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Mapping Science Learning Materials Integrated Ethnoscience "Jamu Madura" for Middle Schools/MTs

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Abstract: This study aims to map natural science materials in junior high schools against the Madura's herbal medicine or *jamu Madura* ethnoscience. The mapping consists of mapping indigenous knowledge about the process of making *jamu Madura*, with scientific knowledge in the form of science concepts and materials for SMP/MTs. This research is a qualitative descriptive study with analytical techniques in the form of interviews, observation, and literature review. Interviews and observations were conducted at the production sites of Madura's herbal medicine which have recipes passed down from generation to generation to find out genuine knowledge about the process of making *jamu Madura*, while a literature review was conducted to examine the linkages between the process of making Madura's herbal medicine and natural science concepts and materials. The results of this study show that each step in the process of making Madura's herbal medicine is related to science concepts and materials taught in junior high schools/MTs. Natural science materials that can be related to the process of making Madura herbal medicine are, substances and their changes, classification of living things, temperature and heat, biodiversity, additive (natural preservatives), and measurements. Material substances and their changes can be related to the process of making Madura's herbal medicine which cuts the jamu material and dries it. The material for the classification of living things and biodiversity can be seen from the process of selecting the raw materials for Madura herbal medicine. Material temperature and heat can be seen in the drying process of the *jamu* material used to reduce the water from the ingredients. While the measurement material is used when weighing the raw materials for Madura's herbs. So, it can be said that the mapping of Madura herbal medicine ethnoscience can be input as a main theme in SMP/MTs learning science.

Keywords: Ethnoscience, Jamu Madura, Science Learning Material.

Introduction

The 21st century is a century defined in knowledge and technology. The rapid development of science and technology makes all activities in human life easier (Prayogi and Estetika 2019). All areas of life can be facilitated in this 21st century. This convenience can be one way to overcome problems that exist in everyday life. So that this century becomes one of the efforts to create solutions with the development of knowledge and technology (Widodo, Indraswati, and Sobri 2019). The development of knowledge and technology has forced every human being on earth to follow its development. Thus, every activity carried out can implement the results of these developments and can also optimize the creation of solutions to civilization problems (Fadhilatunnisa, Rosidah, and Fakhri 2020; Fitri et al. 2022; Prayogi and Estetika 2019).

The problems of life so far are expected to be resolved in the 21st century. One formulation of the solution is through education, so there is the term 21st century education. 21st century education consists of Life and career skills, Learning innovation skills, and Information, media, and technology skills (Hidayat, Dyah M, and Ulya 2019; Mardhiyah et al. 2021). Life and career skills contain abilities that must be imparted to students who are the younger generation in order to gain skills for social life and the world of work later. Learning innovation skills relate to students' abilities to be honed in their abilities in

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critical thinking, communication, and collaboration (Sudarmin et al. 2019; Sutama et al. 2022). Finally, Information, media, and technology skills, namely preparing students to be able to keep abreast of technological developments and use them to help everyday life.

Education in the 21st century not only prepares students to be smart in the academic field but is also required to hone skills that are useful for their future lives (Mardhiyah et al. 2021). In addition, life and career skills in 21st century education also requires students to carry forward traditions/cultures and values in Indonesia or also known as cultural awareness. 21st century education considers the original culture of society as one of the important things to learn for students (Nugraha 2019).

The world era that has focused on the development of knowledge and technology has made all information from all over the world very easy to access. It also facilitates the mixing of foreign and native cultures, so that knowledge of culture for the younger generation becomes one of the main focuses of 21st century education. Students must be equipped with native Indonesian culture so that the character of this nation is not lost in time (Rahayu, Iskandar, and Abidin 2022).

Science learning has an important role in the implementation of 21st century education. This is because science learning is expected to help create solutions to life's problems (Amelia, Jumini, and Khoiri 2021; Tursinawati and Widodo 2019). The end result of learning science is students who are ready to overcome life's problems around their environment through scientific processes that have been obtained at school. In addition, science learning can be an intermediary in fostering students' cultural awareness (Dwipayana, Redhana, and Juniartina 2020). Integrating culture with science learning is one of the means to obtain two solutions at once.

Ethnoscience is one way/method that can be applied in science learning by integrating it with the culture/traditions of society. Previous research stated that ethnoscience in science learning can improve students' critical thinking, scientific literacy, and cultural love characters (Asri Nugraheni et al. 2022; Darmayasa, Jampel, and Simamora 2018; Pertiwi and Rusyda Firdausi 2019; Sakti, Defianti, and Nirwana 2020) discussed in 21st century education. Ethnoscience is a way to connect original knowledge of the community into scientific knowledge which in this case is science material in schools. (Amelia et al. 2021; Sumarni et al. 2020; Utari et al. 2020). One culture that can be implemented in learning is the culture of the Madura's community in processing and consuming Madura's herbal medicine.

Jamu is one of the cultural heritages from Indonesian ancestors which still exists today. Jamu is a traditional herb that is believed to cure various diseases (Kristianto et al. 2020; Ratanawati, Ali, and Wirata 2019). Madura is one of the areas that until now is known for herbal medicine. Madura's people from ancient times have always made and consumed herbal medicine as an alternative medicine to cure disease. However, currently the younger generation of Madura are very rarely interested in herbal medicine, so they are less familiar with this culture (Hidayat 2018; Kristianto et al. 2020; Salat 2020). Therefore, the integration of culture in learning, especially science learning, really needs to be done to introduce Madura's herbal medicine to students.

The previous statements have sufficiently explained the background of this research. It is necessary to map natural science material related to the culture of processing herbal medicine in Madura which is integrated into science learning at schools. The mapping of natural science material is carried out in SMP/MTs by following the latest curriculum, namely the independent curriculum. Science materials for SMP/MTs are mapped with the big theme of Madura's herbal medicine to find out which materials can be integrated with the herbal medicine culture. Integration is done by looking at the process of making traditional Madura's herbal medicine. The hope is that this mapping can be used by schools, especially in Madura, to be implemented in science learning.

Materials and Methods

Study Area

This research is a qualitative descriptive study. This study uses research subjects, namely Madura's herbal medicine manufacturers who still maintain the traditional herbal medicine manufacturing process from ancient times. Madura herbal medicine producers as research subjects came from Sumenep, Madura. This research was started in November by conducting interviews, observations, and literature studies.

Procedures

Interview

Interviews were conducted to find out the process of making Madura's herbal medicine as the main theme in this mapping of SMP/MTs natural science material. Interviews were conducted with Madura's herbal medicine producers who continue to maintain the tradition of making herbal medicine from generation to generation.

Observation

Observations were also made to find out the process of making Madura's herbal medicine.

Literature Review

A literature study was conducted to link the process of making Madura's herbal medicine with natural science material for SMP/MTs, so that the process of integration through ethnoscience can be carried out. This step is also carried out to find suitable materials to be associated with the theme. In addition, you can find out the SMP/MTs science materials that are in the independent curriculum.

Data Analysis

Data analysis resulted from the three data generated, which came from interviews, observations, and literature reviews. The resulting interviews and observations data are qualitative data which are used as the main data to produce mapping of natural science materials. The initial data generated is referred to as indigenous knowledge, then mapped and studied with literature reviews which is referred to as Scientific Knowledge.

Results and Discussion

Interview and Observation Results

Figure 1 is the result of observations and interviews conducted with Madura herbal medicine producers.

Figure 1. Raw materials and production of Madura herbal medicine (Source: Personal Document).

Table 1 is the stages of making traditional Madura's herbal medicine which are commonly used for products that can be stored, not for Madura's herbal products which must be consumed immediately. Table 1 also shows the ethno-scientific process of making Jamu Madura.

Table 1. The process of making Madura's herbal medicine is related to the ethnoscience method.

No.	Stages of Making *Jamu Madura* (Indigenous Knowledge)	Scientific Knowledge
1)	Choose the basic ingredients of herbal medicine according to the type and benefits	The selection of the basic ingredients of Madura herbal medicine uses native Madura herbal plants which have benefits because they contain fiber, prebiotics, probiotics, other phytochemicals.
2)	The basic ingredients are cut thinly and dried in the sun	The process of cutting the material and drying it in the sun is useful in the process of preserving herbal ingredients so that they last longer
3)	The dry raw materials are weighed and mixed according to the types and benefits, then crushed with a mortar	This process makes physical changes to the form of herbal raw materials and the process of using measurement tools
4)	Jamu is ready to be consumed by serving it in warm water	Brewing with warm water is one of the mixed methods to make it easier to dissolve something.

Results of SMP/MTs Science Learning Materials Mapping

Previously, we had known the process of making Madura's herbal medicine which was linked to the ethnoscience method, so that mapping of Madura's herbal medicine with natural science material for SMP/MTs could be done easily. Table 2 below describes the results of the mapping carried out based on the process of making Madura's herbal medicine that has been written down.

Table 2. Mapping the process of making Madura herbal medicine with natural science material for SMP/MTs

No.	Stages of Making *Jamu Madura*	Science Material in SMP/MTs	Sub-Material	Grade level di SMP/MTs
1)	Choose the basic ingredients of herbal medicine according to the type and benefits	1. classification of living things 2. Ecology dan biodiversity	1. classification of living things (plantae kingdom) 2. biodiversity	VII
2)	The basic ingredients are cut thinly and dried in the sun	1. substances and their changes 2. Temperature, Heat, and Expansion 3. Digestive system	1. Physics changes 2. Temperature and Heat 3. additive (natural preservatives)	1. VII 2. VII 3. VIII
3)	The dry raw materials are weighed and mixed according to the types and benefits, then crushed with a mortar	1. substances and their changes 2. The nature of science, measurement, and the Scientific method 3. Elements, compounds, and mixtures	1. Physics changes 2. measurement mixtures	1. VII 2. VII 3. VIII
4)	Jamu is ready to be consumed by serving it in warm water	1. Temperature, Heat, and Expansion 2. Elements, compounds, and mixtures	1. Temperature and Heat 2. mixtures	1. VII 2. VIII

Discussion

Mapping the process of making Madura's herbal medicine into SMP/MTs natural science material using the ethnoscience method can be done. The results of the mapping show that each stage in the process of making Madura's herbal medicine can be linked to scientific knowledge which is then integrated into SMP/MTs natural science material. Natural science materials that can be related to the process of making Madura herbal medicine are, substances and their changes, classification of living things, temperature and heat, biodiversity, additives (natural preservatives), and measurements.

The first process in making Madura herbal medicine is the selection of raw materials. The selection of raw materials is adjusted to the type and benefits of the raw materials, so that herbal medicine with certain properties can be produced. This process can be linked to SMP/MTs natural science material, namely the classification of living things as well as ecology and biodiversity. The classification of living things can be related because the raw materials are selected according to the types and benefits of the raw materials which are plants, so that they are included in the classification of the kingdom Plantae. Ecology and biodiversity can be related to Madura herbal medicine because it is related to biodiversity (flora/plants) in Madura.

The process of cutting and drying the raw materials for Madura's herbal medicine can be related to business materials, energy, and simple machines; substances and their changes; temperature, heat, and expansion; as well as the digestive system. Material work, energy, and simple machines can be related to the use of knives when cutting raw materials which is one of the implementations of using simple machines in life. The material and its changes can be seen when the raw material is cut and dried which is a physical change in the raw material. The material temperature, heat, and expansion are related because there is a process of drying in the sun. The material for the digestive system is connected to the sub-material for additives in the form of natural preservation methods due to the drying process.

The next process is weighing, mixing, and grinding the raw materials. This process can be related to matter, energy, and simple machines; substances and their changes; nature of science, measurement, and scientific method; and elements, compounds, and mixtures. The matter of work, energy and simple machines can be related to the sub-matter of work and energy that occur during these processes. Material substances and their changes can be connected because this process involves physical changes in the raw materials for herbal medicine. The material nature of science, measurement, and the scientific method can be linked because there is a process of weighing raw materials using a balance which is a measurement process. Elemental, compound, and mixed materials can be related because there is a process of mixing the raw materials.

The final process is to consume Madura herbal medicine by brewing the herbal concoction with warm water. This process can be related to matter temperature, heat, and expansion; and elements, compounds, and mixtures. This material can be connected because of the consumption of herbal medicine which is brewed (mixed process) with warm water (hot/heat temperature).

Conclusions

Mapping natural science material for SMP/MTs by being integrated into the culture of making Madura's herbal medicine can be one way to implement the formulation of 21st century education. This mapping can prepare students who think critically, are scientifically literate, and have local cultural characteristics using the ethnoscience

method. Natural science materials that can be related to the process of making Madura herbal medicine are, substances and their changes, classification of living things, temperature and heat, biodiversity, additives (natural preservatives), and measurements. The results of this mapping are expected to be implemented in SMP/MTs, especially in the Madura area.

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