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Identification of Ethnoscience in the Keris Madura as a Source for Learning Science in Junior High Schools

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Abstract

This study aims to identify the ethnoscience found in the Keris Madura which can be used as a source of learning natural sciences for junior high schools. The time of research was in July-September 2023 at the Aeng Tong Tong village, Sumenep. Methods of data collection using the method of observation, interviews and documentation. Data analysis techniques use the interactive analysis proposed by Miles and Huberman, which consists of data reduction, data presentation, conclusions and verification. There is data triangulation using the triangulation method by matching the interview results with the observation sheet. The results of the data findings were then verified by the SMP science teacher. The research results show that: 1) the results of the ethnoscience study can be seen in the tools and materials used, the manufacturing process, community techniques in caring for and conserving Keris Madura in the local community; 2) the results of the ethnoscience study are connected and closely related to the science concept material for grade 7 & grade 8 curriculum merdeka, namely elements, compounds, mixtures of materials, temperature, heat and changes in form. These results show that the Keris Madura can be used as a source of science learning for junior high schools.

Key words: ethnoscience, learning science source, keris madura.

INTRODUCTION

Indonesia has cultural and social diversity that develops in society. There is its own uniqueness in that each culture and society has basic life values that can be preserved to this day, one of which is the Keris Madura. Keris Madura have aesthetic shapes, patterns, pancor, warangka, wilah and prestige (Yuliana et al., 2022). Keris Madura are made using typical tools and materials. In making Keris Madura there are science material concepts of work and energy, simple machines to make work easier, science material elements/compounds of materials, and the body's regulatory system. The Keris Madura, as Madura's cultural and social diversity, is full of social, historical, philosophical, mystical and religious meanings of the Madurese people so that it is preserved.

Keris Madura is a cultural and social diversity that presents certain characteristics. The characteristics of the Keris Madura have the potential to be conserved separately. These efforts are made to protect, preserve and utilize the Keris Madura to ensure its existence, availability and sustainability so that the function, characteristics and benefits of the Keris Madura can be improved. The potential of the Keris Madura is also as an educational means for students to learn directly about existing cultural and

social diversity and interact with the environment in line with sciences.

The process in science aims not only to study a combination of knowledge in the form of facts, concepts and principles, but also in the form of a discovery process through observation or search. It is hoped that science education can become a forum where students can learn about the natural environment, each individual, their development and application in everyday life. According to Tyas et al (2020) science is a subject that is considered complex and difficult by junior high school students. This can be seen from the relatively low student learning outcomes in science subjects.

When teachers provide science lessons, they are often not connected to the surrounding environment. It is very rare for science learning to be linked to local wisdom or use an ethnoscience approach, as a result, students are not yet familiar with local wisdom in their area or environment. This local wisdom can be a source of science learning that is more interesting and less monotonous. In line with the statement above, based on research conducted by Yasir (2023), it was stated that as many as 91.7% of students did not know about ethnoscience learning.

The function, characteristics and benefits of the Keris Madura provide a place as context and content for studies, one of which is as a direct learning resource for students to understand concepts in the field of science (Rahmawati et al., 2020; Nahak, 2019). Research conducted by Mokmin et al (2023) states that cultural diversity has not been widely developed as a learning resource, many teachers have not utilized regional culture and social affairs as a science learning resource. This results in students experiencing learning difficulties. Efforts that can be made to improve this condition are integrating the Keris Madura into science learning through ethnoscience studies. Learning activities that involve culture and society will make it easier for students to understand the learning material (Yasir et al., 2020).

In this regard, various problems arise in learning and research. Study results of Qomaria, Yasir, dan Fikriyah (2019); Rozie & Pratikno (2022) show that the thinking skills and character of Madurese students are still low. This problem was overcome by developing SRL-STEAM based e-modules in science learning (Yasir & Wulandari, 2020); integrative science learning media with a Madura theme (Nadifah et al., 2023; Sukmasari, et al., 2023). The findings obtained in the form of data on students' metacognitive abilities, creative problem solving and scientific literacy have developed well, but the students' national character is categorized as lacking.

The lack of national character of students is also supported by the research results of Wulandari, Yasir, dan Qomaria (2020); Amaniyah (2022); Thahir et al (2023); Hariyanto (2016). From this research, it was found that self-awareness of the importance of Madurese cultural values is still lacking, even though scientific reasoning abilities are well developed. The cause of the lack of awareness of the importance of Madurese cultural values found was that the research conducted had not

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characterized citizen science as a contributor to research data (Yasir, et.al, 2020) and had not raised the context of Madurese local wisdom characterized by Ethnoscience as a source and medium for science learning (Yasir & Wulandari, 2020; Nadifah et al., 2023; Yusa et al., 2023).

The Madurese Keris as one of Madura's local wisdom has the potential to be studied and included in science learning. The Madurese keris is only labeled as branding for the Madurese tourism destination (Yuliana et al., 2022), still limited to studying the origins and characteristics of the Madura keris (Herli and Purwanto, 2022), and ethnography of the magical power of the keris as an heirloom weapon (Rudyanto, 2015). Several previous studies revealed that there has been no ethnoscience study regarding the Madura Keris to be used as a source for junior high school science learning.

It is necessary to carry out research "Identification of Ethnoscience in Keris Madura as a Middle School Science Learning Resource". This study aims to identify the ethnoscience found in the Keris Madura which can be used as a source of learning natural sciences for junior high schools. By conducting this research, it is hoped that students will be able to recognize the typical Keris Madura and ultimately the output of this research is expected to be able to provide a reference source for ethnoscience-based science learning.

METODE

The type of research used is descriptive qualitative research. Qualitative research is research that emphasizes observing a phenomenon or situation and then describing it. This research takes the form of describing, outlining, interpreting problems and then drawing conclusions from problems regarding ethnoscience contained in the Keris Madura as a source of junior high school science learning. The research design used is descriptive qualitative. In this study, the descriptive qualitative research design aims to identify the ethnoscience contained in the Keris Madura which can be used as a learning resource for junior high school science. Researchers determine the research focus, select sources and the surrounding community as data sources, then carry out data collection and instrument validation (Creswell, 2009). Apart from that, it also analyzes data, interprets data, triangulates data and draws conclusions on research findings.

When the research was conducted July-September 2023 at Aeng Tong Tong Village, Saronggi District, Sumenep-Madura Regency. The subjects of this research were the village head and chairman of the Keris Madura association and the surrounding community. Purposive sampling technique was used to select research subjects with certain criteria (government experts and cultural figures). The instruments used in the research, namely interview guides, were used to gather information from subjects or sources and observation sheets were used to observe the ethnoscience of Keris Madura.

The data collection techniques used were observation, interviews and documentation. Observation is a data collection technique resulting from direct observation of the object under study. The type of observation used is non-participant observation, the researcher is only an observer, namely observing and recording the object under study in the form of ethnoscience found on the Keris Madura. An interview is a question-and-answer conversation conducted in two directions. Researchers conducted interviews with the village head and chairman of the Keris Madura association and the surrounding community. The type of interview used, namely an unstructured interview, is free and guided because the freedom and direction of the conversation is firm and basic, to obtain detailed and in-depth data, and the interview is carried out using an interview instrument focused on the ethnoscience of the Keris Madura. Documentation is also used as proof that research has been carried out.

The data analysis techniques use the interactive analysis proposed by Miles and Huberman (Creswell, 2009), which consists of data reduction, data presentation, conclusions and verification. Data analysis in qualitative research is carried out during data collection. Researchers conducted observations and interviews about Keris Madura with sources. Data reduction is carried out to process research data by simplifying, focusing attention, abstracting and transforming rough data that emerges from written notes in the field to make it easier to analyze interview results more clearly. The data collected and classified is then presented either in table form or sentence form or description form. Conclusions and data verification were obtained by triangulating data using the triangulation method, namely matching interview results with data in the field or observation sheets. The data triangulation carried out came from the results of observation sheets and interview results and was presented in table form. The results of the data findings were then verified by the junior high school science teacher.

RESULT AND DISCISSION

The data obtained in this research are the results of interviews with the ethnoscientific potential of the Madurese Keris and the results of observations of the form, tools and materials, manufacturing process, characteristics and methods of preserving the Madura Keris by the surrounding community.

Analysis of interview results with Keris Madura sources. Interviews were conducted with resource persons, namely the village head and chairman of the Keris Madura association and the surrounding community. The interview contained 10 questions which were used to explore the potential for ethnoscience in Keris Madura. The type of interview used is an unstructured interview which is free and guided. The results of interviews with sources were then reduced to make it easier to analyze and draw conclusions. The results of interview data reduction can be seen in table 1 below.

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Tabel 1. Normality Test of SMP Balung 2 Data

No.	Question Focus	Reducing The Source's Answers
1.	What is meant by Keris Madura?	The meaning of the keris can be seen from two sides, namely from the material and functional points of view. As an object, a keris is a work of artistic creation or an imagination expressed in iron which has high aesthetic value. While the second is a keris as a function
2.	What tools and materials are used in making Keris Madura?	Equipment used in making Keris Madura includes: 1. Paron, 2. Hacksaw, 3. Tatah, 4. Wungkal (whetstone), Hammer, 5. Mortise, 6. Miserly, 7. Engraving, 8. Sapit, 9. Grinding and 10. Drill. The materials used in making Keris Madura consist of: 1. The metal used in keris is divided into two, namely iron, nickel and steel. The elements used to make Keris Madura are iron (Fe), arsenicum (As), titanium (Ti), nickel (Ni) because they are high quality metals, strong, light and do not rust. The metal is then forged and shaped with certain ornamental motifs as winding areas. 2. Pancor is a keris ornament motif made from a mixture of iron and steel. 3. The keris warangka functions as a sheath or coating for the keris blade, which is made from sandalwood, trembalo and kemuning wood and is carved with certain ladrang, gayaman, pananggalan and sandhang walikat style carving 4. Pamor made from meteorite or star stone

		which contains titanium and nickel elements as bright metal coating fibers on the blade
3.	What is the process of making a Keris Madura?	The process of making a keris consists of: 1. Preparation, this preparation consists of idea preparation, technical, spiritual and ceremonial preparation, 2. Basic Forging, forging is kary pandhe, in this process the iron is washed to clear it of rust elements by burning, forging, stretching, folding, gluing, etc., 3. Engineering work, in this process the work begins to concentrate on getting the desired results in terms of the prestige pattern and shape of the knife house, the iron smelting process requires a temperature of +- 1.4500C while luxury materials require a temperature of 1.1000C and this is done using the same process, namely burning , forged, stretched, folded, glued, etc, 4. Final Work, the final work is carried out after all the previous work which results in a keris blade that is still too smooth and binds the fibers without a finished pamor pattern appearing. This process consists of the annealing process (re-hardening the blade which was previously softened by burning and immersing it in flower water), an exercise which aims to remove the layer of prestige on the keris blade by soaking the keris blade in a solution of sulfur (S) and salt (NaCl) over time. 1236 hours, mewarangi which aims to highlight the artistic side of the keris blade, where by dipping the keris blade in a solution of warangan (As2S3) which is liquid arsenic-dioxide and acid, the blade will appear with black iron while the pamor appears with a certain pattern.
4.	What are the characteristics of Keris Madura?	The uniqueness of the Keris Madura lies in the warangka (sheath/case for the keris blade) which is made from sandalwood, tin, mentaos,

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		yellow and teak. The shape of the shell made is characterized by carving motifs that match regional patterns and certain mranggi characteristics with the tagline The Soul of Madura, Sumenep
5.	What is dosage/concentration/ measure of each ingredient in making Keris Madura?	Keris Madura are made from three materials: iron, nickel and good quality steel in a dose of 10 kg, kneaded and combined to only one twentieth or even less by forging repeatedly and making folds in layers of at least 64/128-200 layers.
6.	What are the characteristics of Keris Madura?	Inviting the younger generation to participate in making Keris Madura, holding heirloom jamasan rituals, and creating associations for the preservation of Keris Madura.

Analysis of Keris Madura observations. Observations were carried out according to the observation guidelines that had been prepared as a reference. The observation sheet can be seen in Table 2.

Based on the results of observations that have been made, it can be seen that Keris Madura has various types of keris made, namely Ageman keris and Souvenir keris. The Ageman Keris is a keris that is made with a special purpose according to the requests and wishes of the keris owner and is accompanied by certain rituals before the making process. Souvenir Keris is a keris that is made as a souvenir from someone who has visited or just as decoration so there is no particular ritual in the making process.

The results of the observation are in accordance with interviews with sources who stated that the Keris Madura made in Aeng Tong Tong Village are Ageman keris and Souvenir keris. Two types of Keris Madura can be seen in Figure 1. In the process of making Keris Madura, certain tools and materials are used. In accordance with the results of interviews conducted with sources who stated that the process of making Keris Madura

Tabel 2. Keris Madura Observation Sheet Indicators

Indicator	Things to observe
Know the tools and materials for making Keris Madura	Tools and materials for making Keris Madura
Learn the process of making Keris Madura	Process of making Keris Madura
Know the characteristics of the Keris Madura	The uniqueness of the Keris Madura
Find out the methods used by informants/resources to preserve Keris Madura	The methods used by informants/resources to preserve Keris Madura

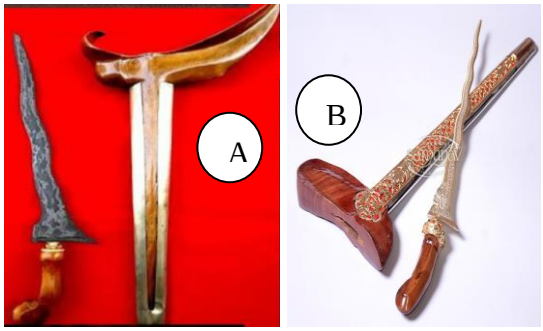

Figure 1. Types of Keris Madura made in Aeng Tong Tong Village (A. Ageman Keris; B. Souvenir Keris)

consists of (1) preparation from ideas, technical, spiritual and ceremonial; (2) basic forging of iron which is first washed to clear it of rust elements and then burned, forged, stretched, folded, glued, etc.; (3) engineering work by melting to forging and forming according to the desired results in terms of the prestige pattern and shape of the knife housing, requiring a temperature of +- 1.45000C; (4) the final work consists of the annealing process (re-hardening the blade which was previously softened by burning and immersing it in flower water), an exercise which aims to remove the prestigious layer on the keris blade by soaking the keris blade in a solution of sulfur (S) and salt (NaCl) with processing time 1236 hours, warangan which aims to highlight the artistic side of the keris blade, where by dipping the keris blade into a solution of warangan (As_2S_3) which is liquid arsenic-dioxide and acid, the blade will appear with black iron while the pamor appears with a certain pattern . The process of making a keris can be seen in Figure 2.

During the process of making Keris Madura, you will see the unique characteristics that differentiate it from other keris. In accordance with the

Figure 2. Process flow for making a Keris Madura (A. Preparation, B. Forging, C. Technical work, D. Final work)

results of interviews with sources who stated that the uniqueness of the Keris Madura lies in the warangka (sheath/case for the keris blade) which is made from sandalwood, tin, mentaos, yellow and teak. The shape of the shell made is characterized by carving motifs that match regional patterns and certain mranggi characteristics with the tagline The Soul of Madura, Sumenep (Yuliana et al., 2022). Documentation of the characteristics of the Keris Madura can be seen in Figure 3.

Not only is it a cultural tourist attraction because of its uniqueness, the Keris Madura is also an object of conservation. This is because the Keris Madura is one of the world heritage heirlooms in the non-tangible category. This is the reason why the Keris Madura has become a cultural heritage object for the Madurese community, such as Sumenep, for conservation. One of the

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Figure 3. The characteristics of the Keris Madura

areas in the archipelago that is famous as a keris craftsman area is Madura, namely Aeng Tong-Tong Village. This village is the village of Keris Madura Craftsmen who produce legendary handicrafts. Aeng Tong Tong Village is a village that is home to 640 Mpu (the name for keris craftsmen in Sumenep) whose quality is recognized worldwide. This is because since 2014, Sumenep has been confirmed as the City of Keris. This is also strengthened by the legitimacy of UNESCO which also designated Sumenep Regency as the area with the most keris craftsmen in the world, and most of them are in Aeng Tong-Tong Village (Fitriadi, 2020).

The results of the ethnoscience study were obtained from the original scientific knowledge of the people of Aeng Tong Tong Village which was translated into scientific knowledge. The community's original scientific knowledge was obtained from interviews and observations conducted in Aeng Tong Tong Village, then reduced or simplified to make it easier to identify ethnoscience, then reconstructed from the community's original science into scientific science.

The results obtained show that there is a match between the community's original knowledge and scientific knowledge. The community has knowledge based on experience from generation to generation as well as socialization from various parties related to the Keris Madura. When viewed with scientific science, it has similarities so that this scientific science strengthens the original knowledge of the community. In line with research conducted by Irawan & Muhartati (2019) identifying local wisdom and then examining the ethnoscience contained in that local wisdom.

Correlation of ethnoscience studies of Keris Madura with junior high school science material. The results of the ethnoscience study of the Keris Madura are then linked to the concepts or material of science for the Merdeka Curriculum. The concept of science material contained in the ethnoscience study of Keris Madura varies from grades 7, 8, and 9.

The meaning of keris is related to process materials and environmentally friendly technological products for the sustainability of life in grade 9, the selection of tools and materials for making Keris Madura is related to the types of types of metals as single substances or mixtures in class 7, the process of making keris which is closely related to the concept of physical, chemical changes and separation of mixtures in class 7, the specificity of Keris Madura resulting from forging appears material on temperature and heat in class 7, the size of Keris Madura which is related with material on elements and compounds in class 7, as well as how to preserve Keris Madura which is closely related to material on

ecological conservation and biodiversity in class 8. This means that ethnoscience studies conducted on Keris Madura can be used as a learning resource for junior high school science.

The results of the study on the transfer of Scientific Knowledge to Indigenous Knowledge and its integration in junior high school science material produced all science concepts related to Keris Madura ethnoscience and can be applied in learning activities at school by teachers, in line with Piaget's constructivist learning theory which states that students can build their knowledge through interaction and experience to gain an understanding of reality. This learning process is known as a science learning process based on ethnoscience or local wisdom.

In line with relevant research by Lestari et al., (2018) which identifies local wisdom in an area that can be used as a source for junior high school science learning. One way of ethnoscience-based learning is by linking the knowledge learned with the culture around students. It is hoped that science learning will become an experience for students to learn about themselves and the surrounding environment, in accordance with Bruner's cognitive learning theory which states that the process of actively interacting a person with their environment will bring about changes in a person, by connecting new information and previously obtained information, a meaningful knowledge.

CONCLUSION

The results of the ethnoscience study of the Keris Madura are very closely related to the concept of science learning in schools. This means that ethnoscience studies conducted on Keris Madura can be used as a learning resource for junior high school science.

DAFTAR PUSTAKA

Amaniyah, I.F. (2022). Upaya Penanaman Karakter Peduli Sosial Melalui Budaya Sekolah dan Pembelajaran IPS Pada Siswa Kelas VIII MTs Al Ula Pamekasan. Skripsi. http://etheses.uin-malang.ac.id/35122/1/18130088.pdf.

Creswell, W. J. (2009). Research Design (Qualitative, Quantitative, and Mixed Methods Approaches). Boston: McGraw-Hill

Fitriadi. (2020). Keris Madura Benda Pusaka Warisan Dunia. Bangka: Bangka Pos. https://bangka.tribunnews.com/2020/05/02/keris-madura-benda-pusaka-warisan-dunia

Hariyanto. (2016). Mengembangkan Karakter Siswa Berbasis Kearifan Lokal dan Kemampuan Akademik Melalui Implementasi Metode Penemuan Terbimbing. Prosiding Seminar Nasional Pendidikan IPA UM Malang. Vol. 1, 2016. ISBN: 978-602-9286-21-2. https://pasca.um.ac.id/wp-content/uploads/2017/02/Hariyanto-771-780.pdf.

Herli, M. & Purwanto, E. (2022). Asal Usul & Karakteristik Keris Sumenep. Sumenep: Wiraraja Press. https://repository.wiraraja.ac.id/2874/2/Dok_Buku_%20Karakteristik

 DOI: https://doi.org/10.35719/mass.v4i2.136

%20Keris%20Sumenep.pdf.

Irawan, B., & Muhartati, E. (2019). Identifikasi Nilai Etnosains pada Kearifan Lokal Berkarang dan Menyondong Ikan Pada Masyarakat Pesisir Bintan. Pedagogi Hayati, 3(1), 53–58. https://doi.org/10.31629/ph.v3i1.1595

Lestari, A., Yolida, B., Rita, R., & Marpaung, T. (2018). Identifikasi Kearifan Lokal Di Sungai Way Kiri Sebagai Sumber Belajar IPA SMP. Jurnal Bioterdidik: Wahana Ekspresi Ilmiah, 6(4). http://jurnal.fkip.unila.ac.id/index.php/JBT/article/view/16366

Mokmin, N.A.M., Hanjun, S., Jing, C., Qi, S. (2023). Impact of an AR-based learning approach on the learning achievement, motivation, and cognitive load of students on a design course. Journal Computer Education. 1(1), 1-12. https://doi.org/10.1007/s40692-023-00270-2

Nadifah, I., Fikriyah, A., & Ahied, M. (2023). Needs Analysis in the Development of an Ethnoscience-Based Educative Magazine. Indonesian Journal of Mathematics and Natural Science Education, 4(1). https://doi.org/10.35719/mass.v4i1.126.

Nadifah, I., Fikriyah, A., Ahied, M., Hadi, W.P., Yasir, M. (2023). Development of an Integrated Ethnoscience Educative Magazine in the Theme of Madura Bamboo Shells Paste. Integrative Science Education and Teaching Activity Journal, 4(2): 170-182. https://doi.org/10.21154/insecta.v4i2.7142.

Nahak, H.I. (2019). Upaya Melestarikan Budaya Indonesia Di Era Globalisasi. Jurnal Sosiologi Nusantara, 5(1), 65-76. https://doi.org/10.33369/jsn.5.1.65-76

Rahmawati, Y., Ridwan, A., Faustine, S., Syarah, S., Ibrahim, I., & Mawarni, P. C. (2020). Pengembangan Literasi Sains Dan Identitas Budaya Siswa Melalui Pendekatan Etno-Pedagogi Dalam Pembelajaran Sains. Jurnal Edusains, 12(1), 54–63. https://doi.org/10.15408/es.v12i1.12428.

Rozie, F. & Pratikno, S. (2022). Edutourism Digital Laboratory: Meningkatkan Keterampilan Berpikir Kritis Siswa SD dalam Upaya Penguatan Karakter dan Potensi Madura. Jurnal Penelitian dan Pengembangan Pendidikan, 6(3): 393-398. https://doi.org/10.23887/jppp.v6i3.55806.

Rudyanto, S. (2015). Etnografi Daya Magis Keris Pusaka. LAKON Jurnal Kajian Sastra dan Budaya, 4(1): 155-177. https://doi.org/10.20473/lakon.v4i1.1940.

Sukmasari, D., Ahied, M., Fikriyah, A., & Qomaria, N. (2023). Preliminary Study in the Development of Ethnoscience-Based Learning Media for Secondary School Students. Indonesian Journal of Mathematics and Natural Science Education, 4(1). https://doi.org/10.35719/mass.v4i1.

114.

Thahir, M., Julius, A., Tamam, B., Thahir, W. (2023). Students Learning Culture In Higher Education after The Covid-19 Pandemic. Conciencia, 23(1): 73-82. https://jurnal.radenfatah.ac.id/index.php/conciencia/article/view/16385.

Tyas, R. A., Wilujeng, I., & Suyanta, S. (2020). Pengaruh pembelajaran IPA berbasis discovery learning terintegrasi jajanan lokal daerah terhadap keterampilan proses sains. Jurnal Inovasi Pendidikan IPA, 6(1), 114–125. https://doi.org/10.21831/jipi.v6i1.28459.

Yasir, M. (2023). Exploration of Madura Local Wisdom as a Support for Ethnoscience Oriented Madura Tourism Database. Science Education and Application Journal (SEAJ), 5(1), 41-55. https://doi.org/10.30736/seaj.v5i1.737

Yasir, M., Wulandari, A.Y.R., Qomaria, N., Prahani, B.K., Al Haq, A.T. (2020). The Contribution of Local Wisdom Integrated Science Learning Model to Students' Scientific Communication Skills in Ecology Learning. Jurnal Bioedukatika. Vol. 8(3) 2020 | 141 – 156. https://doi.org/10.26555/bioedukatika.v8i3.15015

Yuliana, R., Kurniasari, N.D., Subastian, R.M. (2022). Keris as Branding Destination Tourism: Indonesian Heritage Daggers from Madura. Jurnal Komunikator. Vol. 14. No. 1, Hal. 42-52. https://doi.org/10.18196/jkm.12818

BRIEF PROFILE

The first and second authors are lecturers in the Science Education Study Program, Faculty of Education, University of Trunojoyo Madura, who have expertise in ethnoscience and local wisdom as well as science learning strategies. The third author is an MBKM Research student in the same study program as the first and second authors and is actively conducting research on local Madurese wisdom and its integration in science learning.

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