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Ethnochemistry: Analysis of the Relevance of Material Atomic Structure with the *Ngejot* Tradition as a Source for Learning Chemistry

Nanda Suanda*& Dwi Wahyudiati
Department of Chemistry Education, Universitas Islam Negeri Mataram, Jl. Gajah Mada Jempong Mataram No. 100, Mataram, Indonesia 83116
* Corresponding Author e-mail: 200109001.mhs@uinmataram.ac.id

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Abstract
Limitations in the form of teaching materials as learning resources in chemistry learning is a problem that occurs quite seriously in secondary schools and in tertiary institutions so the ethnochemistry approach is one form of modification in the development of contextual chemistry teaching materials. This study aims to analyze chemistry teaching materials as a source of learning by exploring the potential of local *Sasak* wisdom with the *ngejot* tradition. Data collection techniques through literature, interviews, and documentation using a qualitative approach. The use of Miles & Huberman's qualitative analysis in analyzing the data to be obtained. The research subjects consist of community leaders, chemical content experts, and chemical literature relevant to the research study. The research subjects consisted of community leaders in *Lenek* village with the object studied regarding the *ngejot* tradition where the *Lenek* village community was the respondent so that it was relevant to the research study. Based on the research findings, it can be concluded that *Sasak* local wisdom with the *ngejot* tradition can be used as a source of chemistry learning through integrating *Sasak* local wisdom with the *ngejot* tradition in the concept of atomic structure that there is an arrangement of matter from a negatively charged electron surrounding the atomic nucleus. Thus, the implications of this research can be a source of reference in developing contextual chemistry teaching materials so as to make learning more meaningful.

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INTRODUCTION

There are 3 main concepts in the aspect of the characteristics of chemistry learning, namely concepts that are macro, micro, and symbolic. Therefore, the task of the lecturer or chemistry teacher must provide understanding to students by referring to the characteristics of chemistry through the application of a constructivism-based learning approach. Constructivism-based learning focuses more on students' success in organizing experiences, in other words students are prioritized to construct their own experiences (Sundawan, 2016). The advantages of constructivism-based teaching materials are that students can be actively involved in building knowledge and learning experiences physically and mentally, and learning skills so that learning objectives can be achieved optimally (Fadli, 2019; Ador, 2017; Hasanah et al., 2016; Sumardi et al., 2020; Wahyudiati et al., 2019; Aldian & Wahyudiati, 2023).

Chemistry learning in the classroom must focus on activities that encourage active students, so a teacher must design creative and innovative learning strategies so that students find their own new knowledge (Syafitri et al., 2022; Andriani et al., 2019; Puspitasari et al., 2023; Wahyudiati & Qurniati, 2023). Maximum learning can be achieved with teaching material sources that are

easily understood by students. However, the source of teaching materials only focuses on abstract concepts, which is a problem that often occurs in chemistry learning. In addition, students also assume that chemistry is difficult to understand because it contains abstract theories and concepts (Rohanawati et al., 2014).

This problem is caused by chemistry teaching materials which tend to be theoretical in nature, making the presentation of the material monotonous, not factual, and has no connection with everyday life, making it difficult for students to understand (Ador, 2017; Sutrisno et al., 2020; Wahyudiati, 2016). Presenting factual and contextual chemical material is a way to overcome existing problems. Therefore, with the availability of learning resources, both in the form of teaching materials and learning media that are relevant to everyday life, an ethnochemical approach can be implemented so that students can easily understand them.

Ethnochemistry is a new thing in chemistry because in its concept there is a combination of cultural anthropology and chemistry where various cultural practices or traditions in society have a chemical connection that is described in practice which can be identified as the study of concepts, chemical practices, or chemical ideas (Abramova & Greer, 2013; Rahmawati et al., 2017, Rosa & Oray, 2011). In its application, learning based on ethnochemistry should have compatibility with chemistry learning materials so that it is necessary to identify the potential of local culture. So, the integration between local cultural potential and learning materials through a process that can run according to the learning objectives to be achieved. Therefore, ethnochemistry-based learning can only be done on chemical material that has integrity in the local culture. In the end, ethnochemistry-based learning will affect the public's view that chemistry is present in everyday life, not only something dangerous, such as in making bread using baking soda (Rahmawati, 2017).

The application of ethnochemical-based learning will affect students' awareness of chemistry that chemical processes occur in everyday life (Wahyudiati & Fitriani, 2021). The application of ethnochemical-based learning will affect students' awareness of chemistry that chemical processes exist in everyday life. Therefore, the application of ethnochemistry-based learning is able to present new experiences that students gain so that they master chemistry material from a local cultural point of view. The advantages of this ethnochemistry-based learning will make it easier for students to understand chemical concepts that exist in everyday life in their respective cultural perspectives which are the implementation of constructivism learning theory.

This ethnochemistry -based research is the best form of solution to the problem of learning chemistry through combining local wisdom with chemistry based on real life in the daily lives of students which makes learning more meaningful. *Sasak* local wisdom with the *ngejot* tradition, namely the tradition of visits to provide food to family, neighbors, community leaders, village leaders or other relatives which is carried out by gathering to form a circle in the field around the stands where the ceremony begins ahead of Eid al-Fitr (Wahyudiati & Fitriani, 2021).

Various results of previous research indicate that the integration of ethnochemistry as a cultural heritage will recognize the potential for local culture in the community and will increase students' understanding of local culture. The *ngejot* tradition begins with expert figures (protons or neutrons) in the stands (atomic nuclei) who will recite lontar leaves when the reading is finished, then the community goes around (electrons) carrying dulang (negative charge). So it can be said that the *ngejot* tradition is relevant to the concept of atomic structure so that learning based on real life in the daily lives of students can be used as learning will be more meaningful. In addition, the development of the era will not fade the existing culture in society and will increase the sense of love for the motherland. This is in accordance with research conducted by Wahyudiati (2021) that meaningful learning can be realized by

integrating chemical concepts with the local wisdom values of the community in factual daily activities that apply the concept.

Refer to research conducted by Nuralita (2020) that the application of local culture to ethnochemistry-based learning will affect students so as to increase their love for Indonesia and its region. One example of local wisdom possessed by the *Sasak* tribe with the *ngejot* tradition can increase learning and love for local culture. The renewal of this research is to analyze the relevance of chemical material to tradition so that it can be used as a learning resource. One example of local wisdom owned by the *Sasak* tribe in the East Lombok district, *Lenek* village, with the *ngejot* tradition, can increase learning and love for local culture. Thus, this ethnochemistry-based learning can develop students' cognitive aspects as well as affective and psychomotor aspects that can be relevant to the demands of learning in the 21st century. The purpose of this study was to analyze the relevance of chemical material, especially the concept of atoms which says that "a unit of matter composed of atomic nuclei surrounded by negatively charged electrons" is a learning resource for students.

METHOD

In this research, the approach used is a qualitative approach with ethnographic research. The research subjects comprised community leaders, chemical content experts, and chemical literature relevant to the research study. The stages in this study consist of a description stage, an analysis stage, and an interpretation stage. The description stage aims to find and explore problems by means of preliminary observations and interviews involving community leaders and content experts to obtain information related to the object of research.

The analysis stage aims to obtain accurate data based on the problem formulation and research objectives through analysis of research findings in the form of cultural products, *Sasak* local wisdom values with the *ngejot* tradition which are relevant to the subject matter of atomic structure in the concepts of atomic structure itself. The next stage, namely the interpretation stage, aims to obtain an accurate conclusion according to the analysis of the data obtained.

In this study the data collection techniques used were observation and interviews and documentation based on the type of data taken. The research instrument used interview guidelines, observation guidelines, and documentation guidelines which were used as references in data collection, then analyzed using data analysis techniques Spradley (2007) which consisted of four stages of analysis namely; (1) domain analysis; (2) taxonomic analysis; (3) componential analysis, and (4) cultural theme analysis.

Domain analysis and taxonomic analysis serve to select and simplify raw data recorded in observation sheets, interviews, and documentation, as well as discard data that is deemed unnecessary or irrelevant to the research objectives. After the data has been reduced and analyzed, the next step is compiling the data to become more systematic and then analyzing its relevance to existing theories or the results of relevant previous research (componential analysis and cultural themes). Furthermore, the final stage is to draw conclusions on the results of data analysis and research findings that answer the formulation of the research problem.

RESULTS AND DISCUSSION

The local wisdom of the *Sasak* Lombok tribe in *Lenek* Village, East Lombok is one of the *ngejot* traditions that have relevance to the concept of atomic structure in chemistry, namely the existence of a negatively charged electron surrounding the atomic nucleus and the presence of protons and neutrons. Where the atomic nucleus consists of positively charged protons and

neutrally charged neutrons. In addition, the concept of atomic structure has relevance to the *ngejot* tradition, namely that there is an association of participants carrying various kinds of dulang or typical Lombok food containers using a red hood called a ginger and forming a circle with participants walking around the stands (the opening ceremony venue is called pepaosan) with carrying a tray with a red cauldron (cover) indicating the presence of negatively charged electrons.

In theory, the atomic structure consists of negatively charged electrons with positively and neutrally charged atomic nuclei, where the electrons surround the atomic nucleus (protons and neutrons) in the same way that the participants jot around the stands where in the stands there are community leaders who will open the *ngejot* tradition and the participants brought a tray covered with red cauliflower as negatively charged electrons as shown in Figure 1.

Figure 1. The tradition of *Ngejot* in *Lenek* Village (*Sasak* Tribe)

Besides that, in the tradition of *ngejot*, offerings are offered to parents, in-laws leaders or religious leaders, and community leaders. Basically, the implementation is the same, except that the atomic nucleus or the person who is given the tray can be replaced, in the same way, that the proton or the person who makes the offering will determine the chemical element of the atom. When offerings are served in the mosque, if the number of people is the same as the number of dulang, it can be interpreted that the atom is neutral because the appropriate number of people and the dulang will have a fair effect on all people so that conditions are peaceful, safe and peaceful.

The relevance of the Atomic Structure material to local *Sasak* wisdom and the *ngejot* tradition which has the potential as a source of learning is the implementation of a visualization approach termed the chemical triangle concept (Jhonstone, 2006). The implementation of the visualization approach to chemistry learning through the integration of the subject matter, namely the concept of atomic structure with the local *Sasak* culture in the *ngejot* tradition, namely the existence of an association of participants carrying various kinds of dulang or typical Lombok food containers using a red hood called ginger and forming a circle with the participants who walks around the stands carrying a tray using a red cover is called a *dulang*. This is in accordance with the results of interviews conducted with several people from *Lenek.*

The results of interviews with all participants showed that there was a similarity that the *ngejot* tradition required carrying dulang with red cassava filled with food to be handed over to family, community leaders, neighbors or other relatives, but before starting all the people gathered in the field to form a circle around the stands or a small stage for the recitation of prayers found on lontar leaves or usually called pepaosan by community leaders. The implementation of the visualization approach to chemistry learning through the integration of the subject matter, namely the concept of atomic structure with the local *Sasak* culture in the *ngejot* tradition, namely the existence of an association of participants carrying various kinds of *dulang* or

typical Lombok food containers using a red hood called ginger and forming a circle with the participants who walked around the village until they reached the mosque to put the tray. In theory, the atomic structure consists of negatively charged electrons with positively charged atomic nuclei, where the electrons surround the atomic nucleus or are commonly called protons, in the same way, that the participants jot around the village within the center of the village there is a mosque as the atomic nucleus with a tray covered with red cauldrons as electrons. which is positively charged.

The relevance of the findings and research results to the results of observations and interviews conducted so that it can be proven that *Sasak* local wisdom with the *ngejot* tradition has the potential to be very suitable for integration with chemical materials. Chemistry teaching materials that integrate *Sasak* local wisdom with the *ngejot* tradition will make learning more meaningful and increase students' motivation in building understanding independently because they have a connection so that is an advantage they have. The existence of experiences experienced by students in everyday life makes constructivist learning theory that will combine the initial experiences that students have with new knowledge so that learning becomes meaningful and fun and will be more interesting for students.

Other interesting research findings also prove that the relevance of chemistry to *Sasak* local wisdom in *Lenek* village, namely the *ngejot* tradition, can be viewed from an inter-domain analogy approach. The analogy is inductive reasoning, which is a process of phenomena towards other similar phenomena so that if two objects are analogous, the phenomenon will occur simultaneously in both objects (Hajar & Budi, 2014). An analogy approach is an approach that is based on a comparative relationship between two different concepts but has a relevant meaning (Samara, 2016). The implementation of the inter-domain analogy perspective in chemistry learning is based on the cultural wisdom of *ngejot* which consists of protons surrounding the atomic nucleus which are neutrons and if the number of protons and electrons is the same then a neutral atom or neutron will be formed. Linkage is the similarity of the theory or concept that underlies the meaning and values contained in the local *Sasak* culture in the *ngejot* tradition.

Local wisdom values that underlie the concept of *ngejot* or surrounding the atomic nucleus are based on the concept of atomic structure where electrons are equated as people carrying dulang while protons are people who are ready at the place of the atomic nucleus (mosque) and will attack the dulang or eat the dulang, if the number of dulang is equal to people are the same then the atom is neutral or there is fairness in sharing so that a neutron is formed. The application of the analogy approach in chemistry learning has the advantage of being able to make learning more meaningful and interesting for students so that it becomes a motivation for participants to be actively involved in the teaching and learning process. In addition, this ethnochemistry-based learning becomes an interesting thing to learn so that chemistry concepts that have been considered boring lessons and tend to be dominated by abstract concepts will become more obvious (Samara, 2016).

The renewal of the research that has been done is that it is one of the implementations of the ethnochemical approach which has rarely been done so far. Moreover, integrating the local wisdom of the *Sasak* village of *Lenek* on the *ngejot* tradition with chemical concepts has never been done so the findings of this study are expected to be a contribution to innovation in chemistry learning. *Ngejot* has a significant effect on scientific attitudes and students' cognitive achievement. Various appropriate research results show that the implementation of ethnochemistry-based learning models either in the form of integration with learning models or as a source of learning for scientific investigations, as well as as a natural laboratory can develop science process skills, critical thinking skills and can improve students' cognitive learning outcomes (Ador, 2017; Wahyudiati, 2020; Wahyudiati, 2022; Sumardi & Wahyudiati,

2022; Wahyudiati & Fitriani, 2021). Thus, exploring the potential of *Sasak* local wisdom with the *ngejot* tradition as a source of learning chemistry and can become one of the new innovations in learning chemistry, and play a role in fostering a sense of love for the younger generation for their culture.

CONCLUSION

Based on the research findings, it can be concluded that *Sasak* local wisdom with the *ngejot* tradition can be used as a source of learning chemistry through integrating the *ngejot* tradition on the subject of atomic structure as well as the subject of protons and neutron electrons which are analyzed based on the perspective of analogy, representation and visualization. Thus, the implications of this research can be a source of reference in developing contextual chemistry teaching materials so as to make learning more meaningful.

RECOMMENDATIONS

The research that has been done is still limited to analyzing the relevance of the *ngejot* tradition to atomic structure material. Thus it is necessary to carry out further analysis related to the local wisdom of *Sasak* or other areas that have relevance to other chemistry materials so that studies related to ethnochemistry become more comprehensive as a source of learning chemistry.

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