda, ang kabayanihan ni Rizal ay isang testamento na ang paniniil ay hindi kailanman ganap na masusupil ang mga lehitimong demokratikong adhikain. Bagaman si Rizal ay pinakakilala sa pagbibigay-diin sa kahalagahan ng edukasyon at sa intelektuwal na pag-unlad ng isang lipunan, kadalasang nakalilimutan kung gaano kahalaga ang pagkakaroon ng kolektibong kaalaman kaysa sa isang makasariling mithiin, paghahanap ng kadakilaan, at hindi pinag-iisipan na plano sa buhay. Kaya naman maging sa kasalukuyan ay danas pa rin ng bawat mamamayang Pilipino ang hindi makatarungang pagtrato. Idagdag pa ang kawalan ng hustisya, pang-aapi, pagpatay, at pang-aabuso. Ayon naman kay John Schumacher, *“as long as the writings of Rizal continue to be read, and Filipinos continue to reflect on the kind of society their forefathers wanted to create, Rizal’s thoughts will continue to be subversive of all societies which fail to bring justice and freedom to the Filipino people”* (Albela & Hila, 2020). Malaking bagay bilang pundasyon ng pag-aaral na ito ang pagtatag ng Republic Act. 1425 Rizal Law o Ang Batas Rizal na pinangunahan ni Jose P. Laurel noong ika-12 ng Hunyo 1956 at tinawag itong House Bill No. 5561 na pinamunuan ni Jacobo Gonzales at Senate Bill No. 4638 na pinamunuan ni Sen. Claro M. Recto. Hindi naging madali ang pagpapatupad ng Batas Rizal ng mga lider ng gobyerno. Mahabang proseso ang pinagdaanan ng panukalang batas na ito bago ito naging batas. Ang layunin ng Batas Rizal ay maisaad ang kahalagahan na muling buhayin ang kalayaan at nasyonalismo upang malaman kung para saan at bakit ang ating mga bayani ay nabuhay at nag-alay ng kani-kanilang buhay para sa bayan. Dagdag pa, binibigyang-parangal ang pambansang bayani na si Dr. Jose Rizal at ipinaaalala sa mga Pilipino ang mga nagawa at pinaglaban para maging malaya ang Pilipinas. Nakasaad sa batas na ito ang tungkol sa pang-akademiyang institusyon, mapakolehiyo o sekondarya man, pribado man o pampublikong paaralan na kinakailangang isama sa kurikulum ang pag-aaral sa mga ginawang akda ni Rizal, kabilang dito ang dalawang tanyag na nobelang Noli Me Tangere at El Filibusterismo. Para maisakatuparan ito, itinakda sa K to 12 kurikulum ng Department of Education (DepEd) sa pagtuturo ng mga akdang pampanitikan partikular na ang Noli Me Tangere sa ika-9 na baitang sa sekondarya (Mabalhin, 2020).

Sa pagtuturo ng nobela, suliranin ang kakulangan ng mga instruksiyunal na materyal sa pagtuturo ng nobelang ito at isama pa ang kawalan ng interes ng mga mag-aaral tungo sa pagkatuto nito. Ayon nga kay Dr. Jose Rizal, “ang kabataan, ang pag-asa ng bayan” subalit, mayroong kontradiksiyon ang kasalukuyang kalagayan na nararanasan nila

ngayon. Pagdating sa pagtuturo ng nobela ni Rizal partikular na sa antas ng sekondarya ay kinahaharap ng ilang guro ang ilang mga suliranin; Una, ang nobela ay hindi natatapos sa loob ng dalawa o tatlong buwan at ang mga ginagamit na pedagohiya ay hindi nakasasapat sa paglinang ng kaalaman ng mga estudyante (Tugano, 2021). Sa pagtuturo ng nobela ni Rizal, hindi lamang naratibo at nilalaman ang tinutungo ng mga panitikan kundi maging ang kasaysayan at kasalukuyan. Isinaad pa sa pananaliksik na ito na madalas makaligtaan ng ilang mga guro sa kanilang pagtuturo ng nobelang historikal ang pagmulat sa mga mag-aaral ng tendensiya na ang obrang pampanitikan ay minsang nakaugat sa katotohanan. Natatanaw na ang reyalidad ng pedagohiya sa karamihang mga guro ay mas kumakati sa mga malikhaing paraan kung ihahambing sa tradisyonal na pagtrato. Mas praktikal kung tutuusin ang ganoong metodo ng pagtuturo lalo na sa mga nobelang historikal. Sa pag-aaral na ito, ang binigay na ideya ni Grant Rodwell ay maaaring matutuhan ang kabuoang konteksto at konsepto ng mga obrang pampanitikan sa pamamagitan ng interpersonal na mga gawain gaya ng mga dula, sining-biswal, pelikula, pagkanta, pagsayaw, o hindi kaya’y pagsusulat mismo ng mga nobela bilang aplikasyon; ang pagbisita sa mga museo bilang pagdanas ng proksimidad ng kasaysayang inaaral. Ang paggamit ng iilang guro ng ibang materyal na nagsasagawa ng iba pang paraan gaya ng graphic narratives o nilikhang termino sa pagsasama ng komiks at nobelang grapik. Gayundin ang pagsusulat ng iskrip at naratibong may kalakip na mga larawan na makatutulong sa mag-aaral upang maunawaan ang isang nobela (Tugano, 2021).

Sa mga resultang ito patungkol sa kakulangan ng oras sa pagtuturo ng Noli Me Tangere at kawalan ng interes ng mga mag-aaral, binigyang pansin ng pag-aaral na ito ang magkaroon ng mungkahing materyal na makatutulong sa pagkatuto ng mga mag-aaral at pagtuturo ng mga guro nang sa gayon ay matugunan ang kanilang pangangailangan. Kaugnay ng nabanggit, ang mungkahing aplikasyon ay sinuportahan ng edtech, tuon sa cognitive theory ni Jean Piaget. Sa artikulo nina Ertmer at Newby (2013) ang cognitive theory ay binigyang-diin ang pagbibigay ng makabuluhang kaalaman sa mag-aaral upang matulungan silang makapag-organisa ng mga bagong impormasyon mula sa umiiral nilang kaalaman.

Isa ang Kotobee Platforms sa mga interaktibong pagkatuto na naimbento at inilunsad noong 2016. Ayon kay Siano and Potane (2021), *“students are inspired in learning when interactive learning e-books are employed. The digitized interactive learning e-book provided students with an exceptional learning opportunity. Using Self-learning Modules via the Kotobee reader develops students’ sufficient academic learning”*. Ang mga elektronikong libro ay bahagi ng paglipat mula sa papel tungo sa mga elektronikong mga libro. Ayon naman kay Goned et al. (2021), ang paraan sa pagdidikit ng teknolohiya sa edukasyon ay paggamit ng mga interaktibong e-learning na disenyo na maaaring magpalakas ng pakikipag-ugnayan ng mga mag-aaral sa asynchronous distance learning. Bilang resulta, ma-

halaga na baguhin ang estilo ng pagkatuto at tradisyonal na pamamaraan na ginagamit ng mga institusyong pang-edukasyon upang mapataas ang interes sa pag-aaral ng mga mag-aaral.

Ang pangangailangan para sa mga guro na bumuo at gumawa ng mga kagamitang panturo ay mahalaga upang malaman ang agwat ng pagkatuto ng bawat mag-aaral (Luzano, 2020). Para naman kay Kathleen Espiña, ang mga elektronikong kagamitang panturo ay makikita sa Kotobee e-book na makatutulong sa mga mag-aaral na lubusang maunawaan ang isang aralin (Tusoy, 2023). Bukod sa interaktibo at ginagamit sa pang-araw-araw na talakayan ang Kotobee Platform, nagbibigay ito ng ideya sa mga tao at nagiging instrumento ang platapormang ito para sa mabilis at madaling pagdaragdag ng mga lektura. Mayroon na ring mga ready-made templates, mga larawan, at mga bidyo na maaaring gamitin ng mga guro at mag-aaral dito. Dagdag pa, ang mga nakapaloob sa Kotobee platform na mga mini-app ay maaaring gamitin sa talakayan o sa mga pangkatang gawain para sa mga mag-aaral.

Dahil sa pandemya, umusbong ang mga *digitalized module* kaya mahalaga ang mga *devices* sa pag-aaral para sa madaling akses ng mga modyul, bidyo ng pagtuturo, at mga aktibidad na kailangang sagutan. Sa patuloy na pag-unlad ng dumaraming sopistikadong teknolohiya dahil nagkaroon ng *distance learning system*, mahalaga sa Department of Education o DepEd na magkaroon ng mga ganitong aplikasyon na magagamit sa bawat talakayan. Hinalimbawa rito ang Kotobee Platform na para sa mga guro ito ang madaling gamitin at makahihikayat sa makabuluhan, nakaengganyo, at kawili-wiling paraan upang matuto ang bawat mag-aaral. Isa sa pinakamahalagang interactive learning e-book na malawakang ginagamit ngayon ay ang Kotobee Author, isang software program na binuo ng Microsoft. Sa pamamagitan ng mga e-book, ang mga guro ay maaaring bumuo ng isang interaktibong elektronikong libro na may audio-visual, 3D widgets, mga tanong at sagot, at iba pang elemento. Nagbibigay ito sa mga mag-aaral ng nakaengganyong karanasan sa pamamagitan ng paglalaro ng mga touch-based na laro, pagsagot sa mga tanong sa pagsusulit, at kahit na paglahok sa mga botohan o pagsusumite ng komento o opinyon (Attwell, 2019). Ang paggamit ng mga elektronikong libro sa pagtuturo ay ginagawang mas kapanapanabik na mga aralin at nagpapaisip sa mga mag-aaral tungkol sa kanilang pag-aaral. Ang paggamit ng e-book ay naging mas madali para sa mga mag-aaral at guro na makapag-usap sa isa't isa (Nguyen et al., 2021).

Ang pananaliksik na ito ay pinamagatang “Pagsasakonteksto sa Kasalukuyang Suliraning Panlipunan sa Noli Me Tangere Tungo sa Pagbuo ng Mungkahing Materyal sa Pagtuturo”. Ang pag-aaral na ito ay sinuportahan ng Sociology of Literature. Ayon sa aklat ni Meiliana (2019), ito ay hinugot mula sa teoryang realismo at pragmatiks na tumutukoy sa pagsasalamin ng panitikan sa tunay na lipunan. Kaugnay nito, nilayon ng mga mananaliksik na suriin ang iba't ibang representasyong panlipunan ng mga tauhan sa kasalukuyan sa Noli Me Tangere; ang halagahang Pilipino na mayroon ang nobela; at mga kasalukuyang suliraning

panlipunan. Ang mga ito ay nagsilbing basehan upang imungkahi ang materyal sa pagtuturo na makatutulong sa mga mag-aaral tungo sa kanilang kaunlaran tungkol sa nobelang Noli Me Tangere. Dagdag pa, ang mungkahing aplikasyon ay makatutulong bilang kagamitang pampagtuturo para sa umuuland na kurikulum ng bansa kung saan madaling matutuhan ng mga mag-aaral ang literatura sa larang ng Filipino at lagay ng lipunan sa larang ng Araling Panlipunan.

A. *Paglalahad ng Suliranin*

Nilayon ng mga mananaliksik na maisakonteksto ang mga suliraning panlipunan sa Noli Me Tangere at makabuo ng mungkahing materyal sa pagtuturo nito. Kaugnay ng nabanggit, tinugunan ang mga sumusunod na tiyak na suliranin.

1. Ano-ano ang iba't ibang representasyong panlipunan ng mga tauhan sa kasalukuyan sa Noli Me Tangere?
2. Ano-ano ang mga halagahang Pilipino sa kasalukuyan ang tinatalakay ng Noli Me Tangere?
3. Ano-anong suliraning panlipunan sa lokal at global na komunidad ang sinasalamin ng nobela?
4. Anong mungkahing materyal sa pagtuturo ang angkop sa pagtatalakay sa mga suliraning panlipunan?

METHODOLOGY

Nakatala sa bahaging ito ang pamamaraan at instrumento na ginamit sa pananaliksik, balidasyon ng instrumento, pangangalap ng datos, at pagsasaalang-alang sa pamantayang etikal. Inilahad rito ang mga mahahalagang bagay na nakatulong sa pagsasakatuparan ng mga suliranin ng pananaliksik.

A. *Research Design*

Ang pananaliksik na ito ay gumamit ng kuwalitatibong pananaliksik. Ang mga mananaliksik ay nangolekta at sumuri ng mga non-numerical datas upang maunawaan ang bawat konsepto, opinyon, at karanasan gayundin ang pangangalap ng malalim na pagtalakay sa mga suliranin na makatutulong sa pagbuo ng panibagong ideya ng pananaliksik (Bhandari, 2022). Ginamit ng mga mananaliksik ang pagsusuri bilang paraan sa pagsasakonteksto ng kasalukuyang suliraning panlipunan sa nobelang Noli Me Tangere. Nagsuri ang mga mananaliksik sa pamamagitan ng pagbabasa sa nobela. Sa pamamagitan nito, mas nabigyan pa ng malinaw at sistematikong pagsusuri ang nobelang Noli Me Tangere na nakatulong sa mga mananaliksik upang maunawaan ang ugnayan sa kasalukuyang suliraning panlipunan ng nasabing akda.

B. *Data Collection*

Ang unang hakbang na ginawa ng mga mananaliksik ay ang paglapit sa mga gurong nagtuturo ng Noli Me Tangere

sa sekondarya upang humingi ng rekomendasyon hinggil sa librong susuriin. Mula sa rekomendasyon na ito, ang mga mananaliksik ay bumili ng kopya ng mismong libro at edisyon ng Noli Me Tangere na inirekomenda ng guro mula sa Ilaya Barangka Integrated School. Tiniyak din ng mga mananaliksik na makapagpaalam mula sa tagapaglathala ng librong ginamit. Bahagi rin ng pangangalap ng datos at pagpapabalido ng instrumentong ginamit. Ang mga mananaliksik ay nagpasa ng liham para sa mga guro na silang magbabalido ng instrumentong gagamitin ng mga mananaliksik. Sumunod ay lumikha ng content analysis instrument ang mga mananaliksik na angkop at gagabay sa pagsusuri at naging balido ito sa tulong ng tatlong guro na nagtuturo ng Noli Me Tangere sa Sekondarya sa Ilaya Barangka Integrated School at Mataas na Paaralang Neptali A. Gonzales. Matapos ito, ang mga mananaliksik ay nagbasa sa paraang close readings ng nobelang Noli Me Tangere upang masuri nang wasto. Dito, pinagtuunan ng mga mananaliksik ang representasyong panlipunan ng mga tauhan sa kasalukuyang panahon gayundin ang mga halagahang Pilipino at suliraning panlipunan sa lokal at global na komunidad na kasalukuyang sinasalamina ng nobela.

Ito ay proseso upang masagot ang ilang mga suliranin na mayroon ang pag-aaral na ito. Matapos naman ito ay isinaayos ng mga mananaliksik ang mga datos ng pagsusuri sa pamamagitan ng pagkokoda sa separadong talahanayan na naging gabay sa paglalapat ng mga tugon sa bawat suliranin. Dagdag pa, nangalap din ng datos ang mga mananaliksik mula sa iba't ibang pag-aaral upang malaman ang estado o lebel ng interes ng mga mag-aaral sa pagkatuto ng nobelang Noli Me Tangere. Ito ay upang malaman ang mga dapat isaalangalang sa pagsasakatuparan at pagbuo ng mga mananaliksik ng isang epektibong mungkahing materyal sa pagtuturo ng nasabing nobela.

C. Ethical Considerations

Alinsunod sa Republic Act 8293 o Intellectual Property Code of the Philippines, ang mga mananaliksik ay marapat lamang na ingatan at ipabatid sa mga mambabasa ang pinagmulan ng mga sanggunian na ginamit sa pagaaral. Sa pangangalap ng mga datos at impormasyon na gagamitin sa pagsusuri ng mga mananaliksik, inaasahang magiging matapat, maayos, at makatarungan ang pagsusuring isasagawa, gayon din ang pagsasaalang-alang sa mga personal na impormasyong makakalap mula sa mga tauhan, manunulat, at iba pang nasa likod ng nobela. Ang mga mananaliksik ay tiniyak na nakapagpaalam sa tagapaglathala ng librong ginamit sa pagsusuri. Inilahad sa pamamagitan ng isang liham pahintulot ang pangangako na ang librong nabili ay gagamitin para sa pagsasakatuparan ng pag-aaral na ito. Ang mga mananaliksik din ay tiniyak na ang nakuhang datos ay mananatiling konpidensyal at ginamit lamang sa prosesong isinagawa sa pag-aaral upang matugunan ang puwang at layunin ng papel. Ang mga mananaliksik ay ikinonsidera rin ang pagbigay ng proteksyon sa mga tauhan, manunulat, at iba pang mga impormasyon na nakuha mula sa ibang awtor at iskolar na nabanggit sa pag-aaral.

RESULTS AND DISCUSSION

Sa bahagi na ito makikita ang paglalahad ng detalyadong impormasyon, pagsusuri, at sariling interpretasyon mula sa mga datos na nakuha. Ang mga pagsusuri ay isinaayos ayon sa pagkakasunod-sunod ng mga suliranin na inilahad sa unang kabanata.

A. Iba't-Ibang Representasyong Panlipunan ng mga Tauhan sa Kasalukuyan sa Noli Me Tangere

1. Edukado/Ilustrado

Isa sa makikitaan ng pagiging edukado at ilustrado ay si *Crisostomo Ibarra* na nag-aral sa ibang bansa lalo na't kagustuhan din ito ng kaniyang ama. Dahil sa mga natutuhan, napag-alaman niya ang kultura at kasaysayan ng bansang kaniyang pinuntahan. Makikita sa kabanata 3 ang mga sumusunod na pahayag: "Ayon kay Crisostomo, mahalagang pag-aralan ang kasaysayan ng bayang pupuntahan at kung paano ito umunlad. Batay sa pagsusuri ni Crisostomo, ang pagdarahop o pag-unlad ng isang bayan ay may kaugnayan sa pagiging malaya o kahirapan ng mga tao." Batay sa naging pahayag, pinapatunayan lamang nito na maging sa kasalukuyan ay umiiral pa rin ang mga intelektuwalisadong indibidwal na may layuning mapaunlad ang bayan; na siyang nakita kay Crisostomo Ibarra na patuloy na naniniwala sa kapangyarihan ng edukasyon.

Ayon kay Jimenez (2021), "ang tauhang si Crisostomo Ibarra ay nirepresenta ang mga ilustrados sa panahong ito na mataas ang pinag-aralan sa UP, na pinupondohan ng taumbayan kung saan sila ay nagiging manunulat, proporsors, kongresman, o senador." Bukod pa rito, sila ay malay sa kapaligiran partikular na usaping pampolitika at lipunan kung saan sila rin ay nakikisali sa mga isyung ito. Gayunpaman, karamihan sa kanila ay nahuhuli ng mga elitista at itinuring kalaban ng pamahalaan ngunit, may ilan ding sa mga kompanyang nananamantala at kinakalaban ang mga tao.

2. Sunud-sunuran sa nakatataas

Tatlo sa mga tauhan ng Noli Me Tangere ang nakitaan ng ganitong uri ng representasyon gaya na lamang nina Kapitan Tiago, Alfonso Linares, at Sepulturero na may iba't ibang karanasan. Una, si Kapitan Tiago ay pilit niyayakap ang kapangyarihan ng iba sa pamamagitan ng pagsunod sa mga utos ni Padre Damaso. Pangalawa, si Alfonso Linares na hawak ni Donya Victorina sa leeg at binigyan ng kautusan ang binata na hamunin ang Alperes ng duwelo gamit ang isang rebolber, at kung hindi ay isisiwalat nito ang kaniyang lihim. At panghuli, ang Sepulturero na nagtapon sa bangkay ni Don Rafael Ibarra dahil sa isa ring kautusan.

Halimbawa na lamang ng pahayag na ito mula sa kabanata 9: "*Marunong makibagay si Kapitan Tiago sa mga taong may mataas na katungkulan sa pamahalaan. Siya ay sunud-sunuran, nagbibigay ng mga regalong pagkain tulad ng hamon, baboy, pabo, at mga prutas mula sa Tsina. Bagama't isang Pilipino ay itinuturing ang sarili na isang Kastila. Sang-ayon siya sa pagtaas ng buwis.*" Pinapatunayan ng pahayag na ito na si Kapitan Tiago ay sunud-



sunuran partikular na sa mga taong may mahalagang gampanin o mas nakataata sa kaniya sa lipunan gaya na lamang ng mga taong kumakapit sa ngalan ng salapi at identidad; na tanging nagbibigay sa kanila ng kaghinhawaan.

Ayon pa kay Bansil (2019), si Kapitan Tiago ay mayroong takot na mapahiwalay sa lipunan kaya naman mas pinipili nito maging sunud-sunuran upang hindi mangyari ang kinatatakutan at mapanatili ang hinahangad na kayamanan. Sa panahong ito, ang mga kagaya ni Kapitan Tiago ay walang ibang iniisip kundi ang sarili niyang kapakanan at pagbibigay halaga sa mga taong nagpapaangat sa kaniya. Gayunpaman, mahalagang tingnan na hindi lamang ito pagtalikod sa sarili kundi pagtangkilik sa dalang kapahamakan ng iba.

3. Makabayan

Sina Crisostomo Ibarra, Elias, at Pilosopo Tasyo ang nagpakita ng ganitong representasyon na umiiral pa rin sa kasalukuyan. Makikita ito sa kabanata 50: Sinabi ni Ibarra na hindi dapat mangyari ang bagay na tulad ng sinasabi ni Elias sapagkat ayaw niyang pamunuan ang isang pagaalsa sa pamamagitan ng lakas. Hindi pa raw dapat. Hindi pa panahon. Kung ang mga rebelde ay mag-aalsang may dalang sandata, kanyang papanigan ang pamahalaan at lalaban ang mga pinag-uusig. Kaya nga siya raw ay nagpapagawa ng paaralan. Ang pagsulong ay nasa karunungan. Ang bayan ay uunlad sapagkat ang landas ay mabubuksan kung may liwanag. (p. 390).

May iba't iba man silang paraan kung paano masusugpo ang katiwalaan at korapsyon sa San Diego, naging isa pa rin ang kanilang layunin—ang kapakanan ng mamamayan gaya na lamang ni Crisostomo Ibarra na naglalayong magpatayo ng paaralan para sa mga kabataan sapagkat naniniwala siya na ang edukasyon ang sagot sa kahirapan ng bayan.

Ayon nga kay Jimenez (2021), naging taliwas si Elias sa kagustuhan ni Ibarra patungkol sa pagbabagong hinahangad nito na mangyayari sa pamamagitan ng edukasyon. Dahil para kay Elias, ang karahasan at paggamit ng sandata ay siyang susi sa tunay na hustisya sa bayang inaapi ng mga mananakop na mapang-abuso at mapanlinlang. Gayunpaman, base sa naging resulta ng pagsusuri ay hindi naging hadlang ang pagkakaiba nila ng ideolohiya dahil sa wakas, naniwala na rin si Crisostomo kay Elias partikular na sa pahingi ng hustisya kaya naman sa huli, nagkaisa pa rin sila at ang isa ay nagbuwis pa ng buhay para sa ikabubuti ng bayan.

4. Duwag

Isa sa mga karakter sa nobela na nagpapakita ng ganitong representasyon ay si Don Filipino na Tenyente Mayor ng San Diego at matalik na kaibigan ni Pilosopo Tasyo. Gaya ng Pilosopo, siya ay hindi sang-ayon sa pamamalakad ng simbahan lalong-lalo na kung salapi ang pinag-uusapan dahil alam niya kung ano ang pamamalakad ng mga ito.

Batay sa kabanata 53, ipinakita ni Don Filipino ang kaniyang kaduwagan: *Sinabi ni Don Filipino na tinanggap na ng alkalde ang kanyang pagbibitiw sa tungkulin. Si Pilosopong Tasyo ay hindi mapakali sapagkat naniniwala siyang ang pagbibitiw sa tungkulin ay hindi nararapat at napa-*

panahon. Wika pa niya na sa panahon ng kagipitan ang puno ay hindi sumusuko sa mga oras na siya ay nahaharap sa matinding pagsubok. Ngunit ayon kay Don Filipino ang kanyang gagawin dahil kinabukasan ay pinakawalan ng kapitan ng mga sibil ang mga tao na kanyang hinuli at walang paguusig na naganap. Nabanggit niya na si Ibarra ay napadala lamang sa paniniwala ng nakararami. (p. 412).

Kaya naman sinasalamin ng Tenyente Mayor ang mga taong mas pinili maging tahimik sa nangyayari sa paligid gaya ng mga tao ngayon sa social media partikular na ang ilang politiko na hindi nakikisali sa karapatang-pantao ng mga naaapi at ipinagsasawalang-bahala na lamang ang lahat upang hindi mapahamak dahil kung susubukin nilang magsalita, ituturing silang kalaban o patatahimikin.

5. Relihiyosa

Sina Pia Alba at Tiya Isabel ang sumasalamin ng pagiging relihiyosa na hindi tumitigil sa pananampalataya sa kabila ng kanilang pinagdadaanan sa buhay. Bukod pa rito, patuloy silang nananiniwala sa kapangyarihan ng Poong Maykapal at Birheng Maria lalong-lalo na sa kanilang mga hinihiling gaya ni Pia Alba na ilang beses nagdasal at nagsayaw sa Obando sa kapistahan ni San Pascual Bailon dahil kilala ito na nagkakaloob ng anak. Si Tiya Isabel naman ay palaging nagsisimba kasama ang kaniyang pamangkin na si Maria Clara na anak ni Pia Alba.

6. Mapagmahal sa Anak

Makikita kina Tiya Isabel, Sisa, at Kapitan Pablo ang pagkalinga ng isang magulang para sa mga anak lalo na kung tungkol ito sa kanilang kaligtasan at kabutihan. Halimbawa, si Sisa na ina nina Crispin at Basilio na nakaranas man ng pang-aabuso sa kaniyang asawa ay nagawa niya pa ring magtiis, maging buo lamang ang kaniyang pamilya.

Kaya naman ang ganitong representasyon ni Sisa ay inilahad sa kabanata 16 ng nobela: Dinaan na lamang ni Sisa sa iyak ang ginawa ng asawa at dali-dali itong nagsaing na muli at nag-ihaw ng tatlong tawilis sapagkat alam niyang gutom ang kanyang mga anak. Nangangahulugan lamang na sa kabila ng pangmamaltrato ni Pedro kay Sisa ay ipinagsawalang-bahala na lamang niya ito at pinaghandaan pa rin ang kaniyang mga anak na patunay lamang ng pagpapamahal ng isang magulang; na kahit humarap ito sa pinakamatinding pagsubok ay hindi pa rin mawawala sa isipan niya sina Crispin at Basilio. Ito ay konektado sa pahayag ni Mojarro (2023) kung saan si Sisa ay personipikasyon nang maraming inang nagsakripisyo para sa kapakanan ng mga anak niya; maibigay lamang ang pangangailangan nila sa kabila ng pangaabusong natanggap nito na sinusubukan din namang lagpasan.

7. Nasa laylayan/Maralita

Ang pagiging maralita ay danas ng dalawang magkapatid na sina Crispin at Basilio na naging dahilan din upang manilbihan sa simbahan bilang mga Sakristan nang sa gayon ay makatulong sila sa kanilang ina na si Sisa. Sa ibang banda, inilahad naman ito sa kabanata 14: *Ang ibig ng sakristan mayor ay umalis sila ng simbahan ng ikawalo*

ng gabi. Umaasa si Basilio na makakuha niya ang kanyang sahod upang maibigay sa kanyang ina ang salaping kikitain sa pagsasakristan. Sa pananatili nila rito, nakatanggap sila ng pang-aabuso sa Sakristan Mayor na nagdala sa kanila sa labis na kapahamakan lalong-lalo na si Crispin gayunpaman, wala silang magagawa kundi ang magtiis. Ayon pa kay Jimenez (2023), “Crispin and Basilio are represented today by the landless tenants, the squatters, the contractuels, casuals, and the joborder workers of the bureaucracy whose engagement is the most palpable evidence that the government is the number one violator of its own labor laws”. Gaya nila, marami ring mga kabataan sa kasalukuyan ang napipilitang magbanat ng buto partikular na ang mga nasa laylayan upang makatulong sa kanilang pamilya na kung tuusin ay pinagkaitan lamang ng karapatang mamuhay nang payapa at masagana. Sa naging karanasan ng magkapatid sa nobela, malinaw na sinasalamain nila hindi lamang ang mga taong walang permanenteng trabaho kundi maging ang mga nagpapaalipin sa mapang-abusong amo na kakarampot lang din ang ibinibigay na suweldo. Kaya naman ang karanasan ng dalawang magkapatid ay patunay lamang na ang mahihirap ay biktima lang din ng kawalang-hiyaan ng pamahalaan.

8. Social Climber (Colonial Mentality)

Sa kasalukuyang panahon, talamak ang mga gaya nina Donya Victorina at Donya Consolacion na mapagpanggap at tinatalikuran ang sariling pinagmulan upang yakapin ang kultura ng iba. Dito pumapasok ang “Donya Victorina Syndrome” ng isa sa mga karakter na nabanggit kung saan ipinilit nitong ipakira sa lahat na siya ay isang mayaman na nakasuot ng damit Europeo at hindi Pilipino. Batay sa pag-aaral ni Clarisse (2019) “Other characters that significantly represent Filipinos were like Doña Victorina was a social climber who did not want to be known as an Indios,” (para. 2) na nangangahulugang ikinakahiya niya ang pagiging Pilipino sapagkat para sa kaniya, wala itong pinag-aralan at mahihirap lamang. Gayundin kay Donya Consolacion na dating labandera na nangarap lamang na makapag-asawa ng isang Kastila—na nagbigay sa kaniya ng daan upang himukin ang sarili na magsalita ng Kastila. Ayon pa kay Bansil (2019) si Doña Consolacion ay kagaya rin ni Doña Victorina na may kaisipang kolonyal sa kadahilanan na, “Doña Consolacion patronized Western influence as “for one of the beautiful qualities of this lady was to try not to know Tagalog, or at least to appear not to know it,” (para. 2) na kahit taliwas sa kaniyang pisikal na anyo ang hinahangad niya sa buhay, patuloy pa rin siyang nakasandig sa ideya ng kanluranin gayundin sa dayuhang kaisipan nito, at pagnanais na mapabilang sa mga ito dahil lang sa ikinahihiya nito ang sariling lahi.

9. Mapanlinlang at Mapagsamantala

Sinasalamain ni Padre Salvi, Don Tiburcio, Lucas, Padre Sibyla, at Kapitan Tinong ang pagiging mapanlinlang at mapagsamantala. Isinagawa nila ito sa iba’t ibang pamamaraan na may kinalaman kay Crisostomo Ibarra. Ang mga nabanggit na karakter ay nagmalinis gamit ang kanilang posisyon (Padre Salvi), nagpanggap bilang doktor (Don Tiburcio), humingi ng salapi kay Ibarra (Lucas), nagbait-baitan

(Padre Sibyla), at tinalikuran si Ibarra nang mahuli ito ng mga Guwardiya Sibil (Kapitan Tinong).

10. Abusado

Ang pang-aabuso sa loob ng nobelang Noli Me Tangere ay hindi lamang ginagawa ng pareng si Padre Damaso at mga Guwardiya Sibil kundi maging ang Alperes, Sakristan Mayor, at ni Pedro na asawa ni Sisa. Bawat isa sa kanila ay binigyan ng iba’t ibang parusa ang mga taong biktima lang din ng kasinungalingan at karanasan. Halimbawa na lamang ang Alperes na gumamit ng kamay na bakal kay Tarsilo hinggil sa pagkakasangkot umano nito kay Ibarra—na sa huli ay wala palang katotohanan. Dahil dito, tuluyang binawian ng buhay si Tarsilo; na patutunayan ng kabanata 57: *Dahil sa patuloy na hindi pag-imik ni Tarsilo kahit na sunud-sunod ang pagtatanong sa kanya, ang alperes ay nagpuyos ang damdamin kaya pinalo siya ng yantok sa likod. Hindi nila mapagsalita si Tarsilo kaya hinataw nang paulit-ulit.*

Kaya naman batay sa mga naging resulta, ang kagaya ng Alperes ay umiiral pa rin sa kasalukuyang panahon at patuloy na ginagamit ang posisyon upang makapanakit nang walang sapat na ebidensiya. At isang taong may posisyon na naniwala sa maling impormasyon na naghatay ng hindi makatarungang parusa sa mga biktima.

11. Diktador

Dalawa sa mahahalagang karakter sa nobela ay naki-taan ng pagiging diktador na hanggang ngayon ay umiiral pa rin sa kasalukuyan, at sila ang nagpatunay na malaki ang epekto sa bawat indibidwal na pinapatawan nila nito: Sina Padre Damaso at Donya Victorina. Ang kura ay isa sa pinakaginagalang na kura na ginagamit ang kapangyarihan upang mapasunod ang ibang tao gaya ni Kapitan Tiago habang si Donya Victorina naman ay ginawang tuta ang kaniyang asawa na si Don Tiburcio at pamangking si Alfonso Linares. Inilahad ang ilang halimbawa sa kabanata 47 mula: Si Doña Victorina ay nagalit kaya inutusan niya ang asawa na hamunin ang alperes sa pamamagitan ng sable o rebolber. Kung hindi ay kukunin niya ang pustiso nito. Batay rito, kontrolado ng donya ang lahat at kung hindi ito sumunod, bibigyan niya ito ng parusa. Ang ganitong uri ng pang-aabuso ay nangangahulugang tinatapanan nito ang karapatan nila na magkaroon ng sariling desisyon at pagpigil sa kanilang kagustuhan na magsalita—dahil sa huli, wala rin naman silang magagawa. Sa bawat salitang kanilang nais iparating ay hudyat naman upang pigilan sila ng mga gaya nina Donya Victorina, Padre Damaso, atbp. na walang pinapakinggan kundi ang kanilang mga sarili lamang.

12. Oportunista

Si Donya Victorina ay hindi lamang *social climber* at Diktador kundi oportunista rin dahil noong mga panahong naparusahan si Crisostomo Ibarra ng pagiging excomulgado ay ipinakilala niya agad si Alfonso Linares kay Damaso upang hanapan ng asawa si Maria Clara. Ayon sa artikulo nina Bersamina et al. (2020), “there is an opportunist within all of us. Nothing is necessarily wrong with taking the op-



portunities presented in front of you and strategically using them in order to succeed,” na siya namang maihalalintulad sa ginawa ni Victorina sa nobela. Kaya naman laganap ang mga oportunistang bansa, mayaman man iyan o mahirap. Gayunpaman, lubha itong nakaaapekto sa iba dahil hindi nila alam na ginagamit na pala ang kanilang kahinaan. Ito ay inilalahad sa kabanata 43: *Nang mahimasmasan na si Padre Damaso ay lumapit sa kanya si Doña Victorina upang ipakilala si Linares. Minasdan ng pari si Linares mula ulo hanggang paa at kinuha ang sulat na iniabot sa kanya ng binata.*

13. Mga Nagkakalat ng Maling Impormasyon

Sina Hermana Pute, Hermana Ruffa, Kapitana Maria, Don Filipino, at ang binata ang mga tauhan sa nobela na nagpapakalat ng maling impormasyon tungkol kay Ibarra. Makikita ito sa kabanata 35: *“Ganito ang mga kabataan ngayon, tugon ng isang babae na mukhang mabait. “Kung nagkataon kayang buhay ang ina ng Ibarrang iyan ay ano kaya ang sasabihin niya? Ako ay may anak din na mainitin ang ulo. Kung sa darating na panahon ay mangyayari ito sa anak kong lalaki ay baka mamatay naman ako sa sama ng loob.”* Sinasalamin nila ang tsismoso’t tsismosa o marites kung tawagin sa kasalukuyan sapagkat naninira at gumagawa ito ng kuwento nang wala namang basehan na maaaring ikapahamak ng isang tao. Sila rin ay maituturing na judgmental o mapanghusga dahil naniniwala kaagad sila sa mga naririnig at nakikita.

14. Mga Mataas na Tao sa lipunan na iginagalang

Kabilang na sa representasyong ito ang mga politiko, pari, at mayayaman na iginagalang sa lipunan gaya nina Don Rafael, Padre Salvi, Kapitan Heneral, Padre Damaso, at ng Alperes. Pinapatunayan ng mga taong ito na sila ay may pangalan at kapangyarihan na makikilala kaagad ng madla. Gayunpaman, isa sa mga nabanggit ang tunay na nagpapakita ng kabutihan na karapatdapat iginalangkod sa Kapitan Heneral si Don Rafael na nagsilbi at tumulong sa mga taong nangangailangan. Inilahad ito sa kabanata 10: *Si Don Rafael ay ang pinakamayaman sa San Diego at ang mayari ng pinakamalawak na lupain. Siya ang takbuhan ng mga taong nagigipit at hindi naghahangad ng kapangyarihan. Iginagalang siya at kinawiwilihan ng iba. Siya ay hindi kabilang sa makapangyarihan sa San Diego.*

15. Biktima ng Pang-aabuso

Madugo ang nangyaring pang-aabuso sa loob ng nobela na mapahanggang sa kasalukuyan ay nararanasan pa rin lalong-lalo na ng mahihirap. Ilan nga riyan ay sina Crispin at Basilio, Tarsilo, Sisa, at mga anak ni Kapitan Pablo at pamilya ni Elias. Makikita ang ilang mga halimbawa sa kabanata 45: *“Isang alagad ng simbahan ang humalay sa aking mga anak na babae. Nagsiyasat ang dalawa kong anak na lalaki at hinuli, binitin.”* Ang mga pahayag na ito ay nagmula mismo kay Kapitan Pablo na nagpatunay na walang kalaban-laban ang mahirap na kagaya niya pagdating sa hustiya kaya naman naging daan ito sa kapitan upang gamitin ang sandata para maipaghigante ang kaniyang mga anak.

Ayon sa artikulo ng Philippine Revolution Web Center (2024), *“kinundena ng Karapatan-Central Visayas ang walang-tigil na intimidasyon at harassment ng mga puwersa ng estado sa pamilya ng mga Pulang mandirigma ng Bagong Hukbong Bayan para pilitin na umatras sa planong ipaawtopsiya ang labi ng biktima na si Hannah Cesista.”*

16. Mabuting Manggagawa

Sina Nól Juan at ang guro ay sumasalamin ng isang mabuting manggagawa sa kasalukuyan, sapagkat hindi naging tapat sila sa kanilang trabaho sa kabila ng pagsubok na kanilang kinakaharap lalong-lalo na ang guro na nakaranas ng galit mula sa kura. Halimbawa na lamang sa kabanata 19: *Inalis niya ang pamamalo sa paniniwalang ito ay nagdudulot ng takot kaya ayaw mag-aral ng mga bata. Nang mabilatahan ng kura ang kanyang ginawa ay binantaan siya na isusulong sa alkalde.* Walang nagawa ang guro kaya ibinalik niya ang pamalo na naging dahilan kung bakit natakot at nagalit ang mga bata sa kaniya. Gaya ng gurong ito, hindi rin matatawaran ang sakripisyo ng kaguruan dito sa Pilipinas; na sumusunod lamang sa sistema ng edukasyon hinggil sa pagtuturo.

17. Mabuting Pinuno o Lider sa Lipunan

Sa isang lipunan, mahalaga na magkaroon ng isang lider na hindi lamang nagbibigay ng magandang serbisyo sa publiko kundi lider na maaasahan at tapat sa kaniyang tungkulin. Gaya na lamang ng mga katangi-tanging lider sa nobela sina Tenyente Guevarra, Kapitan Heneral, at ang alkalde. Ilan sa mga magpapatunay rito ay ang pahayag ng Kapitan Heneral sa kabanata 37: *“Bilang kinatawan ng hari ng Espanya, wala akong hinahangad kundi ang kapayapaan at katahimikan ng mga nasasakupan.”*

18. Pagkadalisa at Inosente

Si Maria Clara. Siya ay hindi lamang nagtataglay ng kagandahang pisikal at kalooban kundi makikitaan din siya ng pagiging inosente at pagkadalisa dahil alagang-alaga ito at ni minsan ay hindi ito gumawa ng kung anong suliranin na maaari niyang ikapahamak. Inilahad ito sa kabanata 6: *Si Maria Clara ay minahal ng lahat. Ang mga prayle ay natutuwa kapag si Maria Clara ay nasa prusisyon. Siya ay nakasuot ng puting kasuotan.* Batay rito, hinahangaan ng lahat si Maria Clara dahil hindi maitataggi na ito ay marikit at tila isang birhen na naglalakad. Subalit, sa kasalukuyang panahon, ang mga kagaya ni Maria Clara na itinuturing na dalisa at inosente ay may kaakibat na diskriminasyon sapagkat sila ang kadalasang biktima. Ayon pa sa artikulong pinamagatang “Maria Clara, and why she is not the face to represent young Filipinas” ni Villamin (2022) ang kabataang hindi umaayon sa katauhan ni Maria Clara ay itinuring na “slut” na nagiging dahilan kung bakit hindi naging madali sa kanila na ipakita ang kanilang tunay na personalidad.

19. Social Isolationism

Sa bahaging ito, binibigyang-diin ang danas nina Pilosopo Tasyo, Sisa, at ng Taong Ketongin hinggil sa social isolationism na makikita pa rin sa kasalukuyan. Na-

gaganap ang ganitong uri ng karanasan kung saan ang inihihiwalay niya ang kaniyang sarili sa lipunan dahil sa ilang mga kadahilanan. Sa mga nabanggit, si Pilosopo Tasyo ang maituturing na isolated. Itinuring siyang baliw at hinusgahan ng mga tao dahil sa kaniyang dunong. Ito ay inilalahad sa kabanata 14: *"Dahil ang mabuting tao ay ipinalalagay nilang baliw," panlilibak na sabi ng matanda. "Hinahatulan nilang baliw ang tao kapag ang isipan ay iba sa kanila, tulad ng pagpapatang nila sa akin na ako ay baliw.*

B. *Mga Halagahang Pilipino sa Kasalukuyan na Tinatalakay sa Noli Me Tangere*

1. Pananampalataya

Ipinakita sa nobela na likas na sa mga Pilipino ang pagiging relihiyoso, pananampalataya sa mahal na Birhen tulad ng pagkakaroon ng prusisyon bilang pagkilala sa mga santo. Ayon sa artikulo ni Reyes (2023) na Sayaw sa Obando: Diskurso ng pagpapatibay ng pananampalataya at pagpapanatili ng kultura na hindi na nawaglit sa mga Pilipino ang pagiging relihiyoso. Naging marahas man sa kuwento ng Noli Me Tangere, hindi mawawala na malaki ang naitulong ng relihiyon upang mas lalong makilala ng mga tao ang itinuturing ng mga Kristiyano na Diyos. Sa kasalukuyan, napalalaganap ang pananampalatayang Kristyanismo-Katolisismo. Samakatuwid, naging matibay ang pundasyon ng relihiyon dahil nagsisilbi ito sa mga Pilipino na magkaroon ng kabuluhan at kahulugan ang buhay.

2. Pagiging mulat sa maling pamamalakad sa lipunan ng gobyerno

Ang pagmamahal sa bayan ay pagkakaroon ng galang at pakikisangkot sa sitwasyong nararanasan ng bayan na handang matuto sa kasaysayan ng Pilipinas. Kaugnay ito ng artikulo ni Torres-Yu (2016) na Usapin ng Kapangyarihan at Muling Pagsasalaysay ng Carancal. Inilalahad na sa larangan ng panitikang pambata, ito'y mahalagang proyektong pangkultura na muling maisalaysay upang maiparating sa bawat henerasyon na mambabasa ang nga akdang tinangkilik noon ay malinang ang kamalayan ng mga kabataan tungkol sa mga ugat ng kultura at tradisyon ng mga Pilipino.

3. Pagpapahalaga sa pamilya

Sa kasalukuyang panahon, makikita pa rin ang pagpapahalaga sa pamilya. Handang gawin ang lahat para sa anak. Halimbawa, kahit mahirap ang buhay, pinupursigang makapag-apon ang magulang makapagtapos lamang ang kanilang anak upang hindi na maulit pa ang nakagisnang buhay. Sunod, ang laging sinasabi ng mga ina na, "kakainin na lamang ng isang ina, ibibigay pa sa kaniyang anak." Makikita na lubos ang pagmamahal ng isang ina sa kaniyang anak na nairepresenta ni Sisa sa nobela.

4. Pagpapahalaga sa edukasyon

Pinatunayan sa artikulo nina Roman et al. (2015) na Pilosopiyang Pang-edukasyon ni Rizal: Isang Pilosopiyang Pilipino sa Edukasyon na itinuturing ni Dr. Jose Rizal na ang paaralan ay kumakatawan sa edukasyon at nagkaka-

roon.

5. Pagrespeto sa kababaihan

Para kay Rizal, higit pa ang kayang magawa ng babae, kailangang maging mulat sa kung ano ang papel, posisyon sa lipunan, kung gaano kalaki ang impluwensiya ng kababaihan sa kabataan at sa mga susunod pa na mga henerasyon. Halimbawa na lamang sa karakter ni Maria Clara. Mapapansin noon na iba ang paraan ng pagrespeto sa kababaihan. May pagtungo, hiwalay ang babae sa lalake pero sa nobela, mas naipakita ang di pagkakapantay-pantay ng lalake sa babae.

6. Pagmamahal sa kapwa

Ang pagpapahalaga sa kanila ay makikita sa pagiging tapat, maunawain, at handang tumulong sa oras ng pangangailangan. Sa karakter nila Crisostomo Ibarra at Elias-dito. Si Crisostomo Ibarra na hindi nagdalawang-isip na ibuwis ang kaniyang buhay sa piloto. Si Elias na binuwis ang buhay para sa ipinaglalaban ni Crisostomo Ibarra. Naipakita ni Ibarra na kahit buhay niya rin ay nakasalalay, walang alinlangan siyang tumalon para masagip ang piloto sa buwaya. Sa kasalukuyan, hindi man sa paraan ni Ibarra ngunit sa simpleng pagtulong, kayang gumawa nang mabuti na bababago sa buhay ng ibang tao.

7. Magalang at pagrespeto sa mga matatanda

Bata pa lang, tinuturuan nang paggamit ng mga magalang na salita, paghingi ng permiso, pagrespeto sa mganakatatanda, at simpleng pagyuko na kahulugan nito ay pagpapasalamat. Isa si Pilosopo Tasyo sa binibigyan ng respeto lalo na kapag kinakailangan ng mga pangaral at payo ng mga bata o ang mga matataas ang katungkulan sa bayan. Pinatunayan ito sa kabanata 25 ang halimbawa ang halagahang Pilipinong ito. Ang pagbibigay galang sa opinyong ibinigay ngayon, ang paraan ng paggalang at pagrespeto sa matatanda ay tinuturuan ng ang paggamit ng mga magalang na pananalita, paghingi ng permiso, pagrespeto sa mga nakakatanda, at iba pa.

8. Pagmamahal sa sariling kultura

Ang tradisyon na ating nakagisnan ay hanggang ngayon ay patuloy pinapanatili at minamahal pa rin ng mga Pilipino. Makikita sa nobela ang pagpapahalaga ng mga tao sa San Diego ang kultura lalo na ang pagdiriwang ng fiesta. Lahat ay may kani-kaniyang tungkulin at plano para sa ikagagandang pagdiriwang. Sa kasalukuyan, pinagpapatuloy pa rin ang tradisyon na nakagisnan ngunit mababakas sa paanong naiimpluwensyahan ng mga lumang kaugalian at paniniwala ang modernong panahon.

9. Pagtitiwala sa sarili

Ang pagkakaroon ng tiwala sa sarili ay nangangailangan ng determinasyon sa mga hangarin at ninanais sa buhay o sa kabutihan ng komunidad. Isa sa mga katangian ng mga Pilipino upang magampanan ang isang gawain ay ang pagkakaroon ng tiwala sa sarili at gabay ng mga matatanda. Nakita ito sa nobela na humingi ng payo si Crisostomo Ibarra kay Pilosopo Tasyo sa kaniyang nais na plano para



sa bayan ng San Diego.

10. Magiliw sa bisita

Nagpapakita ng mainit na pagtanggap sa mga taong dumalaw sa ating tahanan. Sa pamamagitan ng magalang na pakikitungo, pag-aanyaya, at pagbibigay ng kaginhawaan sa kanilang pananatili. Si Tiya Isabel at Kapitan Tiyago, Ang dalawang tauhang ito ang representasyon ng pagiging magiliw sa bisita. Bukas ang bahay nu Kapitan Tiago sa sinumang maaari o gustong pumunta sa kaniyang bahay.

11. Bukas palad sa mga nangangailangan

Katangiang nagpapakita ng taos-pusong pagtulong o handang magbahagi ng kung ano ang mayroon sa kapwa nang walang hinihintay na kapalit. Si Don Rafael Ibarra ang halimbawa sa pagiging bukas-palad sa mga nangangailanga. Hindi nag-atubiling tulungan ang pulubi kahit ito'y ikapapahamak niya. Ang kaniyang karakter sa nobela ay laging handang tumulong sa mga magsasaka at sa iba pang tao sa bayan. Sa kasalukuyan ito'y gumagawa ng malaking impluwensiya sa mga tao sa lipunan. Nakita natin itong pagtutulungan ng mga Pilipino noong pandemya.

C. Mga Suliraning Panlipunan sa Lokal at Global na Komunidad na Sinasalamin ng Nobela

1. Pang-aabuso/Pananamantala sa kapangyarihan

Si Padre Damaso at ilang pari sa San Diego ang isa sa pinagmulan ng mga suliraning ito kung saan sinasalamin din nila ang pang-aabuso at pananamantala nila sa mga tao sa San Diego. Para sa kanila, ang mga Pilipino ay isang indio na madaling utuin, alipustahin, at handang magijj sunud-sunuran para sa nais nila.

Ang pang-aabuso at pananamantala sa kapangyarihan ay isa sa mga pangunahing suliranin sa Noli Me Tangere. Sa tunay na kasalukuyang panahon ay nangyayari pa rin ito sa lipunang Pilipino. Marami ang mapang-abuso at nananamantala ng kapangyarihan, hindi na ng mga pari kundi ang mga politiko na. Mataas ang tingin ng mamamayan sa isang tao kapag ito ay may posisyon sa pamahalaan, ito ang kapangyarihan na inaabuso ng iilan at ginagamit para sa sariling kapakanan. Ito ay sinuportahan ng artikulo ni Bansil (2019), na may titulong “Relevance of Noli Me Tangere in the Present”. Ayon sa kaniya, isa ang abuse of power o pang-aabuso at pananamantala sa kapangyarihan. Makikita sa kasalukuyang panahon na marami pa ring may katungkulan ang umaabuso sa kanilang kapangyarihan na aglay. Patunay lamang na mula sa panahon na ikatha ang nobela hanggang sa kasalukuyang panahon ay patuloy pa ring lumalaganap ang pang-aabuso at pananamantala sa kapangyarihan.

2. Kawalan ng hustisya ng mga taong walang kakayahang

Isa si Don Rafael Ibarra ang hindi nabigyan ng hustisya sa kaniyang sinapit sa mga kura. Inalipusta, ikinulong, isinisi sa kaniya lahat

hanggang siya'y namatay na. Kahit nang siyang sumakabilang buhay ay inilagay ang kabaong ni Don Rafael Ibarra sa libingan ng mga Tsino.

Sa karanasan ni Don Rafael at ng ibang tauhan ay wala itong sapat na kakayahan na ipagtanggol ang kaniyang sarili dahil wala siyang posisyon at kapangyarihan sa lipunan. Mula sa artikulo ni Thalia (2018), isinaad na ang buhay ay madali lamang patakbuhan ng mga taong may kapangyarihan. Maraming kaso ang hindi nasasagot at maraming tao ang hindi nagkakamit ng sapat na hustisya dahil napawawalang bisa ang kaso kapag walang naibibigay na dapat na halaga upang gumulong ang kaso. Mula sa artikulo na ito makikita na hanggang sa kasalukuyang panahon ay umiiral pa rin ang maling sistema na ito. Tunay na hanggang ngayon ay hindi pa rin pantay ang pagtingin sa dalawang uri ng antas ng mga tao, ang mayaman at mahirap.

3. Kahirapan

Isa ang pamilya ni Sisa rito na nakararanas ng ganitong suliranin, sapagkat pati ang kaniyang mga anak ay nagtatrabaho upang may pangtustos sa pang-araw-araw na pangangailangan habang ang kaniyang asawa naman ay walang ibang ginawa kundi ang magsugal at iasa sa kaniyang mga asawa't anak ang perang ginagasta rito.

Batay sa naging pagsusuri, ang kahirapan bilang isang global at lokal na suliranin ay hindi na mawawala sa lipunan. Marami sa mga mamamayang Pilipino ang dummaan na sa ganitong suliranin na pinagsisikapang alisan dahil ito ay nagdudulot ng kakarampot at limitadong oportunidad sa buhay. Isa ang kahirapan sa mga ugat ng iba pang suliranin sa lipunan. Kung minsan, nakagagawa ng maling bagay o krimen ang isang tao na siya ring suliraning panlipunan dahil lang sa kahirapan sa buhay. Sa madaling salita, ito ang suliranin na nganganak ng iba pang suliranin.

4. Ilegal na negosyo

Ang ilegal na negosyo kagaya ng pasugalan na sabungan ang malalaking negosyo ng mayaman na tauhan sa nobela. Masusuri ito sa kabanata 46 ng librong Obra Maestra Batayang Akdang Pampanitikan: Noli Me Tangere sa kaganapang ito kung saan makikita ang pagkalulong ng mga tao sa sugal na sabong.

Ang mga ilegal na negosyo na may kaugnayan sa nasuri sa akda ay patuloy pa ring nangyayari, at mas lumalaki pa. Marami na ngayong mga pasugalan na kumakalat sa iba't ibang onlayn na aplikasyon. Nariyan ang onlayn na talpakan, mga card games, at mga lucky games. Kumikita ng malaki ang ganitong negosyo at kinagigiliwan ng marami dahil sa mataas na perang maaaring mapanalunan. Sa artikulo ng FEU Advocate (2022) na may titulong “Mula sa Sabungan Patungong Birtwal na Soltada: Ang Pagsusugal sa Walang Katiyakan”, binigyang diin ang pagtatalap sa



espasyong digital. Inilahad dito na binago ng pandemya ang sistema ng tradisyunal na sabong na nakasanayan ng mamamayang Pilipino. Sinasabing naging legal na ang e-sabong dahil sa marami na ang tumatangkilik dito at hindi naman na gambala ang sistema nito kumpara sa tradisyunal na paraan. Ngunit, kalaunan ay inirekomenda rin ng ilang senador na suspendihin ang e-sabong dahil sa kumakalat na balitang may mga nawawalang higit tatlung sabungero at hindi matukoy ang dahilan.

5. Kawalan ng mabuting ugnayan ng mamamayan at pamahalaan para sa ekonomiya

Nasuri ng mga mananaliksik ang hindi pag-unlad ng ekonomiya ng mga taga-San Diego sa nobelang Noli Me Tangere. Walang maayos na proyekto upang masuportahan ang mga maliliit na pamilihan at pinanggagalingan ng mga pangangailangan. Ito ay tanda na walang mabuti at maayos na ugnayan sa pagitan ng pamahalaan at mamamayan para sa ekonomiya.

Walang pag-unlad ng ekonomiya sa San Diego dahil na rin sa mga korap na namumuno rito. Sa totoong lipunan naman ngayon, may mga proyekto na nakatutulong sa mga kapuwa natin upang umunlad nang sama-sama at tulong-tulong para sa ekonomiya, gayunpaman hindi pa rin ito sapat. Maaaring may mga inilalatag na plano para sa pagpa-paunlad at pagtulong sa ating kapuwa Pilipino, ngunit hindi ito konkreto at walang kasiguraduhan.

6. Pagiging mangmang sa paggamit ng pera

Sa panahon ngayon ay tinatawag na itong pagiging “financially illiterate”. Nasuri mula sa nobela na may mga tauhan na hindi marunong o mangmang sa paggamit ng pera kung saan inilahad ang pagkatalo ni Kapitan Tiago sa sugal na sabong na nagpapakita ng malaking paglulustay ng pera.

Sa kasalukuyang panahon, unti-unti nang nilulutasan ang suliranin na ito sa lipunang Pilipino. Marami na ang nagsasagawa ng iba’t ibang palihan patungkol sa tamang paggamit ng pera. Gayundin, marami na ang kumakalat na mga bidyo sa mga social media platforms na naglalaman ng gabay o tips kung paano hawakan ang pera na ginagawa ng mga financial advisor. Sa artikulo ni Alip (2023), inilahad dito ang tungkol sa financial literacy, sinasabi na mainam na inuuna ng Bangko Sentral ng Pilipinas ang financial literacy and education na mga programa dahil mula sa datos ng Financial Inclusion Survey noong 2021, makikita na kapag tinatanong ang mga Pilipino patungkol sa usaping paggamit ng pera, dalawa lamang sa sampung Pilipino ang nakasasagot ng tama sa lahat. Mahalaga ang pera dahil ito ang sagot upang magkaroon ng mga pangangailangan kaya dapat na ang tamang paggamit nito ay ikalat sa buong lipunang Pilipino upang unti-unti na ring masolusyonan ang suliranin sa kahirapan.

7. Siraan sa pagitan ng mga negosyante/kalaban sa negosyo

Isa si Padre Damaso sa nirerespeto at kinatatakutan na kura sa San Diego dahil maling galaw, hindi pagsunod mo lamang sa kaniya ay hindi ka na masisikatan pa ng araw. Kaya niyang gawin ang kahit na ano gaya na lamang ang paninirang-puri sa kapwa negosyante upang siya lagi ang makilala sa bayan.

Sa kasalukuyang panahon na marami na ang negosyo nagkalat at madalas ay pare-parehas lamang ng produksyon, hindi na maaalis ang siraaan ng mga negosyante upang umangat lamang ang sarili nilang negosyo. Sa ulat ni Garzon (2020) makikita ang kaugnayan ng suliranin na ito sa nangyaring insidente. Dito, binanggit na isang negosyante sa Cavite ang namaril sa 4 na kapitbahay bago binaril ang sarili dahil sa sama ng loob nito sa paninira ng mga biktima sa maliit niyang negosyo na construction project. Nakalungkot ngunit hindi naiiwasan ang ganitong suliranin dahil tanyag sa lipunang Pilipino ang panghihila pababa sa mga taong nakaangat. Ngunit kahit ganoon pa man, mas marami pa rin ang mga taong sumusuporta na sa bawat isa lalo na sa mga maliliit at nag-uumpisa pa lamang na negosyo. Ito ang prinsipyo na ipinalalaganap sa panahon ngayon lalo na noong nagkaroon ng pandemya na halos lahat ng tao ay naghikahos.

8. Pagtatrabaho ng bata

Noon pa naman, suliranin na ng lipunan ang pagtatrabaho ng mga bata sa ating bayan. Sa hirap ng buhay, kinakailangang magbanat ng buto ang mga bata upang may makain sa pang-araw-araw. Halimbawa na rito ang dalawang magkapatid na sina Crispin at Basilio. Dahil sa pagmamahal nila sa kanilang pamilya, minabuti nilang magtrabaho sa simbahan upang may mabigay sa kanilang ina na si Sisa.

Hindi maikakaila na hanggang ngayon ay nananatili pa rin ang suliranin hinggil sa child labor ng lipunan lalo na’t marami pa ring kabataan ang nakararanas nito sa lansangan kung saan nagtatrabaho sila upang kumita ng salaping pangtustos sa kanilang pang-araw-araw na pangangailangan. Ayon sa batas, ang bawat tao ay may karapatan sa sapat na edukasyon bilang isa sa mga basikong pangangailangan ng isang tao. Ngunit, hindi maikakaila na hanggang ngayon ay nananatili pa rin ang suliraning child labor sa ating lipunan. Maraming bata pa ring nakikita sa lansangan na nagtatrabaho upang kumita ng salaping panustos sa araw-araw. Sa huling tala ng Philippine Statistics Authority noong 2023, tinatayang nasa 4.7 na porsyento ang mga nagtatrabahong bata na nasa edad 5 hanggang 17 na taon sa taong 2022. Kung itutumbas sa bilang, tinatayang nasa 1.40 na milyon ang nagtatrabahong bata na nasa edad 5 hanggang 17 na taon sa taong 2022 dito sa Pilipinas. Dagdag pa, ito tumaas mula sa nagdaang dalawang taon. Ang datos na ito ay nagpapatunay na pataas nang pataas ang mga



batang nagpapakahirap na magtrabaho upang kumita dahil kinakailangan kaysa nag-aaral sa loob ng paaralan.

9. Pang-aabuso sa bata

Naipakita sa nobela na bata pa lamang sila ay nagtatrabaho na upang makatulong sa kani- lang pamilya. Hanggang sa kanilang pagta- trabaho ay naabuso rin ang mga bata at kapag hindi nila nagawa ang isang gawain ay sila ay pinapalo o ikinukulong na naging bunga nang pagkamatay ni Crispin.

Makikita na hanggang sa ngayon ay hindi natitigil ang pang-aabuso sa mga bata sa ating lipunan. Lalo pang pinai- igting ang batas upang mas lalong bumaba pa nang patuloy ang bilang ng mga kaso na ito hanggang sa mawakasan na.

10. Pang-aabuso sa kababaihan

Bukod sa pang-aabuso na dinanas ni Sisa mula sa kaniyang asawa, marami pa siyang naranasan mula sa mga taong kumukutya sa kaniya dahil lang sa nawalan ito ng bait mat- apos hindi makita ang dalawang anak na sina Crispin at Basilio.

Ang pang-aabuso sa kababaihan ay isa rin sa mga nagpapatuloy na suliranin sa ating lipunan. Marami ang nakararanas ng ganitong pang-aabuso, may mga asawa babae na inaabuso ng asawang lalaki, may mga anak na in- aabuso ng magulang, at kababaihan na inaabuso ng ibang tao. Sa panahon ngayon ay may umiiral ng batas, ang RA 9262 o ang Anti-Violence Against Women and Their Children Act (VAWC Law). Ang batas na ito ay ginawa upang protektahan ang kababaihan at mga batang sa kahit porma ng pang-aabuso. Sa naging karanasan ni Sisa sa no- bela, hindi lamang ang kaniyang asawa ang umabuso sa kaniya gayundin ang kapuwa niya babae gaya ni Donya Consolacion na maging sa kasalukuyan ay danas din ng ilang kababaihan—dahil lamang sa mababang pagtingin nila sa mga ito at pagbibigay ng paunang opinyon nang hindi nalalaman ang tunay na pinagmulan nito.

11. Komplikadong sitwasyon ng edukasyon

Nasuri ng mga mananaliksik ang suliranin na ito sa mga kaganapan noong nagnanais ang tauhan na si Crisostomo Ibarra na makapag- patayo ng paaralan para sa mga bata, gayun- paman taliwas ang ilang kura dito dahil sa maaari nitong kalalabasan.

Batay rito, masusuri na ilan sa mga hindi nagpapahalaga sa edukasyon ay ang mga makapangyarihang kura na takot matuto ang mga Pilipino dahil maaari itong maging pun- dasyon ng pag-aklas mula sa kanilang mga kamay. Hang- gang sa kapakanan ng edukasyon ay ginagamit nila ang kanilang mga kapangyarihan upang makamit ang tanging ninanais para sa sariling kapakanan. Walang pakialam ang mga kura sa magiging lagay ng mga mamamayan na kani- lang sinasakupan basta nakapagsisilbi sila at nakukuha nila ang kanilang nais. Kilala ang mga kura na nagbibigay ng

payo sa mga mamamayan kaya naman kahit anong sabi- hin nito ay waring tama at nararapat para sa isipan ng mga tao. Kaya naman malaki ang naging impluwensiya nito sa mga tao na hindi unahin ang edukasyon sa buhay. Binang- git mula sa ulat ni Eclarinal (2023), “Kulang pa rin ng 2.5 milyon na mag-aaral ang Department of Education (DepEd) sa target nitong 28.8 milyong mag-aaral para sa school year 2023 hanggang 2024. Ito ay matapos ang ikalawang linggo ng klase kung saan 26.3 milyon ang opisyal na naka-enroll na mga mag-aaral sa elementarya at high school”. (para. 1 - 2). Sa panahon ngayon ay nakatanim na sa isipan ng karamihan sa mga Pilipino ang kahalagahan ng edukasyon. Ngunnit, may iilan pa ring hindi nagpapahalaga sa karunun- gang matatamo mula sa pag-aaral. May iilan pa ring pam- ilya na may mga anak na hindi nag-aaral na kung minsan ay dala na rin ng matinding kahirapan. Gayunpaman, kagaya ng nakasaad sa itaas, ang mga taong nasa katungkulan at may responsibilidad na solusyonan ang suliranin na ito ay kumikilos upang makuha ang hinahangad na bilang ng mga batang dapat na makapag-aral sa bansang Pilipinas.

12. Pagkakalat ng maling balita o pala- palagay/Paninirang puri

Batay sa naging pagsusuri, lumalabas ang pagkalat ng maling balita o paninirang puri mula sa mga tauhan ng nobela na kung saan naranasan ito ni Crisostomo Ibarra mula sa mga taong nakapaligid sa kaniya hinggil sa pag-uusap nila ni Padre Damaso.

Sa kasalukuyan, ilan sa kinakaharap na suliranin ngayon sa bansa ay ang “tsismis” o “pagmamarites” lalong- lalo na sa buhay ng ibang tao. Isa ito sa nangyayaring suliranin sa panahon ngayon na nagdudulot ng hindi mag- andang bagay sa buhay, lalo na sa buhay ng taong pinag- uusapan. Batay sa ulat ni Rico (2023), “Isinama sa panukalang batas laban sa workplace bullying na inihain sa Mababang Kapulungan ng Kongreso ang pagpapakalat ng tsismis at maling impormasyon bilang isang uri ng offense”. Naging mainit na usapan na rin ito sa kasalukuyang pana- hon dahil sa malaki at masama nitong naidudulot sa buhay ng mga tao. Palala nang palala ang ganitong suliranin na umaabot hanggang sa paninirang puri ng isang tao. Madalas itong mangyari sa pagitan ng mga taong nasa iisang lugar, maaaring sa isang purok, trabaho, paaralan, at iba pa. Kaya naman, mas lalong pinaiigting ang batas laban sa ganitong suliranin upang mawakasan na. Sa ngayon ay may umiiral ng batas laban dito, ang RA 10173 o ang Data Privacy Act of 2012. Ito ay may layon na protektahan ang mga per- sonal na datos at impormasyon ng isang tao na ikalat o pag- usapan sa sistema ng gobyerno at pribadong sektor. Dahil dito ay mas nagiging seryoso na ang pagtingin sa ganitong suliranin.

13. Seksuwal na pang-aabuso

Nasuri ng mga mananaliksik ang ganitong uri ng suliranin sa kaganapan na kung saan ay naliligo sina Maria Clara at ang kaniyang mga kaibigan sa ilog nang hindi namamalayan na

sinisilipan na pala sila ni Padre Salvi.

Ang pangyayaring ito sa nobela ay umiiral din sa tunay na buhay hindi lamang sa Pilipinas kundi sa buong mundo; na nangangahulugan na ito ay pag-abuso rin sa karapatan ng mga kababaihan. Ayon nga sa Artikulo ni Murray (2021) na mayroong tatlong babae sa mundo ang nakararanas ng seksuwal na pang-aabuso, at ang kadalasang biktima ay mga kababaihang nasa edad 15-45 sinasabi na mas marami pa ang biktima ng seksuwal na pang-aabuso kaysa sa inilabas na resulta sapagkat tikom ang mga bibig ng mga biktima dahil na rin sa kultura at lipunang ginagalawan.

14. Pagsusugal

Makikita ang ganitong suliranin sa mga ilang kaganapan sa nobela na kung saan ay ipinagdiriwang ng mga tao sa San Diego ang bisperas ng Pista kung saan inilalahad ang pagdating ng mga kilalang tao sa sabungan.

Makikita naman sa nobela ang nakahiligan ng ilang mamamayan ng San Diego, ang pagsusugal (sabong) lalo na noong ipinagdiriwang nila ang bisperas ng Pista rito. Sa madaling salita, kasama na ito sa kanilang tradisyon. Mula rito, pinapatunayan na ang sabong ay laganap noong kapanahunan ng mga mananakop at umiiral pa rin ito maging sa tunay na buhay. Gayunpaman, marami ang nalulong dito lalong-lalo na rito sa Pilipinas na tinatawag nilang “talpak” o “e-sabong”. Ito ang suliraning hindi nagdudulot ng maganda sa buhay ng tao, sa pagkalulong sa sugal ay nagdudulot ito ng matinding problema na nagbubunga ng kahirapan.

15. Panlipunang uri

Ito ay malaking suliranin na makikita sa nobela na kung saan ito ay nagiging basehan ng ilang mamamayan kung paano tratuhin ang isang tao–batay sa katayuan nito sa buhay.

Ito ay malaking suliranin na makikita sa nobela na kung saan ay ito ang basehan ng mamamayan kung paano tatratuhin ang isang tao. Sa kasalukuyan ay nangyari pa rin ang ganitong uri ng suliranin, hindi naman maipagkakaila na malaki ang kahalagahan ng antas sa lipunan ng isang tao dahil ito ay may labis na epekto sa kung paano mamumuhay ang mga tao sa lipunang kanilang ginagalawan. Batay sa artikulo ni Paul (2023) na pinamagatang Social Stratification in the Philippines Understanding Class/Divisions and Inequality, isa ang Pilipinas sa mga nahahati batay sa pagkakakilanlan sa lipunan base sa yaman, uri ng trabaho at antas ng edukasyon. Sa tuktok ng social hierarchy sa Pilipinas ay ang mga tinatawag na elites na kung saan binubuo ito ng mga mayayamang indibiduwal na maimpluwensyang politiko at mga negosyante. Kilala sila bilang may hindi mabilang na kapangyarihan, kayamanan at mga mapagkukunan, na kung saan ay may kakayahan silang kontrolin ang sistemang pang-ekonomiya at pamulitika sa bansa. Ang kanilang pribilehiyong katayuan ay kadalasang nagsasanggalang sa kanila mula sa mga paghihirap at hamon na kinakaharap ng karamihan ng populasyon.

16. Pambu-bully

Nasuri ng mga mananaliksik ang ganitong suliranin sa nobela na kung saan pinintasan ni Doña Victorina ang bahay ng mga indio at inutusan ang asawang paluin ng sumbrero ang mga hindi nagpupugay sa kaniya.

Mahihinuha sa kabanata na likas na kay Doña Victorina ang panglala ito sa kapuwa, sa talas ng pananalita nito at mapagmasid na mga mata ay parang naging hobby na nito ang pambu-bully. Ayon kay Meguin (2022) ang bullying ay ang malaking problemang kinakaharap ng mundo, sa paaralan man o sa onlayn na espasyo. Pito sa sampung estudyante ay nakararanas ng bullying. Sa panahon ngayon ay may ginawa ng batas para rito, ang Republic Act No. 10627 o ang Anti-Bullying Act layon ng batas na ito na maprotektahan ang mga batang nag-aaral laban sa pambu-bully, kinakailangang mapatibay ng mga paaralan ang mga polisiya upang mapagtuunan ng pansin ang pagkakaroon ng bullying sa isang institusyon.

17. Paggamit ng dahas ng mga nasa puwesto

Nasuri ng mga mananaliksik ang ganitong suliranin sa nobela na kung saan ang mga pari sa Noli Me Tangere at ang mga nasa matataas na posisyon ay ginagamit ang kapangyarihan upang masunod ang kagustuhan, gaya na lamang ng pagpaparusa ng hindi makatarungan at pangbubugbog para lamang mapaamin ang mga taong nagkasala kahit pa inosente ito.

Isa ito sa suliraning kinakaharap hanggang sa kasalukuyan, ginagamit pa rin ang dahas upang mapasunod ang mga tao lalo na ang mga nasa laylayan. Dahil dito, pinapatunayan lamang na laganap pa rin ang paggamit ng dahas sa kasalukuyan partikular na sa mga taong lumalaban sa kanilang mga karapatan—na kahit sila ang inaabuso, sila pa rin ang tinuturing na kalaban.

18. Pamba-blackmail

Nasuri ng mga mananaliksik ang ganitong suliranin sa nobela sa kaganapan na tinakot ng mga sibil ang inosenteng si Ibarra gayundin ang kapaganapan sa kung paano takutin ni Donya Victorina si Linares sa pamamagitan ng isang liham.

Nasuri ng mga mananaliksik ang ganitong suliranin sa nobela sa kaganapan na tinakot ng mga sibil ang inosenteng si Ibarra. Mahihinuha sa kabanata na laganap ang ganitong uri ng suliranin noon, na kung saan ay tatakutin ang isang tao upang mapasunod ito gaya na lamang ng ginawa ni Doña Victorina kay Linares na kung saan ay tinakot nitong ipapabatid niya kay Kapitan Tiago ay hindi siya naging kalihim at hindi nakasama ni Heneral Martinez. Hindi pa rin nawawala ang suliranin sa kasalukuyan, tatakutin ang inosenteng tao para sa sariling kapakanan.



19. Pangagamit/Panamamantala

Nasuri ng mga mananaliksik ang ganitong suliranin sa nobela na kung saan ay nagsisihan ang mag-asawang Kapitan Tinong at Kapitana Tinchang tungkol sa nangyari kay Ibarra, nagtuturuan ang dalawa kung sino ang may pakana ng pakikipag-usap kay Ibarra para sa yaman nito.

Nasuri ng mga mananaliksik ang ganitong suliranin sa nobela na kung saan ay nagsisihan ang mag-asawang Kapitan Tinong at Kapitana Tinchang tungkol sa nangyari kay Ibarra, nagtuturuan ang dalawa kung sino ang may pakana ng pakikipag-usap kay Ibarra para sa yaman nito. Ang ganitong eksena ay nangyayari pa rin sa kasalukuyan na nagpakita lamang kung gaano kasakim ang isang tao para sa salapi na gagawin ang lahat kahit pa ang pangagamit at panamamantala. Ayon sa ulat ni Garcia (2024) sa Philstar News Ngayon, ay tinawag ng bise presidente Sara Duterte ang pera kapalit ng pirma para sa People's Initiative bilang pagsasamantala sa mga mahihirap. "Ito ay pagsasamantala sa kahirapan ng ating mga mamamayan at kawalan ng respeto sa kanilang karapatan na magdesisyon nang malaya, walang takot, o impluwensya gamit ang salapi," ayon kay Duterte.

20. Extra-judicial na pagpatay

Ito ay nasuri ng mga mananaliksik mula sa dinanas ng tauhan na si Tarsilo sa kamay nina Alperes, Doña Consolacion, at mga guwardiya sibil noong siya ay pinaamin ng Alperes kung ano ang ipinangako ni Ibarra sa kaniya bilang kapalit ng gagawing paglusob sa kuwartel.

Sa ngayon ay may mga naitatala pa ring ganitong suliraning panlipunan sa ating bansa. Banggit sa ulat ni Laqui (2024) sa PhilStar Global, "A report from the United States (U.S.) Department of State said that extrajudicial killings (EJKs) in the Philippines remain a "serious problem". Dagdag pa, "The U.S. State Department attributed the EJKs to the "arbitrary or unlawful killings by police in connection with anti drug operations" as the administration of President Ferdinand Marcos Jr. continued the war on drugs started by his predecessor, former President Rodrigo Duterte" Ang suliranin na umiiral din sa ating bansa. Ito ay dulot ng labis na kagustuhan na mawakasan ang paggamit ng bawal na gamot. Ngunit, kung minsan ay siya na ring sinasamantala ng mga taong nasa posisyon na magbigay ng hatol o parusa sa mga taong nahuhuli na tunay na nagkasala at hindi tunay na nagkasala.

21. Tangkang pagpatay

Ang suliranin na ito ay may malaking bahagi sa mga kaganapan na nangyari sa nobela gaya ng ginawa ng Taong Madilaw kay Crisostomo Ibarra sa araw ng paghuhugos.

Nasuri ng mga mananaliksik ang tangkang pagpatay na ginawa ng Taong Madilaw kay Ibarra gayundin ang pag-

atangka ng binata sa buhay ni Padre Damaso. Ang ganitong kaganapan ay maaaring makapagbago sa mga susunod pa na kaganapan sa nobela. Sa kasalukuyang lipunan ng Pilipinas, nananatili pa rin ang suliranin o isyu na ito. Batay sa ulat ni De Galicia (2023), "Judge Michael Vito of the Regional Trial Court of Gumaca Branch 172 on Tuesday, April 25, sentenced four Quezon province cops from five years and eight months to ten years of imprisonment for the attempted murder on November 1, 2018 of pedicab driver Roger Herrero Jr.". Sa ulat na ito ipinapakita na ang ganitong suliranin ay nangyayari pa rin at maaaring gawin ng kahit sinong tao sa lipunan. Malaki ang naging epekto nito lalo na sa naging biktima. Ang suliranin na ito ay mapahamak at kalaunan ay mas pinag-iigting pa at isinasabatas ang pagpuksa.

22. Pagdidikta/Diktatoryal

Ang pagdidikta ng tauhang si Padre Damaso sa nobela ay nasuri ng mga mananaliksik sa pakikitungo niya kay Kapitan Tiago para sa anak na si Maria Clara. Isa itong suliranin na mayroong malaking epekto sa buhay ng magamang sina Kapitan Tiago at Maria Clara.

Hindi lingid sa kaalaman ng mga Pilipino ang pamamahalang diktatoryal na nangyari noong pamumuno ng dating pangulong si Ferdinand Marcos Sr., ito ay pilit na nilaban at winakasan dahil sa nangyaring EDSA People Power Revolution. Sa artikulo ni Sanchez (2021) inilahad ang dahilan ng rebolusyon na ito. Noong Pebrero 22 hanggang 25 taong 1986, daang libong mga Pilipino ang nagkaisa sa Epifanio de los Santos Avenue o EDSA upang magprotesta laban kay dating Pangulo Ferdinand Marcos Sr. at dahil sa pagako nito ng pagkapanalo sa eleksiyon laban kay Corazon Aquino.

23. Pagrebelde

Sa nobela, nasuri ng mga mananaliksik ang pagrerebelde na nakita sa pangkat ng tauhan na si Kapitan Pablo. Nasabing isa itong suliranin dahil sa mga kaguluhan na idinudulot nito sa buong lipunan. Ngunit, inilahad na ito ay bunga ng pang-aabuso na ginawa sa kanila ng mga taong nasa posisyon at may kapangyarihan.

Ang pagrerebelde ay isa sa mga suliraning bunga ng paghahangad ng ilang mamamayan na wakasan ang pamamahala na taliwas sa kanilang paniniwala at umaabuso sa kanila. Sa kasalukuyan, mayroong pangkat sa ating bansa na may parehong layunin kagaya ng pangkat ng tauhan na si Kapitan Pablo sa nobela. Ang pangkat na ito ay tinatawag na NPA o New People's Army. Sa ulat ni Samonte (2024) sinasabi na noong Enero 13, 2024, mayroong ipinaskil na bidyo sa opisyal na akawnt ni Pangulong Ferdinand Marcos Jr. kung saan sinasabi niyang wala ng aktibong NPA na kampo at pangkat simula Disyembre 2023. Ayon pa raw sa tala ng AFP o Armed Forces of the Philippines, sinasabi niyang maaari nang sabihin ng gobyerno na matagumpay ang naging kampanya nito laban sa mga lokal na terorismo.



24. Paggamit ng bawal na gamot

Bukod sa suliraning pagsusugal, ang paggamit ng ipinagbabawal na gamot ay nasuri din ng mga mananaliksik sa tauhang si Kapitan Tiago lalo na't isa ito sa kaniyang libangan na magdudulot din sa kaniya ng kapahamakan.

Sa ulat ni Caliwan (2024) sa Philippines News Agency sinabi na “Police authorities seized epektibiti. 132 million worth of illegal drugs in the first 18 days of the year, the country’s top cop said Monday.” (para. 1). Dagdag pa, “In a press briefing at Camp Crame, Philippine National Police (PNP) chief Gen. Benjamin Acorda Jr. said 1,376 anti-illegal drugs operations were launched from Jan. 1 to 18, resulting in the arrest of 1,661 drug suspects.” (para. 2). Hanggang sa ngayon ay hindi pa rin nawawakasan ang suliranin na ito sa ating bansa, maging sa global. Isa ito sa mga isyu o suliranin na nagdudulot ng iba pang suliranin na umiiral sa loob ng lipunan. Hindi matigil ang suliranin sa paggamit ng bawal na gamot dahil hindi rin matigil ang operasyon, paglikha, at pagbebenta ng mga taong nasa likod nito. Ngunit kahit na ganoon pa man, umiiral pa rin ang mga batas at proyektong pumupuksa sa suliranin na ito.

D. *Ang Mungkahing Materyal sa Pagtuturo na Angkop sa Pagtatalakay sa mga Suliraning Panlipunan*

Upang mailapat ang mga pagsusuri na nagawa ng mga mananaliksik. Ang awtput ng pag-aaral ay isang mungkahing materyal na offline module/ebook likha mula sa Kotobee Author Application. Ito ay isang interaktibong ebook software at digital publishing platform. Gamit ang aplikasyon na ito ay maraming nailapat na mga feature ang mga mananaliksik na makatutulong upang mas lalo itong maging kagaya-gayak at epektibo sa pagtuturo ng nobelang Noli Me Tangere partikular na sa suliranin panlipunan na sinasalamain nito sa kasalukuyan. Gamit din ang aplikasyon na ito, narito ang mga katangian na mayroon ang awtput, ang mga ito ay mayroong malaking kaugnayan na napulot mula sa kabuoang pagsusuri ng nobela:

1. May disenyo

Ang pagtuturo ng Noli Me Tangere partikular na sa suliraning panlipunan nito ay kinakailangan ng mga makukulay na disenyo o elemento upang mas makakuha ng atensyon ng mga mag-aaral.

2. Nakagagayak ang paggamit ng materyal

Nasuri ng mga mananaliksik ang kahalagahan ng pagiging nakagagayak ng isang materyal. Upang makuha ang atensyon ng mga mag-aaral kinakailangan ng mga bagay na mailalapat para dito.

3. Maayos ang mga impormasyon

Ang bawat impormasyon na nakasaad sa aralin ay isinaayos base sa uri ng pagkatuto nito. Sa paraan na ito, mas madaling nahabi ng mga mananaliksik ang mga datos na mahalagang matutuhan para sa pag-aaral.

4. Naglalaman ng mga pampalinang ng kaalaman na gawain

Ito ay mahalaga upang mataya ang pagkatuto ng mga mag-aaral kada kabanata o tauhan na pinag-aaralan sa Noli Me Tangere. Ang mga gawain na ito ay may kaugnayan sa bawat tauhan at pangyayari na nakalahad sa bawat pahina ng modyul.

5. Moderno

Ang pagiging moderno ay isang epektibong katangian ng mga kagamitang panturo sa panahon ngayon. Ito ay dahil ang mga mag-aaral ay nasanay nang gumamit ng bagay na madali lamang ang akses nila. Ang awtput ng pag-aaral na ito ay may lapit sa modernong materyal ng pagtuturo at pagkatuto.

6. Pleksible

Ang awtput na nilikha ng mga mananaliksik ay offline module/e-book na maaaring gamitin ng parehang guro at mag-aaral. Ito ay mabubuksan gamit ang aplikasyong Kotobee Reader.

CONCLUSION

Batay sa natuklasan ng mga mananaliksik, narito ang mga sumusunod na konklusyon: (1) Ang mga representasyong panlipunan ng mga tauhan sa nobela ay nananatiling makatotohanan at nararanasan pa rin ng mga Pilipino sa kasalukuyan; na nagpapatunay sa kaugnayan ng panitikan at lipunan. Ang mga tauhan at kanilang karanasan ay salamin ng mga umiiral na kaganapan sa lipunang Pilipino; (2) Masasalamain din sa nobela ang mga halagahang Pilipino gaya ng kanilang mga gawi, paniniwala, at aral. Pina-patunayan din nito na patuloy itong isinasabuhay at ipinapalaganap hindi lamang sa panitikan kundi sa tunay na buhay; (3) Ang mga suliraning lokal at global ay tunay na nakakaapekto sa mga Pilipinong nakararanas nito. Binibigyang-pansin nito ang walang katapusang pagsira sa kanilang pagkatao sa lipunang kanilang ginagalawan; (4) napatunayan na ang aplikasyong Kotobee Author ay angkop at maaaring gamitin bilang pantulong sa pagtuturo ng mga guro sa kanilang mag-aaral sa nobelang Noli Me Tangere. Makatutulong din ang modyul na ito sa pagbibigay ng mga aral at impormasyon tungkol sa mga nakapaloob na representasyon ng nasabing nobela; (5) Inirerekomenda ng mga mananaliksik na nararapat na malaman ng mga mag-aaral ang mga suliraning panlipunan na magsisimula sa paaralan sa pamamagitan ng kontekstuwalisadong pagtuturo ng nobelang Noli Me Tangere sa sekundarya; (6) Inirerekomenda rin ng mga mananaliksik na ang iminungkahing materyal ng mga mananaliksik na offline module/ebook likha gamit ang Kotobee Author Application ay maaaring maging kagamitang panturo ng mga guro at mag-aaral sa ikasiyam na baitang para sa pagtatalakay ng Noli Me Tangere; (7) Bukod sa mungkahing materyal, inirerekomenda rin ng mga mananaliksik na maaaring makapaglahad pa ng karagdagang kagamitang panturo ang mga susunod na mananaliksik sa mga guro sa Filipino sa pagtalakay ng nobelang Noli Me

Tangere sa sekondarya.

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CONFLICT OF INTEREST

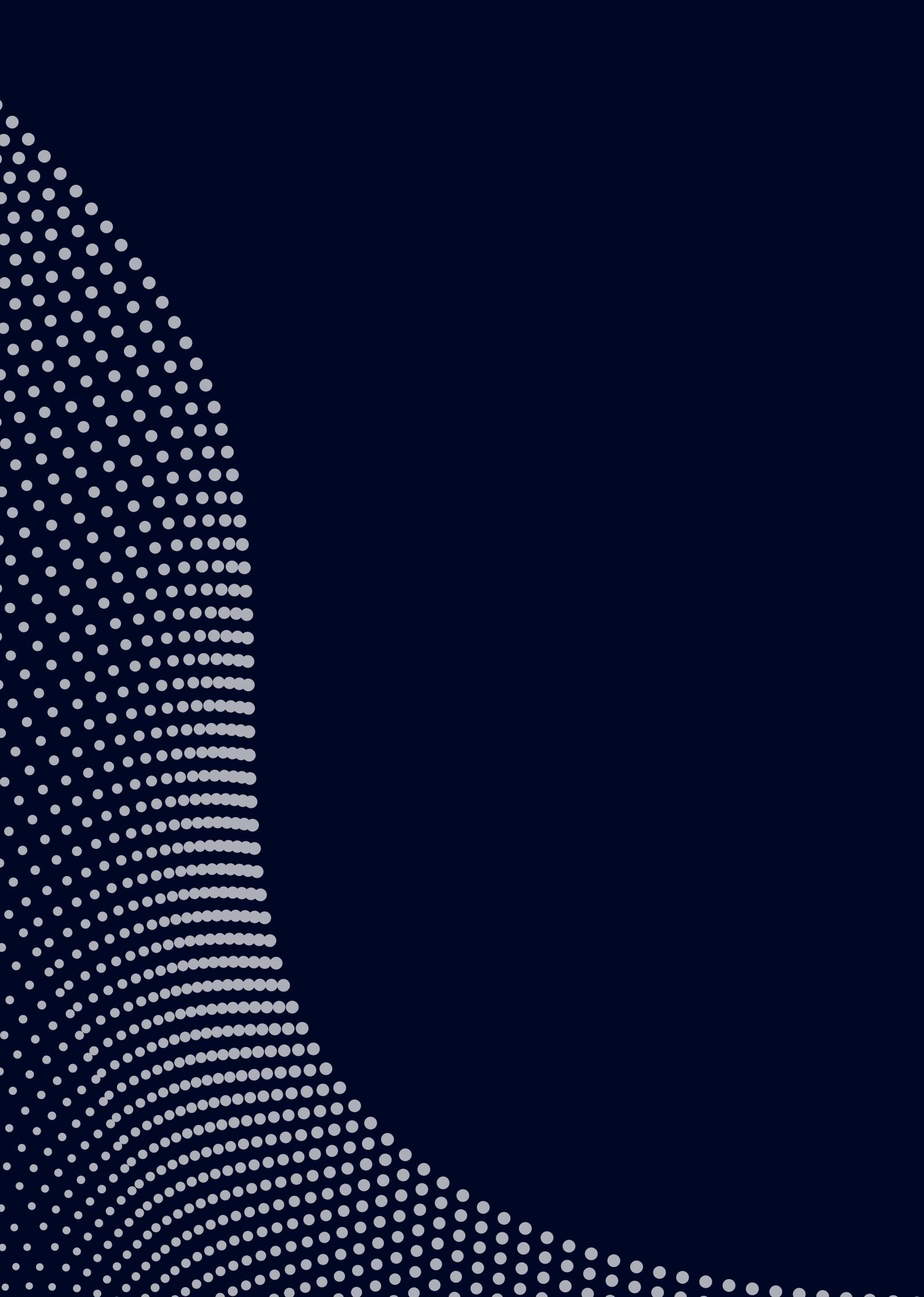
Idinedeklara ng mga mananaliksik na wala itong *conflict of interest*.

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The Rizalian

Dalubtalaan

Acquiring Automatic Picture Transmission of NOAA 18 & 19 using V-Dipole Antenna for Philippine Cloud Cover Monitoring

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Abstract– The National Oceanic and Atmospheric Administration (NOAA) of the United States invests heavily in launching and operating satellites for weather and climate forecasts, as well as environmental data gathering for oceanic, coastal, and land monitoring. NOAA 18 and NOAA 19 Satellites are one of many series of weather forecasting satellites that transmit automatic picture transmission (APT), allowing any user station to receive local data from these satellites. Gathering data for cloud cover is important in the field of Meteorology and weather analysis as it describes meteorological phenomena, and it impacts climate and weather conditions. Using a computer-based radio scanner with a wide frequency range and a dipole V-shape horizontal antenna paired with a low-noise amplifier, this simple setup is sufficient to receive the APT transmitted at 137 MHz. Optimal conditions for acquiring automatic picture transmissions through the V-Dipole Antenna are simulated in the MMANA-GAL. The APT received from NOAA 18 and NOAA 19 Satellites, containing cloud cover images of the country twice a day, was decoded using SatDump. In conclusion, the processed picture transmissions of the archipelago were able to produce visible and infrared spectrum channels that created MCIR composite and rain composite imageries that are fit for visualizing cloud cover monitoring which accounted for the ± 20.687 kHz of Offset shifting the frequency of NOAA 18 and NOAA 19 to a varying range of 137.892 MHz to 137.933 MHz and 137.079 MHz to 137.121 MHz respectively. Moreover, the results indicated that the height and maximum elevation of the satellite pass have an established relationship with maximizing the gain of the antenna, for which the V-Dipole antenna, having a gain of 7.88 dBi and 7.9 dBi should be placed with a height of 8 meters, maximizing its efficiency. Other factors, such as exploring the gain-height relationship of the antenna, reducing the frequency offset, and using other composite filters, are highly suggested.

Keywords– NOAA, Dipole Antenna, Automatic Picture Transmission, 137-Mhz, Polar Orbiting Satellite

INTRODUCTION

Cloud cover is an important factor in both weather and climate as it impacts the precipitation conditions and surface temperatures (National Geographic Society Data and Information Service, 2023). The NOAA Polar-orbiting Operational Environmental Satellites (POES) are polar weather orbiting satellites that accurately gather data to improve weather analysis, including cloud coverage, environmental forecasting, and global climate monitoring (Klaes et al., 2007). These satellites have an analog image transmission system called Automatic Picture Transmission (APT) that enables any user station on the surface to access the weather satellite image data. The weather satellites orbit the Earth about 14 times every day with two passes above the user, travelling from one pole to another, sufficient to provide weather data such as the cloud coverage (National Environmental Satellite Data and Information Service, 2022).

The NOAA Satellites carry Advanced Very High-Resolution Radiometer (AVHRR) for multipurpose imagery and earth observation, enabling these satellites to capture the cloud covering and to measure the cloud optical depth, top height, temperature, leaf area index, and normalized difference vegetation index, sea surface temperature, and sea ice cover (World Meteorological Organization, 2022). Since the APT signals from the NOAA Satellites are

right-handed circularly polarized, a realistic option to generate a satisfactory signal reception is a linearly polarized dipole antenna.

This paper analyzed the hardware and software implementation, emphasizing the antenna designed to receive and decode the APT signal from NOAA 18 and NOAA 19 weather satellites for monitoring cloud cover over the Philippine Archipelago. The type of antenna, as one of the hardware, is a simple V-dipole antenna configured to receive a 137-Megahertz (MHz) APT Signal. The use of this antenna design to receive signals from NOAA weather satellites was proposed and practically tested by Adam 9A4QZ with excellent and promising results. The dipole is arranged into a horizontal ‘V’ shape and spread apart by 120 degrees opening southward or northward so that it will be optimal for NOAA Satellites traveling north to south or vice versa. A USB dongle, most known as Realtek Software Defined Radio (RTL-SDR), which utilizes an RTL2832U chipset, is used for computer-based radio receiving and was attached to a low-noise amplifier with a 20 dB signal gain. The tracking software is called GPredict, and the decoding program, known as SatDumb, is a versatile data processing application featuring real-time decoding, map overlays, advanced color enhancements, three-dimensional imagery, animations, multi-pass imaging, text overlays, and projec-

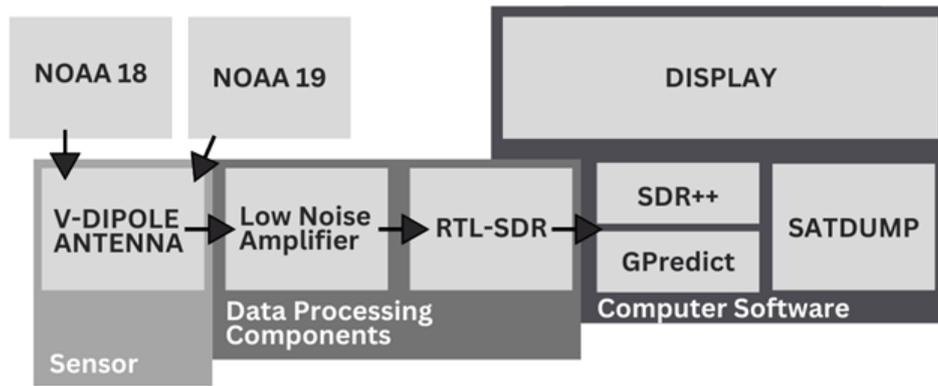


Figure 1 Block Diagram of the Data Acquisition for Satellite Image

Table 1 V-Dipole Antenna Measurement Results of 137.9125 MHz (NOAA 18)

R (Ω)	jX (Ω)	SWR 50	Ga dBi	F/B dB	Ground	Heights
107.7	220.7	11.6	2.01	0.05	Free	–
125.7	268.3	11.6	5.6	0.07	Real	0.5 m
109.2	193.9	9.42	6.47	0.26	Real	1.0 m
116.7	209.4	10.2	6.89	0.3	Real	2.0 m
11.4	221.8	11.2	7.35	0.29	Real	4.0 m
105.6	223.6	12.0	7.88	0.27	Real	8.0 m
109.6	220.6	11.4	7.78	0.28	Real	16.0 m

tion transformations (such as Mercator).

METHODOLOGY

In this study, the data acquisition for satellite image consisted of a computer installed with software for tracking the satellite and decoding the APT, RTL-SDR, female-to-female connector connecting the RTL-SDR and low noise amplifier, 75-Ohms coaxial cable, and V-dipole antenna.

Figure 1 describes the process of data acquisition linearly specifying each part. The V-dipole antenna receives an APT signal from the NOAA Satellites, and this signal is then transferred to the low noise amplifier through the coaxial cable. The low-noise amplifier amplifies the very low-power APT signal, supplying it with significant power gain. The amplified signal is now received by the RTL-SDR, directing it to the computer’s software-defined radio program SDR++. The GPredict tracks the satellite, displaying tracking data in lists, maps, and polar circular maps. The received APT signal is then recorded by SDR++ and then decoded by SatDump, turning it into an image with various filters and overlays, and enhancements such as sea temperature, contrast enhancements, MCIR map color in infrared, thermal, and vegetation for scientific applications.

The V-Dipole Antenna proposed and tested by Adam-9A4QZ was modified, so its legs, with a length of 53.4 centimeters and 120 degrees apart, are in the horizontal direction, enhancing the satellite signals directed towards the front, side, and top of the antenna. Moreover, the hori-

zontally polarized antenna has the advantage of reducing the interference of terrestrial signal with vertical polarization to 20 decibels. The antenna is facing north or south due to the direction of the NOAA satellites orbiting from north to south direction, or south to north (Fathurahman et al., 2019). The V-Dipole Antenna is a suitable antenna to receive the circularly polarized radio waves of the NOAA satellites at about 137 megahertz.

The antenna was mounted to a telescopic tripod to adjust the height accordingly. It was placed on a rooftop with a plain view of the horizon facing south. The Legs of the antenna are 5mm aluminum rods attached to the elements of the coaxial cable using bolts and nuts. RTL-SDR is directly attached to the USB port of the laptop while also connected to the low-noise amplifier via a connector.

RESULTS AND DISCUSSION

A. V-Dipole Antenna Analysis

Figure 2 shows the v-dipole antenna modeled in the antenna analyzing software MMANA-Gal. The antenna analysis from the software was focused on the frequencies of NOAA 18 and NOAA 19, with height as the independent variable. Table 1 presents the antenna measurement results of NOAA 18. The resistance (R) and the reactance (jX) indicate significant fluctuation in impedance as the height varies while the SWR with values ranging from 9.42 to 12.0 have a noticeable impedance mismatch at 50 ohms feedline. The gain measured in dBi increases as the height increases,

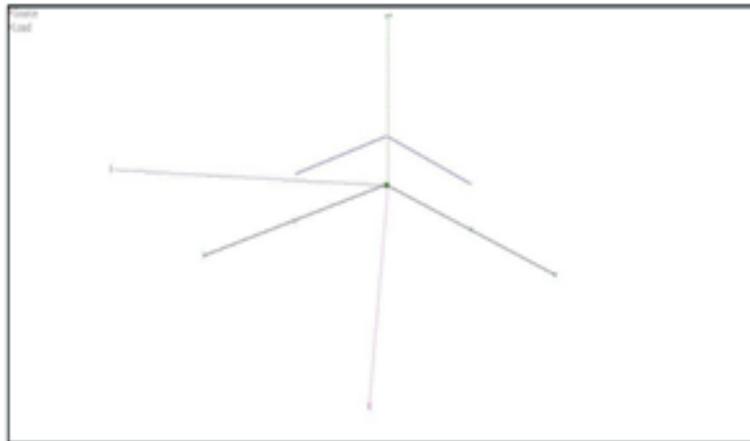


Figure 2 V-Dipole Antenna Geometrical View in MMANA-Gal

Table 2 V-Dipole Antenna Measurement Results of 137.1000 MHz (NOAA 19)

R (Ω)	jX (Ω)	SWR 50	Ga dBi	F/B dB	Ground	Heights
105.0	215.3	11.2	2.01	0.05	Free	–
121.5	261.3	14.0	5.61	0.07	Real	0.5 m
107.4	188.1	9.09	6.42	0.25	Real	1.0 m
114.3	203.9	9.9	6.86	0.29	Real	2.0 m
111.8	216.4	11.0	7.36	0.29	Real	4.0 m
102.1	216.5	11.6	7.9	0.26	Real	8.0 m
106.5	215.2	11.2	7.79	0.28	Real	16.0 m

with a maximum measured value of 7.88 dBi in 8.0 meters. The Front-to-Back Ratio also increases directly proportional to the height with a maximum value of 0.29 dB at 16 meters. Table 2 shows the antenna measurement results for NOAA 19. The resistance (R) and the reactance (jX) also indicate significant impedance fluctuation and the SWR with values ranging from 10.2 to 12, indicating impedance mismatch at 50 Ω . The gain and the F/B also have a direct proportion to height, with a maximum gain of 7.9 at 8 meters and a maximum value of 0.29 at 4 meters for Front-to-Back Ratio. Both tables show that the gain of both frequencies improves with high placement of the antenna, while low placement degrades its directionality.

B. Frequency Offset

The frequency offset refers to the minor deviation in radio frequency caused by discrepancies between the transmitter and receiver oscillators, as well as the Doppler effect resulting from the transmitter’s motion (Moose, 1994). The RTL-SDR consisted of a low-quality crystal oscillator with a ± 150 PPM offset, which corresponds to a 20.687 kHz frequency offset. The NOAA 19, with a working frequency of 137.1000, which deviated from its non-offset frequency of 137.079 MHz, and the NOAA 18, with a working frequency of 137.9125 MHz, which deviated from its non-offset frequency of 137.892 MHz. The deviations caused by the offset in the frequency on NOAA 18 and NOAA 19 is caused by the RTL-SDR’s low-quality crystal oscillator and by en-

vironmental factors, specifically temperature (Wiryadinata et al., 2018).

C. Acquisition Results

1. NOAA 18 Satellite Pass

The path of NOAA 18 in its pass at coordinates of 4°33’ N, 121°06’ E and a time of 10:52 AM at Philippine Standard Time (PhST) on May 22, 2024, started from the north with an initial azimuth of 11.76 degrees, transversing the horizon with a maximum elevation of 88 degrees on the western horizon and ending to the south with an azimuth of 194.22 degrees. The recording lasted 8 minutes and 45 seconds while the pass lasted 13 minutes. The antenna height was 0.5 meters to take advantage of the high elevation pass of the satellite.

2. NOAA 19 Satellite Pass

The path of NOAA 19 in its pass at coordinates of 4°33’ N, 121°06’ E and a time of 9:11 AM PhST on May 23, 2024, started from the north with an initial azimuth of 12.57 degrees, transversing the horizon with a maximum elevation of 89 degrees on the eastern horizon and ending to the south with an azimuth of 193.24 degrees. The recording duration lasted for 8 minutes and 35 seconds, while the pass lasted again for 15 minutes. The antenna height was 0.5 meters, the same as NOAA 18, to take advantage of the high elevation pass of the satellite.

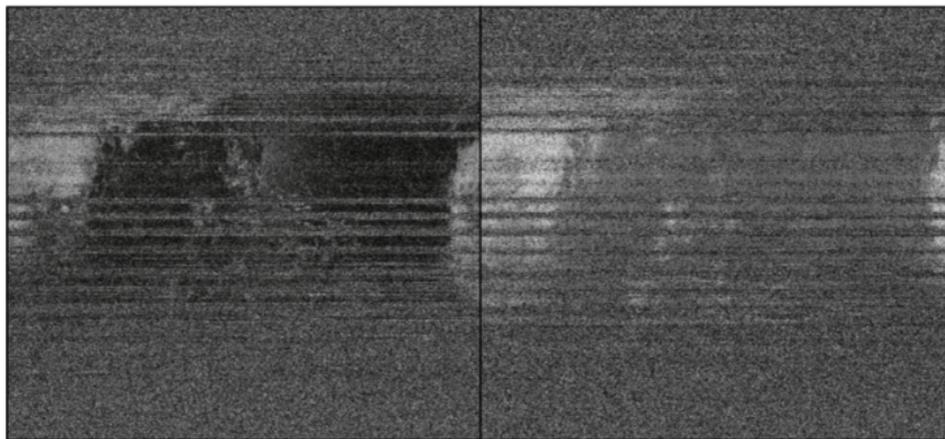


Figure 3 Channel A (Left) and Channel B (Right) of NOAA 18

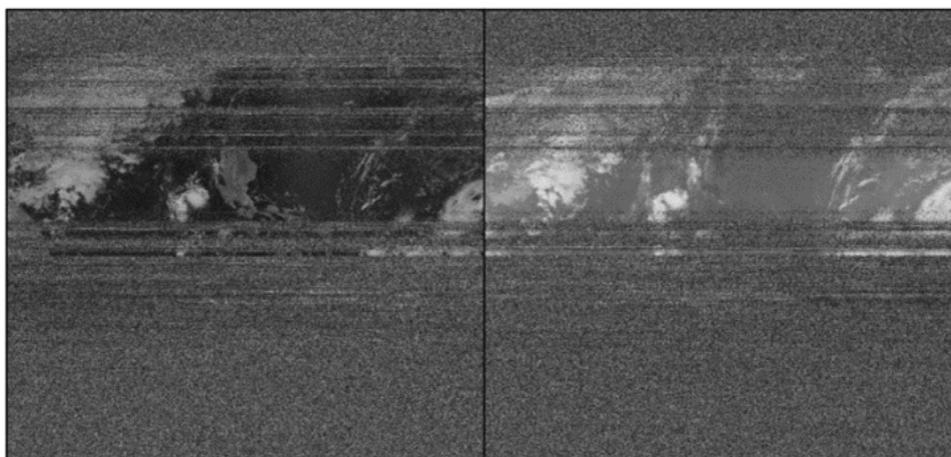


Figure 4 Channel A (Left) and Channel B (Right) of NOAA 19

3. Processed Image

The images data (Figures 3 & 4) from NOAA 18 and NOAA 19 consist of two channels, which are channel A and channel B. Channel A is for visible light, whereas channel B is for infrared. These channels were produced by the 2400 Hz pixel values embedded in the audio file received by the antenna. The Advanced Very High-Resolution Radiometer (AVHRR) employed by NOAA Satellites is a wide-field-of-view spaceborne sensor with a spatial resolution of 4 km, producing maps with 1:8000 scale and is corrected for a nearly constant geometric resolution to free the image of distortion due to the curvature of the earth (National Environmental Satellite Data and Information Service, 2022).

Processed Channels A and B produced different RGB Composite imagery to highlight the presence of meteorological phenomena, specifically cloud cover (Stowe et al., 1991). MCIR composite (Figure 5) enhances the clouds in the composites appearing as white and progressively less transparent as the cloud thickens, preserving more cloud data. MCIR Rain composite (Figure 6) shows the likelihood of precipitation appearing green, yellow, red and black.

CONCLUSION

This paper analyzed the V-dipole Antenna from the designs of Adam 9A4QZ tuned in 137 Mhz as an inexpensive antenna for receiving automatic picture transmission (APT) signals from NOAA 18 and NOAA 19. The V-dipole Antenna with RTL-SDR as its software-defined radio receiver was able to receive APT signals from the NOAA 18 and 19 satellites and was able to decode and process the signal into an image using the decoding software SatDump. Employed with an MCIR filter, the images highlighted meteorological phenomena, enhancing the resolution of the cloud coverage during the passes and gathering substantial meteorological data for analysis and cloud cover prediction. The processed picture transmissions of the archipelago were able to produce visible and infrared spectrum channels. An offset ± 20.687 kHz was observed, which is due to low low-quality crystal oscillator utilized by the RTL-SDR and other chemical-induced factors such as temperature. This offset shifted the frequency of NOAA 18 and NOAA 19 to a varying range of 137.892 MHz to 137.933 MHz and 137.079 MHz to 137.121 MHz, respectively. Moreover, modeling the V-Dipole antenna in MMANA-Gal provided numerical

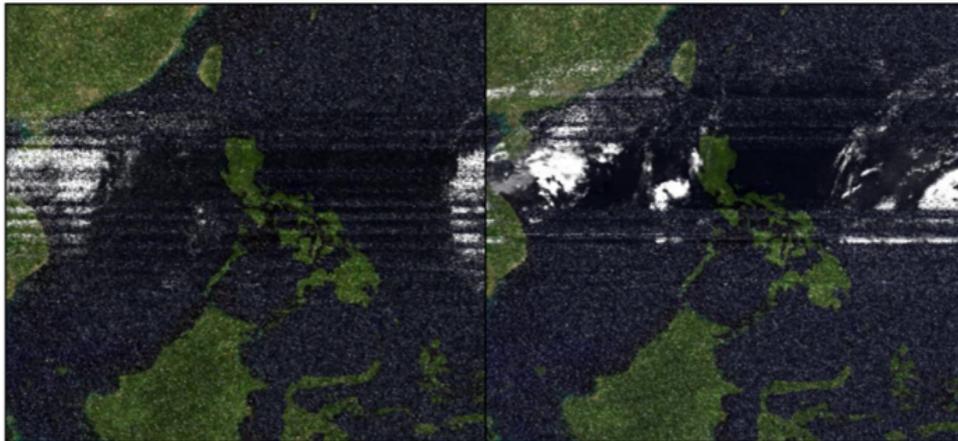


Figure 5 MCIR Composite of NOAA 18 (Left) and NOAA 19 (Right)

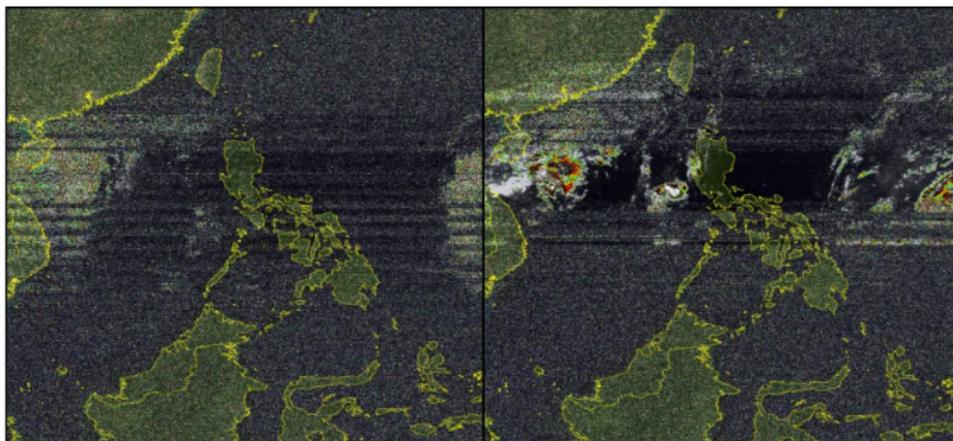


Figure 6 MCIR Composite of NOAA 19 (Left) and NOAA 19 (Right)

interpretation presenting the relationship between the gain and placement of the antenna. The efficient placement of the V-Dipole antenna for its gain of 7.88 dBi for NOAA 18 and 7.9 dBi of gain for NOAA 19 is for both placements of 8 meters.

Other factors that affect the signal reception from NOAA satellites should be explored such as the pass height of the satellite and the Front-to-Back Ratio of the antenna, extensive signal reception in different heights to improve the image quality and reducing the frequency offset using other software-defined radio that is superior to RTL-SDR could also improve the image quality. In addition, extending the composite filters to show algal bloom, sea surface temperature monitoring, and forest fire detection is highly suggested.

ACKNOWLEDGMENT

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CONFLICT OF INTEREST

The authors declare that there is no conflict of interest.

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Symbiotic Eclipsing R Aquarii: Metallicity and Pulsation Analysis

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Abstract— A staple in binary symbiotic research, R Aquarii is revisited again. This study aimed to address the absence of direct, published spectroscopic metallicity analyses of R Aqr's stellar components by conducting pulsation (light) curve analysis and metallicity analysis. Utilizing long-standing UVBRI photometric data from the AAVSO International Database, Period04 software was employed for light curve analysis, while MESA simulated stellar parameters and chemical evolution. Key findings include a primary Mira variable pulsation period of 311.36 days, and a second frequency period of approximately 2.51 days. The 1974-1983 and 2018-present eclipses showed significantly dimmer light curves (8th - 11th magnitudes) compared to the 1928-1934 eclipse (6th - 8th magnitudes), with the light curve displaying quasi-periodic behavior and a long-timescale modulation of oscillation amplitude. The metallicity is within the expected diversity of molecular gases, with hydrogen gases at lower solar mass attributed to the surrounding nebula, and ⁴He and ¹⁶O line profiles suggesting co-location within the same structures. A mass loss rate of approximately $\sim 6.3 \times 10^{-7}$ to $6.5 \times 10^{-7} M_{\odot}/\text{yr}$ was estimated. The researchers recommend more high-resolution observations to fully understand R Aqr's circumstellar envelope and jet kinematics, along with revisiting the primary frequency's link to the jets.

Keywords— *R Aquarii, symbiotic star, variable star, metallicity*

INTRODUCTION

A symbiotic binary is a specific type of interacting binary star system that consists of a cool, evolved star, such as an aging red giant, partnered with a much hotter, compact companion, typically a white dwarf or a neutron star. The defining characteristic of these systems is the transfer of material from the cool giant to its dense companion (Merc, 2025; Mikołajewska, 2007; Perko, 2021).

R Aqr is one of the closest known symbiotic systems (Vasquez-Torres et al., 2024), located approximately 650 to 710 light-years (200-218 parsecs) from Earth, which allows for detailed observation of its intricate outflows and stellar dynamics (ESA, 2024; Toalá et al., 2022). Its system comprises two profoundly different components: a mira variable (red giant), and a white dwarf companion (ESA, 2024).

Further, its primary star is an aging red giant that has exhausted its core hydrogen fuel and expanded to a colossal size, estimated to be more than 400 times the diameter of our Sun (Andreoli, 2025; ESA, 2024). It undergoes powerful pulsations, causing its brightness to dramatically change by a factor of up to 750 over a roughly 385- to 390-day period (AAVSO, n.d.; ESA, 2024; Gromadzki & Mikołajewska, 2009b; Perko, 2021; Tucio et al., 2025). Its mass is estimated at 1 to 1.5 solar masses (M_{\odot}), luminosity around 4,780 solar luminosities (L), and temperature approximately 2,800 Kelvin (K). This pulsation behavior has been documented in detail for over 180 years (AAVSO, n.d.; ESA, 2024; Tucio et al., 2025).

Its companion is a compact, hot, and dense white dwarf,

representing the end-stage core of a star. It is surrounded by an accretion disk, which is continuously fed by the mass lost from its giant companion, primarily through a stellar wind. When the material, rich in hydrogen, accumulates to a critical mass and pressure on the white dwarf's surface, it triggers spontaneous bursts of thermonuclear fusion, akin to a colossal hydrogen bomb. These outbursts violently eject excess material and energy. Its mass is estimated at 0.6 to 1 M_{\odot} , a radius greater than 0.1 R_{\odot} , luminosity 5 to 20 L, and temperature around 60,000 K (ESA, 2024; Gromadzki & Mikołajewska, 2009b; Hinkle et al., 2022).

R Aqr is enveloped by an intricate hourglass-shaped nebula called Cederblad 211, believed to be the remnant of past explosive episodes. It also features a prominent, S-shaped bipolar jet that ejects material at immense speeds and actively shapes the larger nebular structures. Historical records suggest that nova-like outbursts occurred around 1073 AD and the 1770s, forming rings of material that are still observed today (Andreoli, 2025; ESA, 2024; Toalá et al., 2022).

R Aqr serves as a unique astrophysical laboratory for investigating stellar evolution, mass transfer, and high-energy phenomena. Its jets exhibit properties similar to those produced by supermassive black holes, making it a crucial scaled-down laboratory for studying jet and accretion disk physics. It is also considered a critical object for understanding the late stages of stellar evolution, potentially being a progenitor of planetary nebulae and Type Ia supernovae (Toalá et al., 2022; Tucio et al., 2025).

While light curve analysis has been exceptionally suc-



successful in understanding R Aqr, the sources indicate the need for continued, long-term monitoring to capture future outbursts and eclipses. This ongoing observation is essential to refine our understanding of this dynamic and volatile stellar system. The success of predicting and observing the 2022 eclipse, based on long-term data and multi-wavelength campaigns, highlights that continued light curve analysis can still address the continuous "gap" in fully characterizing and predicting every aspect of the system's complex, accretion-driven events and their impact on the stellar environment (Hinkle et al., 2022; SAO, 2023; Tucio et al., 2025). This also indirectly contributes to resolving issues like the kinematics of the jet, which still presents discrepancies requiring future high-resolution spectroscopic campaigns (Liimets et al., 2018), as multi-wavelength light curve data provides crucial context for such studies (Hinkle et al., 2022).

A significant and explicit gap identified in the research for R Aqr is the absence of direct, published spectroscopic metallicity analyses of the stellar components themselves. The sources note that while R Aqr is recognized for its role in releasing heavy elements into the interstellar medium, there is no formal quantitative data on the photospheric metallicity of its stars. This presents a clear opportunity for future spectroscopic studies to address this known challenge in the field of symbiotic stars (ESA, 2024; Gromadzki & Mikołajewska, 2009a; Hinkle et al., 2022; Mikołajewska et al., 2005).

To further understand the dynamic processes, behavior, and stellar composition of R Aqr, this paper conducted a pulsation (light) curve analysis using Period04 and a metallicity analysis using MESA. The following sections outline the details of the study's methodology, data, processing, and the instruments used. The Results and Discussion section relates the results of the study's pulsation and metallicity analysis to existing studies in symbiotic binaries.

METHODOLOGY

A. Data and Processing

Figure 1 shows the data acquisition and processing workflow of the study. The development of novel devices over the last several decades and their use by amateur astronomers has played an essential role in gathering good observational photometric data (Kalaei & Hasanzadeh, 2019), which can better understand R Aquarii behavior. Photometric data for R Aquarii is obtained from the American Association of Variable Star Observers (<http://www.aavso.org>) database. The data archived came from the British Astronomical Association Variable Star Section and Royal Astronomical Society of New Zealand with data dated as early as the 1800s until the present. The observations include the Julian date of the observation and the visual magnitude of the variable at the reported time. The data includes other bands such as the ultraviolet and infrared noted as U and I, respectively. Around 2018, R Aquarii data includes UVBRI and other bands useful for understanding the peculiarity of its pulsation and system.

B. Instruments Used

An essential issue in time series analysis is the effects of external factors on the signals, such as the extent of variability in the data caused by measurement error caused by external perturbations. There is a lack of evidence that there are oscillations in the dynamics instead of random perturbations (Kaplan & Glass, 1995). Fourier Transform is an effective technique for detecting critical characteristics of a time series. Period04 software packages were used (Lenz & Breger, 2005), which combines Fourier and least-square algorithms. The Fourier transform (FT) was used to investigate the irregular behavior of the R Aquarii light curve from January 1970 to December 2023 only, which includes the current eclipse and its predecessor. To detect frequency and amplitude evolution, a time-frequency technique was used. The time plot string, Fourier Transform, Frequencies, and Amplitudes were all processed and computed in Period04. We used Python language to perform basic statistics graphs and plots. To obtain more information about the evolution of the light curve, we have referred to the work of Kalaei and Hasanzadeh (2019) about the time series analysis of R Scuti's light curve. Time series were divided into 49 sections, each with a length of about three years, long enough to consider the behavior of the prominent peaks. For a detailed study, the values of peak frequencies and amplitudes for every section were extracted and plotted into a line graph to look for variations. Then, for binary evolution, the researchers used Modules for Experiments in Stellar Astrophysics (MESA) to determine its stellar parameters. This open-source library suite is designed for a variety of computational stellar astrophysics applications. It is efficient, thread-safe, and built to handle complex calculations reliably (Paxton et al., 2011). MESA can fully integrate nuclear networks containing hundreds of isotopes, enabling precise simulations of advanced burning stages essential for developing supernova progenitor models. MESAbinary is a MESA module designed for evolving binary star systems using MESAstar. It can simulate a full stellar model alongside a point mass companion or simultaneously evolve both stars' structures. The module also includes options for modeling stellar rotation, assuming each star's rotational axis is perpendicular to the orbital plane, and incorporates the effects of tidal interactions and spin-up caused by accretion (Paxton et al., 2015).

$$\begin{aligned} \dot{Y}_i = & \sum_j c_i \lambda_j Y_j + \sum_{j,k} \frac{c_i}{|c_j|!|c_k|!} \lambda_{j,k} Y_j Y_k \\ & + \sum_{j,k,l} \frac{c_i}{|c_j|!|c_k|!|c_l|!} \lambda_{j,k,l} Y_j Y_k Y_l. \end{aligned} \quad (1)$$

Equation 1 describes the continuum limit of reacting nuclei, "where Y_i is the abundance of isotope i , λ is a reaction rate, and the three sums are over-reactions that produce or destroy a nucleus of species i with 1, 2, and 3 reacting nuclei, respectively e.g., (Meyer et al., 1998); (Hix & Meyer, 2006); (Guidry et al., 2013); (Longland et al., 2014). The positive or negative stoichiometric coefficients c_i account for the number of nuclei created or destroyed in a reaction.

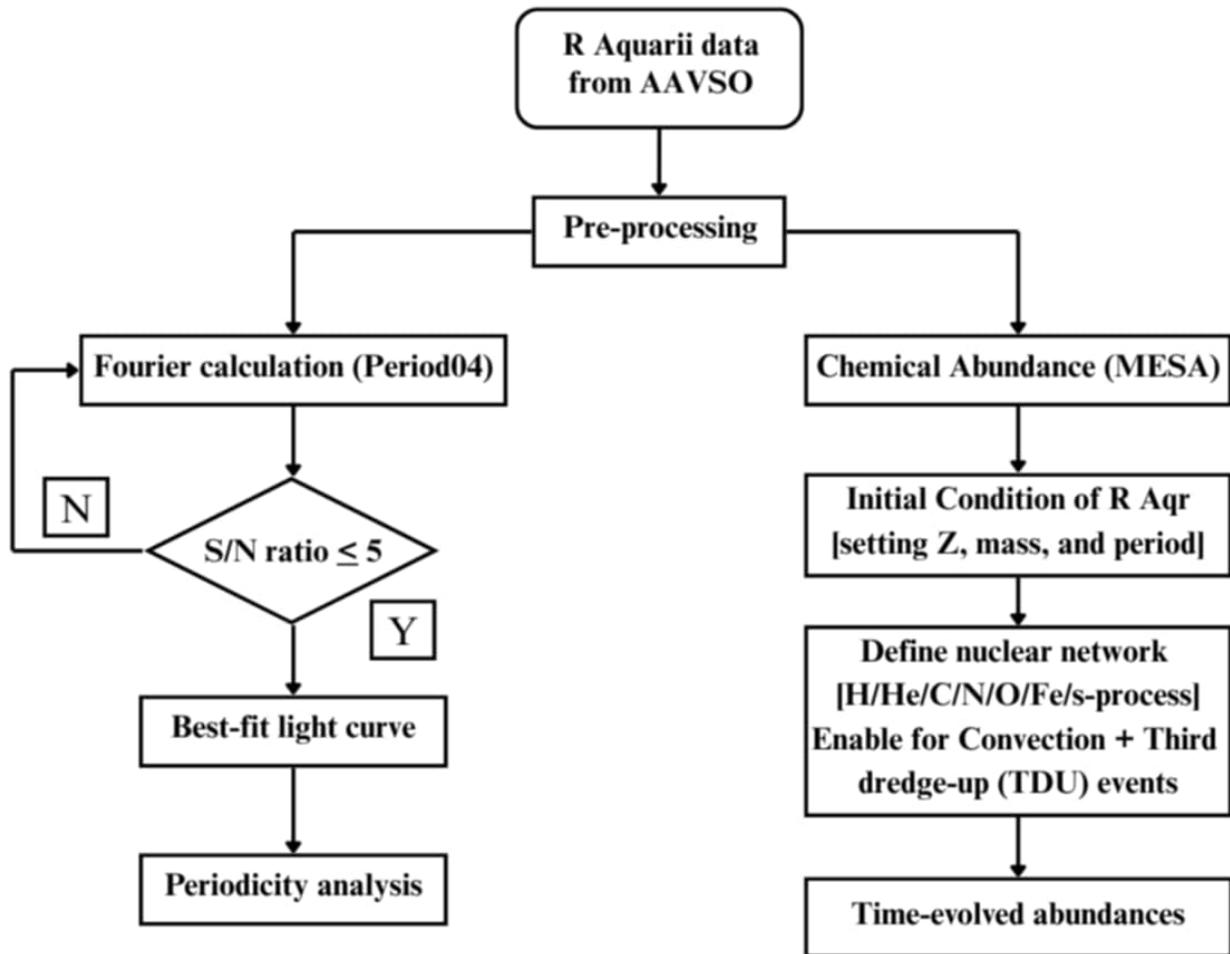


Figure 1 Data and Processing Workflow

The factorials in the denominators avoid double counting of identical particles” (Paxton et al., 2015). Matplotlib was used to visualize the simulation’s data in real-time and generate graphs for the duration of the simulation.

RESULTS AND DISCUSSION

A. Light Curve Analysis

A light curve’s record of brightness changes can aid astronomers in comprehending mechanisms at work within the object they observe and identify specific categories (or classes) of stellar occurrences (TheImagineTeamNASA, 2013). Based on the observations and on the processed time series plot, R Aquarii appears to brighten and dim from time to time . The obscuration in R Aquarii was explained in terms of orbitally related eclipses of the Mira by pre-existing dust. It has been suggested that similar events occur in other symbiotic Miras (Kastner et al., 2000). The last eclipse of R Aquarii was in 1978 and is currently experiencing an eclipse, which happens every 44 years (AAVSO, 2021) and lasts for about 8 years (AAVSO, n.d.). Figure 2 summarizes the eclipsing phenomenon of the binary and also shows the usual dimming and brightness of the Mira

star aside from the eclipse. The usual depth of the light curve at around 11 magnitudes and reaches up to 5th magnitudes. Between 1928 and 1934, R Aquarii brightened from the 11th magnitude to 9th and even as bright as 6th magnitude until it faded back to its usual brightness (AAVSO, n.d.). These are different to the 1974 eclipse and to the ongoing eclipse which have relatively dimmer values. We note that the light curve has decreased since the Mira-type star will soon pass through the line-of-sight of its companion high-energetic star. Since white dwarfs are magnetic, this might have been the cause of the sparring of this light series. It can also be seen on the last panel; the series of light periods were observed in the much shorter time. The same observation was made by Liimets et al. (2020) in their research on R Aquarii, focusing on its jet. By comparing the jet evolution of R Aquarii from 2002 to 2012 with that of 2019, Liimets et al. (2020) detected significant structural, morphological, and brightness changes in the system’s jet after 7-years, suggesting a continuing phase of reduced variability in the Mira star. It was suggested that these changes were related to either the dimming brought on by enhanced mass-loss from the AGB or the continuing eclipse of the Mira by the White Dwarf and its accretion disc, which be-

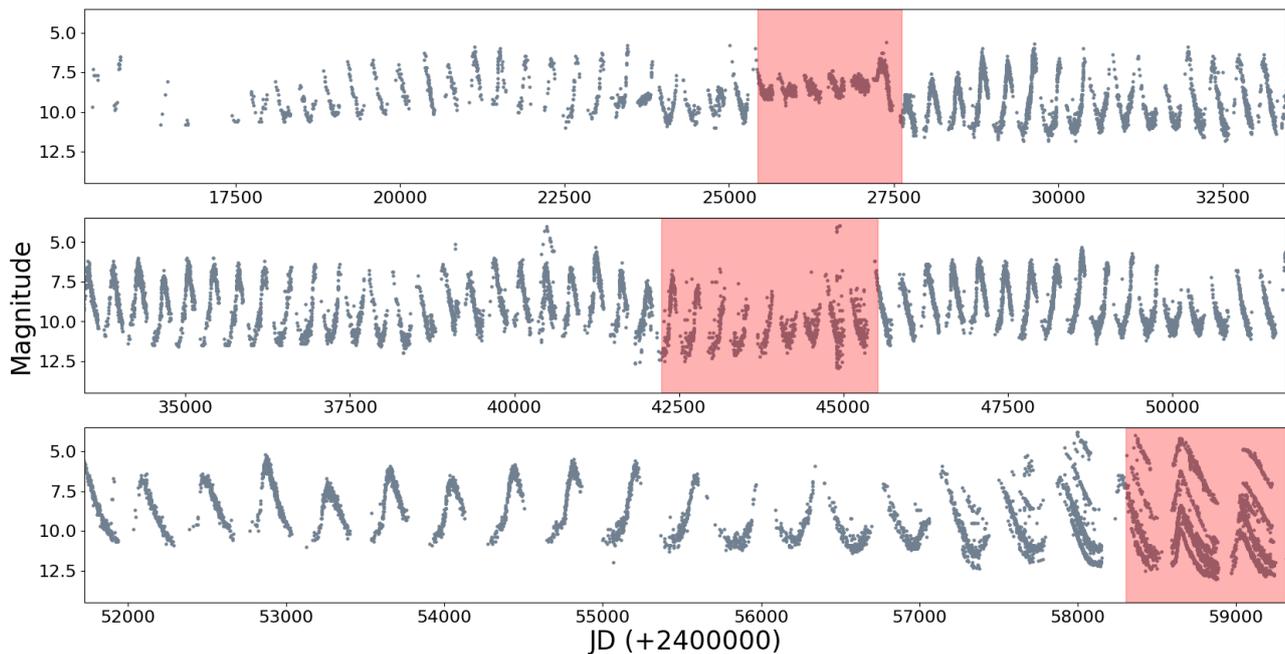


Figure 2 Light Curve of the R Aquarii from 1900 to 2024. In red panels: (a) top panel shows the 1928-1934 eclipse, (b) middle panel shows the 1974-1983 eclipse, and (c) the bottom eclipse of the R Aquarii started in 2018.

Table 1 Values of peak frequencies and amplitudes of R Aquarii during 1970-2020

Years	freq 1 (day^{-1})	amp 1 (mmag)	freq 2 (day^{-1})	amp 2 (mmag)	freq 3 (day^{-1})	amp 3 (mmag)
1970-72	0.0051125330	0.6730859320	0.0016827712	0.7296595460	0.0104533295	0.4494951950
1971-73	0.0024649811	1.6540032500	0.0056564965	0.5295205660	0.0076292242	0.5778104320
1972-74	0.0025271611	1.7947124600	0.0077802162	0.6122333230	0.0036037557	0.2891474530
1973-75	0.0025737063	1.7504429600	0.0079163562	0.5766494870	0.0037831480	0.2242109200
1974-76	0.0025728079	1.7332344100	0.0078028263	0.6003378890	0.8146812170	0.2732256240

gan in 2018.

We investigated the observations for the R Aquarii for the past 51 years. There were two observations with the most replicates (Figure 2), at around 7th and 10th magnitudes. Other memorable values are in between the said magnitudes. This suggests that for the several decades, R Aquarii appears dimmer at almost 11th magnitude and shines at 7th magnitude. From the obtained time string plot and Fourier graph, we observed that the light curve of R Aquarii follows a particular increase and decrease pattern from time to time. Hack and Dous (2018) states that the mean light curve of R Aquarii exhibits a broad minimum lasting 6 to 7 months, followed by a rapid rise to maximum. The shape and amplitude of the light curve vary significantly from cycle to cycle. In some cases, the variability was almost non-existent. This occurred, for example, in the years 1905-10, 1928-30, and 1974-78. As a result, the light curve exhibits a type of long-timescale "modulation" of the oscillation amplitude. From 2015 until 2020, more observations occurred as AAVSO released an observation campaign and alert notices on R Aquarii as it enters the eclipse (AAVSO, 2021). We were able to detect two

dominant frequencies from the first calculation of the frequency alone, at around 0.0051 and 0.0025 which translates to 196.07 days and ~ 400 days of the R Aquarii from 1970-2020. These values might be the effect of the symbiotic system. The presence of two dominant peaks suggests that a double-cycle sinusoidal model, rather than a single sine wave, could be a better fit (Kalae & Hasanzadeh, 2019). The second frequency shows more diverse values ranging from 0.0012 to 3.002 and is similar to the known values in the variety of literature. We can see a recurring pattern with an element of unpredictability that does not lend itself to precise measurement, thus showing a quasi-periodic behavior. Majority of the frequencies and amplitudes in Table 1 corresponds to similar value $\sim 0.0025 day^{-1}$ and ~ 1.6 mmag. Since 1800's, R Aquarii has been a consistent nest for astrophysics studies on light curve analysis, the mentioned values we got are very distinct to the known and established frequency and magnitude of the R Aquarii. On the other hand, we noticed the 196 period to be foreign. We suspect that this might be attributed to the fitting of the spectral data in the Period04 based on the original data. At the same time, the researchers intend to extend this explo-

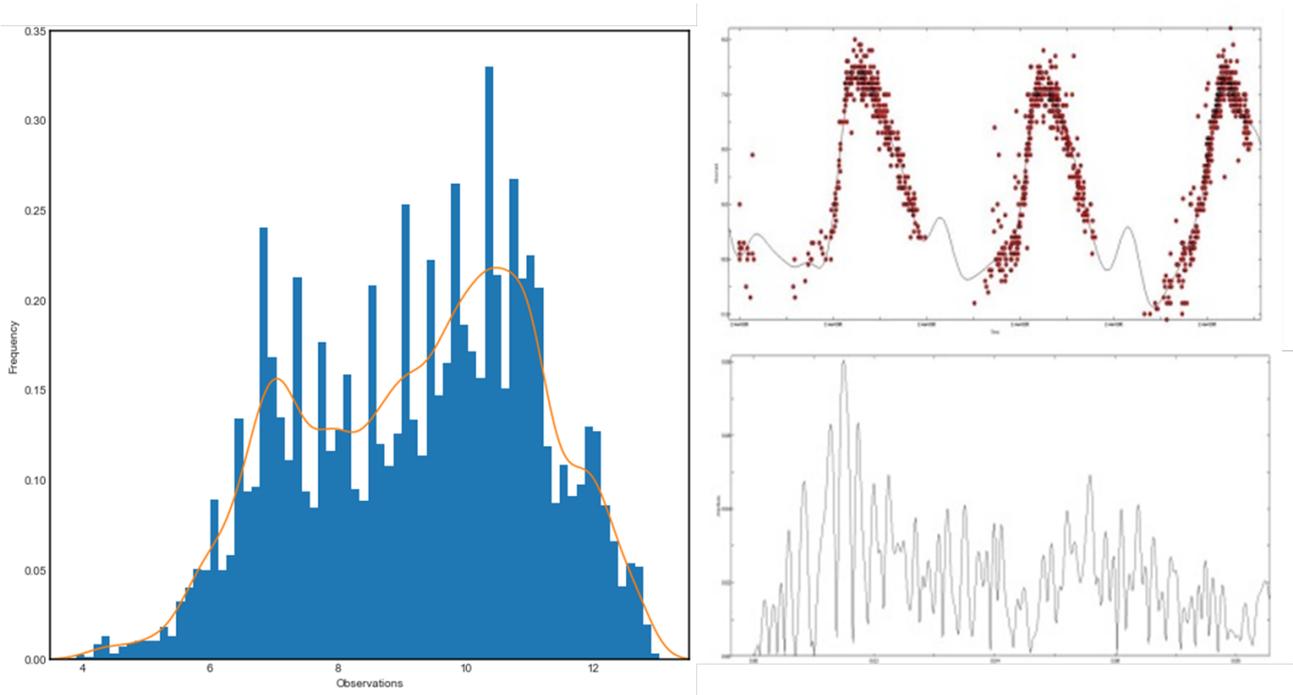


Figure 3 Left panel shows the histogram of observed magnitudes of the R Aquarii, upper right shows the best-fit light curve and its periodogram at the bottom during 1987-1989.

ration on a separate study.

B. Metallicity Analysis

Aside from the drifting materials from the Mira variable to the supposed white dwarf, the R Aquarii binary system sits within a cloud of potential accreting materials. The nebular cloud may affect how we see the R Aquarii especially on exploring its metallicity.

Figure 3 illustrates the thermodynamic conditions present in the core regions of the binary star during its late evolutionary stages. At these high temperatures, the initial composition, which starts as pure ³He, rapidly shifts in comparison to ¹⁶O. The isotopes ⁴He and ¹⁶O dominate the *Ye* ~ 0.5 nuclear statistical equilibrium composition between ~ 102 s and 106 s. Because *T* are constants, only changes in *Ye* can affect the abundances. At ~ 102 s, a second period of intense rearrangement begins and ends at ~ 105 s. The spectrum shows strong lines of He, O, Mg, and Ne that were also seen in the study of (Michalitsianos et al., 1980). The identification of ⁵N and ²Si, is doubtful due to the absence of other lower excitation lines of nitrogen, and similarly for silicon, Si II is not found. Several Fe II features in different multiplets have also been identified in the previous studies which are not visible in the simulated data. Carpenter and Wing (1979) discovered “low-excitation lines of Fe II and Mg II in the spectra of single late-type stars, and the presence of the above lines”, along with “O I and Si II in R Aquarii’s UV spectrum”, strongly support a cool chromosphere *T* ≤ 10,000K for the primary M7 star (Linsky, 2017). As seen from the graph, a series of flat and slight continuums towards higher masses was visible. Furthermore, at a distance of 260 pc, a central ion-

ized cloud with scale size *L* = 2 × 10¹⁴ cm has an electron density of *ne* = 1.5 × 10⁷ cm⁻³, which is sufficient to explain the observed recombination continuum as described by Michalitsianos et al. (1980). The continuum suggests that the density cannot exceed ~ 10⁸ cm⁻³, as this would require the surrounding nebula to be nearly ~ 5 × 10¹³ cm in size—comparable to the dimensions of red giants, making it physically implausible (Michalitsianos et al., 1980).

C. Thermodynamic Conditions in the Core Regions of R Aquarii During Late Evolutionary Stages

The abundance profiles shown in the figure provide crucial insight into the thermodynamic conditions present in the core regions of R Aquarii’s Mira-type component during its late evolutionary stages. The left panel clearly demonstrates hydrogen depletion in the inner regions (within about 0.35 *M*_⊙), a result of earlier core hydrogen burning during the main-sequence phase. The corresponding enrichment of helium isotopes reflects hydrogen fusion via the CNO cycle, which operates efficiently at the elevated core temperatures of asymptotic giant branch (AGB) stars, typically on the order of 10⁷ – 10⁸ K (Karakas & Lattanzio, 2014). At these high temperatures, the initial composition, which starts as pure ⁴He, rapidly shifts in comparison to ¹⁶O. The isotopes ⁴He and ¹⁶O dominate the *Ye* ≈ 0.5 nuclear statistical equilibrium composition between 10² s and 10⁶ s. Because temperature remains nearly constant in this regime, only changes in *Ye* can significantly affect the abundances. At roughly 10² s, a second period of intense rearrangement begins, lasting until about 10⁵ s. This transition is consistent with the spectral signatures observed in R Aquarii, which show strong lines of He, O, Mg, and Ne (Michalitsianos et

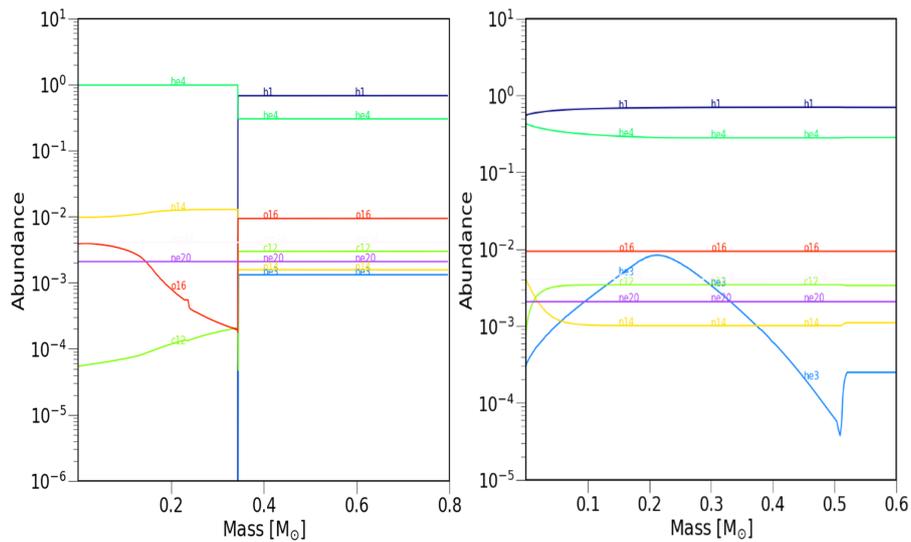


Figure 4 Evolution of the composition inside the binary star. Before weak reactions drive a second period of rearrangement, several orders of magnitude of time pass. A second nuclear statistical equilibrium quiescent period with $Y_e \geq 0.403$ is established within $\sim 10s$.

al., 1982).

The increase in carbon and oxygen isotopes, particularly ^{12}C and ^{16}O , highlights the thermodynamic imprint of the triple-alpha process and subsequent alpha-capture reactions during helium burning. These patterns point to the establishment of a carbon-oxygen degenerate core, a defining characteristic of AGB stellar evolution (Herwig, 2005). The right panel reveals additional details about shell burning and mixing. The bump in carbon and oxygen abundances in the mid-mass regions ($0.2 - 0.4M_{\odot}$) is indicative of dredge-up events, where convective mixing transports nuclear-processed material into higher layers. The persistence of isotopes such as ^{12}C , ^{13}O , and ^{20}Ne , albeit at low abundances, further reflects the role of secondary nucleosynthesis and s-process enrichment in the outer layers (Busso et al., 2001). Meanwhile, spectral studies of R Aquarii indicate features such as Fe II multiplets, Mg II, and O I lines, pointing to the presence of a cool chromosphere ($T \approx 10,000K$) around the primary M7 giant. Notably, Si II and N V lines are weak or absent in both observation and simulation, underscoring uncertainties in the identification of high-excitation species.

As seen in the abundance graphs, a relatively flat continuum toward higher mass coordinates reflects the stratification of lighter elements in the stellar envelope. Furthermore, the observed nebular conditions surrounding R Aquarii are consistent with the thermodynamic and compositional structure implied by these profiles. At a distance of 260 pc, a central ionized cloud with a scale size of $L = 2 \times 10^{14}$ cm has an electron density of $n_e = 1.5 \times 10^{14} \text{ cm}^{-3}$, sufficient to explain the observed recombination continuum (Michalitsianos et al., 1982). However, the continuum also constrains the density not to exceed 10^8 cm^{-3} , as this would require a nebular size comparable to the dimensions of a red giant ($\approx 5 \times 10^{13}$ cm), which is physically implausible. For R Aquarii, a symbiotic binary consist-

ing of a Mira-type AGB star and a white dwarf companion, these conditions are critical. The development of a carbon-oxygen core, the presence of extended ionized gas, and the observed chromospheric lines all point to the dynamic mass loss and accretion processes that drive recurrent nova-like outbursts and jet activity in this system (Hollis et al., 1999; Skopal, 2015).

CONCLUSION

The popular R Aquarii symbiotic system, the light curves exhibit a broad minimum lasting 6 to 7 months, followed by a rapid rise to maximum. The average values achieved 0.003 cycle/day and 1.548 for main frequencies and amplitudes, suggesting that the first frequency period had a value of approximately 311.36 days. The second frequency period had a value of approximately 2.51 days. A recurring pattern was noticeable in R Aquarii's amplitude with an element of unpredictability that does not lend itself to precise measurement, thus showing a quasi-periodic behavior. Fourier transform and time series analysis results indicate that external factors, such as R Aquarii being a symbiotic variable star, play a role in the behavior of the light curve and the seasonal variations in amplitude. The eclipses practically brightened the R Aquarii, however, the current eclipse did not posit the same behavior. The coalescence of the clouds shows the evolution of the molecular and isotope clouds as the star ages. The presence of gases such as molecular hydrogen is justifiable due to the position of the binary stars in the nebula. The line profiles for 4He and ^{16}O present similar shapes but vary in magnitude. It implies that they may be in the same structure. The mass loss rate for R Aquarii was estimated to be $\sim 6.3 \times 10^{-7}$ to $\sim 6.5 \times 10^{-7} \text{ M/yr}$ based on line intensities and chemical composition.

This study of the R Aquarii symbiotic system has con-



tributed to our understanding of binary stars, which is important for studying stellar evolution and powerful jets. Our findings suggest that R Aquarii's varying brightness and quasi-periodic changes are due to both its internal pulsations and external factors within its symbiotic nature, which highlights the need for continuous observation to track its evolving behavior. Initial insights were also gained from the metallicity composition of R Aquarii, along with its role in enriching space with heavy elements, and identified that the surrounding nebula influences its observed composition. The estimated rate at which R Aquarii loses mass provides crucial data for understanding how these systems evolve. Although this research clarifies much about R Aquarii, the study also supports the necessity for more detailed, high-resolution observations to fully grasp the complex movements of R Aquarii's surrounding gas and the prominent jets. Further investigation into whether the primary stellar pulsation is connected to these powerful jets could reveal fundamental aspects of energy transfer in such unique stellar systems.

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Design and Development of a Low-Cost Ion Plasma Thruster for Plasma Generation and Analysis Studies

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Abstract— This study draws its inspiration from an ion-plasma generator design that uses direct current (DC) while integrating commercial off-the-shelf (COTS) components for easy assembly and modifications. Addressing the limited accessibility of plasma propulsion systems in university-level education especially for universities still establishing SST curricula centers on the high cost and complexity of ion thrusters, which restricts hands-on learning opportunities for Space Science Technology students interested in thruster development. Guided by design principles of simplification, cost-reduction and scalability, the low-cost scalable design is modified and tested for plasma observations, aiming to provide modification experience and extend the study for fundamental principles of plasma generation, the basics of propulsion systems, and plasma-material interactions. The researchers utilized commercial off-the-shelf (COTS) components and alternative materials such as a copper tape and aluminum spikes. Instead of a vacuum, prototype was implemented and tested in a room temperature laboratory condition, demonstrating successful plasma emission with observable inconsistencies due to ambient air ionization. Beyond the technical artifact, the study contributes to educational practice by offering a replicable model for teaching plasma physics and propulsion fundamentals, and to theory by formulating design principles for accessible space technology learning tools. Future studies will expand the design including the modifications necessary for propellant usage and more testing in sophisticated environments, enhancing their educational value.

Keywords— *thruster, ion-plasma, cost-effective, electric, direct current, propulsion, rocket science, cathodes*

INTRODUCTION

As backbones of satellite and rocket technology, propulsion systems enable precise navigation and space maneuvers. Relying on the principles of physics and engineering, thrust is generated to lift it off from Earth, maintaining orbits and explore the cosmos. A propulsion system is differentiated through its onboard power. Two types of propulsion systems are classified: electric and non-electric. Onboard power is needed for regulation including termination and initiation of the processes. Encompassing propulsion technology, electric propulsion utilizes electrical power to harness propellant exhaust velocity. Despite its potential contribution in plasma observations and applications, it is unprecedented in educational environments due to its perceived complexity and high cost. Exposure to these systems in establishing academic setting remains rare due to its intimidating nature.

The high cost, complexity, and reliance on specialized materials prevent many universities from providing students with practical experiences in plasma generation and propulsion systems. While previous works have demonstrated miniature ion thrusters including the study of micro-ion thrusters and with the development and testing of a 3cm electron bombardment Micro-Ion Thruster (Wirz et al., 2001) and the pulsed plasma thruster on his study of a continuous plasma thruster using water vapor as a propellant for nanosatellite propulsion, these designs remain financially and technically inaccessible for most university laboratories (Boeva, 2014). To introduce a design suitable for laboratory modeling and demonstrations, a single component

instead of building a whole thruster will be explored. One of the primary components of propulsion system for space explorations is the propellant. These chemicals are ionized in the thruster and then accelerated by the electrical field, creating a high-velocity stream of particles.

Since the researchers will build and operate an ion plasma thruster without using the propellant, one of the goals of this propulsion design is to generate and demonstrate the formation of the plasma. Using ambient air for propulsion systems as the working medium for plasma production simplifies the setup, making it more accessible for experimental observations (NASA, 2023). The usage of ambient still has the potential to help the researchers understand the basic mechanisms of a propulsion system. Using ambient air, instead of specialized propellants, provides a cost-effective and practical solution for educational propulsion experiments. It allows students to observe the fundamental processes of plasma generation and emission spectroscopy without the need for an expensive and complex vacuum environment.

One of the distinctive features of this research is the use of material innovation in developing the plasma generator. Traditional and sophisticated ion thrusters rely on components made of expensive thin copper plates or tedious copper plating procedures that require high-voltage exposure and equipments. This study introduces a practical and sustainable alternative by repurposing recycled aluminum cans that are malleable enough to be shaped into cathode spikes. These spikes will be coated with copper plates, which is a readily available and inexpensive material for conductivity. Educationally, the novelty of this approach directly reduces



the barriers to engaging in complex space propulsion systems. Students can now study ionization and plasma generation instead of relying on theoretical instruction. In this way, the project not only advances hands-on learning in space science but also contributes a replicable material for interested researchers facing resource constraints.

The research seeks to design, build, and test an ion-plasma generator that is downsized for accessibility, especially to university students who aim to understand the mechanisms of the propulsion system for possible plasma observations and analysis interconnected with the propulsion system, rocket science and its principles. Plasma remained; moreover, the researcher aims to reduce the cost of constructing a spacecraft’s engine so that university students will have more access to space technology. The working principles of anion plasma engines will be explored through the representation of its main components. Due to the vastness of this study, the researchers will cover only an ion plasma thruster without propellants such as xenon to make it viable. However, the design is modifiable and can be subjected to improvements and innovations, making it suitable for future studies and focuses can be applied to various studies such as magnetohydrodynamics, plasma-material behavior and confinements, understanding the basics of propulsion and many other rocket science observations and analysis.

A. *Addressing Global Barriers in Space Science Education*

Beyond their academic motivation, the research seeks to respond to broader global concerns which surround accessibility, inclusion, and sustainability in science and technology. Across many developing nations and academic institutions still developing programs in propulsion, aerospace, and space engineering, access to advanced laboratory facilities and specialized materials remains limited, reflecting the global disparities in space science capacity noted by the United Nations Basic Space Science Initiative (Mathai et al., 2015). Inducing educational division, students are intimidated by complex technologies that appear to be unattainable. This approach also promotes the democratization of space science education, which echoes global actions by UNESCO and the United Nations Office for Outer Space Affairs (UNOOSA) for inclusivity to STEM access and space related education. In the long term, projects like this contribute to building local capacity for scientific innovation, encouraging students and researchers to pursue studies that align with the Sustainable Development Goals (SDGs), particularly Goal 4 (Quality Education) and Goal 9 (Industry, Innovation, and Infrastructure). Through the development of educational models that are both scalable and sustainable, the study not only supports the future of space technology education in the Philippines but also contributes to the global movement advocating for equitable participation in space exploration and scientific discovery.

METHODOLOGY

Following the Educational Design Research (EDP) framework, researchers implemented analysis, design, implementation, and evaluation phases for the plasma generator. This model is adapted from an ion plasma thruster design licensed under a Creative Commons Public Domain Dedication (CC0), permitting modification and use for educational purposes (Gigazine, 2023) This will be a more accessible entry point for students, especially in Space Science Technology programs, encouraging exploration and experimentation of the commonly intimidating propulsion systems. One of the desired features includes the simplification of the ion-plasma generator. By starting with a less complex design, the elements exempted can still be integrated in future iterations to enhance the generator’s functionality. This approach encourages the students to understand the foundational concepts first, providing a solid groundwork for more complex experiments. The model highlights the main components of an ion thrust plasma engine which include the following: **Ion Source, Power Supply, Control System.**

A. *Theoretical basis and Equations*

The operation of the low-cost ion plasma generator is governed by the principles of plasma formation and ion acceleration. Although this study did not focus on performing comprehensive measurements of thrust or plasma parameters, a mathematical foundation is presented to explain the mechanisms of plasma generation and the theoretical basis of ion acceleration. As described by Paschen’s Law, plasma is generated when the applied electric field exceeds the breakdown voltage of air (NASA, 2020).

Similarly, the principle of ion acceleration can be explained by the rocket thrust equation, expressed as $F = \dot{m}v_e$ (Lutheran Pioneers, n.d.).

1. Plasma Formation

Plasma is formed when there is ionization of neutral gas under the influence of a sufficiently strong electric field. In order for a discharge to happen between the two set up of electrodes of distance d , the applied voltage must exceed the breakdown voltage of air demonstrated by Paschen’s Law (Chen and Chang, 2012).

$$V_b = \frac{B \cdot p \cdot d}{\ln(A \cdot p \cdot d) - \ln \left[\ln \left(1 + \frac{1}{\gamma_{se}} \right) \right]} \tag{1}$$

Where:

- V_b = breakdown voltage (V),
- p = pressure of the gas (Pa),
- d = distance between electrodes (m),
- A, B = gas-specific constants (for air, $A \approx 112.5$ (1/m · Pa), $B \approx 2737$ V / (Pa · m)),
- γ_{se} = secondary electron emission coefficient.

Under atmospheric conditions, reaching the breakdown voltage produces cascading electron collisions which produces free electrons and ions that sustains the plasma discharge. This principle will explain the visible plasma emission when high voltage goes through the aluminum copper tape electrodes.

2. Ion Acceleration and Thrust Principle

After the plasma formation, ions within the discharge will be accelerated by the applied potential difference. The basic expression for thrust produced by ion acceleration is:

$$F = \dot{m}v_e \tag{2}$$

Where:

- F = thrust (N),
- \dot{m} = mass flow rate of ions (kg/s),
- v_e = exhaust velocity of the ions (m/s).

The exhaust velocity is related to the accelerating voltage by:

$$v_e = \sqrt{\frac{2qV}{m}}$$

Where:

- q = charge of the ion (C),
- V = accelerating potential (V),
- m = mass of the ion (kg).

The expression explains how exhaust velocity increases with higher accelerating voltage and lighter ion mass. Since the prototype utilizes ambient air as working medium instead of a dedicated and conventional propellant (e.g. xenon), the plasma discharge is expected to be unstable and thrust will be immeasurable. Nevertheless, the mechanism illustrates how ion acceleration underlines the functionality of electric propulsion systems.

Although this study did not conduct direct thrust measurement, these equations provided other students with a mathematical basis to connect observed plasma discharges with theoretical propulsion concepts. This theoretical basis complements the physical prototype in ensuring that the educational intervention not only demonstrates plasma visually but also reinforces the underlying physics and mathematical modelling essential in space propulsion.

3. Materials and Components

The ion plasma generator will be constructed using accessible, low-cost and modifiable components to maximize educational value. These materials will be deliberately chosen and tested to balance cost-effectivity, availability and functionality while demonstrating plasma generation. The main components are as follows:

- a. 3.7V 2500mAh Lithium Polymer Battery – used as the primary power source.

- b. DC 3–6V to 4kV–400kV Step-Up High Voltage Transformer Module – for voltage amplification to achieve plasma breakdown.
- c. 3-pin toggle switch – for circuit control and safety.
- d. Aluminum cans – cut and shaped into pointed cathode spikes, serving as a sustainable alternative to copper rods.
- e. Copper tape – applied as plating to both electrodes for enhanced conductivity.
- f. 3D-printed nozzle and electrode holder – designed in CAD (SolidWorks) to house electrodes and stabilize plasma discharge.
- g. Wiring, insulating tape, and Styrofoam base – for safe mounting and electrical insulation.

4. Procedures

Since this research utilized Educational Design Research (EDR), it will follow the typical design-development-testing cycle.

4.1 Design Conceptualization

The researcher’s reviewed the conventional copper plating method which is not accessible to students with the primary reason of its expense with the necessary components. An electroplating setup is not just a battery and a breaker but requires DC power supply with precise voltage and current control as well as specialized plating tanks and filtration systems. Moreover, this plating method requires copper sulfate solution and while students can purchase small, pre-made kits which are often more expensive per unit. Therefore, the inaccessibility is less about the fundamental concept and more about the practical application. The modified design will develop and replace expensive copper electrodes with aluminum spikes covered in copper tape, maintaining conductivity while reducing cost.

Figure 1 Electrode Holder

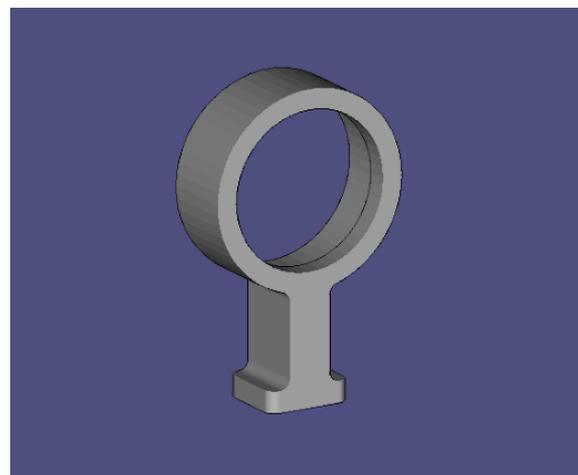


Figure 2 Mount

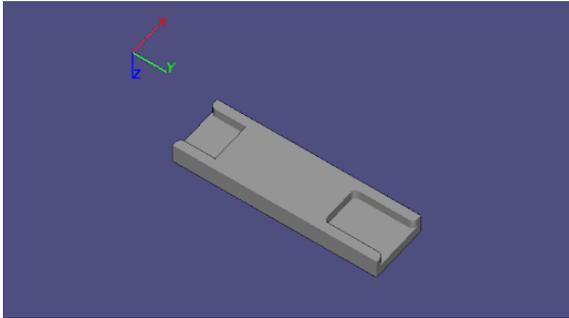


Figure 3 Nozzle

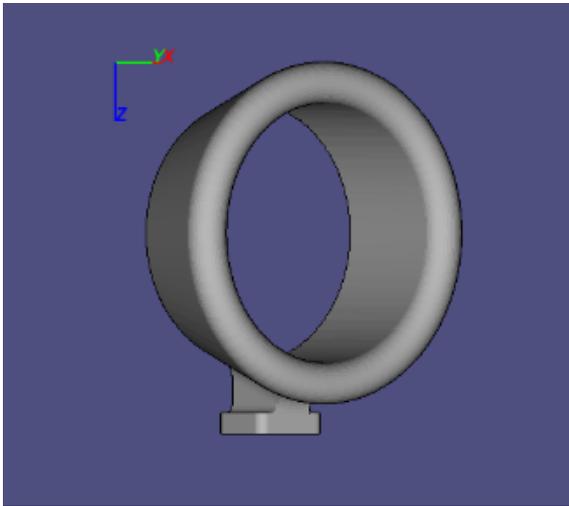
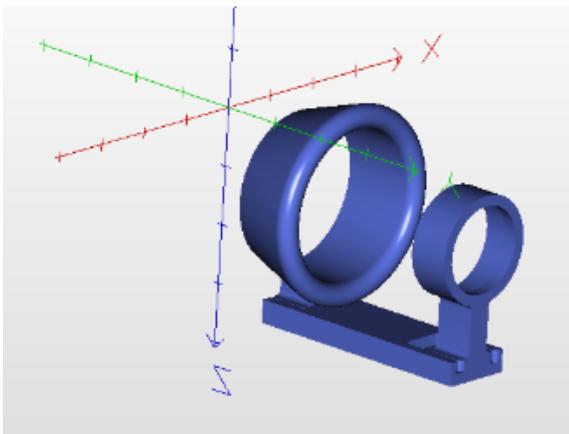


Figure 4 Front Circuit Design



4.2 Prototype Construction

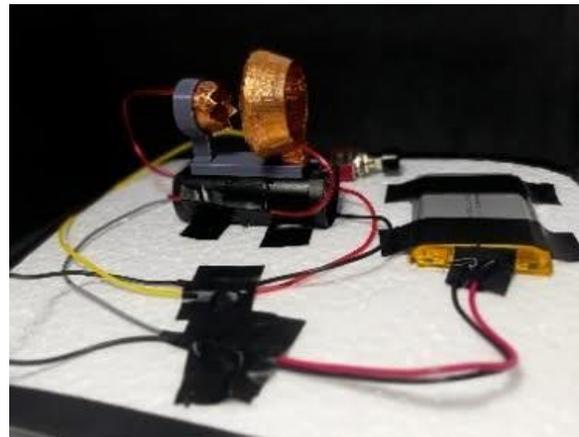
The electrodes was developed by utilizing malleable aluminum soda cans shaped into aluminum spikes. To ensure conductivity, the researcher’s used copper tapes to cover the aluminum surface. Since a 3D printer is available to cater the development of the nozzle and electrode holder, it drastically reduced the cost and time associated with creating a custom design. Moreover, a platform or a holder

was also 3d printed to hold the cathode (spike electrode) and anode (hollow tube) to create a discharge region.

4.3 Electrical Integration

A 2000mAh lithium polymer battery (Li-Po) was connected to the step-up transformer, which is a DC 3v-6v to 4000k-40000V power module generator, which boosted the voltage required for ionization. A toggle switch was installed to regulate current flow and provide operator safety. The wiring was insulated and secured on a styrofoam base to minimize risks of short-circuiting.

Figure 5 Circuit Design



4.4 Testing and Plasma Generation

The assembled thruster was operated in ambient air and voltage adjustments were made incremently to identify breakdowns threshold consistent with Paschen’s Law. Plasma glow discharges were visually observed at the sharp cathode tips which validated functionality. However, issues such as occasional sparking and overheating was documented, attributed to the electrodes geometry and air breakdown variability.

RESULTS AND DISCUSSION

A. Ion Thruster Unit

The fabricated ion thruster unit has successfully demonstrated the generation of plasma under the conditions of ambient air. With the toggle switch on, high voltage is applied through the copper-plated spikes and a visible plasma cloud of bluish-purple tinge is produced, confirming that there is ionization with the surrounding gas molecules. The plasma plume was sustained but only for short intervals, typically ranging from 5-10 seconds, before the intermittent sparking. Moreover, the high voltage and Li-Po battery (2000 mAh) reliably provided sufficient voltage to sustain ionization. The researchers observed that plasma stability is sensitive to spike geometry and that poorly sharpened cathodes resulted in fluctuations of the plume.

With the observed limitations and implications identified for future modifications and improvements, the study identified gas breakdown sensitivity, electrode geometry, and overheating as a limitation that aligns with the prior

finding that miniaturized, nonvacuum plasma systems face instability issues (Nakagawa et al., 2019). However, the ability to generate plasma in ambient air is consistent with the educational goals of this study. A video demonstration of the prototype developed ion-plasma thruster in operation has been provided as supplementary material (Devero & Santos, 2025).

Figure 6 Plasma Observation

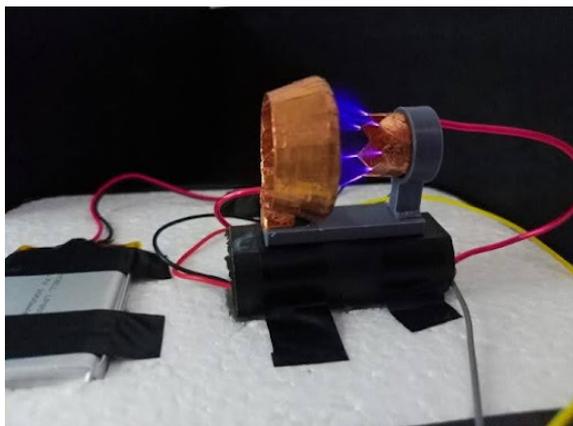
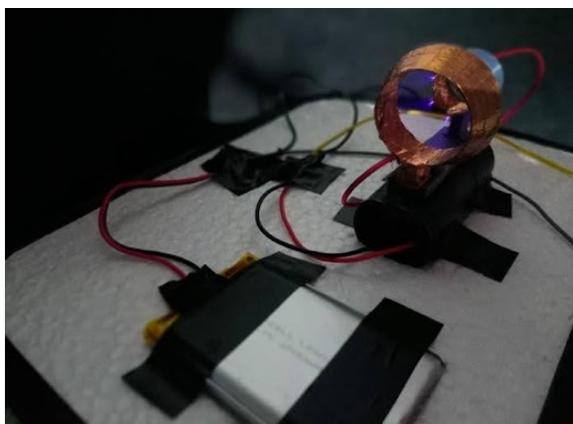


Figure 7 Faint Plasma



This comparison shows that despite prototype cannot match the efficiency and sustainability of the commercial thrusters, it provides cost-effective, accessible entry point for educational and laboratory demonstrations. It is also emphasized that the primary objective of this initial research was not to achieve optimized performance metrics or conduct comprehensive thrust measurements, but rather validate a working design capable of generating plasma under specified conditions. The study deliberately focused on the accessibility and demonstrability, ensuring that the device could be assembled from low-cost, commercially available components while still functioning as a tangible proof of concept. With the establishment of a baseline design that has demonstrated the production of plasma, the study laid the groundwork for future enhancements and experimental iterations. It is a prototype intentionally made to be modular and modifiable, which will allow subsequent re-

searchers to introduce upgrades such as higher power voltage, reined electrode geometries and materials or even and integrated propellant flow systems once budget and laboratory resources permit. In this way, the current design serves as a scalable platform that can evolve into more advanced ion-thruster research set-ups.

B. Design Validation and Significance

The study’s primary contribution lies in validating that a low-cost, modular ion plasma generator can reliably produce plasma using accessible materials and basic laboratory tools. Although not intended for thrust measurement or long-duration operation, the prototype serves as an effective educational model that allows students to observe plasma discharge, breakdown voltage, and ionization phenomena in real time. This tangible exposure helps bridge the gap between theoretical learning and experimental understanding of electric propulsion systems. Table 1 presents the cost analysis of the materials used in the prototype, emphasizing affordability and transparency. The total fabrication cost was approximately PHP 1,100, using commercially available and recycled materials such as aluminum cans and copper tape. This cost efficiency validates the study’s design principle that plasma phenomena can be demonstrated in educational laboratories without highbudget requirements or vacuum facilities.

CONCLUSION

Plasma emission was visually observed through the cathode spikes, which emitted a faint bluish glow when the applied voltage exceeded the air breakdown threshold. The plasma plume displayed short bursts of stability before fading, confirming successful air ionization but highlighting challenges in maintaining consistent discharge. Instability, overheating, and occasional sparking were noted as limitations arising from the absence of a vacuum and the irregular geometry of the aluminum spikes. These results align with Nakagawa et al. (2019), who reported similar instability in non-vacuum, miniaturized plasma systems

A. Limitations and Future Work

The plasma produced by the prototype was intermittent and sensitive to electrode geometry and environmental conditions. The absence of a controlled vacuum environment and limited voltage regulation contributed to performance inconsistencies. Future iterations of the design will focus on refining electrode shape, improving insulation, integrating voltage control, and incorporating a small propellant system to achieve more stable plasma behavior. These enhancements will support more advanced measurements of ion acceleration and thrust, expanding the design’s research and instructional value.

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Table 1 Cost Table Transparency

Material	Quantity	Unit Cost (P / \$)	Total Cost (P / \$)
Li-Po Battery (3.7V, 2500 mAh)	1	P350	P350
Step-up Transformer (3–6V to 400kV)	1	P500	P500
Toggle Switch	1	P50	P50
Aluminum Cans (recycled)	2	–	–
Copper Tape (roll)	1	P120	P120
3D-printed Nozzle & Housing	1	–	–
Wiring & Insulation	–	P80	P80
Total Estimated Cost	–	–	P1,100

Table 2 Comparison of the developed thruster with existing ion thruster technologies

Feature	Present Study (DC, Ambient Air)	Conventional Ion Thrusters (e.g., Xenon-fed, RF/MW)
Cost of Fabrication	P1,356 (low-cost, COTS-based)	P20,000+ (specialized materials, vacuum systems)
Propellant	Ambient air	Xenon, Krypton, or water vapor
Operating Medium	Open-air, no vacuum chamber	Vacuum chamber required
Voltage Range	20–30 kV (DC discharge)	200–1000 V (RF/MW systems)
Plasma Stability	5–15 s (intermittent)	Sustained minutes–hours
Target Application	Educational, demonstration	Satellite propulsion, high ΔV maneuvers

Table 3 Experimental observations and operating parameters

Parameter	Value / Observation	Notes
Input Battery Voltage	3.7–6.0 V (Li-Po)	Stable discharge at 3.7 V
Output Voltage	~20–30 kV	From module specs
Plasma Duration	5–15 s sustained	Sparking observed >15 s
Current Draw	~150–200 mA	Load dependent
Spike Overheating	After ~15 s	Due to ion bombardment

tributed indirectly to the success of this study. Their encouragement and the resources provided created an environment that made the completion of this work possible.

CONFLICT OF INTEREST

The authors declare that there is no conflict of interest.

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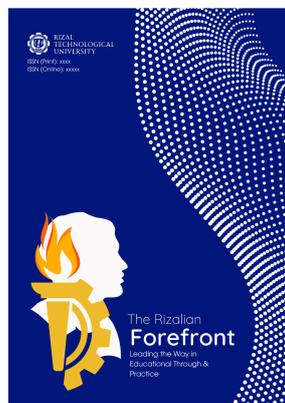
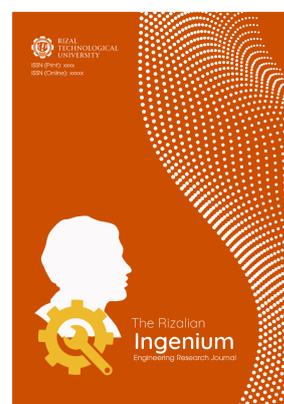
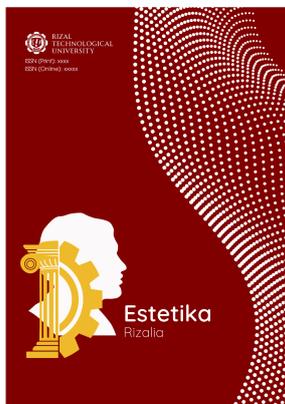
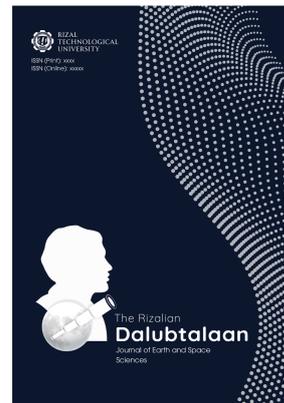
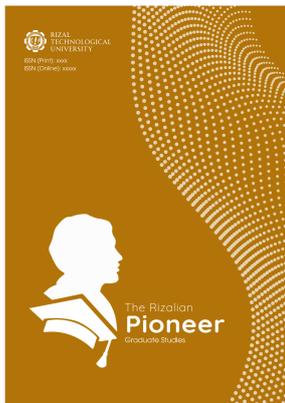
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