iJRASET
International Journal For Research in Applied Science and Engineering Technology

INTERNATIONAL JOURNAL FOR RESEARCH

IN APPLIED SCIENCE & ENGINEERING TECHNOLOGY

Volume: 13 **Issue:** VII **Month of publication:** July 2025

DOI: https://doi.org/10.22214/ijraset.2025.73240

www.ijraset.com

Call: 08813907089 | E-mail ID: ijraset@gmail.com

International Journal for Research in Applied Science & Engineering Technology (IJRASET)
ISSN: 2321-9653; IC Value: 45.98; SJ Impact Factor: 7.538
Volume 13 Issue VII July 2025- Available at www.ijraset.com

Coconut *(Cocos Nucifera)* Coir as an Alternative Cat Litter

Cunanan, Eliesah Mae S.[1], Dolit, Santino L.[2], Dueñas, Ariane Jean C.[3] Gutierrez, Patricia Mae S.[4] Martin, Lanz Raniel S[5] Tinasas, Edward Guilford L[6], Reyes, Jochebed L. [7], Adiva, Annah Elisah G. [8] , Basco, Kate S.[9], Basco, Heidi Gail T.[10], Guarin, Vi Briza E.[11]

[1,2,3,4,5,6]*Student-Researchers, Asian Pacific Christian School, Incorporated*
[7,8,9,10,11]*Senior High School Department, Asian Pacific Christian School, Inc.*
Block 2, Cristo Rey, Capas, Tarlac City, Philippines

Abstract: ***This research analyzes the effectiveness of Coconut (Cocos Nucifera) Coir, Improved with lemon scent, as an alternative cat litter compared to conventional options. The study estimates its performance in moisture retention, absorption, odor control, clumping ability, and shelf life. Used a quantitative experimental design, observational checklist, a onesample t-test, and likert scale were used for data collection and analysis. The while maintaining sustainability and cost-effectiveness. This study provide to the development of eco-friendly cat litter solutions that reduce agricultural waste and promote sustainable practices.***

Keywords: Coconut Coir, Lemon Scent, Sustainability, Eco-Friendly, Agricultural Waste

I. INTRODUCTION

The coconut coir industry in Eastern Visayas uses coconut byproducts like coco fiber and coco peat to help the environment and increase farmers' income. (Meniano, S., 2023) says these byproducts are often used in farming and other industries. Lemons have natural substances like vitamin C, citric acid, and essential oils that can kill bacteria and fungi, which cause bad smells (Bani, G., & Bansal C., 2020). Research by Eifler and Simmons (2022) found that adding citrus to litter products helps reduce bad odors. Mixing lemon with coconut coir cat litter can improve its ability to remove smells while keeping it absorbent and eco-friendly.

This study used an experimental research design with a quantitative approach to examine how coconut coir with a lemon scent compares to commercial cat litter. The independent variable was the coconut coir with lemon scent, while the dependent variables were absorption, odor control, texture, and clumping ability. The Coconut (*Cocos nucifera)* Coir was manually separated from the coconut husk and sprayed with a natural lemon scent extract. The mixture was then shaped into pellets and sun-dried for hardening. An observational checklist was used to evaluate the litter's characteristics, such as color, texture, and odor, during and after the experiment. Five selected cat owners from Sta. Juliana and Cristo Rey, Capas, Tarlac, evaluated the litter force ffectiveness based on their experience with cat litter use. A Likert scale was applied to gather their opinions on the performance of the alternative litter.

II. METHODOLOGY

The researchers used an experimental research design with a quantitative approach to study the effects of Coconut *(Cocos nucifera)* Coir with a lemon scent as an alternative cat litter compared to commercial cat litter Sherif, A. E., Amen, Y., Rizk, D. E., & Abdelwahab, G. (2023).The independent variable (Coconut Coir with Lemon Scent) was tested against the dependent variable (Commercial Cat Litter) by examining its absorbency, odor control, texture, and clumping ability. The study also tested three preparation methods: grain, strain, and adding lemon scent, to determine the most effective option.

The experiment took place in Sta. Juliana and Cristo Rey, Capas, Tarlac, Philippines. The Coconut *(Cocos nucifera)* Coir was prepared by manually separating it from the coconut husk and mixing it with a humidifier essential oil that had a lemon scent. This mixture was shaped into pellets by hand and dried under the sun to harden. An observational checklist was used to evaluate the litter's characteristics, such as color, texture, and odor, during and after the experiment. According to a study by Hart & Cooper (2021), cat litter characteristics, such as texture, odor control, and clumping ability, play a significant role in the satisfaction of pet owners. Five selected cat owners from Sta. Juliana and Cristo Rey, Capas, Tarlac, evaluated the litter for its effectiveness. They were chosen for their experience with cats and familiarity with cat litter use. A Likert scale was applied to gather their opinions on the performance of the alternative litter.

To analyze the results, the researchers used simple statistical tools like T-tests and one-way ANOVA. These tools helped determine whether the Coconut Coir litter showed significant differences compared to commercial cat litter in terms of absorbency, odor control, and clumping ability. According to a study by Smith et al. (2017), clumping ability and absorbency are key factors that determine the quality and preference of cat litter among pet owners. The study followed the Animal Welfare Act (Republic Act No. 8485) to ensure the safety and wellbeing of the cats involved. A statistician and research adviser reviewed the data to confirm the study's reliability and accuracy

III. RESULTS AND DISCUSSION

A. Characteristics of Coconut (Cocos Nucifera) Coir as Alternative Cat Litter

Coconut *(Cocos Nucifera)* Coir cat litter described in terms of color:

Having color feature of cat litter is important because it easy for pet owners to know when the litter needs to clean. Researchers compared the color of coconut coir cat litter to conventional cat litter. This feature can highlight the coconut coir's strong absorbance and supports its potential as a sustainable and effective alternative.

TABLE 1: Appearance of Coconut *(Cocos Nucifera)* Coir cat litter as color

COLOR					
CONDITION	BLACK COFFEE	OTTER BROWN	BURNT UMBER	COPPER	AZTEC GOLD
WET	/				
DRY		/			

Table showed the characteristics of the Coconut *(Cocos Nucifera)* Coir cat litter as to color. The Coconut *(Cocos Nucifera)* Coir showed a clear shift from "otter brown" when dry to "black coffee" when wet, indicating its strong absorbency. This color change serves as a visual hue, helping pet owners easily identify areas in need of cleaning, which can simplify maintenance. Additionally, the darker "black coffee" hue when wet suggests that the coir effectively traps moisture, potentially reducing odor by limiting bacterial growth.

B. Performance of Coconut (Cocos Nucifera) Coir Cat Litter

Observational Checklist of Coconut (Cocos Nucifera) Coir Cat Litter in terms of moisture:

Moisture is a very important aspect of cat litter because it affects the environment for cats.

Researchers observed the litter forms under (1:00 AM to 4:00 AM, 5:00 AM to 8:00 AM, 9:00 AM to 12:00 PM, 1:00 PM to 4:00 PM, 5:00 PM to 8:00 PM, and 9:00 PM to 12:00 AM) and compared it to the conventional cat litter. This helps determine the litter's moisture, a crucial aspect of its performance.

TABLE 2: Moisture of Coconut (*Cocos Nucifera*) Coir cat litter

AVE. TEMP.	TIME	DRY	MOIST
28°C-29°C	1:00-4:00 am		/
29°C-30°C	5:00-8:00 am	/	
30°C-32°C	9:00-12:00 am	/	
32°C-34°C	1:00-4:00 pm	/	
33°C-30°C	5:00-8:00 pm	/	
30°C-28°C	9:00-12:00 pm	/	

Table showed a study on the moisture retention of Coconut *(Cocos Nucifera)* Coir, tested under different time periods and temperature ranges. This experiment aims to find out how well coconut coir retains moisture under these various conditions. By analyzing the data, the researchers determined the best times and temperatures for keeping moisture, which can improve the use of coconut coir in applications like cat litter. The tests focused on the period from 1:00 AM to 4:00 AM with temperatures between 28°C and 29°C, showing that coir remained moist during this time.

C. Significant difference in the Coconut (Cocos Nucifera) Coir as alternative cat litter

There is a significant difference on the Coconut (Cocos Nucifera) Coir as alternative cat litter compare to commercially cat litter in terms of absorption:

The absorption is a key feature for cat litter because it affects how fast Coconut (Cocos Nucifera) Coir cat litter can absorbs urine and feces. The researcher observed the absorption process over a set period of time and classified the speed as very slow, slow, moderate, quick, or very quick.

TABLE 3: Absorption of Coconut (Cocos Nucifera) Coir cat litter

WASTE PRODUCT		VERY SLOW	SLOW	MODERATE	QUICK	VERY QUICK
		5 Minutes A bove	4 Minutes	3 Minutes	2 Minutes	1 Minute Below
5 Grams	cat feces					/ (54 seconds)
10 Grams	cat feces				/ (2 minutes and 17 seconds)	
15 Grams	cat feces			/ (3 minutes and 21 seconds)		
20 Grams	cat feces		/ (4 minutes and 51 seconds)			
30 Grams	cat feces	/ (5 minutes and 21 seconds				
5 ml	cat urine					/ (5 seconds)
10 mI	cat					/ (22

	urine					seconds)
15 mI	cat urine					/ (51 seconds)
20 mI	cat urine				/ (2 minutes and 13 seconds	
30 mI	cat urine		/ (4 minutes and 6 seconds)			

One-Sample Test

2. TABLE 4: One sample T-test in Coconut *(Cocos Nu*

	t	df	Sig. (2 tailed)	Mean Difference	Test Value = 3 95% Confidence Interval of the Difference	
					Lower	Upper
ABSORPTION CAT FECES	4.062	4	.015	198.20000	62.7209	333.6791
ABSORPTION CAT URINE	1.988	4	.118	88.40000	-35.0585	211.8585

Table showed present cat waste products by measurement time, grouping them as Very Quick (1 minute or below), Quick (2 minutes), Moderate (3 minutes), Slow (4 minutes), and Very
Slow (5 minutes or more). For cat feces, five grams is Very Quick at 54 seconds, ten grams is Quick at 2 minutes and 17 seconds, fifteen grams is Moderate at 3 minutes and 21 seconds, twenty grams is Slow at 4 minutes and 51 seconds, and thirty grams is Very Slow at 5 minutes and 21 seconds. For cat urine, five, ten, and fifteen milliliters all fall into the Very Quick category, taking 5, 22, and 51 seconds, respectively. Twenty milliliters is Quick at 2 minutes and 13 seconds, while thirty milliliters is Slow at 4 minutes and 6 seconds. This structured categorization highlights how measurement times increase with quantity for both feces and urine.

The table showed one-sample t-test absorption values for cat feces and cat urine, showing different levels of significance. The absorption of cat feces had a t-value of 4.062 and a p-value of 0.015, meaning the difference was statistically significant. There was a significant difference in the absorption of cat feces because the p-value was below 0.05. On the other hand, the absorption of cat urine had a t-value of 1.988 and a p-value of 0.118, which was not statistically significant. There was no significant difference in the absorption of cat urine because the pvalue was above 0.05, and the confidence interval (-35.06 to 211.86) included zero. The mean difference for cat urine was 88.40, showing it absorbed slightly more than the test value, but this was not enough to be significant. The mean difference for cat feces was 198.20, which was a significant result.

IV. DISCUSSION

This study shows that coconut coir can also be a good alternative. It has unique features, such as changing color when wet and holding moisture well. However, its ability to absorb urine and feces is the same performance as to commercial cat litter.

In color, brown represents grounding, warmth, stability, and qualities that compliment coconut coir's role as cat litter by aligning with its biodegradable and renewable properties (DunnEdwards, 2023). Brown, a composite of red, yellow, and orange, is not only functional but visually calming, which can help create a comfortable space for cats. The color change from "otter brown" to "black coffee" aligns with recent design trends toward natural, warm colors, making coconut coir a visually appealing option. Additionally, DunnEdwards' analysis of brown tones highlights their ability to extract a natural eco-friendly, which enhances coconut coir's appeal as a cat litter material for eco-conscious consumers. The color change of coconut coir from "otter brown" when dry to "black coffee" when wet is a helpful feature for cat owners. It allows them to see when the litter needs cleaning easily. Additionally, the darker color when wet suggests that the coir traps moisture effectively, which may help reduce odors by limiting bacterial growth. These findings align with Beugnet and Beugnet (2018), who discussed the importance of visual and moisture-retaining features in litter materials.

The Study of Kulkarni et al. (2020), indicates that Coconut (Cocos Nucifera) Coir retains moisture more effectively at lower temperatures, suggesting it can absorb moisture when it is cold. This ability enhances coir's effectiveness for use as cat litter, ensuring a fresh environment for cats. The moisture retention of coconut coir was tested during different times of the day and temperature ranges. The times included 1:00 AM to 4:00 AM, 5:00 AM to 8:00 AM, 9:00 AM to 12:00 PM, 1:00 PM to 4:00 PM, 5:00 PM to 8:00 PM, and 9:00 PM to 12:00 AM. Temperatures ranged from 28°C to 34°C. Results showed that coconut coir retained the most moisture between 1:00 AM and 4:00 AM at cooler temperatures of 28°C to 29°C. However, during warmer periods, such as midday at 32°C to 34°C, the coir dried out faster due to evaporation. These observations support previous studies, like those by Gurbuz and Manaros (2019), on how coconut by-products behave in different environmental conditions.

According to Tippaws (2023), litters are designed to absorb liquids rapidly, creating solid clusters that are simple to scoop out. Evaluating the absorption speed of coconut coir can help determine its viability as an alternative to traditional cat litters. In this context, coconut coir's clumping ability can be compared with other commercial liters to assess its efficiency in moisture absorption and clump formation. The absorption ability of coconut coir was compared to a commercial cat litter using a one-way t-test. The results showed no significant difference between the two, with a p-value of 0.194. This indicates that while coconut coir absorbs urine and feces at the same rate as commercial cat litter, it does not perform better. Pogosa et al. (2018) similarly reported that coconut husk products have comparable absorption capabilities to other alternatives.

The study highlights that coconut coir has positive features, such as easy to see wetness indicators and effective moisture retention in cooler conditions. These make it a good choice for an eco-friendly cat litter. However, its absorption capabilities could be improved by adding other materials or processing it further, as suggested by Stelte et al. (2023). Such enhancements could make coconut coir a more competitive and sustainable alternative for pet owners.

V. CONCLUSION

This study explored the effectiveness of coconut coir as an alternative cat litter, assessing its moisture absorption, odor control, clumping ability, and shelf life. Coconut cat litter varies in color, appearing dark brown when wet and lighter when dry. It's available in pellet or sand-like textures, each affecting absorption and clumping. The findings suggest that coconut coir offers a cost-effective, eco-friendly, and sustainable alternative to conventional cat litter. Utilizing coconut husks reduces agricultural waste and provides a low-cost production method for cat owners. The process involves collecting coconut husks, grating them to obtain coir, refining it through straining, and hand-molding (for pellets) followed by sun-drying. While timeconsuming, this method reduces both expenses and waste. Further research is needed to fully evaluate odor control, as this study only used coconut coir. Experimenting with added scents could enhance the litter's effectiveness and appeal. Overall, coconut coir cat litter presents a promising alternative to conventional litter, offering environmental benefits, cost savings, and sustainability.

VI. ACKNOWLEDGEMENT

We would like to sincerely thank the following people and groups for their help and support in completing this research project:
To the Asian Pacific Christian School, Incorporated, our school, for guiding and inspiring us throughout this journey.
To Ma'am Soccorro Alingcumot, our Principal, for her encouragement and helpful insights that shaped the direction of our study.
To Ma'am Vi Briza Guarin, the school chairman and one of our panelists, for her advice, feedback, and for letting us use the compound microscope for our research.

To Ma'am Jochebed L. Reyes, our Research Adviser, for her guidance, support, and advice, which greatly improved the quality of our work.
To Ma'am Vi Briza Guarin, our Research Adviser in practical research 1, for her guidance, support, and helpful advice, which made our work much better.
To Ma'am Annah Elisah G. Adiva, our statistician, for patiently helping us analyze and interpret the data, ensuring the accuracy of our findings.
To Ma'am Heidi Gail T. Basco, our math teacher, for guidance and assistance in discovering tools and methods to better interpret our data.
To Ma'am Kate S. Basco, our Practical Research teacher, for her excellent mentorship and practical advice throughout the research process.
To Mr. Stephen De Jesus for his valuable help with the statistical analysis of our data. Your support made it easier for us to understand and interpret our findings accurately.
To our families, for their love, encouragement, and financial support, which kept us motivated during tough times.
To the Buko Vendor, for kindly providing us with free coconut coir, your generosity made a big difference in our project.
Lastly, we thank God Almighty for His blessings, guidance, and grace, which supported us every step of the way.

VII. LIMITATION

The study focuses on using coconut coir as an alternative cat litter and has certain limitations. Material Source the research used coconut coir obtained locally, which might not reflect the quality or properties of coir available in other areas. Secondly Equipment Availability: The researchers manually processed the coir due to the lack of specialized machines, resulting in uneven pellet sizes. Also, the experiments were conducted in controlled settings and may not account for the variety of real-world conditions faced by cat owners. As well the product Consistency, since the coir was shaped and dried manually, consistency in texture, size, and durability of the pellets might vary. Lastly the study only examines coconut coir as cat litter and does not explore other possible applications or compare it with a wide variety of commercial litters. These factors should be considered when interpreting the results and planning for further research.

REFERENCES

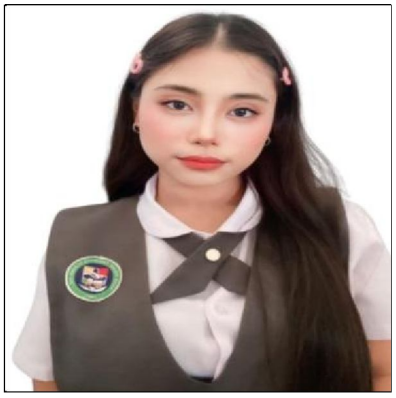
[1] Beugnet, V and Beugnet, F. (2018). Field assessment of cats' litter box substrate preferences. Journal of Veterinary Behavior, 25, 65–70. https://doi.org/10.1016/j.jveb.2018.03.002
[2] Camporrino, C. (2023) Clumping vs. Non-Clumping Litter https://www.prettylitter.com/blog/clumping-vs-non-clumping-litter
[3] Gurbuz, I.B and Manaros M.M (2019) Impact of Coconut Production on the Environment and the Problems Faced by Coconut Producers in Lanao Del Norte Province, Philippines https://www.researchgate.net/publication/342158289
[4] Linh, T. K. (2023). How long does Coco Coir last: reusing, shelf life, and maintenance. Coco Coir Global Vietnam. https://cococoirglobal.com/how-long-does-cococoir-last/
[5] Meniano, S. (2023). Dev't of coco coir to stop coconut farming waste https://www.pna.gov.ph/articles/120205
[6] Pogosa, J.O et al., (2018) Productivity and Sustainability of Coconut Production and Husk Utilization in the Philippines: Coconut Husk Availability and Utilization https://www.researchgate.net/institution/Visayas-State-University?_tp=eyJjb250ZXh0Ijp7ImZpcnN0UGFnZSI6InB1YmxpY2F0aW9uIiwicGFnZSI 6InB1YmxpY2F0aW9uIn19
[7] Syed, H. Nerella, R. and Madduru, S. R. C., (2020) Role of coconut coir fiber in concrete, Materials Today: Proceedings, https://doi.org/10.1016/j.matpr.2020.01.477
[8] TIMESOFINDIA.COM. (2022). Smart ways to use Coconut husk. The Times of India. https://timesofindia.indiatimes.com/life-style/food-news/smart-ways-to-use-coconuthusk/photostory/92858759.cms
[9] Ahmad, J, et al. (2022). Mechanical and durability performance ofcoconut fiber reinforced concrete: A State-of-the-Art Review. https//www.mdpi.com/19961944/15/10/3601
[10] Crisostomo, S. D., Cruz, C., Quilloy, R., & Reaño, C. E. (2023). Narrowing the yield gap of coconut (Cocos nucifera L.) through integrated nutrient management in the Philippines: An On-Farm Experiment approach. IOP Conference Series: Earth and Environmental Science, 1235(1), 012008. https://doi.org/10.1088/1755-1315/1235/1/012008
[11] Dewi, T.K., Mubarok, W.Z. and Antonius S., (2020) Study of Plant Growth Promoting Bacteria from Coconut Coir Dust. https://iopscience.iop.org/article/10.1088/17551315/439/1/012037
[12] Gurbuz, I.B. and Manaros M.M. (2019) Impact of Coconut Production on the Environment and the Problems Faced by Coconut Producers in Lanao Del Norte Province, Philippines https://www.researchgate.net/publication/342158289
[13] Ishafaq, A.M. and Abhishek B., (2018) UTILIZATION OF WASTE COCONUT COIR FIBER IN SOIL REINFORCEMENT. https://iaeme.com/MasterAdmin/Journal_uploads/IJCIET/VOLUME_9_ISSUE_9/IJCIET_09 _09_074.pdf
[14] Ibiyyye, D.E., Adedipe J.O., Olunloyo, O.O. and Akala, A.O., (2021) EFFECT OF COCONUT COIR AND POULTRY MANURE ON THE GROWTH AND YIELD OF Amaranthus hybridus L. http://www.ajol.info/index.php/jrfwe

AUTHOR'S PROFILE

Eliesah Mae S. Cunanan, born on October 4, 2007, in Mabalacat, Pampanga, is a 17-year-old Filipino and a devout Roman Catholic. She is currently studying at Asian Pacific Christian School Incorporated (2023–2025) and previously attended Cristo Rey High School (2019–2023). Eliesah completed her primary education at Asian Pacific Christian School Incorporated (2013–2019). She is a kind and thoughtful individual who enjoys helping others. She has a passion for learning and always seeks to deepen her understanding of the world.
Contact: +639389299676/eliesahmaec@gmail.com

Dolit, Santino L. Born on December 21 2006, in Concepcion, Capas, Tarlac, is 18-year-old Filipino Roman Catholic currently studying at Asian Pacific Christian School Incorporated (2023-2025). Previously attended Sta. Juliana High from (2019-2023). Santino completed his primary education at Sta. Juliana Elementary School (20132019). He is good at adjusting to different situations in life. He actively works on improving himself both in school and in his personal life, always looking for inspiration to help him grow.
Contact: +639504873962/santinodolit332gmail.com

Dueñas, Ariane Jean C. Born on June 8, 2007, in Aranguren, Capas, Tarlac, is a 17-year-old Filipino Roman Catholic currently studying at Asian Pacific Christian School Incorporated (2023-2025). Previously attended Sta. Juliana High from 2019 to 2023. Ariane completed her primary education at Sta. Juliana Elementary School (2013-2019). Ariane is a strong and funny person who values life experiences. She is a motivated and proactive student.
Contact: +639701091891/arianeduenas201@gmail.com



Gutierrez, Patricia Mae S. was born on December 8, 2006. She is a Filipina Baptist who lives in Brgy. Sta. Juliana, Capas, Tarlac. She is a senior high school student at Asian Pacific Christian School Incorporated (2023-2025); she previously attended Sta. Juliana High School (2019-2023) and Sta. Juliana Elementary School (2013-2019). Patricia excels in leadership and communication, is attentive, and is a member of APA (Apcsi Performing Arts). Contact: +639701804262/gutierrezpatriciamae6@gmail.com

Martin, Lanz Raniel S. was born on December 12, 2006, is a Filipino and Catholic, living in Blk 31, Lot 11 Cristo rey Capas, Tarlac. He is a Senior High School student at Asian Pacific Christian School Incorporated (2023-2025) previously attended Cristo Rey High School (2016-2023) previously attended Cristo Rey West Elementary School (2013- 2016). Lanz is good at communication, time management, adaptability and a fast learner**.**
Contact: +639108237145 lanzmartin681@gmail.com

Tinasas, Edward Guilford L. born on November 17, 2007, in Sta. Rita, Capas, Tarlac, a 17-year-old Filipino Born Again currently studying at Asian Pacific Christian School Incorporated (2023-2025). Previously attended Cristo Rey Highschool (CRHS) (2019-2023). Edward completed his primary education at Asian Pacific Christian School Incorporated (2013-2019). Edward is a straightforward person who intends to learn from every experience. He is also a passionate individual who values personal growth and embraces challenges as opportunities to improve himself. Contact: +639510048494 egboypogi193@gmail.com

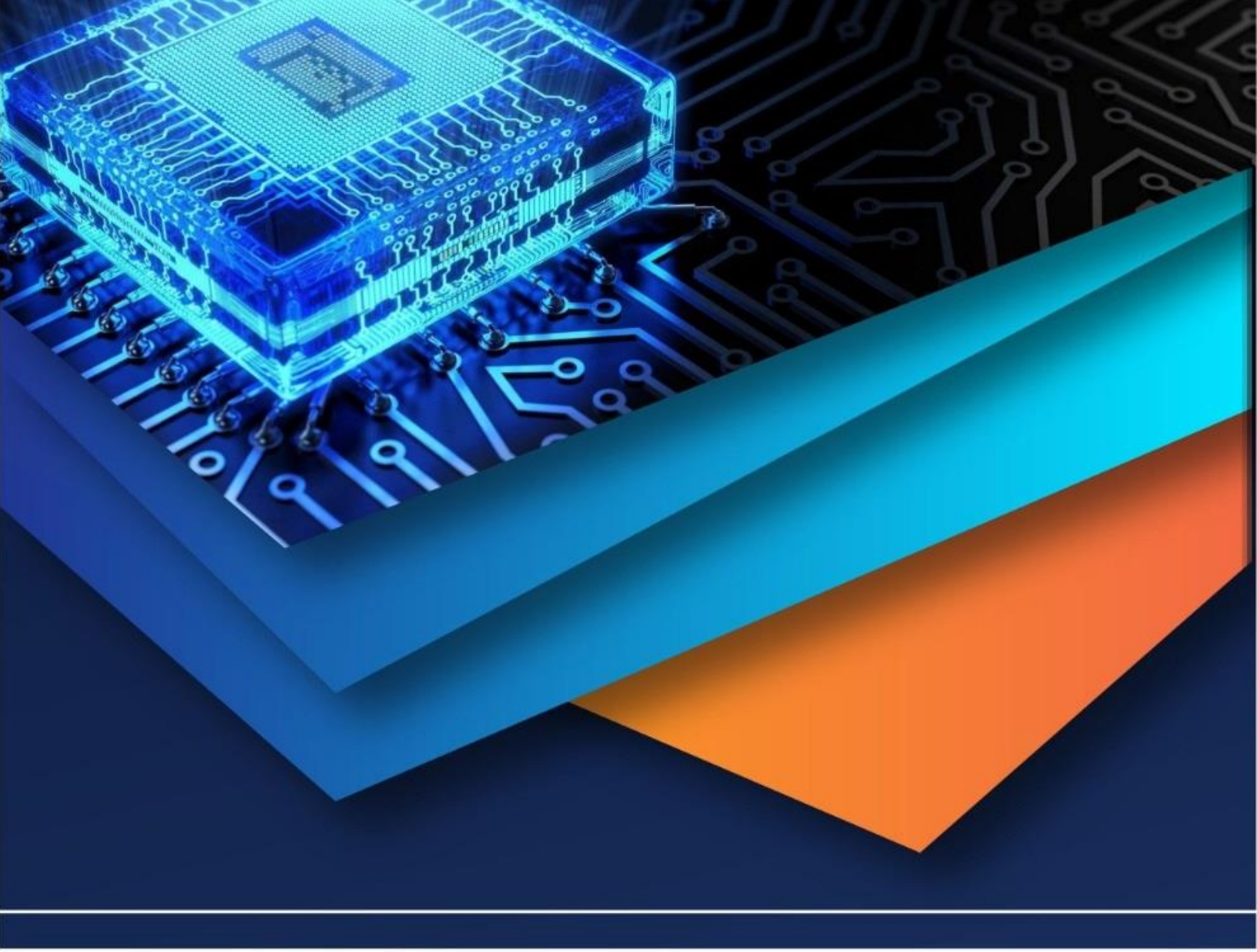
Reyes, Jochebed L., is a research adviser and a newly licensed professional teacher. She graduated from Tarlac State University (TSU) with Latin honors (Cum Laude), earning eligibility for the Civil Service Exam and recognition for the Best in Research Paper. She recently passed the board examination for teachers.
Contact: lopezjochebed@gmail.com.

Adiva, Annah Elisah G., is a Senior High School
Mathematics teacher and a statistician adviser with almost two years of experience in a private school. She earned her Bachelor of Secondary Education, majoring in Mathematics, from Dominican College of Tarlac and became a Licensed Professional Teacher (LPT) in 2023. Currently, she is pursuing a Master of Arts in Education, majoring in Mathematics, at Tarlac State University.
Contact: teacher.annah00@gmail.com.

Basco, Kate Santiago, serves as the research instructor of the researchers. She also holds the majority of research subjects in Asian Pacific Christian School Inc. Also, she is a Licensed Professional Teacher (LPT) and is currently pursuing Master of Education Major in English at Tarlac State University. She can be contacted through kateybasco@gmail.com

Basco, Heidi Gail T., a Licensed Professional Teacher (2019), Statistician, a Mathematics Teacher at the Asian Pacific Christian School, Inc. Senior High School, and is currently pursuing Master of Education Major in Mathematics at Tarlac State University. She can be contacted via email at heidigailbasco1@gmail.com.

Guarin, Vi Briza E., serves as the research adviser for the student-researchers. A nurse by profession and an educator at the same time, she is the Senior High School Academic Coordinator at Asian Pacific Christian School, Incorporated (APCSI) in Capas, Tarlac. With twelve years of teaching experience in private institution, she holds a master's degree in science education from Pangasinan State University, Philippines. She is currently pursuing her Doctor of Philosophy in Science Education at Don Mariano Marcos Memorial State University in La Union, Philippines. For inquiries, she can be contacted via email at vibrizaguarin.apcsi@gmail.com



10.22214/IJRASET

45.98

IMPACT FACTOR: 7.129

IMPACT FACTOR: 7.429

INTERNATIONAL JOURNAL FOR RESEARCH

IN APPLIED SCIENCE & ENGINEERING TECHNOLOGY