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Scientific Reconstruction of Local Wisdom for Contextual Chemistry Education: An Ethnographic Study on *Peuyeum Ketan*, *Jamasan Keris*, and Traditional Roof Tiles

Indah Rizki Anugrah[1*], Laita Nurjannah[2], Maulidiningsih[3], Najah Baroud[4]

[123] *Faculty of Tarbiyah and Teacher Education, Universitas Islam Negeri Siber Syekh Nurjati Cirebon, Indonesia.*
[4] *University of Zawia, Libya*
Corresponding E-mail: indahanugrah@uinssc.ac.id

Abstract: This study integrates local wisdom as a basis for developing contextual chemistry education in the Ciayumajakuning region, Indonesia. Using the Model of Educational Reconstruction (MER) as its theoretical framework and an ethnographic approach to deeply explore cultural values, the research aims to identify potential local wisdom practices and map the scientific structure embedded within them. Through surveys, direct observations, interviews, and literature reviews, three local wisdom contexts—*peuyeum ketan, jamasan keris*, and the production of traditional Majalengka roof tiles—were identified and analyzed. The findings reveal that each context encompasses fundamental chemical concepts such as fermentation reactions, redox processes, thermochemistry, kinetics, and atomic and mineral structure. In-depth analysis uncovers a close interrelationship between cultural practices and chemical principles, thereby opening opportunities for the development of teaching materials and instructional models that are not only scientifically accurate but also culturally relevant. These results are expected to enhance students' interest in and understanding of chemistry through a meaningful contextual approach.

Keywords: Contextual Learning, Local Wisdom, Model of Educational Reconstruction, Ethnography, Chemistry Education

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1. Introduction

Contextual learning has been identified as a potential remedy for students' lack of interest and the limited relevance of scientific content to real-life situations (Pernaa et al., 2022; Sarwinda et al., 2020). A meta-analysis of 66 studies has shown that contextual approaches not only foster positive student attitudes but also motivate them to engage more deeply with science subjects (De Jong, 2018). Despite the extensive research on contextual approaches in education, their relevance persists in contemporary educational research topics, including STEM education (Collins, 2018), scientific literacy (Chen & Osman, 2017), and the Sustainable Development Goals (Oliveira et al., 2019). The integration has proven effective in enhancing students' critical thinking skills through meaningful and relevant learning experiences.

In Indonesia, the potential for developing contextual chemistry education lies in integrating local wisdom. The Ciayumajakuning region (Cirebon, Indramayu, Majalengka, Kuningan) has been chosen as the research locus due to its unique convergence of Sundanese and Javanese cultures, which has given rise to local wisdom practices such as Cirebon *batik*. The *batik*-making process, for instance, involves the oxidation reaction of indigosol dyes (Anugrah & Kartimi, 2022). Regrettably, previous studies have indicated that efforts to integrate local culture into chemistry curricula are often superficial. Although attempts have been made to link local culture with chemistry topics, these approaches frequently lack an in-depth scientific and pedagogical analysis. This deficiency may lead to misconceptions and hinder the achievement of practical learning objectives (Suniati et al., 2013). Consequently, a framework that bridges scientific accuracy and cultural significance is essential.

This study adopts the Model of Educational Reconstruction (MER) as its theoretical framework. MER is selected due to its three key components—(1) analysis of scientific content structure (e.g., enzymatic reactions in *peuyeum*), (2) investigation of students' understanding (e.g., perceptions of fermentation), and (3) instructional evaluation—which enable the multidimensional reconstruction of cultural contexts (Anugrah, 2021b, 2021a). This model has the advantage of emphasizing students' prior knowledge, ensuring that the constructed learning contexts accommodate students' needs for relevant concepts (Ekawati, 2018).

An in-depth cultural investigation must be conducted before analyzing the scientific content structure to explore the core components. The ethnographic method involves participatory observation, in-depth interviews, and literature studies. This approach reveals the technical aspects and the philosophical values embedded in local wisdom contexts. The objectives of this study are: (1) to identify local wisdom practices in Ciayumajakuning that have the potential for contextual chemistry education development and (2) to map the scientific content structure of selected local wisdom contexts in chemistry education. The findings of this research can be further developed into teaching materials, learning media, and instructional models. Thus, this study is expected to significantly contribute to the development of contextual chemistry education based on local wisdom while ensuring scientific integrity and pedagogical effectiveness.

2. Method

This qualitative study employs an ethnographic design to understand and describe local wisdom contexts through direct, participatory interaction. Two primary issues are explored: (1) which local wisdom contexts can be reconstructed to develop contextual chemistry education, and (2) what the scientific structure of these contexts is and which chemical concepts can explain them.

The first aspect is examined through a survey and a review using the Google search engine to identify local wisdom within the Ciayumajakuning region, followed by observations and interviews with key informants with the expertise necessary to elucidate the local wisdom under study. To facilitate data collection, observation instruments and interview guidelines were developed. The interviews were conducted in a semi-structured format, with predetermined question items that could be adapted situationally. Both instruments were validated through expert judgment involving content and language specialists.

The second aspect is explored through educational reconstruction via a literature review and an analysis of the alignment between relevant chemical concepts and the curriculum structure. The scientific structure of the local wisdom contexts was derived from a literature review of journal articles and textbooks related to the analyzed context, focusing on the components of local wisdom rich in chemical concepts. Peer review was conducted by three experts in chemistry education. The results of this process served as the foundation for constructing a map of the interconnections among the local wisdom contexts.

3. Result and Discussion

Identification of Local Wisdom Contexts

Local wisdom contexts were identified by distributing a survey and searches using the Google search engine. The survey instrument consisted of four questions regarding the respondent's region, the local wisdom of that region, and a description of that local wisdom. The survey was disseminated via a Google Form to respondents from the Ciayumajakuning region, yielding the results presented in Table 4.1.

From the survey, no local wisdom from Kuningan dan Indramayu Regency was captured. Therefore, a Google search was conducted. This search identified several unique local wisdom practices characteristic of Kuningan, such as *saptonan, panahan, seren taun,* and *pesta dadung*, including several traditional foods like *tahu susu, jeniper,* and *peuyeum ketan*. Meanwhile, several cultural traditions were identified in the Indramayu region, such as *wayang kulit, tarling,* and *gadis ngarot*.

Based on the survey, an analysis was conducted on the potential of these local wisdom practices for development in chemistry education. This process served as an initial screening before conducting an in-depth literature review on the context and the associated chemical concepts. The analysis resulted in selecting three local wisdom contexts for further literature analysis: *peuyeum ketan*, *jamasan keris*, and the production of *genteng* (traditional Majalengka roof tiles).

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Table 4.1. Identification of local wisdom in the Ciayumajakuning region and its descriptions

No	Region	Local Wisdom Name	Description of Local Wisdom
1	Cirebon Regency	*Batik mega mendung*	*Mega mendung* is one of Cirebon's distinctive motifs, characterized by red and blue hues. This batik pattern is a fusion of Cirebon and Chinese cultures. The batik-making process in Cirebon still essentially employs traditional methods using natural materials, although some producers have adopted modern techniques such as printing.
		Wayang kulit	*Wayang kulit* represents another local wisdom of Cirebon. This traditional shadow puppetry is distinct from other regions in Indonesia and played a significant role in the spread of Islam in Cirebon through the efforts of *Wali Songo*, making it more readily accepted by the community.
		Bubur suro	*Bubur suro* is a traditional dish served during *selamatan* ceremonies (akin to thanksgiving events), which are held every month in either *Suro* or *Muharram.*
		Mudun lemah	Tradition in which a baby's first steps on the ground are celebrated—a practice passed down orally from one generation to the next.
		Obrog	During Ramadhan, the *obrog* tradition occurs at *sahur* (around 2 or 3 a.m.), where young people create "noise" by singing or playing sahur-related songs to wake people up. This tradition helps ensure that community members wake up on time for *sahur*.
		Ngunjung buyut	It is a religious recitation event followed by a village-wide procession held to commemorate the *haul buyut*, the central figure who is typically influential in the establishment of the village.
		Tawurji	*Tawurji* is the tradition of coin tossing (*surak*), usually performed by the palace officials to assist the underprivi-leged. Alternatively, it involves going around the village singing *tawurji* songs to solicit donations from the community.
		Ngapem	This tradition involves making *apem* and distributing it among relatives as a petition for divine protection during the month of *Safar*.
		Burok art	*Burok* art is a traditional art form developed in Cirebon Regency. According to residents of Kalimaro village, *Burok* art is a cultural heritage that characterizes the village and holds significant value for its community.

No	Region	Local Wisdom Name	Description of Local Wisdom
2	Cirebon City	*Tari topeng*	*Tari Topeng* is a masked dance from the Parahyangan region. It is called a mask dance because the dancers wear masks during the performance. This dance has many variations and has evolved in both movement and narrative.
		Cuci keris/ siraman panjang	Refers to the ritual cleansing of heirlooms in the Cirebon Palace. All heirloom objects to be cleansed are gathered at the *Bangsal Pungkuran Keputren* and paraded by palace attendants.
		Nadran	*Nadran* is a ritual where fishermen offer the "earth's alms" in gratitude for abundant sea produce.
		Grebeg mulud	An event held by the palace to celebrate the birth anniversary of the Prophet Muhammad.
3	Majalengka Regency	*Mapag tamba*	Ritual involving a procession around village boundaries through agricultural fields to protect farmers' rice fields from pests and ensure optimal yield.
		Mapag sri	A ritual procession carrying the symbol of *Dewi Sri* (Rice Goddess) around the village, accompanied by various artistic attractions. It is followed by a *Purwa Wayang Kulit* performance depicting the *Sulanjana* story (origin of rice), a communal feast, and a contest over water sourced from seven springs believed by the community to have healing properties and ward off misfortune.
		Guar bumi	Tradition of offering "earth's alms" as an expression of gratitude by the local community in anticipation of the first planting season.
		Mandi Mulud	A ritual of bathing in a sacred well at the end of Rabi' al-Awwal (an Islamic month) as a means of spiritual cleansing and commemorating the Prophet Muhammad's birth.
		Opak	Traditional snack made from glutinous rice pounded finely, flattened, and baked.
		Munjung	Blessed rice is prepared and sent to ancestral graves as an offering to express gratitude and to request timely rainfall. *Munjung* is typically performed during the late dry season.
4	Kuningan Regency	-	-
5	Indramayu Regency	-	-

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Analysis of the Scientific Structure of Local Wisdom Contexts
Peuyeum Ketan

The chemical perspective analysis of *peuyeum ketan* was conducted through a literature review of two books and eight articles related to its production process and optimization, following direct observations and interviews with *peuyeum* producers.The literature review yielded chemical concepts related to the reactions and optimization achieved by modifying various ingredients. *Peuyeum ketan* from Kuningan is distinct from *peuyeum* from other regions in several respects. Firstly, using glutinous rice as a carbohydrate source rather than cassava, which is commonly used in peuyeum from other *Sundanese* areas. Additionally, *peuyeum ketan* from Kuningan typically incorporates *katuk* (*Sauropus androgynus*) leaves to impart a greenish hue during its preparation.

There are several variations in the preparation process of *peuyeum*, including differences in processing methods, fermentation procedures, wrapping techniques, and adding certain additives. These variations affect the organoleptic properties of the final product. Differences, such as soaking duration, the type of yeast used, the wrapping material, and the addition of additives like starch extract and coloring agents, influence the quality of the *peuyeum* produced (Arza et al., 2018; Rachmadiani, 2019; Rofiqoh et al., 2017; Sulastri, 2013; Wardani et al., 2022).

The fermentation process causes the starch substrate in glutinous rice to be hydrolyzed into simpler sugars, resulting in the sweetness of *peuyeum*. The shorter the carbon chain in the carbohydrate, the sweeter it tastes. The hydrolysis reaction can be illustrated as follows:

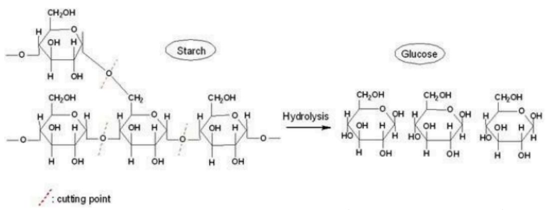

Figure 1. Hydrolysis reaction of starch in *peuyeum* (Cahyana & Adiyanti, 2021)

If hydrolysis continues, glucose will subsequently be converted into ethanol:

$$C_6H_{12}O_6 + \text{zymase (alcoholase)} \rightarrow 2\ C_2H_5OH + 2CO_2$$

Several factors influence the ethanol content in *peuyeum*, including the type of wrapping material used, the duration of fermentation, and the addition of fruit extracts. According to Rofiqoh et al. (2017), guava leaves are the most effective wrapping material compared to plastic cups, banana leaves, noni leaves, and mango leaves. *Peuyeum* wrapped in guava leaves contains the lowest ethanol level (0.50%), while also offering a unique sweet-sour taste and relatively high glucose content. This outcome is likely attributed to the antimicrobial compounds present in guava leaves, which may inhibit yeast activity and thus reduce ethanol formation during fermentation. Furthermore, as reported by Wardani et al. (2022), the highest quality *peuyeum* is produced when the fermentation process incorporates a pre-soaking phase without the use of fruit extracts, since these additives may impede the best possible microbial performance and fermentation dynamics. In this instance, the *peuyeum* retains its shape, exhibits a fresh white color, has a soft and moist texture, a distinctly fresh aroma specific to *peuyeum*, and a taste that is slightly sweet and somewhat sour, with an ethanol content of 2.936% (lower than other variants). Here, the local wisdom of the Kuningan community in choosing guava leaves as a wrapping material is supported by experimental findings that it produces the best quality compared to other types.

The characteristic aroma of *peuyeum* is influenced by ester compounds produced from the breakdown of ethanol and carbonyl compounds, ethyl benzene, and propyl benzene (Soedarmo, 1973). Esters form through the esterification of ethanol with organic acid components present in *peuyeum* via a substitution reaction mechanism. The ester produced is ethylacetate (Azura et al., 2015). Thus, the aroma of *peuyeum* is closely related to its alcohol content. This was confirmed by Putri (2007) who found that higher alcohol content corresponds to a more pungent aroma. Additionally, other characteristic aromas are derived from aromatic compounds in the wrapping leaves, such as banana leaves, guava leaves, or noni leaves, including polyphenolic compounds.

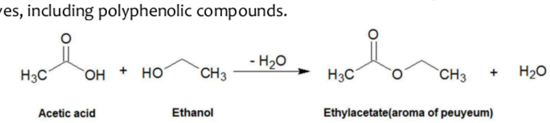

Figure 2. Esterification reaction in *peuyeum* texture

Jamasan Keris

The chemical perspective analysis of the context of *jamasan keris* (or *siraman panjang*, the cleansing of heirlooms) was conducted through a literature review of two books and eight articles related to the process of cleansing keris. Jamasan is a traditional ritual in Cirebon, performed at the Kasepuhan and Kacirebonan palaces and various old mosques in both the regency and city of Cirebon. This tradition involves cleansing heirloom objects such as keris, spears, dagger tips, staffs, swords, and other metal heirlooms. The ritual is carried out in several stages: first, cleansing with citrus water and coconut water; second, rubbing the heirloom with lime; third, washing with flower-infused water and drying; and finally, fumigating the objects with aromatic substances such as *misik* oil, jasmine oil, and anti-corrosion oil. A prominent chemical concept in this process is redox reactions. The cleansing of metal heirlooms using coconut water and lime serves to prevent rust or corrosion.

Corrosion occurs when metal is exposed to its environment—such as air or water—where the oxygen or hydrogen present undergoes reduction. In contrast, the metal is oxidized, forming an oxide compound ($Fe_2O_3 \cdot nH_2O$), commonly known as rust. The oxidation of metal occurs anodically, where the metal transforms into ions by releasing electrons from its surface. These electrons are then accepted by oxygen or hydrogen, which are reduced at the cathode, maintaining an equal reaction rate.

For iron corrosion under humid conditions, the reaction can be described as follows:

$$2\ Fe\ (s) \rightarrow 2\ Fe^{2+}\ (aq) + 4\ e^-$$
$$O_2\ (g) + 4\ H^+\ (aq) + 4\ e^- \rightarrow 2\ H_2O\ (l)$$

The Fe(II) ions formed will undergo further oxidation through the reaction:

$$4\ (Fe)^{2+} + O_2 + 4\ H_2O \rightarrow \underset{Fe^{3+}\ (rust)}{2\ Fe_2O_3} + 8\ H^+$$

Natural materials containing acids, such as coconut water and citrus juice, are used as corrosion inhibitors in cleansing heirlooms. An inhibitor is a chemical compound that, even in small quantities, can significantly slow the corrosion rate. Using inhibitors remains one of the best options for protecting against corrosion. Many studies have been undertaken to identify natural substances that are non-toxic and renewable for use as corrosion inhibitors (Rosdayanti et al., 2018; Mulyati, 2019; Koerner et al., 2020).

Several studies have mentioned that coconut water contains tannin, an acidic polyphenolic compound proven to inhibit corrosion. When metal is washed with coconut water, the tannins present form complex compounds with the metal, creating an iron-tannin complex. This complex plays a role in protecting the metal from corrosion, as illustrated in the following depiction:

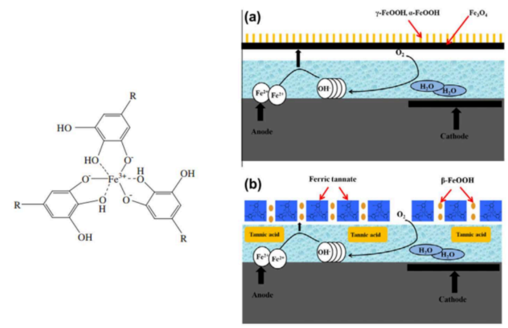

Figure 3. Molecular structure of the iron-tannin complex (left); Illustration of the iron-tannin complex in the metal corrosion process (right) (Zomorodian & Behnood, 2023)

Genteng Majalengka

The chemical perspective analysis of the traditional roof tiles (*genteng*) from Majalengka was conducted through a literature review of nine scientific articles related to the raw materials, chemical and physical properties, the manufacturing process, and quality optimization through various additives. The primary raw material for making roof tiles is clay. Generally, roof tiles are produced from clay mixed with rice husk, then pressed and fired. The quality of the tiles is primarily determined by the raw materials and the firing temperature, as these factors dictate the water absorption and compressive strength of the tiles (Pujiyanto et al., 2022).

Clay is a type of plastic soil classified as a hydrated aluminum phyllosilicate with high silica and alumina content. Its general characteristics include chemical composition, the structure of its crystalline layers, and particle size. Clay particles typically have diameters of less than 2 µm and are found near the earth's surface. All clay minerals exhibit an affinity for water. Some clays expand and can double in volume when wet. Most clays are formed due to chemical weathering when rock comes into contact with water, air, or gases. Physically, clay is sticky and moldable when moist but complex and cohesive when dry. Clays can absorb ions from a solution and release them when conditions change. Water molecules are highly attracted to the surface of clay minerals; therefore, when a small amount of clay is added to water, a slurry is formed as the clay disperses throughout the water. A mixture of a large quantity of clay with a small amount of water yields a malleable mud that can be dried to produce a complex and solid material. Clay minerals include various types such as kaolinite, montmorillonite, illite (or mica), and attapulgite (Kumari & Mohan, 2021).

The atomic structure of clay minerals consists of two structural units:

1. **Silica Tetrahedral Unit** – This configuration forms a silica sheet consisting of four oxygen atoms surrounding a silicon atom.

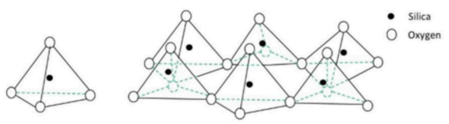

Figure 4. Silica crystal structure (Prajapati et al., 2022)

2. **Aluminum Octahedral Unit** – Consisting of six hydroxyl groups surrounding an aluminum atom, forming a gibbsite sheet (or a brucite sheet when the aluminum is replaced by magnesium).

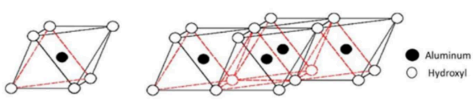

Figure 5. Aluminum octahedral structure (Prajapati et al., 2022)

The tetrahedral network can exhibit two structures: dioctahedral and trioctahedral. The dioctahedral structure has two octahedral cations per unit cell because Al^{3+} is dominant, occupying only two-thirds of the octahedral sites. The trioctahedral structure has three octahedral cations per half-unit cell. In general, the combination of tetrahedral and octahedral sheets produces the structural scheme of clay minerals. Two-thirds of the hydroxyl groups on one face of the octahedral layer are replaced by apical oxygen from the tetrahedral layer, while the OH^- ions in the hexagonal center are formed by oxygen from the tetrahedral layer. Combining one octahedral and one tetrahedral layer results in a 1:1 structure. However, when an additional silica layer is added with opposing hydroxyl groups to the octahedral cations, a 2:1 structure is produced.

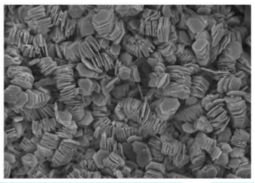

Figure 6: Scanning Electron Microscope (SEM) image of clay surface, where the dark regions indicate the presence of water (source: minersoc.org)

Regarding its firing behavior, the process essentially transforms clay into compressed powder. The firing process renders the clay brittle, allowing it to be crushed back into powder or mixed with water to form a slip.

During the firing process, the emergence of new crystals, especially mullite, within the clay body contributes to a marked increase in its overall strength. Mullite is an aluminum silicate characterized by long, needle-like crystals. The formation of mullite unifies the structure, imparting cohesion and strength.

Mapping the Context-Concept Correlations between Local Wisdom and Chemistry

Based on the analysis of the scientific structure conducted on the local wisdom contexts presented above, the correlations between the content contexts can be mapped as shown in Table 2. This mapping demonstrates that each local wisdom context is not only rich in cultural value but also embodies a variety of fundamental chemical concepts. *Peuyeum ketan* integrates principles of organic reactions, thermochemistry, and kinetics to produce a fermented product with distinctive characteristics. *Jamasan keris* illustrates the application of redox processes, corrosion control, and the formation of complex compounds, where organic inhibitors play a crucial role. *Genteng* Majalengka highlights the interplay between atomic structure, chemical bonds, and thermal processes in the formation of minerals as well as in material transformation. Consequently, the integration of local wisdom can serve as a foundation for contextual learning that not only conveys basic chemical concepts in an abstract manner but also connects them to real-world practices and culturally relevant traditions in the community.

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Table 2. Relationship between the Contexts of *Peuyeum Ketan*, *Jamasan Keris*, and *Genteng* with Chemical Content

No	Chemical Concept	Local Wisdom		
		Peuyeum Ketan	***Jamasan Keris***	***Genteng Majalengka***
1	Atoms, Molecules, and Ions	The fermentation process involves the breakdown of polysaccharide molecules (starch) into simple sugar molecules and subsequently ethanol molecules, as well as the formation of ions in solution during the hydrolysis reaction.	During the oxidation of metals, iron atoms transform into ions (Fe^{3+}) that subsequently participate in redox reactions, producing oxides and complex compounds (e.g., iron-tannin).	The mineral structure in clay involves the arrangement of atoms and molecules, as well as ion exchange occurring on the clay surface that influences its water adsorption properties and reactivity.
2	Elements and Compounds	The transformation of carbohydrates (organic compounds) into ethanol and carbon dioxide; formation of ester compounds (such as ethyl acetate) that contribute to the distinctive aroma.	The formation of oxide compounds (e.g., $Fe_2O_3 \cdot nH_2O$ as rust) and the creation of complex compounds between metal ions and natural inhibitors (tannins) from coconut water or lime juice.	Clay primarily consists of aluminosilicate compounds (e.g., kaolinite, illite) and the formation of new compounds (mullite) during the firing process.
3	Periodic System of Elements	Although not explicitly stated, understanding of the elements involved (such as C, H, and O in carbohydrates, glucose, and ethanol) underlies the fermentation reactions.	Iron (Fe) serves as the primary element in heirloom metals, with its periodic properties determining its oxidation tendencies and reactivity to natural inhibitors.	Elements such as silicon (Si), aluminum (Al), and oxygen (O) dominate the composition of clay, with their periodic properties playing a role in the formation of its mineral structure.
4	Chemical Bonds	The breaking of glycosidic bonds in starch during hydrolysis and the formation of ester bonds between ethanol and organic acids during esterification.	The formation of ionic and coordination bonds between iron ions and polyphenol groups (tannins) that create stable complexes to prevent corrosion.	Covalent and ionic bonds within the aluminosilicate structure; the formation of new bonds (e.g., in mullite crystals) enhances the cohesion and strength of the roof tiles.
5	Thermochemistry	Fermentation and hydrolysis reactions are accompanied by energy changes (exothermic or endothermic), with energy variations affecting the rate and outcomes of fermentation.	Metal oxidation reactions (corrosion) involve energy changes that affect the reaction rate; the use of natural inhibitor substances can alter the thermal profile of the process.	The firing process of clay involves phase changes and thermal reactions that produce mullite crystals; firing temperature and heat transfer are key factors.

No	Chemical Concept	Local Wisdom		
		Peuyeum Ketan	*Jamasan Keris*	*Genteng Majalengka*
6	Kinetics	The rate of hydrolysis and fermentation reactions is greatly influenced by process conditions such as soaking time, type of yeast, and the composition of additives (e.g., fruit extract or wrapping leaves).	The rate of corrosion and rust formation is affected by environmental factors (humidity, pH) as well as the use of inhibitors that slow the kinetics of redox reactions.	The rate of sintering and crystal growth during the firing of clay affects the quality of the roof tiles; the kinetics of thermal reactions plays a significant role in the formation of the mineral structure.
7	Chemical Reactions in Solution	Fermentation reactions take place in an aqueous medium, where pH and the presence of acids or enzymes play a role; esterification reactions also occur in solution.	Metal corrosion is a redox reaction that occurs in solution (e.g., water containing natural acids) and involves the formation of rust precipitates.	Although reactions in solution are less prominent, ion interactions within clay (e.g., ion exchange or partial dissolution) can influence the physical and chemical properties of the clay.
8	Chemical Equilibrium	In fermentation, an equilibrium exists among the starch hydrolysis, glucose fermentation, and ester formation reactions that determine the product's flavor and aroma profile.	The equilibrium between oxidation and reduction reactions in the corrosion process, along with inhibitor formation, plays a crucial role in the stability of heirloom metals.	During firing, the thermal and chemical equilibrium among different crystal phases (e.g., between raw clay and mullite) affects the strength and durability of the roof tiles.
9	Organic Chemistry	Reactions involving organic compounds, such as carbohydrates, ethanol, and esters, are central to the fermentation process and the development of the characteristic aroma of peuyeum.	The use of natural materials (lime juice, coconut water) containing organic compounds (such as acids, tannins, and polyphenols) supports the corrosion control process through the formation of organic–metal complexes.	Although the primary focus is on minerals, traces of organic materials from rice husk or other additives can influence the final properties of the roof tiles, particularly during processing and firing.
10	Elemental Chemistry	Understanding the elements that constitute carbohydrates (C, H, O) and the reagents in the fermentation process is essential for optimizing the chemical reactions that produce ethanol and aroma compounds.	Comprehending the properties of metal elements (e.g., iron) and the elements composing natural inhibitor compounds is crucial for controlling oxidation processes and preventing corrosion.	The composition of elements in clay (Si, Al, O) determines the type and properties of the minerals formed; mastery of elemental chemistry assists in optimizing the firing process and the quality of the roof tiles.

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4. Conclusion

This study successfully identified and mapped three local wisdom contexts in the Ciayumajakuning region—*peuyeum ketan, jamasan keris,* and Majalengka roof tiles—that hold potential for development in contextual chemistry education. Using an ethnographic approach and the Model of Educational Reconstruction as the framework, the scientific structure analysis of each context revealed significant interconnections between local cultural practices and basic chemical concepts, such as fermentation reactions, redox, thermochemistry, kinetics, and atomic and mineral structure. These findings confirm that local wisdom is not merely a cultural heritage but also contains scientific values that can be effectively integrated into the chemistry curriculum. The integration of cultural values and chemical concepts has the potential to enhance the relevance, accuracy, and appeal of teaching materials, thereby fostering improved science literacy and critical thinking skills among students. This research paves the way for the development of innovative instructional models that combine scientific and cultural dimensions, and makes a significant contribution toward enhancing the quality of science education in Indonesia.

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