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Applying Physics Principles to Physical Fitness Games for Junior High School Students

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Abstract

This study explored the use of physical fitness games as instructional tools for teaching fundamental physics principles to junior high school students. The selected activities included tug of war, stilt race, long jump, pair race, and sack race. These games were chosen based on their relevance to physics concepts, availability of materials and space, low cost, high level of student participation, and age-appropriateness. They demonstrated concepts such as balanced and unbalanced forces, the law of acceleration, work, energy, and power. An experimental design using pretests and posttests was employed to evaluate the effectiveness of game-based instruction. Two Grade 8 sections from a public school participated in the study. Both groups received lecture-based instruction; however, the experimental group engaged in game-based learning activities, while the control group received module-based instruction. Results showed that the experimental group achieved a higher gain score (5.50 points) compared to the control group (2.88 points), indicating a significant difference in student performance. Additionally, the students' previous Science grades, used as a covariate, yielded a p-value of 0.001 which is below the 0.05 significance level. These findings suggest that incorporating physical fitness games into instruction significantly enhanced students' understanding of physics concepts.

Introduction

Physics is the study of everyday events explained through natural laws, fundamental principles, and theorems that people experience daily. Many students consider physics a difficult subject, which often leads to poor academic performance. The subject's complexity is attributed to mathematical problems, the need to draw illustrations and diagrams, and the requirement for accurate and precise measurements. Furthermore, most students are reluctant to choose physics as a specialization in college due to its perceived difficulty and irrelevance.

A study by Williams (2003) reported that students tend to select subjects in which they believe they will excel. Consequently, many develop a negative attitude toward physics, resulting in poor academic performance likely linked to their lack

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of interest. Among 316 Grade 10 students at the University of Liverpool (44% male and 56% female), the study identified several reasons why physics is considered

boring: (1) it is difficult, (2) it is not enjoyable, (3) its content is uninteresting, (4) it involves too little practical work, and (5) the subject is perceived as irrelevant.

In the Philippine context, science education lags that of other countries. Results from the Second International Science Study (SISS) and the Trends in International Mathematics and Science Study (TIMSS) have consistently placed the Philippines at a disadvantage. In the SISS, the Philippines ranked 17th out of 17 participating countries. Similar results were observed in the 1995, 1999, and 2003 TIMSS assessments. Among science subjects, physics consistently scored below international standards; in both the 1999 and 2003 TIMSS, the Philippines ranked third or fourth from the bottom. Contributing factors include inadequate higher education training, technological readiness, and innovation.

In view of these challenges, this study aims to demonstrate a recreational approach to enhancing students' knowledge and skills in physics through physical fitness games. It seeks to improve teaching strategies by incorporating innovative methods that promote the growth and development of both learners and teachers. Game-based learning is one such innovation, capturing students' interest and immersing them in the learning of physics concepts and principles. This adaptable instructional method integrates physics with enjoyable fitness activities.

For this study, the researcher selected tug of war, stilt race, long jump, pair race, and sack race which apply different physics principles while promoting health, agility, coordination, balance, speed, endurance, and overall well-being. These games also promote camaraderie, teamwork, and cooperation, reflecting the "makatao" core value that should be inculcated in students. The selection criteria included relevance to physics principles, availability of materials and space, low cost, high student participation, age-appropriateness, and playability. These games demonstrate physics principles such as speed, balanced and unbalanced forces, the law of acceleration, work, energy, and power.

Through this approach, students will recognize the application of physics in everyday life, thereby appreciating the subject's relevance. The Greek philosopher Plato emphasized the need for "mente sana en cuerpo sano"—a sound mind in a sound body—highlighting the connection between mental and physical health. By incorporating these principles through physical fitness games, students are encouraged to develop rational and critical thinking skills.

Methodology

This study employed a modified version of the Analysis, Design, Development, Implementation, and Evaluation (ADDIE) Model. In this model, the Analysis stage involved planning and conceptualizing the physical fitness games to be used for teaching physics principles. The Design stage focused on creating the activities to be implemented, while the Development stage involved revising and validating these activities. During the Implementation stage, students actively participated in playing the physical fitness games that demonstrate physics principles. Finally, the Evaluation stage collected students' feedback regarding the effectiveness of the physics activities.

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Research Design

This study employed a quantitative approach using an experimental design. The researcher aimed to determine whether the use of physical fitness games that apply physics principles enhances students' innate learning abilities, knowledge acquisition, and skills development. A pretest-posttest design was utilized, allowing the researcher to identify the effects of the physical fitness games incorporating physics principles (Glen, 2017).

Participants

The participants of this study consisted of two Grade 8 classes enrolled in academic year 2018–2019. The students were considered heterogeneous but were at the same academic level based on their previous general Science averages. One class served as the experimental group, and the other as the control group.

Instruments

The instruments used in this study included pretests and posttests, an evaluation checklist completed by physics teachers, a student feedback checklist on the game-based learning activities, and the physical fitness game activities themselves. Both pretests and posttests were administered to both groups. The evaluation checklist was used by physics teachers to validate the learning activities. The feedback checklist was completed by the experimental group only. Lastly, the game-based learning activities were developed by the researcher to test their effectiveness in teaching physics principles.

Procedure

Before implementing the physical fitness games, the researcher prepared an evaluation checklist for the physics validators. These game activity sheets were subjected to validation by physics teachers from the region. To familiarize the evaluators with the study, the researcher discussed and explained the research methodology and the intended use of the activities with the validators. The researcher also collected their comments and suggestions for revising and improving the learning activities.

The physical fitness games demonstrating physics principles were implemented in two Grade 8 classes at a public school during the 2018–2019 academic year. These students were heterogeneous but shared similar academic levels based on their previous Science averages. One class served as the experimental group and the other as the control group. Permission to conduct the research was obtained from the school principal.

In the pretest-posttest design, both classes took the pretest. Afterward, the experimental group received lectures, class discussions, and participated in physical fitness game activities. The control group received lectures, class discussions, and completed module-based activities. Posttests were administered to both groups. The data from pretests and posttests were processed, analyzed, and statistically treated to determine the study's results.

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Results and Discussion

Table 1 shows the descriptive statistics of gain scores of both experimental group and control group.

Table 1.

Descriptive Statistics of Gain Scores of the Experimental and Control Groups

Group	Mean	Standard Deviation	N
Experimental	5.50	4.45	40
Control	2.88	5.08	40

Table 1 shows that the experimental group achieved a higher mean gain score of 5.50 points, compared to the control group, which had a gain score of 2.88 points. A positive gain score indicates that the posttest score is higher than the pretest score, reflecting effective learning. Both groups demonstrated positive gain scores, signifying an increase in posttest scores relative to their pretest scores. However, the mean gain score of the experimental group was notably higher than that of the control group. The standard deviation of the two groups differs slightly with the experimental group having 4.45 and the control group having 5.08.

Table 2.

Analysis of Covariance of Gain Scores of Experimental and Control Group Using their Grades in Science in AY 2017-2018 as covariate.

Source	Type III Sum of Squares	Df	Mean Square	F	Sig	Partial Eta Squared
Corrected Model	395.061[a]	2	197.531	9.986	.000	.206
Intercept	217.836	1	217.836	11.012	.001	.125
Science Grade	257.249	1	257.249	13.005	.001	.144
Group	136.009	1	136.009	6.876	.011	.082
Error	1523.126	77	19.781			
Total	3321.000	80				
Corrected Total	1918.188	79				

R Squared = .206 (Adjusted R Squared = .185)

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Table 2 shows the analysis of covariance of the gain scores of the experimental group and control group using their Science grade in the preceding year as a covariate. It also reveals that there is a significant difference in the performance of the experimental group and control group. This is shown by the p-value (sig of the variable group in the table) of 0.011 which is less than 0.05. The covariate, the Science grade of the students has a p-value (sig of the variable group in the table) of 0.01 which is less than 0.05. Therefore, the experimental group performed significantly better than the control group with their science grade as a covariate.

Table 2 presents the effect of the intervention as shown by the partial eta-squared value. The groups have 0.082 (or 8.2%) of the gain score and 0.144 (14.4%) of their grade in Science. Together, these account for 0.206 (or 20.6%) of the gain in score. It means that although the experimental group obtained a higher mean gain score than the control group, the use of game-based learning activities with the covariate of their science grade accounted for only 20.6% of observed difference in their academic performance. The remaining 79.4% could be attributed to the other factors that were not measured in the study.

Table 3 presents the analysis of covariance of the gain scores of the experimental group and control group using their science grade in the preceding year as covariate. It also reveals that there is a significant difference in the performance of the experimental group and control group. This is shown by the p-value (sig of the variable group in the table) of 0.011 which is less than 0.05. The covariate, Science grade of the students, has a p-value (sig of the variable group in the table) of 0.001 which is less than 0.05. Therefore, the experimental group performed significantly better than the control group with their science grade as covariate.

Table 3.

Analysis of Covariance of Gain Scores of Experimental and Control Group Using their Grades in Science in AY 2017-2018 as covariate

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The results presented in Tables 1-3 show that the use of game-based activities is effective in teaching Physics principles such as balanced and unbalanced forces, law of acceleration, work, energy and power in improving the academic performance of the students. However, it is shown on Table 3 that it only accounts for 20.6% of the observed variability in the gain scores of the experimental and control groups. It implies that the use of game-based activities was only accountable to only 20.6% of their academic performance. With this limitation, the teachers should consider the problems that has been identified by the students to improve the usage of these games by Grade 8 students. These activities can be further enhanced by incorporating other related strategies or methods that the teacher may use. To improve the effectiveness of the game-based activities, the rules and mechanics should be modified to be more student-friendly. Additionally, extending the playing time would allow students more opportunity to enjoy the games and better understand the physics concepts being taught.

Conclusion

There were significant gain scores in knowledge acquisition for both the control and experimental groups, as demonstrated by the students' pretest and posttest results. However, the experimental group showed a significantly higher gain score compared to the control group. These results indicate that the use of game-based learning activities incorporating physical fitness games that apply physics principles can improve students' academic performance more effectively than traditional teaching methods.

Recommendations

Based on the findings and conclusions of this study, the researcher proposes that, since the physical fitness games align with the DepEd Grade 8 Science curriculum guide, the game-based learning activities were designed according to the Physics topics outlined in the curriculum to enhance students' academic performance in the subject. Future researchers may apply similar activities to other selected Physics topics within the DepEd Science curriculum. As the researcher is a public school teacher, the references used were primarily DepEd materials such as the Learner's Module and Teacher's Guide for Grade 8 Science. However, educators are encouraged to use other references they find suitable. Educational games have universal applicability and can be adapted not only for teaching Physics principles but also for other academic disciplines. Furthermore, the duration of the game-based learning activities should be carefully considered. Improvements are also needed in the introduction of the games and the development of diagrams included in the activities. As suggested by Physics specialists, the components, organization, and design of the physical fitness games may be enhanced to provide learners with a proper sequence of activities.

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References

Bruner, J. (1960). *The Process of Education.* Cambridge, MA: Harvard University Press. Ellington H., Addinall E., & Percival F. (1981). *Games and Simulations in Science Education.* NY: Nichols Pub. Co.

Butler, J.I. & Griffin, L.L. (Eds.). (2010). *More Teaching Games for Understanding: moving globally.* USA: Human Kinetics

Chen, Y.C. (2017). Empirical study on the effect of digital game-based instruction on the students' learning motivation and achievement, *EURASIA Journal of Mathematics Science and Technology Education*, 3177-3187, doi: 10.12973/eurasia2017.00711a

Clark, D. & Martinez-Garza, M. (2012). *Prediction and explanation as design mechanics in conceptually integrated digital games to help players articulate the tacit understandings they build through game play*. New York, NY: Cambridge University Press

Clark, D., Tanner-Smith, E., & Killingsworth, S. (2013). *Digital games for learning: A review and meta-analysis*. Menlo Park, CA: SRI International

Cratty, B.J. (1971). *Active Learning: Games to Enhance Academic Abilities.* New Jersey, NJ: Prentice Hal, Inc.

Dickey, M.D. (2015). *Aesthetics and Design for Game-based Learning.* New York, NY: Routledge

Gredler, M. (1994). *Designing and Evaluating Games and Simulations: A Process Approach.* Texas: Gulf Publishing Company

Leighton, M.S. (2006). *Classroom teaching skills.* New York, NY: Houghton Mifflin Company

Noemi, P.M. & Maximo, S.H. (2014). Educational games for learning, Universal Journal of Educational Research, 230-238, doi: 10.13189/ujer.2014.020305

Steinkuhler, C., Squire, K., & Barab, S. (Eds.). (2012). *Games, learning and society: learning and meaning in the digital age.* New York, NY: Cambridge University Press

O'Neil, H., Baker, E., & Perez, R. (Eds.). (2016). *Using games and simulations for teaching and key issues.* London: Routledge, Taylor & Francis Group

Rockler, M. (1988). *Innovative teaching strategies.* Scottsdale, AZ: Gorsuch Scarisbrick Publishers

Wright, P., Horn, S. and Sanders, W. (1997) Teacher and classroom context effects on student achievement: Implications for teacher evaluation, Journal of Personnel Evaluation in Education, Boston: Kluwer Academic Publishers, Boston

Williams, C., Stanisstreet, M.,Spall, K., Boyes, E., Dickson, D. (2003) *Why aren't secondary students interested in phsyics?* Retrieved from http://users.df.uba.ar/sgil/physics_paper_doc/papers_phys/teaching/williams.pdf

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GEAPHEI RESEARCH JOURNAL
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Vgotsky, L.S. (1978). *Minds in society: The development of higher psychological processes.* Cambridge, MA: Harvard University Press.

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Appendices

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S.Y. 2018-2019

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Activity Sheet #1: Tug of war

Introduction:

In physics, force is something that causes a change in the motion of an object. The modern definition of force was given by Isaac Newton in Newton's laws of motion wherein an object's mass multiplied by its acceleration. The most familiar unit of force is Newton.

In simple terms, force is a push or pull of an object. It may make the objects move, change the direction of the motion, slow down the object's motion, or stop motion.

There are two types of forces:

1. Balanced force
   - These are two forces acting in opposite directions on an object, and equal in size. Anytime there is a balanced force on an object, the object stays still or continues moving and continues to move at the same speed and in the same direction.
2. Unbalanced force
   - When two forces acting on an object are not equal in size, we say that they are unbalanced forces. If the forces on an object are unbalanced this is what happens: an object that is not moving starts to move. an object that is moving changes speed or direction.

Source: Prado, J.A., Pascual, R.P.&etc. (2004). *Science_HS.com: Physics based on Basic Education Curriculum.* Bookman, Inc.

Objectives: By the end of the session, the students are expected to:

1. Identify how balanced force is present with the activity.
2. Identify the unbalanced force in the given activity.

Materials:

- Rope
- Safety gloves among players (or handkerchief as alternative)

Procedure:

1. The class will be divided into two groups composed of 5-10 members each.
2. The center of the rope with a red mark would be aligned to the center of the ground.

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3. Each group is 0.5 meters away from the center of the rope.
4. As soon as the whistle of the referee/teacher is heard, the students may start pulling the rope towards the other end.
5. The group that will be able to pull the center of the rope with a red mark on their side will be hailed as the winner of the game.

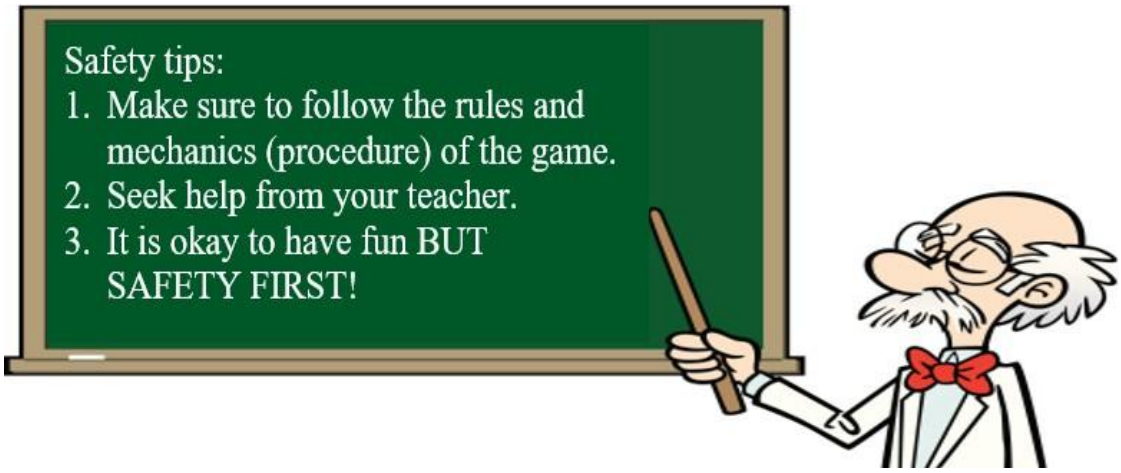


Diagram:



Guide Questions:

1. In the activity, was there force being applied? If yes, how is it being applied? If not, how is it not being applied? Explain your answer.
2. How was balanced force present with this activity?
3. How was unbalanced force present with this activity?

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Conclusion

Scoring Criteria:

Criteria	4 Outstanding	3 Satisfactory	2 Developing	1 Beginning
Content and Accuracy	All information written are correct.	All but one of the information written are correct.	All but two information written are correct.	Several information written are incorrect
Knowledge gained	All students in the group could easily and correctly state several facts about the topic used for the game.	All students in the group could easily and correctly state one (1) to two (2) facts about the topic used for the game.	Most of the students could easily and correctly state 1-2 facts about the topic used for the game.	Several students in the group could NOT easily and correctly state facts about the topic used for the game.
Methodology	The students strictly followed the rules, mechanics and procedure of the game.	The students followed all but one of the rules, mechanics and procedure of the game.	The students followed all but two of the rules, mechanics and procedure of the game.	The students did not strictly follow the rules, mechanics and procedure of the game.
Teamwork and Cooperation	All of them completed their task so as to come up with the expected output/outcome and also counterchecked the works/tasks of others.	All of them completed their task so as to come up with the expected output/outcome.	Some of them completed their task so as to come up with the expected output/outcome.	None of them completed their task so as to come up with the expected output/outcome.
Gameplay	The students won the game with exemplar performance.	The students were on the 2nd rank.	The students were on the 3rd rank.	The students were on the last rank.

Total Score: 20 points

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Activity Sheet #2: Stilt race

Introduction:

Newton's second law of motion states that the relationship between an object's mass m, its acceleration a, and the applied force F is F = ma. Acceleration and force are vectors (as indicated by their symbols being displayed in slant bold font); in this law the direction of the force vector is the same as the direction of the acceleration vector.

Newton's Second Law applies to a wide range of physical phenomena, but it is not a fundamental principle like the Conservation Laws. It is applicable only if the force is the net external force. It does not apply directly to situations where the mass is changing, either from loss or gain of material, or because the object is traveling close to the speed of light where relativistic effects must be included. It does not apply directly on the very small scale of the atom where quantum mechanics must be used.

Source: http://www.pas.rochester.edu/~blackman/ast104/newton3laws16.html

http://hyperphysics.phy-astr.gsu.edu/hbase/Newt.html

Objectives: By the end of the session, the students are expected to:

1. Identify how law of acceleration is present with the activity.
2. Identify the relationship between force, mass and acceleration.

Materials:

- Stilt
- Chair

Procedure:

1. The class will be divided into two groups composed of 5-10 members each.
2. Before the game starts, each member will identify first their mass.
3. Each member will be using the stilt and walk towards where the chair is located (1 meter away from where the students are standing) and go back to their respective groups (1 m away from the chair).

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4. While one player is on the race, the next player will be recording the time of his race.
5. Once the player has reached its team members, the next player may start until all players have already played.
6. The team that will be able to finish the race first with time recorded for each member will be hailed as the winner of the game.

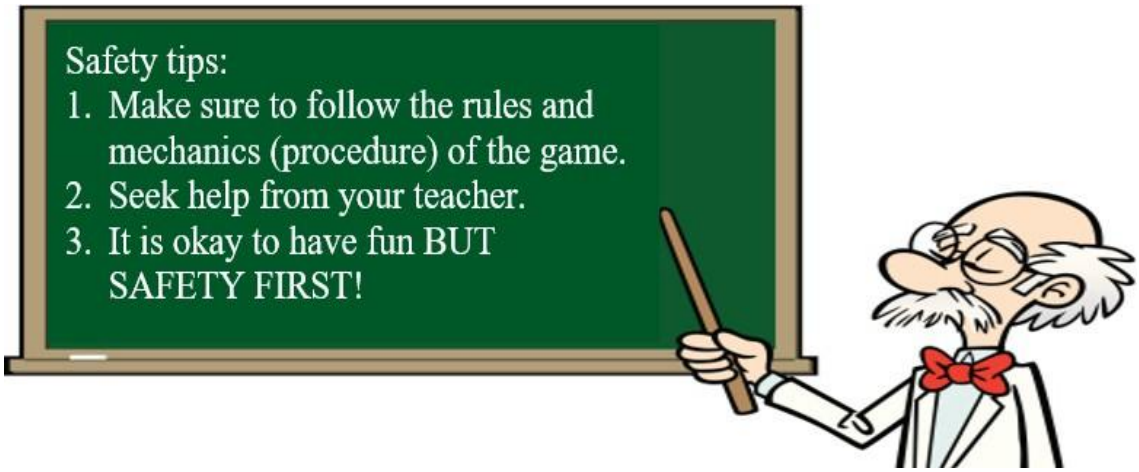


Diagram:



Fill out the table using the time recorded and standard distance used which is 2 meters.

Formula to be used:

$v = \frac{d}{t}$ $a = \frac{v}{t}$ $F = ma$

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Name	Mass (kg)	Distance (m)	Time (s)	Velocity (m/s)	Acceleration (m/s^2)	Force (N)
		2				

Guide Questions:

1. In the activity, is Newton's second law of motion applied? How?
2. If there is more mass, what happens with the force they applied?
3. If there is lesser mass, what happens with the force they applied?
4. If there is more acceleration, what happens with the force applied?
5. If there is lesser acceleration, what happens with the force applied?
6. What is the relationship between force and mass; and force and acceleration?

Conclusion:_____

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Activity Sheet #3: Long Jump

Introduction:

Work results when a force acts upon an object to cause a displacement (or a motion) or, in some instances, to hinder a motion. Three variables are of importance in this definition - force, displacement, and the extent to which the force causes or hinders the displacement. Each of these three variables find their way into the equation for work. That equation is:

$$\text{Work} = \text{Force} \bullet \text{Displacement}$$

$$W = F \bullet d$$

Since the standard metric unit of force is the Newton and the standard meteric unit of displacement is the meter, then the standard metric unit of work is a Newton•meter, defined as a Joule and abbreviated with a J.

Source: Prado, J.A., Pascual, R.P.&etc. (2004). *Science_HS.com: Physics based on Basic Education Curriculum.* Bookman, Inc.

Objectives: By the end of the session, the students are expected to:

1. Identify how work is present with the activity.
2. Identify the relationship between work, force and distance.

Materials:

- Meterstick (or tape measure as alternative)
- Stopwatch

Procedure:

1. Before the game starts, each member will identify first their mass.
2. The students will align themselves at the starting point marker.
3. As soon as the whistle of the referee/teacher is heard, the students may jump already.
4. The student with the longest jump will win the game.
5. The student will record the time of their jump and measure the distance covered of their jump.

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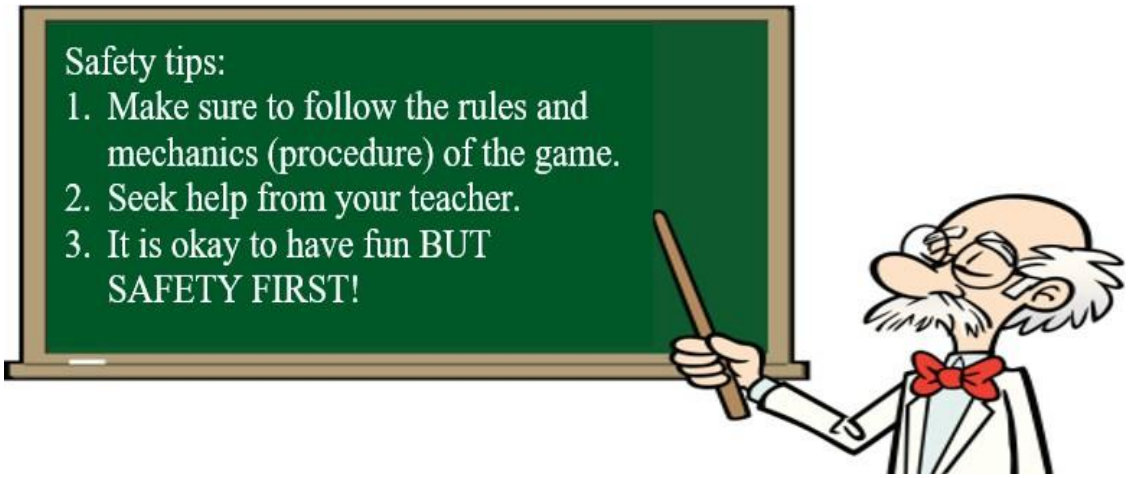


Diagram:



Fill out the table using the time recorded and standard distance used which is 2 meters.

Formula to be used:

$v = \frac{d}{t}$ $\quad\quad$ $F = ma$

$a = \frac{v}{t}$ $\quad\quad$ $W = Fd$

Name	Mass (kg)	Distance (m)	Time (s)	Velocity (m/s)	Acceleration (m/s^2)	Force (N)	Work (J)
		2					

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Guide Questions:

1. In the activity, is work done? How?
2. If there is more force, what happens with its work?
3. If there is lesser force, what happens with its work?
4. If there is more distance covered, what happens with its work?
5. If there is lesser distance covered, what happens with its work?
6. What is the relationship between work and force; and work and distance?

Conclusion:_____

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Scoring Criteria:

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Content and Accuracy	All information written are correct.	All but one of the information written are correct.	All but two information written are correct.	Several information written are incorrect
Knowledge gained	All students in the group could easily and correctly state several facts about the topic used for the game.	All students in the group could easily and correctly state one (1) to two (2) facts about the topic used for the game.	Most of the students could easily and correctly state 1-2 facts about the topic used for the game.	Several students in the group could NOT easily and correctly state facts about the topic used for the game.
Methodology	The students strictly followed the rules, mechanics and procedure of the game.	The students followed all but one of the rules, mechanics and procedure of the game.	The students followed all but two of the rules, mechanics and procedure of the game.	The students did not strictly follow the rules, mechanics and procedure of the game.
Teamwork and Cooperation	All of them completed their task so as to come up with the expected output/outcome and also counterchecked the works/tasks of others.	All of them completed their task so as to come up with the expected output/outcome.	Some of them completed their task so as to come up with the expected output/outcome.	None of them completed their task so as to come up with the expected output/outcome.
Gameplay	The students won the game with exemplar performance.	The students were on the 2nd rank.	The students were on the 3rd rank.	The students were on the last rank.

Total Score: 20 points

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Bulacan State University
City of Malolos, Bulacan
S.Y. 2018-2019

Applying Physics Principle to Physical Fitness games among Junior High School Students

Activity Sheet #4: Pair race

Introduction:

There are two forms of mechanical energy - potential energy and kinetic energy. Potential energy is the stored energy of position. In this set of problems, we will be most concerned with the stored energy due to the vertical position of an object within Earth's gravitational field. Such energy is known as the gravitational potential energy (PEgrav) and is calculated using the equation:

$$PE = m \bullet g \bullet h$$

where m is the mass of the object (with standard units of kilograms), g is the acceleration of gravity (9.8 m/s/s) and h is the height of the object (with standard units of meters) above some arbitrarily defined zero level (such as the ground or the top of a lab table in a physics room).

Kinetic energy is defined as the energy possessed by an object due to its motion. An object must be moving to possess kinetic energy. The amount of kinetic energy (KE) possessed by a moving object is dependent upon mass and speed. The equation for kinetic energy is:

$$KE = 0.5 \bullet m \bullet v^2$$

where m is the mass of the object (with standard units of kilograms) and v is the speed of the object (with standard units of m/s).

Source: www.physicsclassroom.com/calcpad/energy

Objectives: By the end of the session, the students are expected to:

1. Identify the difference between kinetic energy and potential energy.
2. Identify the relationship between kinetic energy, mass and velocity.
3. Identify the relationship between potential energy, mass and height.

Materials:

- Stopwatch
- Meter stick (or tape measure as alternative)

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Procedure:

Before the game starts, each student will identify first their mass.

1. The students will pair themselves.
2. The student will lift their partner.
3. They will measure their total height together using the meter stick.
4. As soon as the whistle of the referee/teacher is heard, the student may run already towards the finish line.
5. The student with the fastest time of arriving at the finish line will be the winner.

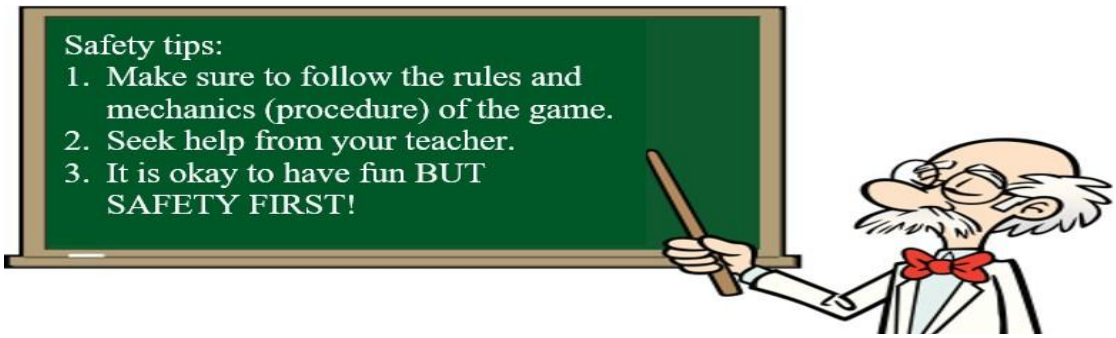


Diagram:



Fill out the table using the time recorded and standard distance used which is 2 meters.

Formula to be used:

$v = \frac{d}{t}$

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

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Name	Mass (kg)	Distance (m)	Time (s)	Velocity (m/s)	Height (m)	Gravity (m/s^2)	Potential energy (J)	Kinetic Energy (J)
		2				9.8		

Guide Questions:

1. In the activity, how was potential energy present?
2. In the activity, how was kinetic energy present?
3. If there is more mass/lesser mass, what happens with its potential energy?
4. If there is more height/lesser height, what happens with its potential energy?
5. If there more mass/lesser mass, what happens with its kinetic energy?
6. If there is more velocity/lesser velocity, what happens with its kinetic energy?
7. What is the relationship between potential energy, mass and height?
8. What is the relationship between kinetic energy, mass and velocity?

Conclusion:_____

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Knowledge gained	All students in the group could easily and correctly state several facts about the topic used for the game.	All students in the group could easily and correctly state one (1) to two (2) facts about the topic used for the game.	Most of the students could easily and correctly state 1-2 facts about the topic used for the game.	Several students in the group could NOT easily and correctly state facts about the topic used for the game.
Methodology	The students strictly followed the rules, mechanics and procedure of the game.	The students followed all but one of the rules, mechanics and procedure of the game.	The students followed all but two of the rules, mechanics and procedure of the game.	The students did not strictly follow the rules, mechanics and procedure of the game.
Teamwork and Cooperation	All of them completed their task so as to come up with the expected output/outcome and also counterchecked the works/tasks of others.	All of them completed their task so as to come up with the expected output/outcome.	Some of them completed their task so as to come up with the expected output/outcome.	None of them completed their task so as to come up with the expected output/outcome.
Gameplay	The students won the game with exemplar performance.	The students were on the 2nd rank.	The students were on the 3rd rank.	The students were on the last rank.

Total Score: 20 points

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Bulacan State University
City of Malolos, Bulacan
S.Y. 2018-2019

Applying Physics Principle to Physical Fitness games among Junior High School Students

Activity Sheet #5: Sack race

Introduction:

Power is defined as the rate at which work is done upon an object. Like all rate quantities, power is a time-based quantity. Power is related to how fast a job is done. Two identical jobs or tasks can be done at different rates - one slowly or and one rapidly. The work is the same in each case (since they are identical jobs) but the power is different. The equation for power shows the importance of time:

$$P = W / t$$

The unit for standard metric work is the Joule and the standard metric unit for time is the second, so the standard metric unit for power is a Joule / second, defined as a Watt and abbreviated W. Special attention should be taken so as not to confuse the unit Watt, abbreviated W, with the quantity work, also abbreviated by the letter W.

Source: www.physicsclassroom.com/calcpad/power

Objectives: By the end of the session, the students are expected to:

1. Identify how power is present.
2. Identify the relationship between power, work and time.

Materials:

- Sack
- Chair
- Meter stick
- Stop watch

Procedure:

1. The class will be divided into two groups composed of 5-10 members each.
2. Before the game starts, each member will identify first their mass.
3. Each member will be wearing the sack and jump towards where the chair is located (1 meter away from where the students are standing) and go back to their respective groups (1 m away from the chair).
4. While one player is on the race, the next player will be recording the time of his race.

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5. Once the player has reached its team members, the next player may start until all players have already played.
6. The team that will be able to finish the race first with time recorded for each member will be hailed as the winner of the game.

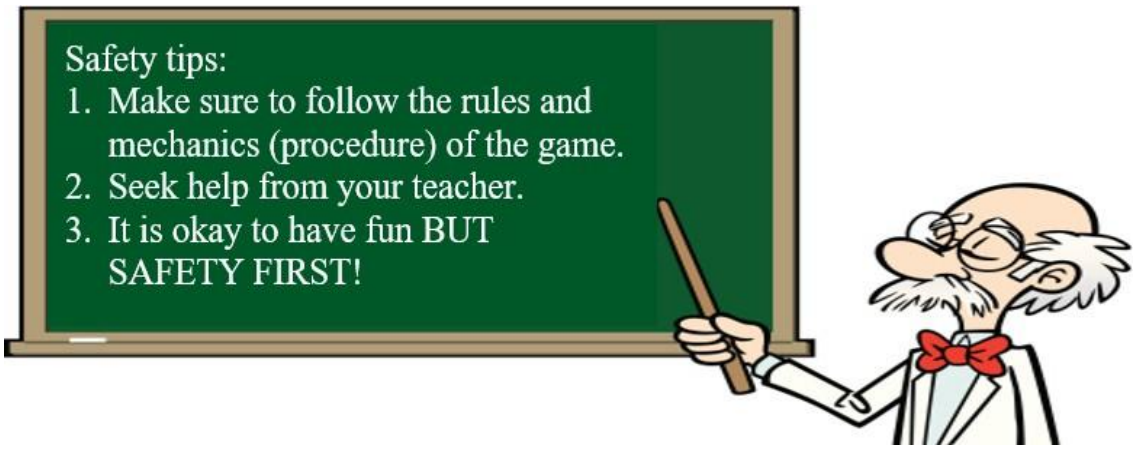


Diagram:



Fill out the table using the time recorded and standard distance used which is 2 meters.

Formula to be used:

F=ma v==$\frac{d}{t}$ a =$\frac{v}{t}$ W=Fd P = $\frac{W}{t}$

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Name	Mass (kg)	Distance (m)	Time (s)	Velocity (m/s)	Acceleration (m/s^2)	Force (N)	Work (J)	Power (W)
		2						

Guide Questions:

1. In the activity, how was power present?
2. If there is more work, what happens with its power?
3. If there is lesser work, what happens with its power?
4. If there is more time, what happens with its power?
5. If there is lesser time, what happens with its power?
6. What is the relationship between power and work; and power and time?

Conclusion:_____

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Teamwork and Cooperation	All of them completed their task so as to come up with the expected output/outcome and also counterchecked the works/tasks of others.	All of them completed their task so as to come up with the expected output/outcome.	Some of them completed their task so as to come up with the expected output/outcome.	None of them completed their task so as to come up with the expected output/outcome.
Gameplay	The students won the game with exemplar performance.	The students were on the 2nd rank.	The students were on the 3rd rank.	The students were on the last rank.

Total Score: 20 points