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Ethno-chemistry: Relevance Analysis of Electron Valence Subject Material to *Sasak* Local Wisdom as a Chemistry Learning Resource

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Abstract
The lack of learning resources in the form of teaching materials is one of the problems found in the chemistry learning process, both within the scope of high schools and universities so that the development of contextual teaching materials is very important to do as an implementation of the ethno-chemistry approach in education. The purpose of this research is to explore and reveal the wisdom or local wisdom of the *Sasak* community, which is developed into teaching materials. This research approach uses a qualitative approach with data collection techniques using interviews, literature studies and documentation methods. A qualitative research approach with interview techniques, literature studies, and documentation methods was used to collect information in the form of individual views, theoretical understandings, and historical data related to the research topic, with the aim of gaining in-depth insights, contextual understanding, and theoretical support needed in the analysis and explanation of the phenomenon under study. The data obtained Analyze by Miles and Huberman qualitative analysis. Research subjects include community leaders, chemical content experts, and reading books relevant to the research. Based on the research findings. It is concluded that *Sasak* Begibung Culture can be used as a source of learning chemistry through integrating *Sasak* Begibung culture with valence electron material. Thus, the implementation of this research can be used as a reference in the development of contextualized chemistry teaching materials so that lessons become more meaningful and effective.

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INTRODUCTION

Macro, micro, and symbolic concepts are the three fundamental factors that make up chemistry learning characteristics. Chemistry learning is faced with a number of specific problems, including the high level of abstraction of concepts, limitation of appropriate learning resources, lack of relevance to students' daily lives, lack of active engagement in learning, false initial understanding, potential fear of chemistry, and other psychological challenges. Constructivism and ethni-chemistry integration approaches are important as they can help address these issues by enabling students to construct a deeper, relevant understanding and actively engage in chemistry learning. Thus, it is the responsibility of chemistry lecturers and instructors to help students comprehend the fundamental principles of chemistry, which can be done by implementing the constructivism learning strategy. A constructivism-based learning strategy is used to produce teaching materials for chemistry that are relevant to students' everyday activities in order to make learning more meaningful (Wahyudiati et al., 2020; Wiwit, Ginting, & Firdaus, 2013).

The benefits of teaching materials based on constructivism include the ability for students to actively participate in the construction of knowledge and learning experiences acquired in real and moral forms in order to acquire new knowledge, skills, and expertise in order to achieve learning objectives as effectively as possible (Fadli, 2019; Ador, 2017; Hasanah et al., 2016; Wahyudiati et al., 2019 Sumardi et al., 2020). One can quickly learn knowledge, skills, and competence through seeing and listening. To advance the scientific method and promote student learning outcomes, constructivist-based chemistry learning resources must be accessible (Coll et al., 2002; Wahyudiati, 2021).

The availability of constructivist-based chemistry learning tools is one of the issues that arises in chemical education. This issue arises from the fact that the creation of chemistry learning resources frequently focuses on abstract concepts through the use of examples that are frequently theoretical in nature. As a result, the presentation of material in chemistry teaching materials is tedious, lacking in specificity, and challenging for students to comprehend (Ador, 2017; Sutrisno et al., 2020; Wahyudiati, 2016). So, one way to implement the ethni-chemistry approach in learning is to present chemistry material that is factual and contextual through the availability of learning resources that are pertinent to students' daily activities both in the form of teaching materials and learning media. By incorporating chemical ideas that are pertinent to the local cultural structure of the society that uses chemical practices in daily life, ethnochemistry can be implemented in learning (De Jong, 2018; Hasanah et al., 2016; Wahyudiati, 2021).

According to Rahmawati et al. (2017) and Abramova & Greer (2013), ethnochemistry is the study of concepts, chemical practices, or chemical concepts that may be found in culture. It describes cultural practices or community traditions that have a chemical relationship. Several earlier studies that used the ethni-chemistry approach by using culture's products as a learning tool had an impact with an increase index related to students' concept understanding and were able to train critical thinking skills, as well as had a positive impact on students' scientific attitude abilities, and human rights. (Fadli & Irwanto, 2020; Rahmawati et al., 2017; Rosa & Clark, 2011; Sumardi & Wahyudiati, 2021). In order to learn by using local culture as a learning resource and a natural laboratory, it is crucial to apply ethnochemistry. Because it is connected to students' daily activities and is an implementation or application of the constructivism learning paradigm, learning chemistry with the concept of ethnochemistry will aid students in understanding chemical theories.

The importance of this research to do is to be a choice of solutions regarding the problems of learning chemistry by applying ethnochemistry to make learning more meaningful. Based on the results of previous research, it can be seen that the curriculum that integrates ethnochemistry presents the context of cultural heritage and local wisdom values used as a basis for learning to gain concept understanding and scientific investigation through natural laboratory-based learning so that it has a positive effect on student learning outcomes (Ador, 2017; Singh, 2016; Sumardi & Wahyudiati, 2021).

Such as the local wisdom of the ***Sasak*** tribe. The renewal that occurs due to this research is to explore the values of the local wisdom of the ***Sasak*** tribe. which has relevance to be used as a natural laboratory. which in this study raises the local ***Sasak*** culture, namely the Begibung culture (eating together) and Bale tani (***Sasak*** traditional house). The relevance of the two cultures raised with chemistry material is in the concept of shared use, where in the valence electron material, there are electons that are used together, this is the basis for using the two cultures as research objects, in the *Begibung* tradition there is a process of eating food dishes together, as well as in Bale tani there is a ***Sesangkok*** room in the bale tani which is used together. so that in this study it raises or **implements** the concept of analogy. Thus it is expected not only to develop the cognitive aspects of students, but also expected to develop affective and ps**yc**h**h**omotor aspects which are related to 21st century teaching. This study aims to identify the

diversity of local wisdom of ***Sasak*** culture that is relevant and can be used as a learning resource in chemistry subjects.

METHOD

A qualitative technique with an ethnographic research design was used in this study. Community leaders, chemical content specialists, and relevant chemical literature made up the research topics. Research is done in stages, beginning with description, analysis, and interpretation. The description approach is used to explore the problem's history utilizing preliminary observations and interviews with community leaders and subject-matter experts to gather relevant data on the research topic. The analysis process is the procedure for obtaining data that is accurate in accordance with the research objectives and problem formulation through analysis of observational findings in the form of cultural products, the values of the *Sasak* and Javanese community order, and the relationships between those values and the subject matter of chemical bonds and changes in elements, compounds, and mixtures. The process of interpretation comes next in order to arrive at findings that are accurate and in line with the data analysis that has been done.

Ethnographic research in the context of chemistry materials will probably have certain limitations in covering aspects of *Sasak* culture, such as begibung and the traditional bale tani house. This is because chemistry research usually focuses more on analyzing and understanding chemical elements, chemical reactions, or chemical applications in the culture. Although ethnographic research can understand how *Sasak* people interact with chemistry in daily life, such as the use of chemicals in certain traditional processes or customs, this scope may be more limited compared to formal chemistry studies.

So, in ethnographic research focusing on chemistry, researchers need to consider that the main focus is on the chemistry aspect, while aspects of *Sasak* culture such as begibung and the traditional bale tani house will probably be an important background or context in the research. The correlation between depth of chemistry research and coverage of *Sasak* cultural aspects is that the deeper the chemistry research, the more limited the coverage of those cultural aspects in the chemical analysis

the formulation of research problems is another aspect of the final The data collection steps applied in this research are observation, interview, and documentation based on the type of data taken. The research instruments used interview guidelines, observation guidelines, and documentation guidelines which were used as references in data collection, then analyzed using Spradley's (2007) data analysis technique which consists of four stages of analysis, namely; (1) domain analysis; (2) taxonomy analysis; (3) componential analysis, and (4) cultural theme analysis. Domain analysis and taxonomy analysis serve to select and simplify samples that have been recorded on observation sheets, interviews, and documentation, and eliminate samples that are not needed or not relevant to the research objectives. Following reduction and analysis of the data, the next step is to organize the data in a more systematic manner and assess its applicability using the relevant guidelines or findings from earlier research (componential analysis and cultural themes). Drawing conclusions in accordance with data analysis findings and research findings that address step.

RESULTS AND DISCUSSION

Results

A qualitative technique with an ethnographic research design was used in this study. Community leaders, chemical content specialists, and relevant chemical literature made up the research topics. Research is done in stages, beginning with description, analysis, and interpretation. The description approach is used to explore the problem's history utilizing

preliminary observations and interviews with community leaders and subject-matter experts to gather relevant data on the research topic. The analysis process is the procedure for obtaining data that is accurate in accordance with the research objectives and problem formulation through analysis of observational findings in the form of cultural products, the values of the *Sasak* and Javanese community order, and the relationships between those values and the subject matter of chemical bonds and changes in elements, compounds, and mixtures. The process of interpretation comes next in order to arrive at findings that are accurate and in line with the data analysis that has been done.

Depending on the sort of information needed, the research's data collection techniques include observation, interviewing, and documenting. The data analysis method used in Spradley's (2007) research involved four stages of analysis: (1) domain analysis, (2) taxonomy analysis, (3) componential analysis, and (4) cultural theme analysis. The research instruments used interview guidelines, observation guidelines, and documentation guidelines that were used as references in data collection. In order to choose and streamline the samples that have been noted on observation sheets, in interviews, and in other documentation, domain analysis and taxonomy analysis are used, along with the elimination of samples that are not required or pertinent to the research goals. Following reduction and analysis of the data, the next step is to organize the data in a more systematic manner and assess its applicability using the relevant guidelines or findings from earlier research (componential analysis and cultural themes). Drawing conclusions in accordance with data analysis findings and research findings that address the formulation of research problems is another aspect of the final step.

The integration of local wisdom in chemistry learning is important because it can provide a more real and relevant context for students. It helps students to more easily relate chemistry concepts to everyday situations in their culture. When students see the connection between what they learn in chemistry class with their personal or cultural experiences, they tend to be more motivated to learn. In addition, the integration of local wisdom also allows students to see the contribution of chemistry in their culture, such as the traditional use of chemicals in ceremonies or cultural practices. This not only makes learning more interesting but also helps students understand the importance of chemistry in their daily lives. Thus, the integration of local wisdom can result in learning that is more meaningful, relevant, and connected to students' cultural reality, which in turn can enhance a deeper understanding of chemistry concepts.

Figure 1. Process of Serving Food Before Serving

Figure 2. Tradition *Begibung*

In NaCl compounds, the valence electrons used together are the valence electrons in sodium ions (Na+) and valence electrons in chlorine ions (Cl-). Sodium ions lose one valence electron to form positive Na+ ions, while chlorine ions receive one valence electron to form negative Cl- ions. These ions are then attracted to each other and bonded through electrostatic forces of attraction between opposite ionic charges, forming the ionic compound NaCl with an ordered arrangement.

Sodium ions (Na+) and chlorine ions (Cl-) are examples of valence electrons that are shared in the NaCl ionic compound. Sodium ions have an electron configuration of [Ne]3s1, so sodium atoms tend to lose one valence electron to achieve a stable configuration like the noble gas neon (Ne). Therefore, sodium ions have one valence electron missing, so they have a positive charge of one (+1). Meanwhile, chlorine ions have an electron configuration of [Ne]3s23p5, so chlorine atoms tend to accept one valence electron to achieve a stable configuration like the noble gas argon (Ar). Therefore, the chlorine ion has one more valence electron, so it has a negative charge of one (-1). In the ionic compound NaCl, sodium ions and chlorine ions bond through ionic bonds. Sodium ions lose one valence electron to form positive Na+ ions, while chlorine ions accept one valence electron to form negative Cl- ions. These ions are attracted to each other and bond through the electrostatic force of attraction between the opposite charges of the ions, forming ionic crystals with an orderly arrangement. In NaCl, Na+ and Cl- ions do not share valence electrons directly, but rather attract and bond with each other through ionic bonding. Since these ions have opposite charges, they attract each other and form strong bonds in NaCl compounds.

Despite not sharing electrons directly, these ions effectively use their valence electrons together in the NaCl ionic bond. So the concept of using valence electrons simultaneously is very relevant to the *Sasak Begibung* culture, where in the Begibung process after the food is served in the form of Sele (*pesaji*) this food will be eaten together according to the number of servings of food served, usually in the begibung tradition 1 *sele* (1 *pesaji*) is eaten by 2-4 people depending on the amount of food available in 1 *sele* (1 *pesaji*) so as to get the right portion. It is from this concept that the begibbbung tradition relates to the chemistry material, namely the Valence Electron meter, where the concept is to use together (*begibung*).

Bale Tani Tradition (House)

Bale Tani is a house inhabited by the *Sasak* tribe, the majority of whom work as farmers. This house is characterized by a small entrance and no windows. The structure of the room in Bale Tani consists of two main parts, namely Bale tani Luar or often called Sesangkok, which

functions as a porch to receive guests and also as a bedroom, and Bale tani Dalam which is divided into Dalem Bale tani (room) and Pawon (kitchen).

In the Bale Tani house, Dalem Bale tani is used exclusively by female family members. This room serves as a place to store valuable treasures, such as jewelry and other valuables. In addition, Dalem Bale tani is also used as a sleeping room for girls, a place for childbirth, and a place to put the body before the funeral process. In the Pawon section, there are two stoves used for cooking. These stoves are attached to the floor and are where food is cooked. In addition, there is also a sempare, which is a bamboo container used to store food and kitchen utensils. Thus, the Bale Tani traditional house reflects the life and culture of the *Sasak* tribe, with a room structure that takes into account the special roles and functions for female family members. The kitchen equipped with a stove and sempare also shows the traditional cooking habits of the *Sasak* tribe.

(a)

(b)

Figure 3. a. *Bale Tani* (b) *Sesangkok*

From the term *Sasak* traditional house which is named Bale Tani, it can be related to material in chemistry where the material that can be relevant is valence electrons. Separately, the definition of valence is defined as a device, degree, combined reaction or interaction energy, a number that states the ability of an element to compound with other elements. While electrons are defined as subatomic particles that surround the atomic nucleus with a negative charge. So that it can be related to the definition of valence electrons is a number that states the ability of an element to bond with other elements around it. Valence electrons are located on the outer shell so they have the highest energy level.

In the term Bale Tani, which has a component, namely sesangkok, which is the outermost place of the Bale Tani part used to establish the interaction of the *Sasak* community, which is the same as the term of valence electrons that use their outer shell to interact with other elements. Sesangkok is commonly used by the *Sasak* community to gather to bond, interact, or use together. This interaction or association will produce a strong bonding energy between the *Sasak* people. Thus, it can be seen the relevance of integrating the local culture of the *Sasak* tribe with valence electron material on the concept of chemical bonding, namely the concept of joint use, and the location or position of valence electrons and also sesangkok which is part of the bale tani (traditional *Sasak* tribal house) which are both at the very outside.

Applying a visualization approach called the chemical triangle concept by integrating Basic Chemistry 1 material with *Sasak* and Javanese local wisdom that has the possibility of being used as a learning resource (Jhonstone, 2006). Applying a visualization approach in learning chemistry by integrating material and its changes about chemical elements that are utilized from several types of metals such as gold, silver, bronze, and copper as the basic material for making tools for traditional activities and traditional arts of the *Sasak* tribe that contain local wisdom. The research results found have high relevance to previous research which shows that *Sasak* and Javanese local wisdom has significant potential to be applied in integrating chemistry materials. (Sutrisno, Wahyudiati, Louise, 2020; Wahyudiati & Fitriani, 2021). The integration of *Sasak* and Javanese local wisdom in chemistry teaching materials has the advantage of making learning more meaningful and increasing students' motivation to know, and understand chemical concepts independently because it is related to their activities in daily

activities. The learning approach based on the context of learners' lives is in accordance with the theory of constructivism that integrates the prior knowledge of learners (students) with new knowledge concepts, so that learning becomes more interesting, fun, and meaningful. The results of previous research also show that the integration of knowledge concepts with previous experiences has a positive impact on improving students' cognitive, affective, and psychomotor abilities. (Sumardi et al., 2020; Wahyudiati et al., 2020; Fadli, 2018).

The relationship between chemistry material, namely valence electrons and the *Sasak* culture of begibung which is a local variety of the *Sasak* tribe, namely where in the valence electron material there is a shared use of free electrons to achieve stability in chemical bonds, has a correlation with the Begibung culture in the *Sasak* tribe, which in each process has a relationship and needs between individuals to be able to enjoy the results of each process together, more specifically when food that has been served in the form of sele (1 pesaji) will be enjoyed or used together in accordance with the right number of portions so that they can enjoy together usually between 2-4 people. There are several appropriate research results that prove that the application of ethnochemistry in learning, either through the relationship with the learning model, the use of learning resources for scientific inquiry, or its use as a natural laboratory, can help develop skills in critical thinking and the shrewdness of the science process, and improve students' cognitive learning outcomes. (Ador, 2017; Wahyudiati, 2020; Wahyudiati & Fitriani, 2021).

Thus, with the exploitation of local wisdom in the aspect of existing culture, especially in the *Sasak* tribe, which can be used as learning material, of course it will be able to improve and make it easier for students to understand concepts in education, especially in chemistry subjects, besides that the most important thing in integrating local wisdom as a material or source of learning for students is that they can get to know and know about their culture so that it can increase students' awareness and love for their culture, so that it can motivate them to preserve and sustain their culture.

Discussion

By combining the information from Basic Chemistry 1 with *Sasak* and Javanese local knowledge, a visualization technique known as the chemical triangle concept is applied that may be used as a learning resource (Jhonstone, 2006). By incorporating information and its changes about the chemical elements that are used from various types of metals, such as gold, silver, bronze, and copper as the basic material for making tools for traditional activities and traditional arts of the *Sasak* tribe that contain local knowledge, a visualization approach to learning chemistry is used. The study's findings are highly relevant to earlier research, which demonstrates that Javanese and *Sasak* local knowledge may be used to integrate chemistry materials. (Sutrisno, Wahyudiati, Louise, 2020; Wahyudiati & Fitriani, 2021; Suanda & Wahyudiati, 2023).

It is connected to students' daily activities, the inclusion of *Sasak* and Javanese local knowledge in chemistry teaching materials has the advantage of improving students' drive to know and understand chemical topics on their own. The constructivism theory, which integrates existing knowledge of learners (students) with new knowledge concepts, is in line with the learning technique based on the context of learners' lives. This makes learning more fascinating, enjoyable, and meaningful. The outcomes of earlier studies also demonstrate that the enhancement of students' cognitive, emotional, and psychomotor capacities is positively impacted by the integration of knowledge concepts with prior experiences. (Sumardi et al., 2020; Wahyudiati et al., 2020; Fadli, 2018).

The relationship between chemistry material, namely valence electrons and the *sasak* begibung culture which is a local variety of the *sasak* tribe, namely where in the valence electron material

there is a shared use of free electrons to achieve stability in chemical bonds, has a correlation with the Begibung culture in the *sasak* tribe, which in each process has a relationship and needs between individuals to be able to enjoy the results of each process together, more specifically when food that has been served in the form of sele (1 pesaji) will be enjoyed or used together in accordance with the right number of portions so that they can enjoy together usually between 2-4 people. Numerous relevant research findings demonstrate how using ethnochemistry in the classroom can enhance students' cognitive learning outcomes by fostering critical thinking abilities and the shrewdness of the scientific method. This can be done through the integration of ethnochemistry into the learning model, the use of learning resources for scientific inquiry, or the use of ethnochemistry as a natural laboratory. (Ador, 2017; Wahyudiati, 2020; Wahyudiati & Fitriani, 2021; Cahyani & Wahyudiati, 2023).

The integration of local wisdom in chemistry learning has a deep significance because it can strengthen the understanding of chemistry concepts, increase student motivation, and connect education with their daily lives. By linking chemistry materials with local culture and students' experiences, they become more engaged in learning and better able to relate chemistry theories to real-world situations. This not only helps students understand the material better, but also gives deeper meaning to their education, thus encouraging higher learning motivation and relevance in their daily lives. This has been proven to increase students' interest and participation in learning chemistry, as well as help them apply this knowledge in their everyday context, which in turn has a positive impact on a deeper understanding and mastery of chemistry concepts.

Thus, with the exploitation of local wisdom in the aspect of existing culture, especially in the *Sasak* tribe, which can be used as learning material, of course it will be able to improve and make it easier for students to understand concepts in education, especially in chemistry subjects, besides that the most important thing in integrating local wisdom as a material or source of learning for students is that they can get to know and know about their culture so that it can increase students' awareness and love for their culture, so that it can motivate them to preserve and sustain their culture.

CONCLUSION

This study reveals that ***Sasak*** Begibung Culture can be used as a chemistry learning resource by integrating this local culture into valence electron material. This integration solves the problem of lack of learning resources in chemistry learning in high schools and universities. The main findings show that this approach makes learning more relevant and interesting for students, increases their learning motivation, and provides a deeper understanding of chemistry concepts. The long-term implication is that the development of teaching materials contextualized with local wisdom can be a model for the development of other chemistry teaching materials and improve the quality of chemistry education in general.

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