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Identification Physics Concept in Local Wisdom Pigeon Race on Madura Island

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Abstract – *Indonesia is a rich country in local wisdom, but it is starting to fade along with technological developments. pigeons racing on Madura island is an example of local wisdom that can be used as a source of new knowledge in understanding physics concepts in social life. Pigeon racing is a big competition that is held after the rice harvest season arrives. This research aims to analyze the physics concepts contained in pigeon racing. This research was conducted using a descriptive method with a qualitative approach. data collection was obtained by technically analyzing the data subjectively using interview, observation and literature study methods. Based on data analysis and literature studies, it was found that in pigeon racing, there are physics concepts related to motion and displacement. At a rapid rate, the calculation results show, that the speed of an object can increase uniformly or decrease uniformly. An object is said to be moving in a straight line and changing uniformly to accelerate if the object's speed increases uniformly. Meanwhile, an object is said to be moving in a straight line and changes evenly and is slowed down if the object's speed decreases uniformly. The change in speed per unit time is called acceleration. Then, The results of this research can be used as a contextual learning resource in high school physics subjects about motion.*

Keywords: *learning physics; local wisdom; motion*

I. INTRODUCTION

Indonesia has many different ethnicities, cultures and local wisdom spread throughout its regions. The diversity of local wisdom and culture in each region is a characteristic of this area. The development of education and culture has an important role in shaping the individual character of this nation's (Novitasari et al., 2017). Therefore, along with the development of education system with changes in curriculum, culture and knowledge must go hand in hand to create education with a cultural character. In this globalization era, the existence of local culture and wisdom needs to be instilled in students by integrating knowledge and culture in learning process (Melati et al., 2023).

Universally, the problem faced in learning physics at school is that it is difficult for teachers to provide understanding to students because some physics concepts and principles are used for problem solving. Students are less interested in physics lessons, students perceive that physics subjects are difficult subjects. These negative perceptions of students have a direct effect on students' physics learning outcomes which tend to be low (Nurnaifah et al., 2023). One of the contributing factors is that physics learning in schools to date has focused more on theoretical aspects with little emphasis on concepts and principles, and is not linked to local culture, in this case the local wisdom of each region (Safitri & Salma, 2023). Leraning process-based culture is learning that can be realized through the environment and learning experiences which can integrate culture in teaching and learning process (Fahrudin & Maryam, 2022; Lubis et al., 2022).

Physics learning will be more meaningful if there is continuity between physics subect and daily life activities in the environment where students live which is used as a learning tool and resource. This can be realized through connecting the application of physics subjects with local potential of the region, especially on madura island. Therefore, physics learning does not only emphasize mathematical aspects, physics concepts and principles, especially understanding that can be linked to local wisdom values found in students' environment (Putra et al., 2022). This is important ,so that students will be able to understand the relationship between learning at school and daily life in environment (Elisa et al., 2022).

The negative assumption of students regarding physics learning process that has occurred so far is the assumption that physics learning is difficult to be understand, this is because teachers do not provide opportunities for students to learn meaningfully and do not emphasize the achievement of character values in contextual learning and other environment on daily life (Silla et al., 2023). Physics education that pays attention to local wisdom, culture, character and customs is one of the things that needs to be considered in secondary school curriculum. Students' cultural background influences their learning attitudes at school, therefore the developing of Physics learning process requires students to elaborate on Physics principles without ignoring value of cultural in local community (Lubis et al., 2021).

Culture and local wisdom-based physics learning refers to the direct transfer of knowledge and experience for students at school in order to build competence the understand and think critically about what is occurred around them with science critical thingking (Munandar et al., 2022). The exploration of physics concepts can be seen in everyday life, for example in flocking of pigeons race which is to be a characteristic of Madurese culture. *"Kerabhan dhara"* or

"*kerapan merpati"* is a term in Madurese that is used to give name a pigeon racing competition. Pigeon racing is also defined as the racing of a pair of male and female pigeons. Pigeon racing are usually held in several locations, either at the sub-district level, then continue to district level and finally on all of Madura level. The participants are the best pigeons from various regions in certain areas, especially in Pamekasan city. This competition is very close to Madurese people in general public, this competition usually become symbol gathering of all pepople love bird. Merpati lovers spread on all public people start from children to adults and even elderly grandfathers don't miss out on watching (Rumiati et al., 2021). Pigeon race in Madura has become a symbol of the glory of rice farmers. Usually this event is held on a large scale after the rice harvest season ends in the northern region of Pamekasan Madura community.

Based on background above, the researcher is interested in conducting an analysis of local wisdom on Madurese culture of pigeon racing related to physics concepts contained in there. Researchers emphasize the concept of motion which can be further integrated into physics learning resources for senior high schools (Khoiri & Sunarno, 2018). This research aims to identify physics concepts found in pigeon culture so that they can be used as a physics learning resource. The problem raised in this research is how to identify the physics concepts that exist in the local wisdom of pigeon racing. This research aims to identify physics concepts that exist in local wisdom; pigeons in Madurese society.

II. METHODS

The research was conducted using descriptive methods with a qualitative approach. The location of pigeon pigeon racing on this research was carried out in Guro'om village, Proppo, Pamekasan regency. Data was obtained by technically analyzing data subjectively using interview, observation and literature study methods (Shofiyah & Wulandari, 2020).

Interviews were conducted with the local community where the pigeon racing was held by describing all forms of information regarding the pigeon racing tradition. Observations were carried out to see the places where the pigeon racing tradition is usually carried out. The samples chosen in this study were 3 people who were residents around the research location who had an important role in pigeon racing. Sample selection was based on the level of knowledge in the field of pigeon flying, which involved in-depth knowledge of the research object. In the initial stage of data analysis, researchers examined the data collected from field notes based on field observations and interview results. In the next step, all collected data is checked. Researchers review and adjust the data needed by researchers to answer the problem formulation. The final stage carried

out was to carry out data analysis using descriptive and literature studies to strengthen the results of the analysis in achieving the research objectives. Data obtained from the field and analysis are then combined and matched with strengthening literature obtained from several reputable journals in the last ten years (Rahma et al., 2022).

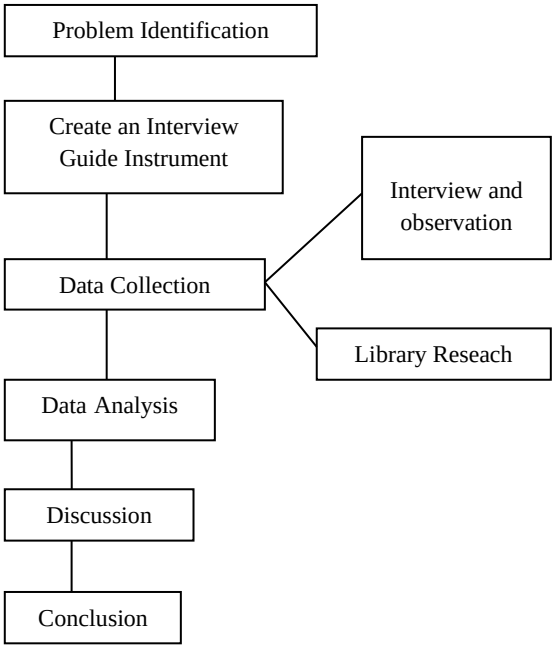

Figure 1. Research design

III. RESULTS AND DISCUSSION

This research was conducted in April 2023. The research began with a survey activity to determine venue for pigeon racing competition. Furthermore, observation and interview activities as well as documentation were carried out on 19 and 20 April 2023. Based on the results of interviews conducted with pigeon owners who almost every year always win pigeon competitions from the canoe district, information was obtained that the pigeon racing event was held twice a year. Pigeon lovers gather and make this event a means of strengthening brotherhood. Pigeon racing is a native Madurese culture which is now popular throughout in Indonesia. According to history, pigeon racing has been popular in China since 1368. Pigeons were first recorded in " Ming Dynasty era", namely around 1368-1644.

Since then, pigeons from Europe were imported to China, and Europe itself became the birthplace of the best pigeons, and in the end, it became a sport and culture with a lot of money at stake. Since then, the development of pigeon racing has accelerated to present and has spread around the world, one of which is Indonesia.

From the results of interviews with local people, it was explained that pigeons are the result of breeding pigeons that are specially made to be able to fly faster. Pigeons have a stronger instinct to return home than wild pigeons. Pigeon racing is a pigeon racing competition that doesn't exist in other countries, where two or more pairs of pigeons are pitted against each other. The male pigeon is released from a distance of 500-1000 meters while the female is held in by jockey. The pigeon that arrives quickly is the winner. This traditional art was often performed when the rice harvest was over.

The frequency of pigeons flying is not a way of pitting the strength of pigeons against each other. The power in question is by comparing the flying speed of two pigeons in

reaching the finish line which has been prepared by pigeon race guides or jockeys. However, there are many techniques and processions that must be used, such as the jockey's hand movement technique to attract the pigeon's attention to the finish line, as well as attracting the male's attention by placing female at the end of the track. Currently, pigeon racing has been competed at international level.

Identification physics concept in pigeon racing

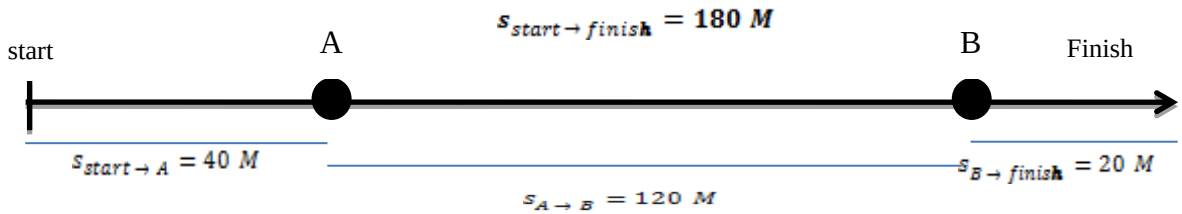

Figure 2. Pigeon racing sketch

Table 1. The result of identification physics concept on pigeon racing

The stage of local wisdom pigeon racing	Etno (local wisdom)	Etnosains Identification
1. Pigeon move from the start point to finish point	Pigeon move from the start point to finish point	It is said to apply the physics concept of displacement if in this case the pigeon experiences a change in position.
2. When the pigeon leave jockey (driver) hands or wants to land	Pigeons move into the air because they are released by triggers due to attraction to the opposite sex.	In this case, pigeons will be said to apply the physics concept of GLBB (accelerated) if their speed increases over a certain distance in a certain time interval. Where : $\upsilon_0=0$, $t_0=0$ and υ_t = certain distance and time to create V_{max}so that, the acceleration is increase.
3. When the pigeon has taken off in the air at a certain height (stable)	Pigeons move in the air by waving both wings at the same time.	Merpati is said to be implementation the physics concept of GLB when υ_{max} = *konstan* when crossing a distance with a certain time interval.
4. The pigeon has reached the finish point	The pigeons have arrived at finish point. It's marked by the meeting of male and female pigeons.	In this case, pigeons will be said to apply the physics concept of GLBB (slowed down) if their speed decreases by a certain distance in a certain time interval. where $\upsilon_0=\upsilon_{max(konstan)'}$, υ_1 = certain distance and time, , t_2=0 dan $\upsilon_2=0$ in silence) to reach to reach $\upsilon_{max}=0$. So that, the acceleration is decrease.

From table 1, the results of identifying physics concepts in pigeon racing can state that in the pigeon racing stage there is a physics concept in it. These include displacements, uniformly changing rectilinear motion is accelerated, uniform rectilinear motion and uniformly changing rectilinear motion are slowing down. An object can move or remain still depending on the reference point we take. In physics, motion is relative, depending on reference point chosen. Likewise, the movements carried out by pigeons are based on the scheme in Figure 1. When the pigeon is released, the pigeon can immediately be said to experience straight movement (Makhmudah et al., 2019). Below ,we will present data from observations in the field during the pigeon racing. There were two observers in this research with the aim of obtaining more precise and accurate observation results (Arifi et al., 2021).

Table 2. The results of field observations

observer	$Start \rightarrow Point\ A = GLBB$		$Point\ A \rightarrow Point\ B = GLB$		$Point\ B \rightarrow Finish = GLBB$	
	distance (m)	**time (s)**	**distance (m)**	**time (s)**	**distance (m)**	**time (s)**
1.	40	5				
2.	40	5,4				
3.			120	15		
4.			120	15,8		
5.					20	2,6
6.					20	2,7

Table 3. The results analysis of field observations (according to data in table 2)

Observer 1	**Observer 2**
known : s= 40m t= 5 s Because the situation was originally silent, then : v_0= $0\ \frac{m}{s}$ automatically t_0= 0 s asked : v_t=…? answered : $v_t = v_0 + a.t$ *part 1* $v_t = \frac{40\ m}{5\ s} = 8\ \frac{m}{s}$ $a = \frac{\Delta v}{\Delta t} = \frac{v_1 - v_2}{t_1 - t_2} = \frac{8-0}{5-0} = \frac{8}{5}$ $= 1{,}6\ \frac{m}{s^2}$ $v_t = v_0 + a.t$ $v_t = 0 + (1{,}6).(5)$ $v_t = 8\ \frac{m}{s}$	known : s= 40m t= 5,4 s Because the situation was originally silent, then : v_0= $0\ \frac{m}{s}$ automatically t_0= 0 s asked : v_t=…? answered : $v_t = v_0 + a.t$ *part 1* $v_t = \frac{40\ m}{5{,}4\ s} = 7{,}4\ \frac{m}{s}$ $a = \frac{\Delta v}{\Delta t} = \frac{v_1 - v_2}{t_1 - t_2} = \frac{8-0}{5-0} = \frac{8}{5}$ $= 1{,}4\ \frac{m}{s^2}$ $v_t = v_0 + a.t$ $v_t = 0 + (1{,}4).(5{,}4)$ $v_t = 7{,}6\ \frac{m}{s}$

observer 3	observer 4
known : s= 120m t= 15 s because the situation is constant, then : v_0= 8 $\frac{m}{s}$ asked : v_t=…? answered : $v_t = \frac{120\ m}{15\ s} = 8\ \frac{m}{s}$	known : s= 120m t= 15,8 s because the situation is constant, then : v_0= 7,6 $\frac{m}{s}$ asked : v_t=…? answered : $v_t = \frac{120\ m}{15{,}8\ s} = 7{,}6\ \frac{m}{s}$
observer 5	**observer 6**
known : s= 20m t= 2,6 s because the situation is constant, then : v_0= 8 $\frac{m}{s}$ automatically t_2= 0 s because the position must be in silence asked : v_t=…? answered : $v_t = v_0 - a.t$ *part 1* $v_t = \frac{20\ m}{2{,}6\ s} = 7{,}7\ \frac{m}{s}$ $a = \frac{\Delta v}{\Delta t} = \frac{v_1 - v_2}{t_1 - t_2} = \frac{0-7{,}7}{0-2{,}6} = \frac{-7{,}7}{-2{,}6}$ $= 3{,}0\ \frac{m}{s^2}$ $v_t = v_0 - a.t$ v_t = 8 - (3).(2,6) v_t = 8 - (7,8) $v_t = 0{,}2\ \frac{m}{s}$	known : s= 20m t= 2,7 s because the situation is constant, then : v_0= 7,6 $\frac{m}{s}$ automatically t_2= 0 s because the position must be in silence asked : v_t=…? answered : $v_t = v_0 - a.t$ *part 1* $v_t = \frac{20\ m}{2{,}7\ s} = 7{,}4\ \frac{m}{s}$ $a = \frac{\Delta v}{\Delta t} = \frac{v_1 - v_2}{t_1 - t_2} = \frac{0-7{,}4}{0-2{,}7} = \frac{-7{,}4}{-2{,}7}$ $= 3{,}0\ \frac{m}{s^2}$ $v_t = v_0 - a.t$ v_t = 7,6 - (2,7).(2,7) v_t = 7,6 - (7,29) $v_t = 0{,}31\ \frac{m}{s}$

Based on table 2, the results of analysis of field observations in the calculations from observers 1 and 2 can be explained that the concept of accelerated uniform straight motion was identified at the pigeon's speed stage. This is proven by analysis of the calculation results of the speed values obtained. The results of calculating speed of observers 1 and 2 obtained an average of 8 m/s. This result is in accordance with the physical concept in GLBB formulation. The calculations from observers 3 and 4 are also proven and are in accordance with an application of physical concept of uniform rectilinear motion of matter found in the stages of pigeon racing.

As for the calculations from observers 5 and 6, in the application of a material physics concept, the uniform, straight-line motion that occurs at the stage of pigeon's speed can be said to be almost proven because the pigeon's speed is slowing down. Where the initial speed of pigeon was 8 m/s and 7.6 m/s, it became 0.2 m/s and 0.31 m/s in a track distance of 20 meters. The final results of analysis in observations 5 and 6 show that the final speed is not zero (it should be based on

concept of zero motion), this can be proven by testing the normality test value.

The results of this research are relevant with research related to integrating local wisdom as a learning resource. Integrating local wisdom can help students understand learning material and make physics learning more enjoyable and meaningful in line with research conducted by (Laos & Tefu, 2019; Afifa et al., 2023; Asra et al., 2021). In this way, it can be seen that physics concepts based on local wisdom can be explored from around the community. This aims to ensure that people can learn physics from the surrounding environment, especially students, who can learn physics in a fun, contextual and more meaningful way (Shaqinah et al., 2021).

IV. CONCLUSION AND SUGGESTION

Based on the results of data analysis and discussion, it can be concluded that in the implementation of pigeon racing there are physics concepts in it which can be used as a source of physics learning. The physics concepts found in pigeons racing are in the subject of motion, displacement, acceleration and GLBB. These physics concepts can be used as a physics learning resource in high school so that they can be used to develop teaching materials and develop contextual learning as well as being an alternative for teachers to be able to add physics learning strategies using the introduction of local wisdom so that they can make physics learning more innovative and interesting.

The suggestion of this research is that the results of this research can be developed into teaching materials in form of modules or reference books. Apart from that, the results of the teaching materials that have been developed can be applied in physics learning in secondary schools. Furthermore, other local wisdom can also be developed and studied considering that Madura Island is one of the islands that is rich in culture and local wisdom from its respective regions.

REFERENCES

Afifa, J. I., Siregar, M., Agustin, R., Lubis, N. A., & Nurmansyitah. (2023). Kajian konsep fisika berbasis etnofisika pada alat tradisional Sumatera Utara Panggilingan. *Gravitasi : Jurnal Pendidikan Fisika dan Sains*, *6*(1), 20–26. https://doi.org/10.33059/gravitasi.jpfs.v6i01.7955

Arifi, M. F., Lesmono, A. D., & Handayani, R. D. (2021). Analisis konsep fisika pada penggunaan alat pertanian cangkul oleh petani sebagai bahan pembelajaran fisika. *Jurnal Pembelajaran Fisika*, *10*(3), 121-129. https://doi.org/10.19184/jpf.v10i3.25563

Asra, A., Festiyed, F., Mufit, F., & Asrizal, A. (2021). Pembelajaran Fisika mengintegrasikan etnosains permainan tradisional. *Konstan - Jurnal Fisika dan Pendidikan Fisika*, *6*(2), 66–73. https://doi.org/10.20414/konstan.v6i2.67

Elisa, E., Prabandi, A. M., Istighfarini, E. T., Alivia, H., Inayah H., L. W., & Nuraini, L. (2022). Analisis Konsep-konsep fisika berbasis kearifan lokal pada

jajanan tradisional Dawet dan Klepon. *Orbita: Jurnal Pendidikan dan Ilmu Fisika*, *8*(2), 194-199. https://doi.org/10.31764/orbita.v8i2.10197

Fahrudin, A., & Maryam, E. (2022). Review analisis pendidikan fisika berbasis etnosains, budaya, dan kearifan lokal di Indonesia. *Jurnal Riset Rumpun Matematika dan Ilmu Pengetahuan Alam*, *1*(1), 12–24. https://doi.org/10.55606/jurrimipa.v1i1.126

Khoiri, A., & Sunarno, W. (2018). Pendekatan etnosains dalam tinjauan fisafat (implementasi model pembelajaran STEM: science, technology, enginering, and mathematic). *Spektra : Jurnal Kajian Pendidikan Sains*, *4*(2), 145-153. https://doi.org/10.32699/spektra.v4i2.55

Laos, L. E., & Tefu, M. O. F. I. (2019). Identifikasi konsep fisika pada kearifan lokal pengolahan sagu (putak) kabupaten Timor Tengah Selatan. *Jurnal Fisika : Fisika Sains dan Aplikasinya*, *4*(2), 77–84. https://doi.org/10.35508/fisa.v4i2.1827

Lubis, S. P. W., Suryadarma, I. G. P., Paidi., & Yanto, B. E. (2022). The effectiveness of problem-based learning with local wisdom oriented to socio-scientific issues. *International Journal of Instruction*, *15*(2), 455-472. https://doi.org/10.29333/iji.2022.15225a

Lubis, S. S., Sahyar, S., & Derlina. (2021). The development of high school physics textbooks based on Batak culture. *Journal of Physics: Conference Series*. *1811*, 1-7. https://doi.org/10.1088/1742-6596/1811/1/012081

Makhmudah, N. L., Subiki., & Supeno. (2019). Pengembangan modul fisika berbasis kearifan lokal permainan tradisional Kalimantan Tengah pada materi momentum dan impuls. *Jurnal Pembelajaran Fisika*, *8*(3), 181–186. https://doi.org/10.19184/jpf.v8i3.15222

Melati, D. S., Lira, F., Radiati., Lubis, N. A., & Nurmasyitah. (2023). Analisis penerapan konsep fisika terintegrasi kearifan lokal permainan tradisional Aceh tarek siteuk. *Gravitasi: Jurnal Pendidikan Fisika Dan Sains*, *6*(1), 32–37. https://doi.org/10.33059/gravitasi.jpfs.v6i01.8150

Munandar, R., Ristanti, C. I., Nurhidayati, N., Busyairi, A., & Rokhmat, J. (2022). Analisis potensi pembelajaran fisika berbasis etnosains untuk meningkatkan kecintaan budaya lokal masyarakat Bima. *Jurnal Penelitian dan Pembelajaran Fisika Indonesia*, *4*(1), 6-14. https://doi.org/10.29303/jppfi.v4i1.169

Novitasari, L., Agustina, P. A., Sukesti, R., Nazri, M. F., & Handhika, J. (2017). Fisika, etnosains, dan kearifan lokal dalam pembelajaran sains. *Prosiding Seminar Nasional Pendidikan Fisika*, 81–88.

Nurnaifah, I. I., Anggriani, S., Zulpiah, A., & Wahyuni, S. (2023). Increasing students' physics learning outcomes through experiential learning model. *Jurnal Pendidikan Fisika*, *11*(1), 37–46. https://doi.org/10.26618/jpf.v11i1.9590

Putra, A. M. S., Handayani, R. D., Prihandono, T., & Bachtiar, R. W. (2022). Analysis of equilibrium concepts at traditional dance of Tari Banjarkemuning, Sidoarjo as an innovation of physics learning by ethnoscience approach. *Jurnal Penelitian Fisika Dan Aplikasinya (JPFA)*, *12*(1), 62–75. https://doi.org/10.26740/jpfa.v12n1.p62-75

Rahma, S. N., Suliyanah, S., & Halim, A. (2022). How do Astrophysics and the qur'an perceive the extraterrestrial life? A qualitative study. *Jurnal Pendidikan Fisika*, *10*(2), 107–122.

https://doi.org/10.26618/jpf.v10i2.7433

Rumiati, R., Handayani, R. D., & Mahardika, I. K. (2021). Analisis konsep fisika energi mekanik pada permainan tradisional Egrang sebagai bahan pembelajaran fisika. *Jurnal Pendidikan Fisika*, *9*(2), 131-146. https://doi.org/10.24127/jpf.v9i2.3570

Safitri, A. N., & Salma, V. M. (2023). Analisis konsep fisika pada kearifan lokal petik laut Situbondo sebagai sumber belajar fisika di SMA. *Jurnal Inovasi Pendidikan Sains dan Terapan (Intern)*, *2*(1), 27–32. https://doi.org/10.58466/intern.v2i1.1164

Shaqinah, N. I., Helmi, H., & Amin, B. D. (2021). Analysis of the utilization of physics laboratories in state senior high schools in Luwu regency. *Jurnal Pendidikan Fisika*, *9*(3), 253–261. https://doi.org/10.26618/jpf.v9i3.5824

Shofiyah, N., Wulandari, F. E. (2020). Buku ajar gerak dan perubahan. Umsida Press. https://doi.org/10.21070/2020/978-623-6081-15-0

Silla, E. M., Dopong, M., Teuf, P. J., & Lipikuni, H. F. (2023). Kajian etnosains pada makanan khas Usaku (Tepung Jagung) sebagai media belajar fisika. *Jurnal Literasi Pendidikan Fisika (JLPF)*, *4*(1), 30–39. https://doi.org/10.30872/jlpf.v4i1.2060