



Exploring Ethnoscience through Dodol Pangi: Context-Based Learning in the Soppeng Community

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Abstract: This study aims to explore the scientific concepts embedded in the traditional production of dodol pangi (*Pangium edule*) in the Soppeng community, South Sulawesi, and to examine its potential as a context for integrating ethnoscience into science learning. Using a qualitative ethnographic design, data were collected through participatory observation, in-depth interviews, and documentation involving eight purposively selected informants. Analysis followed Miles and Huberman's interactive model, revealing key scientific mechanisms embedded in each production stage, including detoxification through leaching and diffusion, heat and mass transfer, starch gelatinization, Maillard reactions, and retrogradation during cooling. The results show that the stages of boiling, washing, soaking, cooking, and cooling reflect empirically grounded scientific processes that are consistently applied by the community in producing dodol pangi. These findings indicate that traditional knowledge is not merely cultural practice, but also represents contextual scientific understanding that can be meaningfully connected to formal science concepts in learning. These findings demonstrate how local wisdom reflects contextual scientific principles relevant to everyday practices. In conclusion, the dodol pangi tradition has strong potential to serve as a meaningful context for ethnoscience-based science learning that supports scientific literacy and appreciation of local wisdom.

Keywords: Context-based learning; Dodol pangi; Ethnoscience; Local wisdom; scientific literacy

Introduction

Contemporary science education emphasizes the importance of connecting scientific concepts with students' real-life experiences to make learning more meaningful and enhance scientific literacy. The context-based learning (CBL) approach has been shown to increase relevance (Mohamad & Baran, 2025), motivation (Ali et al., 2025; Özgür, 2023; Slovinsky et al., 2021), and learning participation (Tesfaw et al., 2024) because concepts are taught through authentic contexts that are close to the learners' experiences. In this regard, Sheshtawy et al. (2023) showed that CBL can encourage learners to explore phenomena, explain concepts, and elaborate their knowledge in authentic contexts. This is also supported by a recent bibliometric review, which confirms a shift in science education research toward

more contextualized learning (Fayzullina et al., 2023). This view is consistent with constructivist learning theory, which emphasizes that students build scientific understanding more effectively when new concepts are connected to their prior experiences and real-life contexts.

Science learning in Indonesia is still dominated by rote memorization with weak real-world connections (Muakhiroh, 2022; Mutanaffisah et al., 2021), and the use of local cultural practices as learning resources remains limited (Dungga & Indarti, 2025; Husin & Billik, 2019). This is reflected in Indonesia's low PISA 2022 science score of 383, far below the OECD average of 485 where more than half of students fail to reach Level 2 and only around 1% achieve Levels 5–6 (OECD, 2023). These indicators show that current practices do not yet foster contextual scientific thinking. Although teachers value

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context-based learning, they still require concrete models and tools to integrate cultural contexts consistently into science instruction (Gungor et al., 2023). Therefore, research that identifies scientifically meaningful local contexts is needed to provide a stronger empirical basis for contextual science learning in Indonesia.

Many local cultural practices in Indonesia contain scientific principles that can serve as meaningful contexts for science learning. Ethnoscience, which links traditional community knowledge with modern scientific concepts, helps bridge science and culture (Sudarmin et al., 2017). Recent studies show that integrating ethnoscience enhances students' critical thinking and conceptual understanding (Sakti et al., 2020; Widiyawati et al., 2023). Several previous studies (Dalimunthe et al., 2022; Sahara et al., 2022) also highlights ethnoscience as a "scientific bridge," emphasizing the need for context-specific studies that align with local traditions, such as the process of making palm sugar (Indriani et al., 2023), the production of Uwi Kaju Ndota and Alu Ndene (Wae et al., 2024), the production of Usaku (Silla et al., 2023), salt production (Hadi & Ahied, 2017), and the production of kapurung (Imranah et al., 2024). Collectively, these studies support ethnopedagogical efforts to revitalize local wisdom while preventing cultural erosion in the digital era. This also aligns with sociocultural perspectives that view knowledge as closely related to cultural practices and community life.

One cultural practice that illustrates the integration of science and local wisdom is the making of dodol pangi (Pangium edule) in Soppeng, South Sulawesi. Each processing stage reflects scientific principles, including diffusion/osmosis during soaking (Asghari et al., 2024), heat transfer through conduction and convection during cooking (Molua et al., 2022), starch gelatinization that thickens the mixture (Qiu et al., 2024), and the Maillard reaction that affects color, aroma, and taste (Starowicz & Zieliński, 2019). These processes demonstrate the authentic and contextual application of modern scientific concepts within traditional practices.

In terms of content, Pangium edule seeds have bioactive compounds with antioxidant and antimicrobial potential, making them relevant to discussions in food biology and chemistry (Yunus et al., 2024). It contains toxic cyanide acid (HCN) (Aminullah et al., 2024; Jamaluddin, 2016; Ramdana Sari, 2015) alongside oxalates, tannins, and minerals such as calcium, iron, zinc, and manganese (Villame-Gayagas et al., 2023). These characteristics raise important issues of food safety and traditional detoxification. The scientific potential of Pangium edule highlights the need to integrate updated scientific knowledge with cultural

practices, enabling students to understand science through local traditions.

Although ethnoscience has been explored in various cultural settings, studies that specifically investigate the Soppeng community's practice of making dodol pangi remain scarce. Yet this tradition contains rich scientific phenomena with strong potential as a contextual learning resource. This study fills that gap by systematically uncovering the scientific values embedded in dodol pangi production as a form of living ethnoscience. This research is conducted because the scientific concepts embedded in the dodol pangi tradition of the Soppeng community remain underdocumented, despite their potential to serve as a research-based foundation for culturally grounded science learning. It is also important for demonstrating the relevance of local wisdom to modern science education and for addressing the need for meaningful learning approaches that strengthen conceptual understanding, scientific literacy, and appreciation of national cultural identity.

Method

Research Design

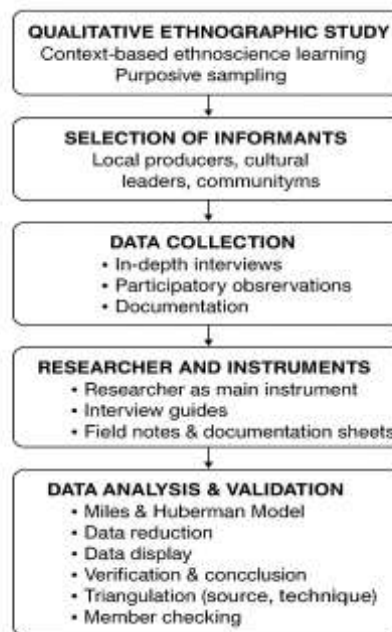


Figure 1. Research procedure flowchart

This study uses a qualitative approach with an ethnographic design, as it aims to gain an in-depth understanding of the cultural practices of the Soppeng community in making dodol pangi and to interpret the scientific values contained therein. The ethnographic approach allows researchers to explore the meanings, symbols, and social activities that are part of the daily life of the community (Cresswell & Poth, 2016;

Hammersley & Atkinson, 2019). Ethnography places researchers as the main instrument who actively conduct observations, interviews, and documentation in their natural cultural context (Anrubia, 2018; Morse, 2016; Spradley, 2016; Tardy, 2023). The research was conducted in Umpungeng Village, Lalabata District, Soppeng.

Data Collection Techniques

Data collection was conducted through in-depth interviews, participatory observation, and documentation. There were eight research informants selected using purposive sampling, which is the selection of participants based on specific criteria in accordance with the research objectives (Fusch & Ness, 2015).

Table 1. Profile of Informants

Code	Age	Gender	Role	Experience	Notes
I1	56	F	Senior producer	30 years	Expert in traditional heating
I2	46	F	Villager	20 years	Specializes in detoxification
I3	77	F	Local elder	40 years	Guardian of local values
I4	75	F	Local elder	40 years	Knowledge of history
I5	48	M	Villager	10 years	Assists in mixing process
I6	41	M	Villager	15 years	Helps during rituals
I7	54	F	Villager	20 years	Helps during rituals
I8	55	F	Senior producer	25 years	Controls heat & stirring

Data Analysis

Data analysis was conducted interactively and cyclically following the model proposed by Miles et al. (2020), which consists of three stages: data reduction, data presentation, and conclusion drawing. To ensure analytical transparency, the researcher applying systematic coding procedures during the data reduction stage, involving open coding, axial coding, and selective coding. During open coding, key phrases and

meaningful units from interview transcripts and observation notes were identified. Axial coding involved grouping these codes into categories that represented emerging patterns, while selective coding synthesized these categories into major analytical themes relevant to the ethnoscientific processes in dodol pangi production. To illustrate how raw qualitative data were transformed into conceptual themes, a Coding Framework is presented in Table 2.

Table 2. Coding Framework

Raw Data / Field Observation Indicators	Open Coding	Axial Coding	Selective Coding (Themes)
“The boiling water turns brownish; the seeds become softer.” (I1,I6)	Color change; texture softening	Release of soluble compounds; heat-induced softening	Detoxification mechanism
“Wash water looks cloudy.” (I2,I8)	Cloudiness; suspended particles	Leaching of toxic substances; diffusion	Detoxification mechanism
“Water becomes clearer after several washes; bitterness decreases.” (I1,I8)	Clarity increases; bitterness reduction	Reduced cyanogenic content; sustained concentration gradient	Detoxification mechanism
“Soaking water is replaced every hour.” (I4,I6,I7)	Frequent water replacement	Maintenance of concentration gradient; continuous diffusion/osmosis	Mass transfer processes
“The dough becomes thick, elastic, and brown.” (I5,I8)	Texture thickening; browning reaction	Starch gelatinization; Maillard reaction	Thermal transformation
“The dough must be stirred continuously.” (I1,I5,I8)	Continuous stirring	Heat distribution; prevention of burning	Thermal control
“The surface becomes glossy and firm when cooled.” (I2,I3)	Glossy surface; firm texture	Retrogradation; gel stabilization	Structure formation & stabilization
“Dodol lasts 3–4 days before mold or rancidity appears.” (I3, I7,I8)	Shelf-life changes; spoilage indicators	Water activity (Aw); microbial growth patterns	Preservation & food safety

The table illustrates how informants’ empirical statements were systematically transformed into scientific interpretations. For instance, the observation that “water becomes clearer after several washes and bitterness decreases” was coded as an indicator of turbidity reduction, signaling the leaching of soluble cyanogenic compounds, an axial category aligned with the broader theme of detoxification mechanisms.

Similarly, color changes and the requirement for continuous stirring were connected to scientific processes such as Maillard reactions, heat distribution, and thermal control. This structured coding approach ensured that ethnographic data were interpreted coherently within ethnoscience and food chemistry frameworks. To enhance data validity, triangulation was applied across sources and techniques, and key

interpretations were verified through member checking with informants before finalizing analytical themes. Additionally, the findings were compared with established scientific literature to ensure conceptual accuracy.





Result and Discussion

Scientific Concepts in the Dodol Pangi Production

The tradition of dodol pangi production in Umpungeng Village, Lalabata Subdistrict, Soppeng Regency, represents a combination of cultural practices and scientific phenomena that are part of everyday life

in the community. This activity not only serves as an economic and social activity, but also reflects a form of empirical knowledge that has been passed down from generation to generation. The process of making dodol pangi is carried out through several main stages, namely boiling the pangi seeds, washing and soaking, cooking, and cooling. Each stage contains scientific principles related to the fields of chemistry, physics, and food biology. The local community may not use formal scientific terminology, but they understand these principles through repeated experience and observation, thereby forming practical knowledge that is adaptive to the local environment. It can be seen in Table 3.

Table 3. Steps in Dodol Pangi Production

Activities	Description of Stages	Field Observation Indicators	Scientific Concepts
Initial boiling (± 4 hours) 	Pangi seeds are boiled to reduce toxins (HCN) and soften the texture; the heat is kept stable during boiling	The boiling water turns brownish; a distinctive aroma emerges; the seeds become softer	Cyanogenic detoxification through heating and leaching of HCN compounds (Sheikh et al., 2022; Urugo & Tringo, 2023) Heat conduction-convection as a cooking mechanism (Meena et al., 2022; Molua et al., 2022)
Slicing (lengthwise) 	Boiled beans are sliced to increase the contact area and facilitate washing	The seed surface is more exposed; the first wash water appears cloudy.	Mass Transfer (diffusion & leaching) increases due to the expansion of the surface area (Takako, 2023)
Repeated washing 	The seeds are washed multiple times to remove any remaining water-soluble toxins	The colour of the washing water becomes clearer; the bitter aroma decreases	Diffusion of dissolved substances from the material into the water (Asghari et al., 2024); The concentration gradient is maintained through water replacement.
Soaking (± 2 days, water changed every hour) 	Seeds are soaked until safe to consume (no bitterness).	The initial soaking water is cloudy then becomes clear; the bitter taste disappears	Continuous osmosis and diffusion remove toxic components (Asghari et al., 2024; Rasyid et al., 2019); water replacement maintains mass transfer (Al-Najjar et al., 2023)
Mixing of ingredients (coconut milk, brown sugar, glutinous rice flour, pangi seeds)	All ingredients are mixed before cooking	The dough is cream-coloured; soft and smooth in texture	Oil in water emulsion (coconut milk) & its stability (role of protein / polysaccharides as emulsifiers) (Chen et al., 2023; Tan & McClements, 2021); Sugar mixture provide Maillard precursors (Liu et al., 2022); Glutinous rice starch as a gel-forming phase when heated (Gong et al., 2024; Yan et al., 2024)

Activities	Description of Stages	Field Observation Indicators	Scientific Concepts
			
Cooking & stirring until thickened 	The dough is heated and stirred until thick and brown	The dough becomes thick, elastic, and brown; a characteristic aroma emerges	Starch gelatinization (Qiu et al., 2024), Maillard reaction (Liu et al., 2022; Starowicz & Zieliński, 2019) Heat transfer (conduction-convection) (Meena et al., 2022; Molua et al., 2022); Water evaporation reduces water activity (Aw) to relatively low levels and affects shelf life (Setiavani et al., 2024)
Cooling 	Dodol is left to harden at room temperature	The surface is glossy: the texture is firm and easy to cut	Gel formation and starch retrogradation during cooling; reorganization of the amylose-amylopectin structure (Gong et al., 2024; Qiu et al., 2024; Setiavani et al., 2024)
Packaging and storage 	Dodol is wrapped in plastic or food-grade paper to make it easy to portion and store.	Color, texture, and aroma of dodol for 3-4 days; signs of spoilage (rancid odor, mold, color change)	Water Activity (Aw) affects microbial growth and determines product shelf life (Erkmen & Bozoglu, 2016; Setiavani et al., 2024; Tapia et al., 2020)

Detoxification Mechanisms during Pre-processing

The stages of boiling, slicing, repeated washing, and soaking of pangli seeds demonstrate an effective natural detoxification process. Chemically, this treatment combines the leaching of water-soluble cyanogenic compounds, the volatilization of HCN, and the enzymatic hydrolysis of cyanogenic glycosides such as linamarin into cyanohydrin and HCN, which are easily eliminated (Sheikh et al., 2022; Urugo & Tringo, 2023). Villame-Gayagas et al. (2023) also emphasized that the combination of soaking and boiling consistently reduced HCN in pangli seeds, which was also reflected in field sensory indicators such as the loss of bitterness and clearer boiling water/wash water.

During boiling for approximately 4 hours, stable heat softens the cell walls, increasing permeability and allowing the diffusion of toxic compounds out of the tissue. Similar practice-based studies on cassava boiling show that cooking can reduce HCN levels through leaching and evaporation (Forkum et al., 2025; Kakwu et al., 2018). These findings are relevant to explain the

phenomenon of brownish boiling water due to the release of pigments, phenols, and volatile compounds from pangli seeds. In addition, the community uses firewood as a source of thermal energy, and their ability to regulate the intensity of the fire demonstrates practical knowledge of energy efficiency and temperature stability during cooking. The elongated slicing stage increases the contact area, thereby accelerating leaching. In principle, smaller particle sizes shorten the diffusion path of soluble components (HCN, glycosides, phenolics) into the water medium, in line with the observation of cloudy first wash water as an indicator of the release of soluble components. The reduction in HCN levels is even more effective with processing methods such as boiling and soaking (Nyaika et al., 2024).

Repeated washing and soaking for 2 days with hourly water replacement increases the interphase concentration gradient and facilitates continuous diffusion. Evidence based on risk assessment and

processing practices places dynamic soaking as an effective low-tech strategy for reducing HCN to below the safety threshold. For safety standard references, the Codex Alimentarius (2023) sets the total HCN limit in cassava flour at ≤ 10 mg/kg, which is widely adopted internationally as a post-soaking quality benchmark. Water acts as a natural solvent that dissolves toxic compounds such as hydrocyanic acid (HCN) contained in *Pangium edule* seeds. This mechanism is in line with the principle of mass transfer in biological systems, where concentration differences cause substances to move from high to low concentration solutions (Asghari et al., 2024). This process is a form of natural detoxification that is carried out without laboratory instruments, but is effective thanks to the empirical understanding of the community gained from generations of practice.

Formation of Texture and Flavor during Cooking

The mixing stage (coconut milk, glutinous rice flour, brown sugar, pangli seeds) marks the transition from detoxification to food structure formation. According to Setiavani et al. (2024), coconut milk acts as a lipid-protein phase that affects emulsion stability during heating, and stirring has been shown to increase the stability of vegetable emulsions, including coconut milk, which has implications for the consistency of the initial dough that affects the rheology of dodol. Glutinous rice flour, rich in amylopectin, becomes the primary viscoelastic matrix when heated (Lapčiková et al., 2024).

During cooking and stirring until thickened, starch gelatinization occurs where starch granules absorb water, swell, and then form a gel network that increases viscosity (Qiu et al., 2024). This behavior has been characterized in glutinous rice starch and explains the change in the dough to become thick and elastic. At the same time, non-enzymatic browning (Maillard reaction) between sugar (brown sugar/palm sugar) and amino groups (coconut milk protein) produces melanoidins that contribute to the characteristic brown color and aroma (Liu et al., 2022; Starowicz & Zieliński, 2019). Continuous stirring maintains even heat distribution, preventing excessive caramelization that can cause burning. In this case, the community recognizes the optimal gelatinization point not through measuring instruments, but through changes in the texture and color of the dough. This is evidence of their ability to read scientific indicators through sensory experience as a reflection of empirical yet precise thermal reaction control.

Structural Stabilization during Cooling

After the cooking process is complete, dodol pangli is left to cool naturally at room temperature. This stage

is important because it determines the stabilization of the gel structure formed during the gelatinization process. Natural cooling allows for a gradual decrease in temperature so that the water remaining in the starch matrix has time to re-interact with the amylose and amylopectin polymer chains. During this process, retrogradation occurs, which is the rearrangement of amylose molecules that were released during heating to form new hydrogen bonds between chains. This process produces a semi-crystalline three-dimensional structure that provides a solid, elastic, and easy-to-cut texture (Gong et al., 2024; Qiu et al., 2024).

Natural cooling in an open environment without artificial cooling has important thermodynamic implications. A moderate rate of temperature decrease prevents phase separation between water and the starch network, resulting in a shiny surface and no cracking of the dodol pangli. Additionally, partial retrogradation of amylopectin during storage enhances structural rigidity and texture stability at room temperature (Setiavani et al., 2024). This mechanism is consistent with the principle of molecular reorganization in high-amylopectin starches (such as glutinous rice flour), where slow cooling strengthens the mechanical stability of the gel without reducing its elasticity. Therefore, natural cooling not only serves to lower the temperature but is also a determining stage for the final texture and sensory quality of dodol pangli, thereby demonstrating the empirical understanding of the community regarding the balance of temperature and time in the formation of a stable food structure.

Extending Shelf life and Preventing Spoilage

Packaging dodol pangli in plastic or food-grade paper serves to maintain hygiene, prevent microbial contamination, and inhibit the oxidation of coconut milk fat. Scientifically, packaging helps maintain water activity (A_w). The result of a long cooking process that evaporates water can inhibit the growth of bacteria, yeast, and fungi (Erkmen & Bozoglu, 2016; Tapía et al., 2020). A stable A_w value keeps dodol pangli chewy, its characteristic brown color, and sweet aroma for 3–4 days of storage at room temperature. If dodol is exposed to humid air or the packaging is not sealed tightly, A_w can increase and cause damage such as rancid odor, discoloration, and mold growth. This shows that controlling A_w through intensive cooking and tight packaging is a traditional method used by the Soppeng community to extend the shelf life and prevent product spoilage (Setiavani et al., 2024).

Thus, each stage of pangli dodol production contains scientific activities that can be interpreted into formal scientific concepts. This process illustrates how the Soppeng community applies scientific principles through traditional practices harmonized with local

wisdom. Ethnographically, this knowledge is passed down through direct practice (learning by doing), rather than through formal education, but it still exhibits the characteristics of science: observation, testing, and generalization. This proves that dodol pangi is a tangible form of 'contextual science' that lives in society, where science and culture are not separate, but complementary.

The Potential of Dodol Pangi as a Context for Ethnoscience-Based Science Learning

The results of this ethnographic exploration show that dodol pangi has great potential to be used as a context for ethnoscience-based science learning, especially in the context-based learning (CBL) framework. The CBL approach emphasizes teaching science through phenomena that are close to the lives of students, so that they can relate scientific concepts to their daily experiences (Januarti et al., 2024; Mohamad & Baran, 2025; Sheshtawy et al., 2023). In this context, the stages of making dodol pangi can be adapted as a learning resource that supports science literacy, critical thinking skills, and appreciation of local culture.

First, the integration of the scientific values of dodol pangi into science learning can be done through exploratory activities and culture-based projects. For example, on the concept of diffusion/osmosis, students can conduct simple experiments by soaking local food ingredients to observe changes in solution concentration. On the concept of heat transfer, they can observe the difference in heating results between large and small flames and relate this to energy efficiency. Meanwhile, for gelatinization and the Maillard reaction,

students can compare changes in the texture and color of ingredients when heated at different temperatures. This approach fosters scientific abilities as well as awareness of local wisdom relevant to their lives.

Second, from a pedagogical perspective, science learning based on ethnoscience through the context of dodol pangi can improve scientific literacy as well as cultural literacy. Sakti et al. (2020) and Widiyawati et al. (2023) emphasize that ethnoscience-based learning expands students' space for reflection to see the relationship between scientific knowledge and cultural values. In the context of Soppeng, students can understand that scientific concepts such as heat, substance change, and chemical reactions are not foreign, but have long been present in people's lives.

Third, the results of this study also show its relevance to the Merdeka Belajar (Independent Learning) paradigm, which emphasizes character-based, collaborative, and contextual learning. Through the study of dodol pangi, students not only learn science cognitively, but also develop character values such as perseverance and ecological responsibility towards local natural resources. Conceptually, the results of this study can be developed into an integrative model of ethnoscience-based science learning, which is oriented towards four main stages: (1) exploration of cultural context, (2) identification of scientific concepts, (3) simple scientific experiments or analysis, and (4) reflection on cultural and scientific values. This model enables teachers to systematically and measurably link local phenomena such as dodol pangi with science lesson material.

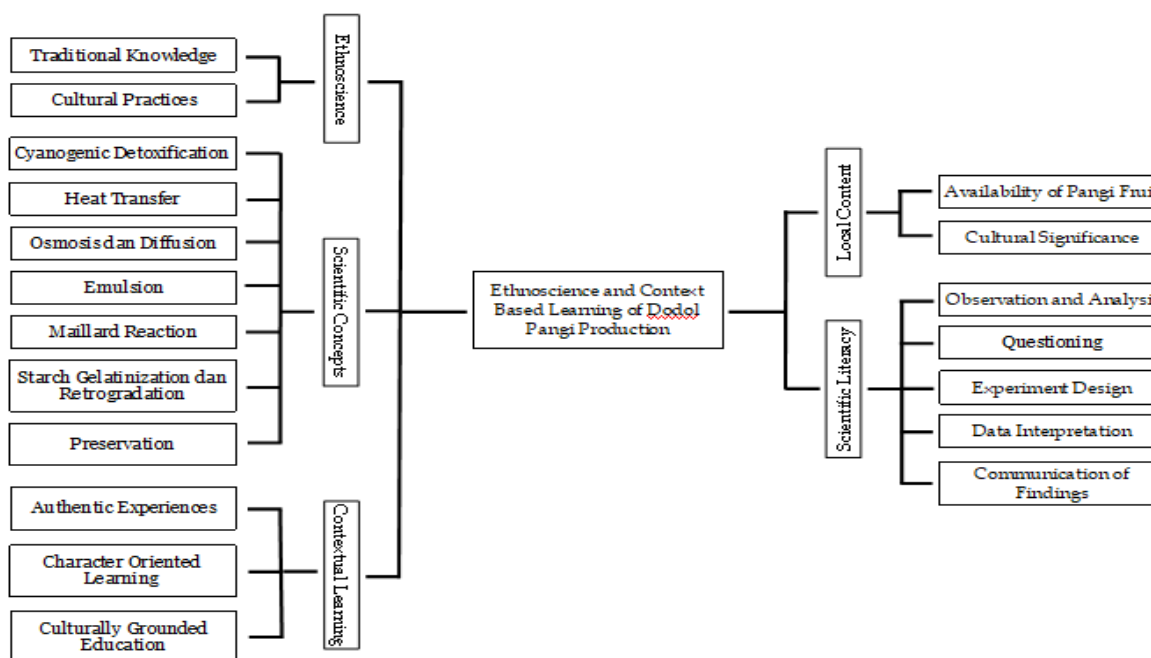


Figure 2. Ethnoscience and context-based learning of Dodol Pangi production

To further clarify the relationship between ethnoscience, local context, scientific concepts, scientific literacy, and contextual learning, a conceptual map (Figure 2) was developed to illustrate how the traditional process of making *dodol pangi* can serve as a bridge between cultural practices and scientific understanding. Ethnoscience reflects the integration of indigenous knowledge and empirical understanding within community practices, which, in the Soppeng context, manifests through the *dodol pangi* production process. This local context provides a culturally relevant environment where learners can observe and analyze scientific phenomena such as cyanogenic detoxification, heat transfer, osmosis and diffusion, Maillard reactions, and starch gelatinization and retrogradation. Through this exploration, students develop scientific literacy – the ability to think critically, interpret natural processes scientifically, and apply this knowledge to real-life situations. Ultimately, this relationship supports context-based learning, enabling science education to become more meaningful, reflective, and aligned with the *Merdeka Belajar* paradigm that emphasizes authentic, character-oriented, and culturally grounded learning experiences.

However, the implementation of ethnoscience-based learning faces several challenges, such as time constraints, teacher readiness, and the availability of resources in schools. Therefore, further research needs to focus on the development of modules, student worksheets, or interactive digital media based on local culture. Thus, the results of this research can contribute not only to strengthening scientific understanding but also to preserving the culture and scientific identity of the nation.

Conclusion

This study reveals that the traditional process of making *dodol pangi* in the Soppeng community represents a form of living ethnoscience, where local wisdom reflects scientifically explainable food processing practices. The stages of boiling, slicing, repeated washing, and soaking illustrate natural detoxification mechanisms through leaching, diffusion, and volatilization of cyanogenic compounds, while the cooking stage demonstrates heat transfer, starch gelatinization, viscoelastic network formation, and Maillard reactions that shape the product's texture, color, and aroma. In addition, the cooling stage contributes to structural stabilization through retrogradation, and the packaging and storage practices reflect the community's empirical understanding of water activity in maintaining product quality and shelf life. Overall, these findings confirm that the knowledge embedded in *dodol pangi* production has a clear

scientific basis and strong potential to be used as a meaningful context for ethnoscience-based and context-based science learning, particularly to support scientific literacy and appreciation of local wisdom, which are consistent with the contextual and culturally responsive orientation of the *Merdeka Belajar* paradigm.

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Author Contributions

I.I. Conceptualization, methodology, data collection, and original draft preparation. A.S.A. Data collection and manuscript editing. E.E. Research permission coordination and interview transcript processing.

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Conflicts of Interest

The authors declare that they have no conflict of interest.

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