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Identification of Physics Concepts in the Local Wisdom of Remo Surabaya Traditional Dance as One of the Efforts to Preserve Culture in East Java

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ABSTRACT

Indonesia has a variety of cultures that can be used for ethnoscience-based learning. Indonesian culture will be better known if it is integrated into education, one of which is physics learning. One of the cultures that exist in Indonesia is the Remo Dance which is a traditional dance originating from East Java. Dance is a cultural heritage that we need to preserve because culture is a reflection of a nation. This research was conducted with the aim of identifying the physics concepts contained in the Remo Gagrak Anyar Dance so that they can be integrated into physics learning activities. This study uses a qualitative descriptive method with observations, interviews, and a literature study. Based on the results obtained, there are physics concepts in Remo Dance, including the material of muscle force, Newton's third law, gravity, circular motion, static balance, sound sources, and light. The results of this study indicate that there is potential in ethnoscience-based physics teaching materials and can be applied to physics learning to help students improve understanding and learning outcomes. Other local cultural studies can be carried out to facilitate contextual understanding of the material in various subjects and aim to preserve the culture of the Indonesian nation.

INTRODUCTION

The current situation shows that most aspects of human life in terms of social, economic, cultural, and educational changes are fundamentally nothing but a characteristic of life in the era of globalization [1]. Life in the era of globalization has succeeded in eroding Indonesian local culture as a whole [2] [3]. Such a situation is due to the relatively low interest of the younger generation of the nation's successor to preserve the existing culture [4] [5]. One of the efforts to build civilization is to increase understanding of the surrounding environment, especially those related to Indonesian culture that has been left behind or inherited from previous generations [6] [7]. Indonesian culture will be better known if it is integrated into teaching and learning activities, one of which is in the fields of science

and physics education [8] [9] [10] [11]. Cultural values such as local wisdom vary from one region to another, especially in Indonesia which consists of various tribes, races, and traditions [10] [12].

Learning that combines local cultural wisdom with science is called ethnosience [5] [7] [10] [13] [14] [15] [16] [17] [18]. The science learning process that integrates local culture with the strategy of creating a learning environment and designing learning experiences is learning in an ethnosience approach [19]. Learning with an ethnosience approach is very important because Indonesia has various ethnic groups and cultures that must be preserved [7] [20] [21]. One of the fields of ethnosience and a branch of natural science that studies related to local culture is physics [22] [23]. Physics is a branch of science that studies phenomena in everyday life [24] [25] [26]. Physics learning will feel more contextual by implementing local culture as a learning resource [27]. Based on Mudjid et al [28] and Abdullah et al [29], activities in the daily environment where students live are used as learning resources and learning tools, physics learning will be more meaningful.

Currently, physics learning is still rarely found in implementing materials with local wisdom [28] [30]. To overcome this, one of the efforts is to integrate local cultural wisdom into learning materials so that students will find it easier to understand the material and be more familiar with the surrounding culture. The existence of local wisdom will be an alternative that can be used by teachers as teaching materials in schools [31]. Based on research by Lubis et al [32], Kamid et al [33], and Heliawati et al [34], learning that is integrated with local wisdom can improve students' creative thinking skills and scientific literacy skills. Therefore, it is necessary to develop learning with an ethnosience approach. By applying physics learning through an ethnosience approach, the teacher's ability to integrate indigenous knowledge (*indigenous science*) with scientific knowledge is required (*scientific knowledge*) [27] [35].

One of the cultures that exist in Indonesia is the Remo Dance which is a traditional dance originating from East Java [36] [37] [38]. Remo dance is a traditional dance that tells about the struggle of someone brave in battle who is assisted by his men who have the same courage [39]. Remo dance is a welcome dance or welcome dance typical of East Java that describes the dynamic character of the people of Surabaya and symbolizes one's courage. This traditional dance is the opening part of the Ludruk performance [40] [41]. The term remo or *ngremo* comes from the word "*remong*" which means *sampur* and "*rekmo*" which means to describe people applying make-up to make themselves better [42] [43]. Today's Remo dance is not only danced as part of the opening ceremony, but also as entertainment for the community. In fact, in the city of Surabaya, Remo Dance is one of the learning resources that must be learned by students, especially elementary school students [44]. Remo dance is characterized by dynamic and agile foot movements. In this movement, it is supported by a bell (*gongseng*) which is attached to the ankle of the dancer. The bells will ring when the dancers get on stage and stamp their feet. In addition, other characteristics are the *sampur* shawl movements, head shaking, nodding movements, facial expressions, and *tanjak* movements that make this dance more interesting [45] [46] [47].

Based on the characteristics of the Remo Dance, researchers are interested in identifying the physical concepts contained in the Remo Dance. In addition, it can be used as physics learning material based on local wisdom, and the preservation of the traditional Remo dance is maintained.

METHOD

The type of research used is descriptive qualitative with an ethnographic approach carried out to describe and analyze culture [48] [49]. The flow of the research stages of identifying the concept of physics in Remo Dance can be seen in Figure 1.

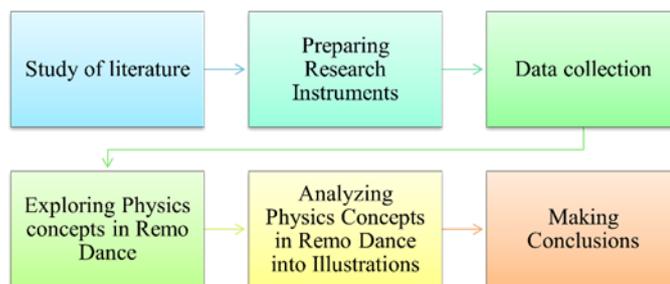


Fig 1. The flow of Research Stages [50]

In this study, samples were taken using a purposive sampling technique [51]. The sample selected in this study were two people, one of whom was an Arts and Culture teacher at one of the SMKN 2 Surabaya who had a dance studio. While one other person is a student of the Wilwatikta High School of Arts who often trains someone in Remo Dance. The reason the researcher chose the sample is that the sample is someone who knows in depth about the object of research. The research data were obtained through observation, interviews, and literature studies. Interviews and observations were carried out directly with two samples. The interviews were conducted with structured questions and had the same questions according to the research objectives referring to the interview guide instrument [52]. The question rubric is prepared and includes the Remo Dance which is adapted to several Physics concepts.

Furthermore, structured observation data were collected by asking samples to perform the Remo Dance movement to observe the concept of Physics [53]. The results of the observations are then documented and analyzed for physics concepts related to the Remo Dance. Finally, data collection is carried out by researching literature studies through various library sources to obtain more in-depth research data through the results of previous research [54]. The study material in the research is in the form of history and physics concepts in Remo Dance. Then the three data were triangulated to strengthen the findings obtained [55] [56].

RESULTS AND DISCUSSIONS

Remo dance is one of the traditional dance forms of the people of East Java. According to Tri Broto, Remo dance is a dance form that is expressed from the vibrations of the soul and emotions of its creator which shows the movement of society through the expressive and spontaneous body and space movements [57]. The word *remo*, *ngremong* which is pronounced by the people of East Java refers to a type of heroic dance which was originally an opening dance in a ludruk performance. Remo is also said to be a dance that depicts people applying make-up. The origin of Remo comes from the Jombang area which was born from traditional theater and was developed by *Cak Durasim* in Surabaya in 1927, hereinafter referred to as Ludruk plays. Dance performances from the development of this art are used by *Cak Durasim* to increase expression and dynamics in its development, known as Remo Dance [58].

Ludruk is synonymous with Surabaya art. Ludruk art developed in East Java, especially in the Surabaya area. In Surabaya, many famous Ludruk artists were born before and after independence in 1945. Before independence, Ludruk art was founded by *Cak Durasim*. Ludruk art was very famous in the Japanese era because with his song he dared to satirize the Japanese government. In the period after the proclamation of independence of the Republic of Indonesia in 1945, the art of Ludruk grew and developed rapidly in the city of Surabaya. Ludruk features several elements consisting of the Remo Dance, slapstick, *kidungan*, and the Ludruk story itself. The stories played in Ludruk describe the daily lives of the people, heroic legends, and other stories known to the public. In the Ludruk performance, the *kidungan* is performed by a Remo dancer (*kidungan Ngremo* dance) at the opening of the Ludruk performance [59].

Cak Durasim struggle in the Japanese occupation of Indonesia is a history of Remo dance entering the political realm. Through his *kidungan* that moves the mind and view of the world that must be avoided from stress, it is necessary to fight. Through the *kidungan* “*Bekupon omahe dara, melok Nippon tambah sengsara*” the Remo Dance begins to emphasize its thematic identity. The Surabaya remo dance is famous for the character of Sir Munali Fattah, which has existed since the time of the war of independence. Munali Fattah is a *remo ludruk* artist generation in the 1920s who argues that remo dance was inspired by the *Beskalan* dance which uses a *sampur* on the shoulder and is danced in a female style, but over time, it is then performed by a male style [42] [60].

At first, Remo was known to the public because he was always present with Ludruk, in subsequent developments, Ngremo was able to show his own existence outside of Ludruk's performances. The Remo dance with Ludruk in Surabaya is a form of politics when the state needs collective solidarity to raise the spirits of the fighters in Surabaya. The characteristics of the Remo Dance are built through the reinterpretation of Surabaya heroes as a cultural symbol as well as a political identity. The symbol that has been achieved in Remo Dance is a symbol as a marker of ideals or hopes for achieving social status traditionally coveted by most people and by Remo artists, these ideals can be achieved even if they are limited to imaginary works or aesthetic expressions. Therefore, Remo is realized through the values of heroism that are inherent in a sustainable manner and inspire the Remo Dance artists [61].

Through political policies at that time, Remo Dance underwent a form of refinement with the development of elements of motion, make-up, and fashion that approached the typical noble clothes of Surabaya, East Java. In the aspect of presenting the Remo Dance, it leads to strengthening the form of heroic values. The achievements in the formation, development, refinement of the form and presentation of the Remo Surabaya Dance, which is full of political values, can be felt as a natural reality because the value of heroism is already a common property. With political policies, the government issued policies and fostered Remo Dance which is a special program implemented to strengthen the identity of the City of Surabaya as a City of Heroes [61].

Since the presence of Remo Dance in ludruk performances until it is able to become a pure dance performance discipline, Remo Dance has received sympathy from the audience. Through educational institutions, Remo Dance is made as mandatory material for students. Through training, Remo Dance is made into a festival, competition, and achievement event. Now Remo Dance has a general perception for the people in Surabaya which is thick with heroic values which is a culture that must be maintained its existence because the values contained in it are an important part of the historical reality of the nation through struggle which is the soul of the people of Surabaya and East Java [61].

Remo dance was originally born in Jombang with ludruk made. Remo dance then developed in various areas, including in Surabaya. The Remo dance that developed in Surabaya experienced a struggle with the struggle against the invaders until it was known as the Ngremo struggle because it followed the flow of the movement for the independence struggle. Remo Surabayan dance shows the characteristics of heroic figures from East Java in the past. The characteristics and beauty of the Surabayan remo dance seem to be oriented towards Ludruk's story about the heroes and legends of East Java. The embodiment of character and beauty is carried out through the interpretation of Pengreman (Remo dancers) against legendary warrior figures from Java who are driven by the cultural environment of their era. With the political situation of the movement that gave birth to a fighting spirit to defend the country that brought up past memories of local warrior shops as played in the ludruk show [62].

Based on its origin, Remo Dance was initially born in Jombang with Ludruk made. Remo dance then developed in various areas, including in Surabaya. The Remo dance that originated in Surabaya experienced a struggle with struggle against the invaders until it was known as the *Ngremo* struggle because it followed the flow of the movement for the independence struggle. Remo *Surabayan* dance shows the characteristics of heroic figures from East Java in the past [63]. The characteristics and beauty of the *Surabayan* Remo dance seem to be oriented towards Ludruk's story about the heroes and legends of East Java. The embodiment of character and beauty is carried out through the interpretation

of *Pengreman* (Remo dancers) against legendary warrior figures from Java. The cultural environment of their era drives them. With the political situation of the movement gave birth to a fighting spirit to defend the country that brought up past memories of local warrior shops as played in the Ludruk show [62].

Remo dance culture is diverse from various regions. The mention of remo dance is accompanied by the embedding of the name of the owner of the style, such as: *Cak Munali Fattah's* Surabayan Ngremo Style, *Cak Bolet's* Jombangan Ngremo Style, *Cak Khatam A.R.* Malangan Ngremo Style, and *Cak Anwar's* Maduran Ngremo Style. Various remo rates continue to grow in the East Java Region [62]. The variety of Remo Dance develops very much according to their respective regions. Every region in East Java has a Remo dance movement that reflects the characteristics of the area [64]. But basically, the movements in the dance remain the same, and only have slight differences. All movements in Remo dance have a philosophy regarding the story that is raised, which is about a struggle when fighting against the invaders, the movements in Remo dance must be strong, full of energy, agile, and firm [36] [65] [66]. The style of Remo dance that develops and is in demand by the public has various kinds, the focus of this research is on the Remo Gagrak Anyar Dance performed by Mr. Sariono [67].

Based on interviews conducted by researchers, it is said that the new Remo Gagrak Dance was created by Mr. Sariono. The Remo dance movement has different characteristics and has its character. Each area of East Java has its character, so it depends on each region and who created it. The Remo dance is the same in every area in East Java. Some examples of movements in the Remo dance are *Kipatan sampur*, *Tanjak*, *Gedruk Lombo*, *Iket*, *Lampah Ngancik*, *Ayam Alas* and many more. The Remo dance movement also has a count or so-called dance rhythm. The count must exist in every movement in Remo's dance. Remo dancers must know the accompaniment used, to create certainty in counting (benchmarks) and to show harmonious movement between dancers. In this dance, the count is used in general in traditional dances, namely 1, 2, 3, 4, 5, 6, 7, 8. The movement in Remo is usually repeated, 2 to 3 times.

The characteristic of remo is that with a strong, firm, and full of energy movement, every Remo dance movement there is the energy released. One of them is the *kipatan sampur* movement to make it look dashing and look its aura. So when doing the remo dance, it should not be weak, even if only the wrist is moving, it must have energy and must not be slack (slow). Broadly speaking, Remo dance must release the same energy, the characteristics of the dance are also the same, so the characteristics of Remo dance are firm, strong, and dynamic. Learning the movement of Remo Dance is not easy, because Remo must have a firm attitude, one must be able to do *tanjak* movements, and that is the initial exercise in doing remo. So that someone will find it difficult because the remo movement is a bit complicated and must be in accordance with the rhythm. Because dance must *know Wiraga*, *Wirama*, and *Wirasa*.

Based on the results of observations made, the physics concept of Remo Gagrak Anyar Dance was obtained as shown in Table 1.

Table 1. Exploration of Physics Concepts in Remo Gagrak Anyar Dance

Movement Name	Physics Concept	Description of Theory Concept
<i>Lampah Ngancik</i>	Muscle Force	The <i>Lampah Ngancik</i> movement is carried out when the heels are lifted back alternately right and left and the body is upright and facing straight ahead. This requires muscle force in performing these movements.

Movement Name	Physics Concept	Description of Theory Concept
<i>Gedruk Lomboh</i>	Newton's Third law	Newton's third law is identified when the dancer performs a movement with the knee position facing the left-right side and the right foot stomping on the earth. This causes an action force by stomping the foot down and the ground reacts by pushing the sole of the foot so that it can be pushed up. According to equation (1). Newton's third law is $F \text{ action} = - F \text{ reaction}$
<i>Kipatan Sampur & Gedruk Lomboh</i>	Gravity	The movement of <i>Gedruk Lomboh</i> also has a gravitational force that is seen in the movement of the hand, namely the left hand holding the <i>sampur</i> and the condition of the fingers being slightly moved from top to bottom so that the <i>sampur</i> seems to sway and fall. Gravity is also found in <i>Kipatan Sampur</i> hand movements. When the hands fold the <i>sampur</i> and throw it, it is seen that the <i>sampur</i> falls. The fall of the <i>sampur</i> indicates that there is a gravitational force.
<i>Iket</i>	Circular Motion	In the <i>Iket</i> movement, it is done by rotating the wrist, the left hand is straight to the side with the palm open up and flanking the <i>sampur</i> . In this motion process, there is the concept of circular motion. Where this motion is the motion of an object that forms a trajectory in the form of a circle and surrounds a fixed point.
<i>Nebak Bumi</i>	Static Equilibrium	Movement the <i>Nebak Bumi</i> motion has the concept of static equilibrium. When the dancer performs the <i>Nebak Bumi</i> movement, the right foot is in a raised position at an angle of 90° and the left foot remains on the ground. The position of the foot remains in an incline position but slightly tilted forward of the right foot with the left thumb standing upright (<i>njengat</i>). After the position has been done, the next position that must be done by the dancer is to fold the <i>sampur</i> using the right hand. At this equilibrium, the position of the feet affects the dancers so they don't fall.

Table 2. Exploration of Physics Concepts on Attributes of Remo Gagrak Anyar Dance

Remo Dance Attributes	Physics Concept	Description of Theory Concept
<i>Gongseng</i>	Sound Source	Attributes or accessories used by dancers contain the concept of physics, namely the source of the sound. Where the attributes worn by Remo dancers are made of aluminum metal which when moved will make a clattering sound.
<i>Kalung, Rapek, and Gongseng</i>	Source of Sound and Nature of Light	The attribute of Remo Dance also has the property of light, that is, light can be reflected. Reflection is the process of re-emitting light from the surface of an object that is exposed to light. Such a situation is shown when the bark is exposed to a beam of light, it will give a glare effect to the eyes of the observer.

Muscle Force

In the *Lampah Ngancik* motion there is a muscular force, where in doing so, the heel is lifted back and forth alternately right and left. Not only that but muscle force is also needed when maintaining the body "*ndegek*" with the body in an upright position and the head facing straight ahead. Muscle force is needed to maintain the position of the bent right elbow and straight left elbow. The *Lampah Ngancik* movement is shown in Figure 2



Fig 2. Movement of Lampah Ngancik

Newton's third law

Next, there is the Gedruk Lomboh movement which is done with the knees facing the left-right side and the right foot stomping on the earth. In this motion process, there is the concept of Newton's Third Law if there is an action force then there is a reaction force, the action force and the reaction force have the same magnitude but in the opposite direction, the equation can be systematically written as follows:

$$F \text{ action} = - F \text{ reaction} \quad (1)$$

Newton's third law says that if there is an action force acting on object 1 to object 2, then there will be a reaction force exerted by object 2 on object 1 with the same magnitude but opposite direction. An explanation of the application of Newton's third law in Remo Dance is illustrated in Figure 3.

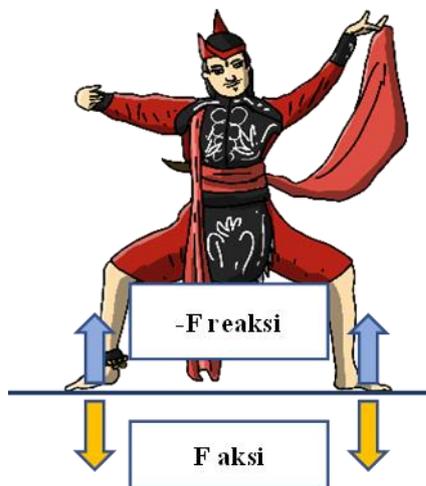


Fig 3. Movement of Gedruk Lomboh

When the sole exerts an action force by pushing the ground down and the ground reacts by pushing the sole so that it can be pushed up. In the statement, "action" and "reaction" are two forces in opposite directions. This does not mean applying all cause-and-effect relationships, but in this case, considering one force as "action" and another force as "reaction". The term can be said that the forces are "equal and opposite" which means they have the same magnitude in opposite directions [68].

Gravity

In addition to Newton's third law, the motion of *Gedruk Lomboh* in Remo Dance also has a gravitational force. This gravitational force is seen when the movement of the hand is when the left hand is holding the *sampur*, with the fingers slightly moved from top to bottom so that the *sampur* seems to be swaying and the released *sampur* will always fall. The movement of the *sampur* that falls indicates the force of gravity. This can be seen in Figure 4.

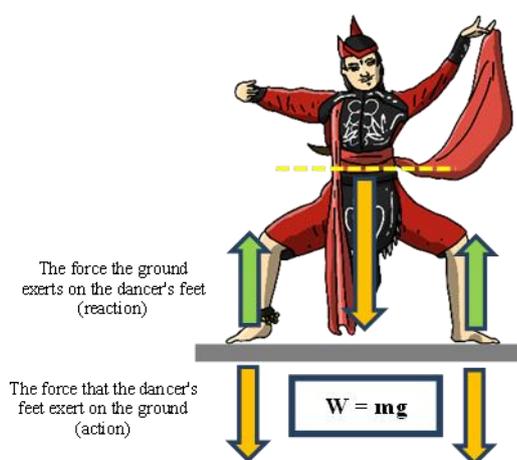


Fig 4. Movement of *Gedruk Lomboh*

The force of gravity is also found in the movement of the hand when waving the *sampur* (*kipatan sampur*). When the *sampur* is swung forward then it is flicked up so that the elbow is bent upwards with the palm facing forward and the *sampur* is in a state that has been released from the wrist. After the *sampur* is thrown it is seen that the *sampur* falls. The fall of the *sampur* indicates that there is a gravitational force. It looks like in figure 5.



Fig 5. *Kipatan Sampur* Movement

Circular Motion

When the dancer performs the *Iket* movement with the right-hand *ukel* (rotating wrist motion), the left hand is straight to the side with the palms open upwards and flanking the *sampur*. In the process of this motion, there is the concept of circular motion in which the motion of a moving object forms a circular path and surrounds a fixed point. As seen in Figure 6.

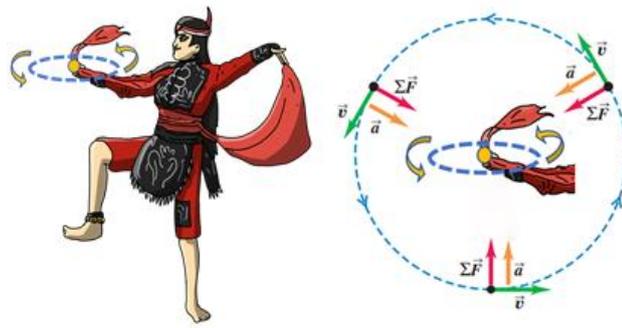


Fig 6. Iket Movement

The dancer who performs this circular motion of the *sampur* is likened to a ball of mass m tied to a string of length r and rotating at a constant speed along a circular path. The concept of circular motion is through the circular motion of the *sampur* performed by the dancer. In this case, the end of the *sampur* can be likened to a particle that moves along a circular path with the center point being the dancer's hand holding the *sampur* and the moving particle (*sampur*) has a fixed speed. In addition to speed, the *sampur* rotated by the dancer also moves in a circle which of course will experience centripetal acceleration as stated in equation (2).

$$a_{rad} = \frac{v^2}{r} \quad (2)$$

This movement indicates a total force directed towards the center of the circle, as stated in equation (3).

$$T = \frac{2\pi R}{v} \quad (3)$$

Static Equilibrium

Movement the *Nebak Bumi* motion has the concept of static equilibrium. When the dancer performs the *Gebak Bumi* movement when the right foot is lifted at an angle of 90° and the left foot remains on the ground. The position of the foot remains incline but slightly tilted in front of the right foot with the left thumb standing upright (*njengat*). Then the right hand waved the *sampur*.

In this equilibrium, the position of the feet affects the dancer so as not to fall. If the position of the soles of the feet is straightforward, then the dancer will easily fall, so the dancer needs to move the left thumb with an upright position and the body position is "*ndegek*" (the body is upright) so that the dancer gets stability in doing the movement. An object is said to have equilibrium if the value of translational and rotational equilibrium is equal to zero ($\Sigma F = 0$ and $\Sigma \tau = 0$). The following shows the concept of static equilibrium in Remo Gagrak Anyar Dance.



Fig 7. Nebak Bumi Movement

Sound Source

In addition to the Remo Dance Movement, the attributes or accessories used by dancers include the concept of physics, namely the sound source. Where the attributes worn by Remo dancers are made of aluminum metal and when they are moved they make a clattering sound. As in Figure 8, the *gongseng* will sound in the *Gedruk Lomboh* movement, namely when the dancer stomps his right foot to the earth twice so that the *gongseng* will make a sound according to the number of pounding feet. We can hear this sound because it travels through the air.



Fig 8. *Gongseng*

In addition, in the musical element or the accompaniment of the Remo Gagrak Anyar Dance, there is a musical instrument that is hit, which makes a sound. In Remo dance, the study of physics related to the concept of sound sources can be found in the attribute elements (external music) and other musical accompaniments. The internal music that exists in a Remo dancer is a bell (*gongseng*) which is located on the dancer's ankle. The attributes worn by the Remo dancers are made of aluminum metal that jingles when moving. As shown in Figure 8, when the Remo dancer performs the *Gedruk Lomboh* movement, it will sound, when the dancer steps on the ground with her child's foot twice, it will make the sound and rhythm of the *gongseng* according to the number of feet that are pounded. We can hear the sound of this sound because the sound propagates through the air [69]. In addition, in the musical element or accompaniment of the Remo Gagrak Anyar Dance, an external sound source comes from the musical accompaniment instrument. External accompaniment music is music produced externally by an instrument or dancer. External musical accompaniment from outside the dancers such as *xylophone, bonang, gongs, flutes, kenong, and slendro rhythms* [70].

Nature of Light

It is known that the Remo Dance attribute also has light properties, namely light can be reflected. In Remo Dance Attributes that can reflect light are *gongseng, rapek, and necklaces*. Here are some of the attributes that exist in Remo Dance as shown in Figure 9

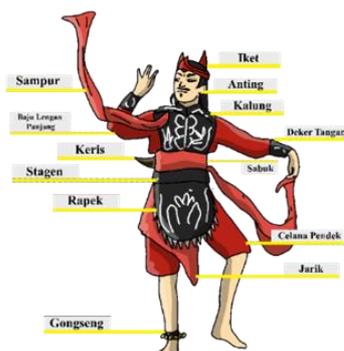


Fig 9. *Attributes of Remo Tari Dance*

The attributes of the remo dance, it has their characteristics, including the Remo Surabaya dance, namely Gagrak Anyar which consists of a red headband (*iket*) with a batik pattern. The clothes used in the Gagrak Anyar Remo dance are red which depicts courage in fighting. The pants used in the Remo Dance are black pants with a length that reaches below the knee and are decorated with gold needles at the bottom. Where the golden needle interprets a knight who is ready to go to war. Remo dancers wear two red scarves (*sampur*), with one side attached to the shoulder and the other side tucked into the belt. The function of the *sampur* in Remo Dance is to support the movement of the Remo Dance in the form of *kipatan sampur*.

Remo dance has three aspects that can be observed through motion. Make-up and fashion. Based on the concept used by this Remo dancer, it has the meaning of the message presented in makeup and clothing. The impression given is in the form of "nobility" which is felt from the form of makeup and the arrangement of fashion designs. The impression of "nobility" gives a message of the meaning of the struggle during the colonial period to achieve independence. There is pride from the Ludruk community towards these historical figures, so a sense of pride in the art form that the public can feel is Remo Dance. The strong "charm" of Remo Dance can be felt through the make-up and fashion designs that use colorful batik patterns. Fashion designs that are dominated by sparkling colors present a magnificent view so that they can amaze the audience.

Color is a symbol or human character which is symbolized by *manca warna* or *panca warna* [71]. Color can also be defined as a visual element that has the power to influence someone or something [72]. Color is the impression that the eye gets from the light reflected by the object it hits [73]. The colors used in the Remo Gagrak Anyar dance attributes are dominant with the colors Red, Black, and Gold. Each color has characteristics based on its nature and type. The color red has the meaning of courage and strength. The color red has the characteristics of bright light and character [74]. The color black is symbolized by acts of wisdom, intelligence, calm, has a deep impression and responsibility. While the color gold has the meaning of success, luxury, achievement, victory and prosperity [75]. In the Remo Dance, the red color becomes dominant which is considered as courage and fiery spirit. In addition, the gold color which has a dominant symbol of majesty is also seen in the Remo Dance costume. And black as a connector in combining unity and bringing out the color combinations located on the *sabuk*, *deker*, and *rapek* [45].

The attributes and all the ornaments and colors used in the Remo Dance when studied in physics are closely related. In physics itself, color is an electromagnetic wave with a wavelength between 390 nm to 780 nm [76] [77] [78] [79] [80]. These wavelengths can be captured by the human eye under normal conditions. The red color has a wavelength between 620-750 nm [81] [82] [83] [84] [85] [86] [87]. Colors that have a wavelength below 390 nm are known as ultraviolet. Ultraviolet includes invisible light so that it cannot be seen by the eye, while wavelengths above 750 nm, known as infrared [88] [89] [90].

The attributes used by Remo dancers are black. In terms of physics, the use of color has an absorption value of light intensity. The use of black has the highest light intensity because black absorbs the light emitted by the substance [91] [92] compared to other colors such as red, yellow, green, and blue which reflect the light emitted on the substance. Black also has the highest temperature absorption value compared to other colors, such as green and blue. This happens because black absorbs all light or rays that fall on objects that are exposed to light [93] [94] In accordance with the theory of black body radiation theory that a black body absorbs all intentional radiation regardless of the wavelength and direction of the incident light [95] [96] [97]. Black bodies have more energy for each surface that is exposed to radiation.

CONCLUSION AND SUGGESTION

Based on the results and discussion, it can be concluded that in the Remo Gagrak Anyar Dance, every movement made by the dancer can be studied by physics. The physics concepts contained in the Remo Dance are contained in each of its movements, namely muscle force, gravity, Newton's third law, circular motion, and static equilibrium. Not only that but in the attributes of the Remo Dance, there is also the concept of a sound source and the nature of light. The results of this study indicate that there is potential in physics learning media with the local wisdom of Remo Gagrak Anyar Dance Culture. Learning physics with ethnosience will help students improve understanding, and learning outcomes, and students are more interested and motivated to study physics and remo dance culture at the same time. Suggestions for further researchers to study more deeply related to the physics concepts contained in Remo Dance and look for more references to assist in analyzing the concepts in Remo Gagrak Anyar Dance. And it is also advisable to study other local cultures. Studies of other local cultures can be carried out to facilitate contextual understanding of the material in various subjects and to preserve the Indonesian nation's culture.

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