Assessing the Impact of Real-Time Simulations on the Pretest and Posttest Performance of Grade 8 Learners

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DOI: https://dx.doi.org/10.47772/IJRISS.2025.905000180

Received: 28 April 2025; Accepted: 04 May 2025; Published: 03 June 2025

ABSTRACT

Education is shifting towards modern approaches particularly with the integration of digital resources and STEM in the classrooms. One significant advancement in the field of science education is the use of simulation tools, which provide an interactive and engaging ways in teaching complex science concepts. The primary aim of the study is to determine the significant difference between the pretest and posttest scores of Grade 8 learners after the intervention of a developed learning packet on typhoons. Grounded in the principles of STEM education, the learning packet incorporated real-time simulation tools such as Project NOAH and Zoom Earth to enhance learners' conceptual understanding of typhoon formation and movement. Using a one-group pretest-posttest design, seventy (70) learner-respondents participated in the intervention. Data analysis revealed a significant improvement from the pretest mean score of 14.01 to the posttest mean score of 18.28. A paired sample t-test showed that the improvement was statistically significant at $p < 0.05$. Furthermore, the study supports the Sustainable Development Goals (SDG 4: Quality Education, SDG 13: Climate Action) by improving access to quality science education and fostering a deeper understanding of climate resilience and disaster risk reduction. The development of this learning packet not only enhances conceptual understanding of typhoons but also fosters disaster risk awareness and readiness for real-word environmental challenges.

Keywords: Typhoons, Learning Packet, Pretest-Posttest Design, Grade 8 Learners, Conceptual Understanding, Paired Sample t-test, Sustainable Development Goals (SDG)

INTRODUCTION

Typhoons are one of the most destructive natural disasters, and their impact is particularly severe in countries like the Philippines. Due to its location in the Intertropical Convergence Zone (ITCZ), the country experiences approximately 20 typhoons annually, many of which cause significant damage and loss of life (Santos, 2021). Given their frequency and the vulnerabilities, they pose, teaching typhoon formation and its associated risks is important in helping learners understand these phenomena and make connections to real-world situations. However, one of the most challenging areas for Grade 8 students is understanding the process of typhoon formation. This competency remains one of the least mastered in the Science 8 curriculum (Soberano & Matiras, 2024). Additionally, typhoons have complex characteristics, making them difficult to understand (Chen & Li, 2024).

Despite the importance of this topic, many instructional approaches still rely on traditional, static materials that fail to promote active engagement and conceptual understanding, where learners struggle to demonstrate competence and develop essential scientific skills (Balansag, 2019). Learning materials, particularly textbooks, are frequently designed in a way that encourages surface-level learning strategies rather than fostering a deep understanding of complex scientific concepts (Ambag, 2018). Furthermore, the persistent use of traditional teaching methods leads to rote memorization instead of meaningful learning (Tabamo, 2023). This limits students' ability to apply scientific knowledge effectively, preventing them from achieving the intended learning outcomes (Abah, 2020).

To address these gaps, the learning packet was designed using the Successive Approximation Model (SAM), ensuring an iterative and responsive development process based on expert feedback. Evaluations from pre-service and in-service teachers showed strong instructional design, content clarity, and overall effectiveness, with "Tracing Typhoon Movements" and "Know Your Hazards" receiving favorable ratings. Revisions were made based on these evaluations to further refine the materials.

By integrating real-time simulation tools, the learning packet aims to enhance STEM education by providing a dynamic, interactive, and learner-centered experience. Furthermore, this educational innovation contributes to the United Nations Sustainable Development Goals, specifically SDG 4 (Quality Education) by promoting access to inclusive and equitable quality education, and SDG 13 (Climate Action) by strengthening learners' understanding of climate resilience and disaster risk reduction.

Specifically, this study evaluates the effectiveness of the developed learning packet by determining whether there is a significant difference between the pretest and posttest scores of Grade 8 learners. Through analyzing learners' performance before and after the intervention, the study seeks to establish whether the learning packet significantly improves conceptual understanding of typhoon-related concepts.

Objectives of the Study

This study sought to attain the research objective:

Determine the significant difference between the pretest and posttest scores of the learner-respondents.

METHODOLOGY

Research Design

This study employed a quantitative one-group pretest-posttest design to determine the significant difference in learners' scores before and after the implementation of a developed learning packet (Privitera & Delzell, 2019).

In this design, the same dependent variable which is the learners' achievement scores was measured before (pretest) and after (posttest) the intervention. Seventy (70) Grade 8 learner-respondents were purposively selected as participants. Quantitative analysis, specifically a paired sample t-test, was utilized to determine whether there was a statistically significant improvement in the learners' scores.

Research Participants

The participants in the study were seventy (70) Grade 8 learners from a private school in Kauswagan, Lanao del Norte. These participants voluntarily participated in the study, providing assent along with consent forms signed by their parents. The criteria for selecting the learner-respondents were: (a) currently enrolled as Grade 8 learners for the academic year 2024–2025; and (b) had not previously covered or discussed typhoons in their science lessons. Participants were purposively selected to ensure alignment with the study’s objectives and content focus. Although specific demographic data were not collected, learners were assumed to fall within the typical age range for Grade 8 students based on the school’s enrollment records. The limited demographic scope and the use of a single private school may affect the generalizability of the findings. Future studies are encouraged to include participants from more diverse backgrounds and school settings to strengthen external validity.

Research Instruments

The primary instrument used in this study was a researcher-made 30-item achievement test aligned with the Most Essential Learning Competencies (MELCs) for Grade 8 Science. The achievement test (pretest-posttest) was designed based on a Table of Specifications (TOS) to ensure alignment with the intended learning outcomes on typhoons and associated risks. To establish content validity, the test underwent face validation by the research advisers who are science education experts, who reviewed the appropriateness, relevance, and clarity of the items. Revisions and refinements were incorporated based on the experts' feedback to ensure the validity and reliability of the instrument.

Description of the Developed Learning Packet

The learning packet was designed using the Successive Approximation Model (SAM) and consisted of two key activities: (1) Tracing Typhoon Movements and (2) Know Your Hazards. These activities focused on understanding typhoon movement and related hazards, aligned with the Most Essential Learning Competencies (MELCs) in Science 8. Real-time simulation tools such as Zoom Earth and Project NOAH were used to allow learners to interact with live weather data and hazard maps. In addition, supplementary materials such as worksheets, and simplified maps supported concept reinforcement and learner engagement. To support transparency and facilitate replication of the intervention, a summary of the learning packet’s components and two learning activities are provided in Appendix A

Data Gathering Procedure

The study was conducted at a private school in Kauswagan, Lanao del Norte. A formal letter of approval was sent to the school principal to request permission to conduct the research. Upon approval, the researcher then coordinated with Grade 8 class advisers and science teachers to arrange the schedule and conduct orientation to the learners regarding the study. Parents’ consent forms and learners’ assent forms were distributed and collected before finalizing the list of participants. The researcher then administered the pretest to the seventy (70) Grade 8 learner-respondents to establish baseline data on their understanding of typhoons and associated risks. Following the pretest, the learning packet, which incorporated real-time simulation tools such as Project NOAH and Zoom Earth, was implemented during the learners’ regular science classes. Upon completion of the learning packet activities, the posttest was administered to the same group of learners.

Data Analyses

The following statistical tools were used to analyze and interpret the data gathered in the study:

- Mean was used to analyze the learners' pretest and posttest scores to determine the level of conceptual understanding before and after the implementation of the learning packet.
- Standard Deviation was utilized to measure the variability of the learners' scores in relation to the mean for both the pretest and posttest results.
- Paired Sample t-test was conducted to determine the significant difference between the learners' pretest and posttest scores. A significance level of 0.05 was set to decide whether the observed difference was statistically significant.

RESULTS AND DISCUSSIONS

A 30-item researcher-made pretest and posttest was administered to the learner-respondents to determine their conceptual understanding on the topic of typhoons, particularly its movement and its corresponding risks to the areas it passes through. The questions were formulated in accordance with the Most Essential Learning Activities for Grade 8 Science, Second Quarter, under the content typhoons.

Table 1 shows the distribution of scores and their descriptions based on the NAT Result for Grade 6 (2012). The NAT result was considered a reliable reference for test scoring due to its accuracy and thorough

ISSN No. 2454-6186 | DOI: 10.47772/IJRISS | Volume IX Issue V May 2025

documentation. The achievement test results from both the pretest and posttest were evaluated using rating scales, each accompanied by an appropriate qualitative description.

Table 1 Learner's Conceptual Understanding of Typhoons and its Risks

Scores		**Pretest**		**Posttest**		**Description**
		f	%	***f***	%	
29	– 30	0	0	3	4	**Mastered (M)**
26	– 28	0	0	6	9	**Closely Approximating Mastery (CAM)**
20	– 25	3	4	16	23	**Moving Towards Mastery (MTM)**
12	– 19	50	72	38	54	**Average (AVR)**
6	– 11	17	24	7	10	**Low (L)**
3	– 5	0	0	0	0	**Very Low (VL)**
0	– 2	0	0	0	0	**Absolutely No Mastery (ANM)**
		70	100	70	100	**Total: 70**

As shown in Table 1, none of the learner-respondents exhibited mastery of typhoon concepts in the pretest, whereas 4% of the respondent's acquired mastery in the posttest. This indicates that before engaging with the learning packet and participating in real-time simulation activities, the learner-respondents had no prior mastery of typhoons.

The data revealed that none among the learner-respondents achieved closely approximating mastery in the pretest, which increased to 9% in the posttest. Meanwhile, 4% of respondents were categorized as moving towards mastery on the pretest, which significantly improved to 23% in the posttest. On the other hand, 72% of the learner-respondents were classified as having average mastery in the pretest, which decreased to 54% in the posttest. The percentage of learner-respondents classified as having low mastery dropped from 24% in the pretest to 10% in the posttest. Very low and absolutely no mastery categories remained at 0% in both the pretest and posttest. This indicates that all learner-respondents improved their understanding to at least an average level or higher.

Results of the pretest and posttest also show that in the pretest, 76% of the students demonstrated at least an average level of mastery or higher (Average, Moving Towards Mastery, Closely Approximating Mastery, and Mastery). In the posttest, this percentage increased to 90%, with more learners attaining higher mastery levels. This suggests that a greater number of learners gained a deeper understanding of typhoons by the time of the posttest.

Furthermore, none of the learner-respondents remained in the very low (VL) or absolutely no mastery (ANM) categories in either the pretest or posttest, reinforcing that all learners had at least a foundational knowledge of typhoon concepts before assessment, which was further enhanced after the intervention. The results confirm that learner-respondents improved their understanding, with some reaching the highest mastery levels, while others moved from lower to higher performance categories.

Additionally, the findings suggest that learner-respondents had some prior knowledge of typhoons before testing, as seen in the pretest results. However, their understanding deepened significantly in the posttest, as more learners transitioned to higher mastery levels. This aligns with studies emphasizing that effective instructional materials and engaging learning experiences contribute to higher academic achievement. Turner et al. (2018) emphasized that integrating interactive digital tools, such as online computer games, into educational settings fosters greater engagement, accommodates different learning preferences, and improves learners' academic performance. Their findings suggest that active and dynamic learning experiences can enhance comprehension and support deeper understanding while Adipat et al. (2021) emphasizes the role of well-designed instructional materials in enhancing meaningful learning experiences. These findings imply that providing learners with structured and interactive learning resources can facilitate significant improvements in conceptual understanding.

Table 2 Difference of the Conceptual Understanding of the Learner-Respondents

Implementation	**Conceptual Understanding**		**Mean Difference**	**t-value (69)**	**P-value**	**Remark**
	M	SD				
Before (N=70)	14.01	3.71	-4.28	-7.49	< .001	**Significant**
After (N=70)	18.29	5.28				

Note. N = 70. p < .001 is significant at the .05 level.

Table 2 shows the comparison between the respondents' pretest and posttest scores using a paired t-test to determine statistical significance at $\alpha = 0.05$. The mean pretest score was 14.01 (SD = 3.71), while the mean posttest score increased to 18.29 (SD = 5.28), reflecting a mean difference of -4.28. The calculated t-value of -7.49 and a p-value of < .001 indicate a statistically significant difference between the two tests. These results suggest that the intervention had a positive effect on the learners' conceptual understanding of typhoon-related concepts. The significant improvement in posttest scores demonstrates that the learners gained knowledge and enhanced their understanding following the intervention.

The findings are consistent with previous research on the effectiveness of well-designed learning materials combined with simulations. According to Rutten et al. (2012), Blake and Scanlon (2007), Matute-Vallejo and Melero-Polo (2019), and Sanina et al. (2020), the use of simulations leads to substantial learning gains compared to traditional teaching methods. Similarly, Dardashi et al. (2015) highlighted how simulations introduce cognitive conflict, promoting deeper conceptual change in learners. Further, Rooney and Nyström (2018) emphasized that real-time simulation tools and interactive learning strategies strengthen learners' ability to connect theoretical knowledge with real-world applications, According to Merchant et al. (2014), virtual reality-based simulations significantly improve learners' learning outcomes and engagement learners better, especially within e-learning environments that align with learners' learning preferences.

Thus, the results of this study underscore the critical role of well-designed learning materials, particularly those incorporating interactive simulations, in improving learners' understanding of typhoon movements and associated risks.

CONCLUSION

The results of the study demonstrate that the use of real-time simulations significantly improved the conceptual understanding of Grade 8 learners on typhoons and their associated risks. A comparison of pretest and posttest scores revealed notable improvement after the intervention, as confirmed by a statistically significant mean difference. These findings highlight the effectiveness of integrating interactive simulations into science instruction to promote deeper conceptual learning and engagement. Consistent with previous research, the study emphasizes that real-time simulations offer learners dynamic and meaningful learning experiences, allowing them to better connect theoretical concepts with real-world applications. Thus, the use of well-designed learning materials supplemented with simulations is highly recommended for improving learners' comprehension in science education.

Although the findings suggest a positive impact of the intervention, the study did not include a control group, which limits the ability to attribute the gains exclusively to the learning packet. Future studies should consider employing experimental designs to isolate the effect of simulations from other influencing variables.

It is also important to note that this study was conducted in a single private school, and detailed demographic data were not collected. Therefore, while the results show promise, their generalizability to broader contexts may be limited.

ISSN No. 2454-6186 | DOI: 10.47772/IJRISS | Volume IX Issue V May 2025

Future research is encouraged to explore the long-term retention of learning gains by implementing delayed posttests to assess the sustainability of learners' understanding over time. Including qualitative feedback such as learner reflections or interviews may also provide richer insights into learners' experiences and perceptions of simulation-based instruction.

ACKNOWLEDGEMENT

This study was made possible through the support and guidance of many individuals. I sincerely thank my thesis advisers, Assoc. Prof. Joy R. Magsayo and Dr. Jun Karren V. Caparoso, for their invaluable insights and unwavering support. To my panel members, Assoc. Prof. Ellen J. Castro, Asst. Prof. Eleasar V. Malicoban, and Assoc. Prof. Sotero O. Malayao, your expertise greatly refined this work. I am grateful to MSU-IIT and the Department of Science and Technology (DOST) for their financial assistance and to Dr. Monera Salic-Hairulla and Sir Vanjoreeh Madale for their constant encouragement. Special thanks to Ms. Josephine N. Ayuno, principal of St. Vincent's Academy Inc., for permitting the data collection, and to the participating educators and learners for their valuable input. Above all, I thank the Almighty Father for granting me strength and perseverance throughout this journey.

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APPENDIX

APPENDIX A

Summary Table of the Learning Packet

Activity Title	Learning Focus	Simulation Tool Used	Key Learning Activities
Where Will the Typhoon Go Next? – Tracing Typhoon Movements WWhee	Understanding typhoon formation and tracking using live simulation data	Zoom Earth	T rack typhoon paths by adjusting date/time filters; analyze changes in direction and speed
Mapping for Safety: Understanding Community Hazards using Project NOAH	Assessing local risks such as flooding, landslides, and storm surges	Project NOAH	Evaluate community vulnerability using hazard maps; identify safe zones and hazard-prone areas

Learning Activity 1

Activity No. 1

Where Will the Typhoon Go Next?" – Tracing Typhoon Movements

Group No.___ **Date:** ____________
Name: __________________________ **Score:**____________

Introduction

Typhoons are among the most powerful and destructive natural phenomena that affect the Philippines and other Pacific regions. But why do typhoons follow specific paths? How can we better predict its impacts accurately?

In this activity, you will trace the path of Typhoon Pepito and predict its movement using real- time data, just like experts at PAGASA. These questions will guide our exploration.

Objectives

At the end of this activity, you will be able to:

1. Trace the path of typhoon Pepito using real-time data from Zoom Earth
2. Determine the factors influencing typhoon behaviors
3. Predict the movement of typhoon Pepito based on its center position, intensity and motion.

Materials

- Internet connection to access Zoom Earth
- Printed Philippine Map with Coordinates
- Colored Pen
- Ruler

Procedure

1. Visit Zoom Earth to track the movement of typhoon Pepito that is affecting some regions in the Philippines.
2. Record the typhoon's data at 6-hour intervals over a 3-day period, including its center position, intensity, and direction of movement.
3. Pause when necessary to record data for each given time.
4. Observe how the behavior of Typhoon Pepito changes in areas it passes through.
   a. *What might explain these changes?*

5. Using the data you've collected, trace the typhoon's path on the map based on the coordinates.
6. Mark each location and movement of the typhoon on the map.
7. Observe the changes on the category of Typhoon Pepito as it passes through several regions in the Philippines.
    a. *How do you think local geography (landforms, water bodies) affect typhoon's path?*

Results and Discussion

Fill in the table with the necessary information, after filling the table, reflect on the following questions:

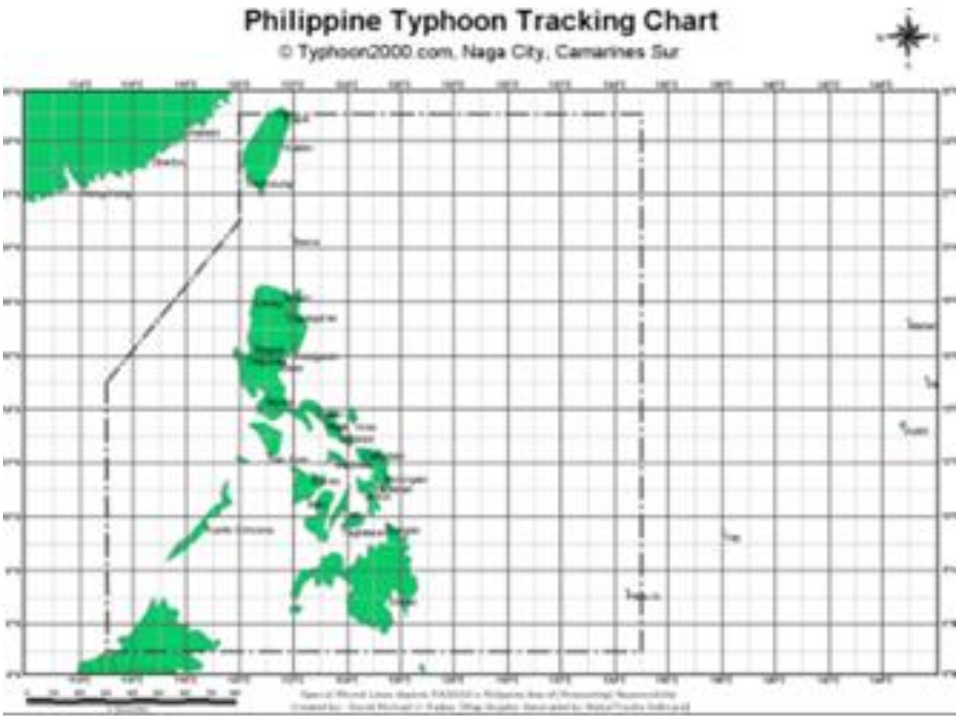
Date	Time	Movement (km/hr)	Center Position (Location)	TCI, TCA or PAR	Category
11/15/2024	8:00 AM	130 km/hr	10.6°N, 131.9 °E	PAR	Tropical Depression

1. What do the data patterns tell us about typhoon behaviors?

2. Were there any surprising observations in the typhoon's movement or changes in its category?

Conclusion

What have you learned about predicting typhoon movements, and how might this be useful in educating the people on disaster preparedness?



Activity No. 2

Mapping for Safety: Understanding Community Hazards using Project NOAH

Group No.___ **Date:** ____________
Name: ____________ **Score:**____________

Introduction

Typhoons are among the most devastating natural disasters that frequently affect the Philippines. The heavy rains, strong winds, and storm surges it brings often lead to widespread flooding, landslides, and destruction in vulnerable areas. But how can we identify which areas in our community are most at risk from these types of hazards?

Hazard mapping, supported by real-time monitoring tools like Project NOAH (Nationwide Operational Assessment of Hazards), plays an important role in disaster preparedness. It allows communities to visualize areas at risk and plan our according to reduce vulnerability.

In this activity, you will use Project NOAH to create a hazard map for your community, focusing on typhoon-related hazards like floods, storm surges and landslides.

Objectives

At the end of this activity, you will be able to:

1. Navigate the Project NOAH platform to collect important information on hazards
2. Create a hazard map, highlighting areas in your community that are in high-risk areas.
3. Propose actionable safety measures based on your map.

Materials

- Internet access and a device to access Project NOAH platform
- Printed map of your local community
- Colored pens
- Ruler

Procedure

1. Each group will be assigned to a certain community to study.
2. Explore Project NOAH. Visit the website: https://noah.up.edu.ph/ and make yourself familiar with its features.

7. Analyze you community's risk, identify which areas in your community are at highest risk.
8. Write down at least three suggestions to mitigate risks in high-hazard zones in your community.

Results and Discussions

1. Hazard Map: Attach your completed community hazard map.

2. What patterns did you observe about the location of hazard-prone areas?

3. How might the local geography (e.g., mountains, rivers) contribute to these risks?

Conclusion

What did you learn about using technology like Project NOAH for disaster preparedness and how can hazard mapping help save lives in your community?

APPENDIX B

Table of Specifications

Rosemarie P. Llido

Grade 8 Science **Second Quarter Period**

Content	Learning Competencies	Weight (%)	Remembering	Understanding	Applying	Analyzing	Evaluation	Creating	Total No. of Test Items
Formation of typhoons and their movement within the PAR	Explain how landmasses and bodies of water affect typhoons.	20%	2 (4,6)	1 (7)		2 (26,27)	1 (28)	-	6
	Trace the path of typhoons that enter the Philippine Area of Responsibility (PAR) using a map and tracking data.	80%	7 (1,2,3,8,9,10,13)	6 (16,17,18,20,21,22)	2 (19,24)	3 (15,23,25)	1 (30)	-	19
	• Mitigate the risks and effects of typhoons		2 (5,11)	1 (12)	1 (14)	1 (29)		-	5
TOTAL		100%	11 (36.67%)	8 (26.67%)	3(10%)	6(20%)	2(6.66%)	-	30

APPENDIX C

Name: ______________________________ **Score:** _____

I. Directions: Please read each item carefully and make sure you understand them. Write the letter of the best answer on the space provided before each number.

____1. Which agency in the Philippines is responsible for monitoring typhoons and issuing advisories to people?

A. Philippine Volcanology and Seismology (PHIVOLCS)
B. Philippine Atmospheric, Geophysical and Astronomical Services Administration (PAGASA)
C. Department of Education (DepEd)
D. Department of Environment and Natural Resources

____2. It is issued by PAGASA to inform the public about the amount of rainfall a particular atmospheric disturbance may bring.

A. Flood Warning
B. Warning Advisories on Typhoons
C. Color-coded rainfall warning advisories
D. Rainfall code warning

____3. Which color of the rainfall warning signifies the highest level of danger?

A. Yellow C. Green
B. Orange D. Red

____4. Which of the following best describes the Intertropical Convergence Zone (ITCZ)?

A. A region near the equator where the trade winds from the Northern and Southern Hemispheres meet, often causing thunderstorms and rainfall.
B. A zone where cold and warm air masses converge, creating typhoons.
C. A boundary where typhoons typically form and travel toward the Philippines.
D. A high-pressure area that moves from east to west, bringing dry weather.

____5. Which of the following conditions is most favorable for the formation of typhoons?

A. Warm ocean temperatures C. Low humidity levels
B. Cold ocean temperatures D. Dry air masses

____6. Which of the following occurs when strong winds push towards the shore during a typhoon?

A. tsunami C. storm surge
B. flash flood D. landslide

____16. Typhoon Yolanda was classified as a super typhoon with maximum sustained winds of 235 kph. If it traveled a distance of 600 kilometers over 2.5 hours before making landfall in the Visayas, what was its average speed?

A. 210 kph
B. 240 kph
C. 270 kph
D. 280 kph

____17. Typhoon Rolly (Goni) was one of the strongest typhoons ever recorded. It moved from the eastern boundary of the PAR to landfall in Catanduanes, covering a distance of 840 kilometers in 3 hours. What was Typhoon Rolly's average speed?

A. 250 kph
B. 350 kph
C. 280 kph
D. 270 kph

____18. When a TCWS No. 1 is raised due to an approaching typhoon, like Typhoon Agaton in 2022, what wind speeds should residents expect?

A. Winds of 30-60 kph
B. Winds of 61 kph or less
C. Winds of 62- 88 kph
D. Winds of 89- 117 kph

____19. What should residents expect under TCWS No. 2, like in the case of Typhoon Basyang?

A. Light damage to buildings and infrastructure.
B. Winds of 62-88 kph with minor to moderate damage.
C. Severe damage to structures and crops.
D. No damage but some inconveniences.

____20. The following things may be experienced by regions with TCWS No. 3, except:

A. Winds of 89-117 kph
B. Moderate to significant threat to all life and property
C. A warning lead time of 12 hours
D. The area will experience severe tropical storm or higher

____21. If TCWS No. 3 is raised for a Severe Tropical Storm like Josie (2022), what wind speeds should residents prepare for?

A. 61 kph or less
B. 62-88 kph
C. 89-117 kph
D. More than 220 kph

____22. If your area is under TCWS No. 2 due to a Tropical Storm (TS), which precautionary measure is recommended?

A. No precautions are needed.
B. Secure outdoor items and prepare to stay indoors.
C. Evacuate immediately.
D. Go about your daily activities as usual.

____7. What happens to a tropical cyclone that passes through mountainous regions?

A. It is unaffected and continues to speed up.
B. It loses its moisture and weakens its strength.
C. Its winds move in different directions.
D. Its winds return to its original location.

____8. What happens when a typhoon passes over a large body of water after crossing land?

A. It strengthens again
B. It weakens further
C. It stays the same
D. It dissipates immediately

____9. Which part of the tropical cyclone is described as a dangerous zone due to its strong winds and heavy precipitation?

A. eye
B. eyewall
C. tail end
D. spiral rain band

____10. What is the least maximum sustained wind of a typhoon?

A. 36 km/hr
B. 63 km/hr
C. 64 km/ hr
D. 118 km/hr

____11. What is the purpose of monitoring tropical cyclones in the Philippine Area of Responsibility?

A. To keep track of storm surges
B. To prepare for possible landfall and provide advisories to people
C. To track global weather systems
D. To control the direction of typhoons

____12. Which of the following is not a risk associated with typhoons?

A. flash flood
B. landslides
C. volcanic eruption
D. storm surge

____13. Which type of area is most vulnerable to the effects of storm surge?

A. mountainous regions
B. coastal low-lying areas
C. inland agricultural areas
D. densely forested regions

____14. Which province was severely affected by the Typhoon Yolanda (Haiyan)?

A. Cebu
B. Leyte
C. Bukidnon
D. Lanao del Norte

____15. Why are coastal communities often evacuated when a strong typhoon approaches?

A. To prevent destruction of farmland
B. To avoid the risk of storm surges and flooding
C. To monitor the strength of the typhoon
D. To prepare for landslide

ISSN No. 2454-6186 | DOI: 10.47772/IJRISS | Volume IX Issue V May 2025

____23. According to the new PAGASA guidelines, which wind speed corresponds to a Super Typhoon under TCWS No. 5?

A. 118-220 kph
B. 185 kph or higher
C. 62-88 kph
D. 89-117 kph

____24. What precautionary measure should residents take if TCWS No. 3 is raised due to Severe Tropical Storms (STS) with wind speeds between 89-117 kph?

A. Avoid travel and prepare for possible evacuation
B. Continue daily activities as usual.
C. Stay outdoors to monitor the storm.
D. Wait for further instructions.

____25. Typhoon Glenda moved from the eastern boundary of the PAR and crossed Luzon in 8 hours, covering a total of 720 kilometers. What was its average speed during this period?

A. 80 kph
B. 70 kph
C. 90 kph
D. 60 kph

___26. A typhoon with a TCWS #3 signal weakens to TCWS #1 after interacting with the Sierra Madre mountain range. What is the primary reason for this weakening?

A. The mountain range causes friction, slowing down the winds
B. The typhoon loses access to warm, moist air from the ocean
C. The mountains block the typhoon's movement, dispersing its energy
D. All of the above

____27. Which of the following conditions is most likely to cause a typhoon to intensify as it approaches land?

A. Interaction with mountainous terrain
B. Cooler ocean surface temperatures
C. Warmer sea surface temperatures and low wind shear
D. Proximity to the equator with high pressure systems in place

____28. A typhoon suddenly changes direction as it nears the Philippines. Which of the following is the most likely cause of this change?

A. The typhoon weakens as it loses energy
B. Changes in the surrounding high and low-pressure systems
C. Increased rainfall affecting its trajectory
D. Interaction with cold ocean currents

____29. Why is it important to follow evacuation orders during a typhoon?

A. To protect your personal belongings
B. To avoid unnecessary travel
C. To ensure your safety from dangerous conditions
D. To avoid getting wet in the rain