Makeover Challenge:
Converting a Lesson Plan into a IDEA Lesson Exemplar

Physics 4As Lesson Plan

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An lesson exemplar submitted in partial fulfillment of the requirements in
Teaching of Mathematics and Science (MST 123)
under Prof. Rosemarie Eusebio, 1st Semester, A.Y. 2022-2023

University of the Philippines Los Baños
College of Arts and Sciences
BS Mathematics and Science Teaching Program

LESSON PLAN FOR GRAND DEMONSTRATION IN TEACHING
GRADE 10 - SCIENCE

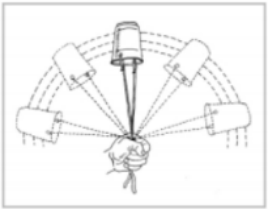
School	**University of the Philippines Rural High School**	Grade Level	**Grade 10**
Teacher	**Regine A. Vicente**	Learning Area	**Science - Physics**
Teaching Date and Time	**November 28, 2019** **12:00 - 2:00 PM**	Quarter	**Third**

I. Objectives	**Performance Standard:** The learner should be able to solve problems involving uniform circular motion using experimental and theoretical approaches. **Content Standard:** The learner demonstrates an understanding of uniform circular motion. At the end of the lesson, the students should be able to: a. Define the terms axis, rotation, revolution, center, tangent, speed, velocity, acceleration, and wheel; b. Compare linear speed from rotational speed; c. Describe uniform circular motion; d. Enumerate real life applications of uniform circular motion; and e. Clarify misconceptions about centripetal force.
A. Content Standards	The learners demonstrate an understanding of the concept of: 1. Uniform Circular Motion 2. Types of Speed 3. Relationship of Tangential and Rotational Speed
B. Performance Standards	The learners should be able to: 1. Solve problems involving uniform circular motion using experimental and theoretical approaches
C. Most Essential Learning Competencies (MELCS)	1. Infer quantities associated with circular motion such as tangential velocity, centripetal acceleration, tangential acceleration, radius of curvature (STEM_GP12KIN-Ic-25) 2. Solve problems involving two dimensional motion in contexts such as, but not limited to ledge jumping, movie stunts, basketball, safe locations during firework

	displays, and Ferris wheels (STEM_GP12KIN-Ic-26)
D. Enabling Competencies	The learners should be able to perform: 1. Problem-solving 2. Analysis and critical-thinking
E. Enrichment Competencies	The learners are recommended to: 1. Apply their understanding of the lesson to real-life situations
II. Content	Uniform Circular Motion
III. Learning Resources	
A. References	
a. Teacher's Guide Pages	Final K-12 MELCS with CG Codes, page 641 *(if under MELCS, post 2021)*
b. Learner's Material Pages	N/A
c. Textbook Pages	Hewitt, P. G. (2015). ***Conceptual Physics***, 12th Edition. City College of San Francisco: Pearson. Serway, R. (1990). ***Physics for Scientists and Engineers: With Modern Physics***, 3rd Edition. Englewood Cliffs, New Jersey: Prentice-Hall International Incorporation. Young, H. D. & Freedman, R. A. (2003). ***University Physics with Modern Physics***, 11th Edition, pp. 100-108. San Francisco: Addison Wesley.
d. Additional Materials from Learning Resources	SoftSchools. (n.d.). ***Centripetal Force Formula***. http://www.softschools.com/formulas/physics/centripetal_force_formula/43/ Solar Schools. (n.d.). ***Types of Energy***. solarschools.net/knowledge-bank/energy/types The Classroom Physics. (2019). ***Newton's Law***. http://www/physicsclassroom.com/Physics-Tutorial/Newton-sLaws.
B. List of Learning Resources for Development and Engagement Activities	Virtual experiments or simulations via online applications: - A virtual simulation on uniform circular motion where speed, radius, and mass may be set. Velocity, acceleration, and net force may be determined: https://bit.ly/2HL5wG4 Other multimedia resources (e.g. video demonstrations or animations, GIFs, and links to online applications) - A recorded video demonstration on uniform circular motion: https://bit.ly/3X7YtJT

IV. Procedures	
A. Introduction	**RECALL ACTIVITY** **Activity No. 1: FACT or BLUFF!** The students will be divided into 14 groups (3 members each). Each of the groups will have a FACT (Rodrigo Duterte) and BLUFF (Xi Jinping) cards that they need to raise as the questions are flashed. The recall activity is composed of five (5) questions from the past lesson/s. Another four (4) questions will be prepared in case of ties. The scores of each group will be tallied at the end of the game. The winning team will receive a prize. No notes should be opened in the duration of the recall game. The questions are as follows: 1. Impulse is also defined as the product of mass and the change in velocity. (FACT) 2. There are four categories of collisions such as: elastic collisions, inelastic collisions, perfectly elastic collisions, and perfectly inelastic collisions (BLUFF – *perfectly elastic is not included*) 3. According to the law of conservation of mechanical energy, the sum of the kinetic energy and potential energy in a conservative system is changing and not equal to the total mechanical energy of the system. (BLUFF – *is constant and equal to the total mechanical energy of the system*) 4. Power is the rate of doing work (FACT) 5. When you go up the stairs fast, you expend more energy in shorter time than when you go slowly (FACT — *This is true based on the equation of power = W/t*) TIE BREAKER QUESTIONS: 1. It is always true that heavy or massive objects have a greater momentum even if they are moving slowly. (BLUFF – *A light object can have as much momentum as a heavy object, depending on how fast it moves, example bullet*) 2. When you push with the same force for twice the contact time, you impart twice the impulse and produce twice the change in momentum.

	(FACT) 3. Anything that is moving has kinetic energy. (FACT) 4. The sum of kinetic energy and potential energy is called elastic potential energy. (BLUFF – *mechanical energy*) **PRIMING ACTIVITY** **Activity No. 2: 4 pics 1 word!** Four pictures will be shown to the students. They will be asked to guess which particular word best describes the theme of the images. All of the images will be based on concepts to be discussed in the session.
	Goal Orientation: The teacher will state the lesson's objectives and the strategies for achieving each one. a. Define the terms axis, rotation, revolution, center, tangent, speed, velocity, acceleration, and wheel; b. Compare linear speed from rotational speed; c. Describe uniform circular motion; d. Enumerate real life applications of uniform circular motion; and e. Clarify misconceptions about centripetal force.
B. Development	**Activity No. 3: Swing all you can!** The class will be divided into six (6) groups. The teacher will discuss the objectives of the activity, and introduce its materials and procedure. Each group shall create a mini-bucket (using a cup) with a marble inside. They will swing the mini-bucket in a small circle, mimicking a loop-the-loop roller coaster. A representative from each group will go in front of the class to get their materials. Before they proceed to the activity, the teacher will ask them questions while demonstrating the experiment. The teacher will tell the students to observe properly what will happen to the marbles inside the mini-bucket. First, the students will try the experiment with only one marble inside the mini-bucket. After that, they will add one more marble and repeat the experiment. Afterwards, the marble will be replaced by five-peso coins, repeating the process. A finished product will be presented to serve as a model. Instructions: 1. Make your own mini-bucket. With the stick, poke a hole near the rim of the cup. Poke another hole directly across from the

	first hole, on the other side of the cup. 2. Cut two pieces of string about 2 feet (60 cm) long each. Attach each string to a side of the cup by looping it through the hole and tying a knot.  3. Take the ends of the strings, and whip the bucket around in a circle over your head. Be sure to stand far away from your classmates and other objects. You may have swayed the bucket back and forth before you can make a full circle.  The teacher will now ask the students with the following questions: 1. What do you think will happen to the marble? Will it fall out or not? Explain. 2. Why did not the marble fall out when you whipped the cup around over your head? 3. How is this similar to a loop-the-loop roller coaster? 4. What do you think is the outside force responsible at work in this activity or on the roller coaster? 5. What do you think will happen if we try the activity with water inside the cup? **Activity No. 4: Time to wrap!** The teacher will now define the terms related to the experiment pertaining to uniform circular motion. **AXIS** - is the straight line around which rotation takes place. **ROTATION** - when an object turns about an internal axis—that is, an axis located within the body of the object **REVOLUTION** - when an object turns about an external axis **REMARKS!** *You rotate about an internal axis when you spin. You revolve around an internal axis when you circle about that axis.*

1. Earth undergoes both types of rotational motion.
   - It revolves around the sun once every 365 1⁄4 days.
   - It rotates around an axis passing through its geographical poles once every 24 hours.

UNIFORM CIRCULAR MOTION
- is the motion of an object traveling at a constant (uniform) speed on a circular path

TYPES OF SPEED

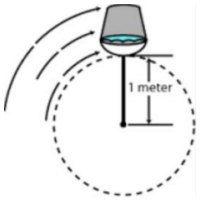
1. LINEAR SPEED (TANGENTIAL SPEED)
- distance traveled per unit of time.
- a point on the outer edge of the turntable travels a greater distance in one rotation than a point near the center.
- the linear speed is greater on the outer edge of a rotating object than it is closer to the axis.
- the speed of something moving along a circular path can be called tangential speed because the direction of motion is always tangent to the circle

2. ROTATIONAL SPEED (ANGULAR SPEED)
- the number of rotations per unit of time.
- all parts of the rigid turntable rotate about the axis in the same amount of time.
- all parts have the same rate of rotation, or the same number of rotations per unit of time. It is common to express rotational speed in revolutions per minute (RPM).

Example:
All parts of the turntable rotate at the same rotational speed.
a. A point farther away from the center travels a longer path at the same time and therefore has a greater tangential speed.
b. A ladybug sitting twice as far from the center moves twice as fast.

Relationship Between Tangential and Rotational Speed
1. Tangential speed and rotational speed are related.
2. Tangential speed is directly proportional to the rotational speed and the radial distance from the axis of rotation.
3. Tangential speed ~ radial distance × rotational speed

NOTE!
~ is the symbol for directly proportional
In symbol form,

	$$v \sim r\omega$$ where **v** is tangential speed and **ω** is rotational speed a. You move faster if the rate of rotation increases (bigger ω). b. You move faster if you are farther from the axis (bigger r)
C. Engagement	**Activity No. 5: Rotate in real-life!** Prompt: At an amusement park, you and a friend are sitting on a large rotating disk. You sit at the edge, giving you a rotational speed of 4 RPM and a linear speed of 6 m/s. Your friend sits halfway to the center. What is your friend's rotational speed? What is your friend's linear speed? **ANSWER:** Your friend's rotational speed is also 4 RPM, while the linear speed is 3 m/s.
D. Assimilation	**Activity No. 6: Check your understanding** The following questions regarding uniform circular motion will be answered by the students. They will write their answers on a paper, have them checked, and then lead the class in reviewing their answers. The questions are as follows: 1. Centripetal acceleration always points _____. a. In the direction of the object's motion b. In the opposite direction of the object's motion c. Towards the center of the circle d. Towards the outside of the circle 2. The velocity is always _____ to the line of a circle. a. Outwards b. Towards the center c. Tangent d. Faster 3. You swing a bucket of water attached to a string in a circle above your head. What keeps the water in the bucket? Refer to the illustration below. 

	a. Friction b. Gravity c. Centripetal force d. Inertia 4. Centrifugal force is a _____. a. Force that pushes you to the outside of a circle during uniform circular motion b. The force that keeps the planets in orbit c. Fictitious force that is really just the linear momentum of an object in uniform circular motion d. The force directed toward a fixed center that causes an object to follow a circular path 5. A 400-g rock attached to a 1.0 m string is whirled in a horizontal circle at the constant speed of 10.0 m/s. Neglecting the effects of gravity, what is the centripetal force acting on the rock? Given: $v = 10.0\frac{m}{s}$ $r = 1.0\ m$ $m = 400\ g\ x\ \frac{1\ kg}{1000\ g} = 0.4\ kg$ Find: Fc Solution: $F_c = \frac{mv^2}{r}$ $F_c = \frac{(0.4kg)(\frac{10.0m}{s})^2}{1.0m}$ $F_c = \frac{(0.4kg)\frac{10.0m^2}{s^2}}{1.0m}$ $F_c = 40kg\ x\ m/s^2$ $F_c = 40N$
V. Reflection	Before the session, I already knew that _____. During the session, I want to know _____. In today's session, I learned that _____. The muddiest point in today's session is _____. In line with this, I will _____.

Prepared by:

REGINE A. VICENTE
Student Teacher

Recommending Approval by:

_____
_____

Noted by:

_____
Cooperating Teacher

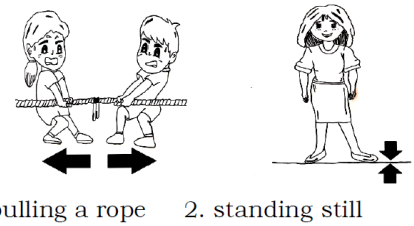
Approved by:

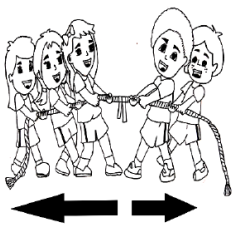
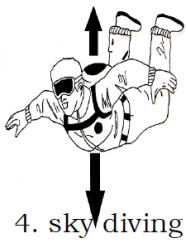
_____
_____

LESSON PLAN FOR FINAL TEACHING DEMONSTRATION

Learning Delivery Modality	**Face to Face Learning Modality**			
LESSON EXEMPLAR	School	**UP RURAL HIGH SCHOOL**	Grade Level	**8**
	Teacher	**MIKE ANGELO A. ALOBA**	Learning Area	**Science**
	Teaching Date	**December 14, 2022**	Quarter	**First**
	Teaching Time	**9:20-10:20**	No. of Days	**1**

I. OBJECTIVES	
	Knowledge: Identify the factors that affect potential and kinetic energy.
	Skills: Show the factors that affect potential and kinetic energy by completing the venn diagram.
	Attitude: Recognize the importance of knowing the factors that affect potential and kinetic energy.
A. Content Standards:	Grade 8 students demonstrate an understanding of work using constant force, power, gravitational potential energy, kinetic energy, and elastic potential energy.
B. Performance Standards:	
C. Most Essential Learning Competencies (MELC)	Identify and explain the factors that affect potential and kinetic energy.
D. Enabling Competencies (If available, write and attached enabling competencies)	
II. CONTENT	
	Factors Affecting Potential and Kinetic Energy
III. LEARNING RESOURCES	
A. References	
a. Teacher's Guide Pages	Science G8 Learner's Module, Teachers' Guide Department of Education
b. Learner's Guide Pages	PIVOT 4A Learner's Material Quarter 1 Week 3 pages 17-20.
c. Textbook Pages	

d. Other learning resources	Laptop, white board, Powerpoint Presentation, marker and eraser	
B. List of Learning Resources for Development and Engagement Activities	Glazer , T., & Dottie, E. (n.d.). *Kinetic and potential energy*. Retrieved December 6, 2022, from https://www.youtube.com/watch?v=vl4g7T5gw1M/	
IV. PROCEDURES		
	Teacher's Activity	**Students' Activity**
A. Introduction		
Lesson Review	*Daily Routine* Good morning/afternoon class! Let us begin our class with an opening prayer. Let me call on our prayer leader for today. Before we begin, kindly align your chairs and pick up the trash along your seats. Do we have any absentees for today? Do you recall the topic that we discussed last week? Very good *name of the student*! To further recall what we have learned last week, I will flash some images on the screen and you will identify whether the situation shows balanced or unbalanced force.  1. pulling a rope 2. standing still	 Good morning/afternoon, Sir! *(The prayer leader of the class will lead the opening prayer.)* None sir. *(The teacher will now select a student to answer the question)* Yes Sir! Last week we discussed Balanced and Unbalanced Forces. 1) Balanced 2) Balanced

	 3. tug of war  4. sky diving Correct. Today, as you might already know, we will be learning about the factors that affect potential and kinetic energy.	3) Unbalanced 4) Unbalanced
Purpose of the Lesson	*The lesson objectives will be flashed.* May I have a volunteer to read our objectives for today? At the end of the lesson, learners should be able to: a. Identify the factors that affect potential and kinetic energy. b. Explain the factors that affect potential and kinetic energy. c. Recognize the importance of knowing the factors that affect potential and kinetic energy. Thank you, *name of the student.* Are there any questions about the learning objectives before we proceed?	*Student volunteers to read the objectives.* No, Sir.
Presentation of Samples	Now, let us have our word of the day! Today, we will be using the word **energy** a lot. Let us now have a working definition of what it is. **Energy** - the capacity or the ability to do work.	
A. Development		
Discussion	**Differentiating Potential and Kinetic Energy** **-** There are two types of energy that we will be discussing today. - Remember that we define **work** as the **measure of energy transfer** that occurs when an object is moved over a distance by an external force at least part of which is applied in the direction of the displacement. - When work is being done, we say that it is **kinetic energy** or energy in motion. The word	

"kinetic" in English comes from the Greek word **"kinetikos"** which means **moving**.
e.g. rolling ball, falling leaves

- **Potential energy** on the other hand, is present when the work is **waiting to be done** or when there is potential for work to be formed.

Factors Affecting Potential Energy
- Potential energy is affected by the **mass of the objects** and the **gravitational force.** The acceleration due to gravity is 9.8 m/s^2 rounded off as 10 m/s^2.

- Two objects that are in the **same position** have potential energy, yet an object with **greater mass** has **greater potential energy**, with respect to each position.

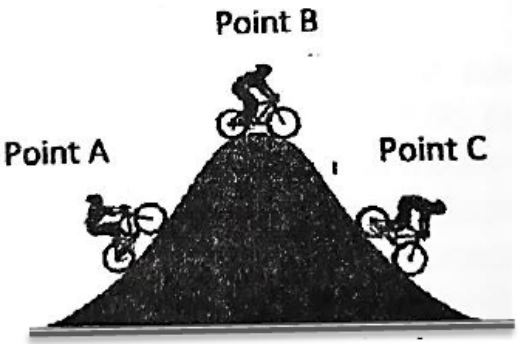
- An object of the **same mass** that is placed at a **different position** has **different potential energy** contained.

- The object at a **higher** position or height will have a **greater potential energy**.

- We can now show that potential energy (PE) is related by the equation:

$$PE = mgh$$

where **m** = mass,
g = $9.8 m/s^2$
h = height or change in height



At point B, the potential energy is highest.

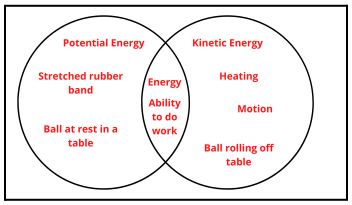
Factors Affecting Kinetic Energy
- Kinetic Energy (KE) is related by the equation:

$$KE = \frac{1}{2}mv^2$$

where **m** = mass, and **v** = speed of the object

	- We can conclude from the equation that **Mass** and **speed of the object** have great effects on kinetic energy. However, it is the velocity that is more significant. Now observe the picture below:  Which picture (1, 2 or 3) of the child shows potential energy? Correct! How about which of them showed kinetic energy? Very good! The child number 3 has a **decreasing kinetic energy** while child number 2 has **an increasing kinetic energy** relative to the position of child number 1.	The child number 1, that is stationary or not swinging Sir therefore it is an example of potential energy! The child numbers 2 and 3 Sir since they are moving but at different rates.
Mastery Development	Now that you know a lot of information about kinetic and potential energies, you can now answer our first activity. Please get your Science Notebook. **Activity No. 1: Potential or Kinetic?** Analyze the picture below. Determine if it shows potential or kinetic energy. Write your answer in your Science notebook.	1) Kinetic 2) Kinetic

	  1. pushing the hammer into the nail 2. a boy walking in the street   3. the man holds the bow and arrow 4. the arrow approaching the dart board	3) Potential 4) Kinetic
B. Engagement		
Application	We will now watch the Kinetic and Potential Energy song and listen carefully to the lyrics. Afterwards you will be answering the second activity. Link to the Video Lyrics: https://www.youtube.com/watch?v=vl4g7T5gw1M/ **Activity 2. FACT or BLUFF!** Read the following statements carefully and write **FACT** if it is true and **BLUFF** if it is false. _____1.) The rolling boulder crashing down the mountain is an example of potential energy. _____2.) Mass and velocity are the factors that can affect kinetic energy of an object while only the height of the object can affect the potential energy. _____3.) If you stretch a rubber band and then release it, that is an example of kinetic energy. _____4.) The energy encapsulated by a gasoline tank is an example of energy in motion. _____5.) The heat that comes when the gasoline is burning is an example of kinetic energy.	1. BLUFF 2. BLUFF 3. FACT 4. BLUFF 5. FACT
C. Assimilation		
Generalization and Abstraction	**Activity 3: Let us summarize!** Construct a venn diagram highlighting the differences and similarities of potential and	

	kinetic energy by using the words/phrases from the word bank. - Energy -Potential Energy - Motion -Kinetic Energy - Heating -Ability to do work - Ball at rest in a table - Ball rolling off table - Stretched rubber band - Simply put, **potential energy** is **stored energy** while **kinetic energy** is energy **in motion.** - **Potential energy** is affected by the **mass**, constant **gravitational acceleration** and **change in height** of the object in a system. - **Kinetic Energy** is affected by **mass** and **velocity** of the object in focus. - We can easily find a lot of examples of potential and kinetic energies in action within the world around us.	
Evaluation	We will now have a 5-item quiz. Please get your ¼ sheet of pad paper. The questions will now be posted on the screen. 1. Which of the following quantities has the greatest influence on the amount of kinetic energy of a car while traveling on a highway? A. mass B. size C. speed D. weight 2. Which of the following pairs of quantities are the factors that affect kinetic energy? A. force and distance B. mass and height C. mass and speed D. time and height 3. Which of the following does not affect the amount of potential energy of an object? A. mass B. speed C. height or location D. strength of gravity	1. C 2. C 3. B 4. B 5. Answers may vary

	4. The following applies the concept of potential energy EXCEPT: A. water in a dam B. a person playing the guitar C. a rock sitting at the edge of a cliff D. tree branches high up in a tree 5. What is the importance of knowing the factors that affect kinetic and potential energy? (2-3 sentences only)	

Prepared by:

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Practice Teaching

Observed:

Rainier Kent Emerson Gonzales
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