ISSN 2807-9329 (Print) ISSN 2807-9167 (Online)

Journal of Mathematics, Science and Computer Education (JMSCEdu)

https://ppjp.ulm.ac.id/journals/index.php/jmsc-edu

Interdependence of Science and Social Context Through Lens of Banjar Culture Activities (*Batimung*): Convergent Model

Almubarak[1,2*], Siti Sriyati[1], and Winny Liliawati[1]
[1]Doctoral Program of Science Education, University of Education, Bandung, Indonesia
[2]Study Program of Chemistry Education, Faculty of Teacher Training and Education, University of Lambung Mangkurat, South Kalimantan Indonesia
*almubarak@upi.edu

Received: 6 May 2024 **Accepted: 30 May 2024** **Published: 8 June 2024**

DOI: https://doi.org/10.20527/jmscedu.v4i1.12387

Abstract

The integration of culture into science education serves as a bridge of knowledge, ensuring that students develop a comprehensive understanding of the scientific and social context and possess literacy as potential educators. The research objectives are to determine the following: 1) the topics that students are most interested in discussing in the context of "diversity," 2) the perspective of students on cultural integration in science learning, and 3) the interdependence of the context of science and the *Batimung* culture that is characteristic of South Kalimantan. The research methodology relies on a mixed-method with convergent model. Students in the 2020-2023 class of chemistry education comprised the sample. The data collection techniques comprise interviews, questionnaires, and literature reviews. According to the results, the scientific and social contexts are interconnected. The quantitative technique employed is a questionnaire that encompasses diversity aspects comprising a variety of topics. The results indicate that 1) the most desired subject matter for discussion is "the impact of the environment on an individual," with a 59% response rate; 2) cultural integration in science education is a critical endeavour; and 3) the *Batimung* culture demonstrates that the context of science and social (culture) are not only related but also mutually influential. The conclusion is that the context of science and social, particularly cultural aspects can be the most recent presentation in the teaching and profound interpretation of science through a cultural lens.

Keywords: *Batimung*; colligative properties of solutions; essential oil; ethnoscience; science and cultural context

How to cite: Almubarak, A., Sriyati, S., & Liliawati, W. (2024). Interdependence of science and social context through lens of banjar culture activities (*Batimung*): Convergent model. *Journal of Mathematics, Science, and Computer Education (JMSCEdu)*, 4(1), 85-98.

INTRODUCTION

To be cognizant of the presence of minority groups in a classroom is one of the indicators of a competent teacher in the context of science education. Teachers must be cognizant of the existence of minor groups in order to ensure that all participants acquire the fundamental principles of science learning, as outlined in the Next Generation Science Standards report (NGSS, 2013). In the context of diversity, minorities can also be associated with factors such as language, gender, geography, and culture. This diversity is highly pertinent to the investigation of Taylor & Sobel (2011a), which asserts that teachers must possess the ability to demonstrate sensitivity to diversity. Nadiem Makarim, the

Minister of Education and Culture, elucidated the necessity for significant changes in the education system, which he referred to as the transformation of national standards and higher education accreditation (Kemdikbud, 2023), in a speech posted on the Youtube channel. The Government underscored the necessity for teachers to implement innovations in the learning process, as it is crucial to alter the mindset of students in order to become qualified teachers.

Cultural integration in science education is an appropriate reform, as culture is an integral component of human existence. Culture is the most distinctive component of self-identity (Rahmawati et al., 2017; Roth, 2016). Meanwhile, science education is the primary human orbital, serving as a platform for comprehending the social context, including culture as the foundation of science (Rahmawati et al., 2019; Winarti et al., 2022). One of the objectives of science education is to establish a scientific information repository for the resolution of social issues (NGSS, 2013; Yager, 1996). An additional objective is for science education to serve as a platform for participants to utilize science to enhance the quality of life and technology (NGSS, 2013; NSES, 1996; Yager, 1996). The discussion of this research also includes ethnoscience, as the incorporation of ethnoscience into the learning of science must become a habit in order to develop the thinking skills of participants (Rahman et al., 2023; Rahmawati et al., 2019, 2020). It is evident from these objectives that participants can acquire new knowledge by researching culture (social context) in order to have a positive impact on people's lives (Dittrich et al., 2022; Mezirow, 1997; NGSS, 2013; Setyaningsih et al., 2022; Taylor & Sobel, 2011a; Trilling & Fadel, 2009a; Yager, 1996).

Batimung is a culture that is a highly intense activity among the Banjar and Dayak communities in South Kalimantan (Noortyani et al., 2023). In practice, *Batimung* is more commonly recognized for its use in wedding processions and in the maintenance of health. In the context of knowledge, individuals perform *Batimung* with the intention of ensuring that the bride-to-be has a fragrant body fragrance on the wedding day (Afifah, 2022; Noortyani et al., 2023). *Batimung* is designed to replace the sweat that comes out with sweat that has a pleasant odor as a result of the *Batimung* procedure. This is intended for the bride or groom (Noortyani et al., 2023). The *Batimung* procession is typically conducted one to three days prior to the wedding ceremony. Nevertheless, it is typically executed the day prior to the commencement of the event, contingent upon the consent of the two families.

The primary objective of the research is to comprehend the *Batimung* tradition from two distinct perspectives: its relevance to scientific terminology and its comprehension by the community. An appropriate learning design for the purpose of developing students' science interpretation skills through cultural studies is collaborative transformative learning (Mezirow, 1997) and culturally responsive teaching (Taylor & Sobel, 2011a). The fulfilment of internal motivation is believed to have an impact on student literacy (prospective teachers) when science is integrated with culture. This motivation is referred to an interest that significantly influences participants' mental models and long-term motivation (Barke et al., 2012).

The diversity indicator related to the topic of "understanding how the environment affects a person" had the highest percentage of 15%, as indicated by the interest analysis conducted previously (Almubarak & Saadi, 2023). This implies that students are intrigued by the impact of the environment on an individual's perspective. This discovery is pertinent to the concept of Almubarak & Saadi (2023), as the results acquired have the potential to serve as a theoretical and practical foundation for science education. The research question is as follows: 1) What are the most popular topics for students to discuss in the context of "diversity"? 2) What is the perspective of students on the integration of cultural elements

into the study of science? and 3) what is the interdependence between the *Batimung* culture that is characteristic of South Kalimantan and the context of science?

METHOD

The research design employed the mixed-methods with convergent model (Creswell & Clarck, 2007). The convergent model is the most pertinent choice for conducting research, as the data acquired is a combination of quantitative and qualitative. Consequently, this research model is deemed to be highly appropriate. The data collection techniques employed were interviews, questionnaires, and literature reviews, with the sample consisting of chemistry education students from 2020 to 2023. The data analysis techniques employed were coding (qualitative) and statistics (quantitative). Purposive sampling, which involves the selection of samples with consideration, is employed in the sampling technique. The sustainability of the significance of cultural integration in science learning is of the utmost importance and urgency, as chemistry education students are prospective science teachers. Students were provided with supplementary resources regarding the teaching of science from a diverse range of community perspectives, with a particular emphasis on cultural identity, as a result of this research. In terms of objectives, students were provided with a statement regarding the topics they would most like to discuss in class, with an emphasis on diversity. Students were permitted to select four topics from the statement provided. Next step was interviewing them to ascertain their general perspectives on the integration of culture into the learning of science. Afterward, the *Batimung* culture is examined by identifying scientific knowledge and indigenous knowledge.

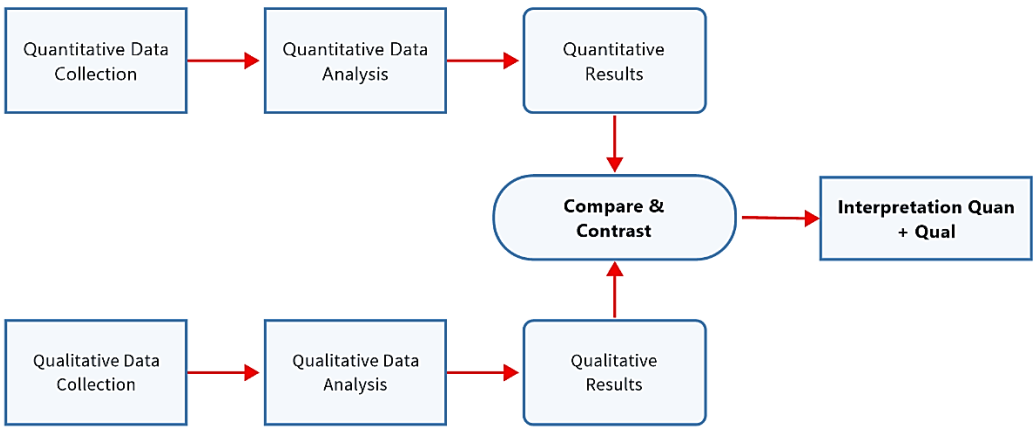

Figure 1 The research design of a convergent model (Creswell & Clarck, 2007)

RESULTS AND DISCUSSION

The results indicated that the most frequently requested subject matter was "the impact of the environment on an individual," with a 59% response rate. Subsequently, 2) the results of the interviews indicate that cultural integration is a critical component of science education. Additionally, 3) the *Batimung* culture demonstrates the interdependence and mutual influence of scientific and social (cultural) contexts, as evidenced by the identification of indigenous and scientific knowledge. The conclusion is that the most recent presentation in the teaching and profound interpretation of science through the lens of *Batimung* culture is the context of science and social, particularly cultural aspects. The interview results indicate that nearly all students firmly advocate for the integration of

culture into the learning process in order to acquire a more comprehensive understanding of the scientific content and more easily comprehend it through *Batimung*.

The results obtained are consistent with the description of some research that learning with multi-cultural integration aids in the paradigmatic development of students and has an impact on cognitive structures in learning (Fuentes-Vilugrón et al., 2023). This discovery is also consistent with the assertions of Taylor & Sobel (2011b) that the primary objective of future educational development should be to develop teachers who are sensitive to diversity. The ability to comprehend diversity is recognized as a 21st-century skill, specifically "social and cross-cultural interaction skills" (Trilling & Fadel, 2009b). Consequently, the most suitable approach is to acquire this skill through the integration of social and scientific contexts in order to develop individuals who are relevant to the technological era (NGSS, 2013; NSES, 1996; Yager, 1996).

What are the most popular topics for students to discuss in the context of "diversity"?
The data in Figure 2 is indicative of the topics that students are most interested in discussing in class, as determined by interest analysis. The urgency of this treatment is to determine whether students are presented with topics related to diversity and, if so, which topics they are most interested in discussing (see graph below). This is crucial in order to ensure that the teacher is aware of the participants' learning requirements. The questionnaire is the instrument employed to ascertain the subject matter. The graph indicates that the analysis of the topic "understanding how the environment affects others" yielded the highest results at 59%, while the lowest results were for the topic "chemistry and cognitive of a person" at 21.60%. The percentages of other topics, including "human activity-based chemistry learning," "human activity-based chemistry projects," and "recognizing other people's cultures," exceed 35%. Conversely, the percentages of culture-based chemistry projects and chemistry and wetlands were below 32%. However, the subject of "understanding how the environment affects people" is the most popular, indicating that students are more interested in discussing the effects of the environment and how they affect us. It is crucial to emphasize that the graphical presentation surpasses 100% by calculation. This is due to the fact that students were permitted to select a maximum of four options from the given list when the questionnaire was distributed. Consequently, the visual data presented below indicates that the data exceeds 100% in accordance with the graph presentation.

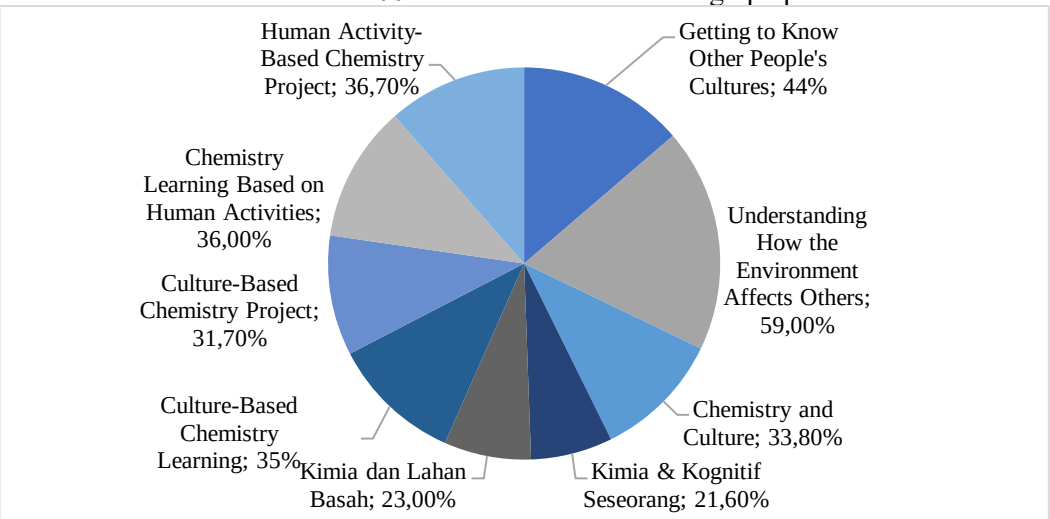

Figure 2 Recapitulation of the student interest analysis regarding diversity

The graph's results indicate that the environment significantly influences an individual's perspective and mentality. This topic is pertinent to the cultural issues that are being discussed in the context of diversity, as culture is an integral component of human activities. The integration of cultural identity into the learning process (Taylor & Sobel, 2011a) encourages participants to develop cognitive progress and motivation, thereby enabling them to acquire new knowledge and recognize the cultural identity. A more in-depth examination of culture in science learning can enhance students' problem-solving abilities, thereby inciting the development of scientific intellectuals. The Next Generation Science Standard also elucidates that "science for resolving current societal issues," which implies that science education serves as a scientific information repository for addressing a variety of phenomena, including the development of innovations in a cultural context (NGSS, 2013; NSES, 1996; Yager, 1996).

What are the perspectives of students regarding the assimilation of culture into the science learning?

It is crucial to understand the perspectives of students on cultural integration in science education in order to provide prospective teachers with a comprehensive understanding of culture-based learning design. In order to ascertain students' perspectives regarding cultural integration in the learning process, the open-ended question technique was implemented. The inquiries are open-ended to allow students to articulate their perspectives on cultural issues that are relevant to the study of science. The fundamental purpose of posing this inquiry is to explore the significance of mutual respect and respect for diversity, including culture, heritage, language, and demographics, as exemplified by 21st-century skills, specifically "social and cross-cultural interaction skills" (Taylor & Sobel, 2011b; Trilling & Fadel, 2009b). The classroom is undoubtedly influenced by diversity, and the integration of diverse elements serves as a bridge of knowledge that enhances the literacy of participants.

When asked, "In your opinion, is it important for cultural aspects to be integrated in chemistry learning? YES or NO, write down your perspective!", the results of student interviews are as follows.

"…**(MRF, batch 2021):** YES, chemistry learning should be integrated with cultural aspects because culture is one aspect that is very close to students' daily lives so that the chemistry learning taught can be applied in many daily life situations so that it creates more meaningful learning..."

"…**(MR, batch 2021)**: YES, because many cultures are very beneficial for health after we review the chemical aspects..."
I believe that it is crucial to incorporate cultural aspects into the study of chemistry in order to help students understand that there are always chemical components in this aspect of life, even in everyday culture.

"…**(NAP, batch 2021)**: I think cultural aspects integrated in chemistry learning are important to be applied so that students can realize that in this aspect of life and even in everyday culture there are always chemical aspects..."

"...**(RH, batch 2021)**: YES, because culture is closely related to people's lives and beliefs, as well as culture can influence people's perspectives, so that cultural aspects are important to be integrated in chemistry learning so that we can provide a positive view of

chemistry to the community where chemistry is not always negative but also positive, just like the culture of the community which has positive meanings and benefits..."

The aforementioned interview demonstrates that learning science also incorporates diversity, particularly culture. The cultural activities of the community are also inextricably linked to scientific aspects. Consequently, this situation is highly pertinent to the investigation of the hypothesis that culturally responsive learning serves to inspire students (Taylor & Sobel, 2011a). Consequently, participants undergo cognitive transformation, which results in a shift in their perspective that facilitates the acquisition of meaningful knowledge (Gagne, 1970; Mezirow, 1991; Taylor & Sobel, 2011a; Trilling & Fadel, 2009b; Yager, 1996).

What is the interdependence between the *Batimung* culture of South Kalimantan and the scientific context?

The previous discoveries showed that cultural integration serves as a means of fostering student comprehension and the ability to interpret the context of science through a cultural lens. *Batimung* is the primary subject that serves as the foundation for scientific explanations of the interdependence between science and culture. *Batimung* is a product of the unique culture of South Kalimantan, one of the provinces on the island of Kalimantan, Indonesia. Banjarbaru City has served as the provincial capital of South Kalimantan since March 16, 2022, when it was relocated from Banjarmasin City. The province is home to the Banjar ethnicity and spans 38,744.00 km². As of the end of 2023, the population was 4,234,214. The administrative area is divided into 11 regencies and 2 localities (Wikipedia, 2024a).

Figure 3 Location visualization of South Kalimantan Province (Wikipedia, 2024a)

Interviews with Banjar Culture researcher Prof. Rusma also yielded some data (Personal Communication, 2024) (Noortyani, 2024) from Lambung Mangkurat University in South Kalimantan. She clarified that the marital *Batimung* tradition is one of the distinctive customs observed by the Banjar people of South Kalimantan, Indonesia (Afifah, 2022; Noortyani et al., 2023; Saefuddin & Maryadi, 2018; Susanto et al., 2024). This custom is observed prior to the wedding ceremony by the bride and groom. The *Batimung* bride is typically conducted on the evening preceding the wedding day, when the bride's family convenes at her residence. Nevertheless, the duration of the event is contingent upon the family's consent of the bride and groom. As well as demonstrating support and unity in greeting the wedding, this tradition also serves as an opportunity to fortify relationships between families (Noortyani et al., 2023).

Prof. Rusma also stated that the bridal *Batimung* tradition in the Banjar community is not explicitly associated with the story of Putri Junjung Buih (Noortyani et al., 2023). One of the most renowned legends in South Kalimantan is the narrative of Putri Junjung Buih. Putri Junjung Buih is a character in a legendary tale who is renowned for her attractiveness. The narrative centers on a princess who possesses an extraordinary level of attractiveness. The relationship between the marital *Batimung* tradition and the story of Putri Junjung Buih can be characterized as more symbolic or associated with the cultural values that are present in the narrative. The bridal *Batimung* tradition can be interpreted as a symbol of unity and collaboration in the celebration of a wedding, whereas the narrative of Putri Junjung Buih serves as an inspiration for virtues such as loyalty, attractiveness, and the obstacles that must be surmounted in order to realize one's aspirations. However, there is no direct connection between the marital *Batimung* tradition and the legend of Putri Junjung Buih.

-a -b -c -d

Figure 4 -a. the procedure of evaporating the boiled *Batimung* ingredients, -b. *Batimung* ingredients (lemongrass, jasmine, magnolia x alba, ylang-ylang, patchouli, pandan, and roots), -c. the process of boiling the ingredients, and -d the covering (isolation) of the mat for the bridal and groom to begin the *Batimung* (Trans7, 2018).

Data was also collected from Rilia Iriani, an organic chemistry lecturer who is a native of the Banjar tribe and has a history of research on natural materials. She further stated that the bridal *Batimung* tradition is characterized by the community's selection of ingredients or plants based on the aroma of natural ingredients, and the *Batimung* material has been handed down through generations. She also mentioned that the majority of *Batimung* ingredients contain aetheric oils, which have been shown to be highly advantageous for health in recent research. For instance, citronella (*Cymbopogon Nardus*) is a mandatory component of the *Batimung* process. The fragrant fragrance generated by the boiling of citronella is undeniable and has a beneficial impact on the body, particularly during the evaporation process. The aromatic lemongrass utilized is identified as follows.

Table 1 Biodata of "citronella" (Ken, 2022; Wikipedia, 2024b)

Biodata of "citronella"	Photo
Division : *Tracheophyta* Subdivision: *Spermatophytes* Class : *Angiospermae* Ordo : *Poales* Family : *Poaceae* Subfamily : *Panicoideae* Tribes : *Andropogoneae* Subtribes : *Andropogoninae* Genus : *Cymbopogon* Species : *Cymbopogon nardus*	

Prof. Rusma (Personal Communication, 2024) added that the selection of *Batimung* materials is influenced by philosophical considerations, specifically symbolic significance. (Noortyani, 2024). In the culture or traditions of the local community, certain flora or materials hold significant symbolic significance. The use of jasmine, roses, or other fragrant flowers can represent the purity, beauty, and fragrance of matrimony. In the same vein, pandanus leaves are emblematic of pleasure and fertility. The *Batimung* ceremony can also serve as an opportunity for the families and acquaintances of the bride and groom to come together and work together. This process fortifies the bonds of solidarity and social relations among community members. *Batimung* provides assistance and affection to the bride and groom during the bridal preparation process. The following is a review of *Batimung* cultural studies in terms of Banjar community knowledge and modern research-based knowledge, which serves as evidence that science and culture are interdependent.

Table 2 Description of indigenous knowledge, scientific knowledge, and community traditions/activities

No	Tradition/ Activity Indigenous Science	Indigenous Knowledge	Scientific Knowledge
1.	Selecting natural materials/spices/roots to be used as basic ingredients in the *Batimung* procession	The selection of spices is based on the fact that the spices have a fragrant smell or aromatic aroma and it is considered that this aromatic property is a factor in making the bride's body fragrant (Noortyani et al., 2023)	Community knowledge is relevant to research in the context of natural ingredients. For example, citronella (*Cymbopogon winterianus*) contains essential oil with the compound citronellal, an aromatic compound that has the molecular formula $C_{10}H_{18}O$ (Balakrishnan et al., 2014; Harianingsih, 2018) and eugenol and kamfor (García et al., 2023).
2.	After selecting the spices, then cutting the spices that will be used in the *Batimung* process	The selected plants/spices/flowers are then cut into several parts so that the content of the ingredients easily evaporates. In addition to the efficiency of the boiling process (*manjarang*) of the material, the pieces of material make it easier for the plant content to cause the fragrant aroma of the plant	Cutting the material aims to make the surface area of the compound volatile when exposed to boiling water (Petrucci et al., 2011). Then, the touch surface area has a very important role in the reaction rate. The greater the surface area of the touch plane between particles, the more collisions that occur, causing the reaction rate to accelerate (Petrucci et al., 2011).

No	Tradition/ Activity Indigenous Science	Indigenous Knowledge	Scientific Knowledge
3.	The ingredients are then put into a pot and then boiled or the Banjar language is “menjarang”.	It will be simpler for the plant's content to produce the fragrant fragrance of the plant during the boiling process.	The boiling process is also related to the volatile nature of essential oils due to their low vapor point. In addition, the arrangement of its component compounds strongly affects human nerves (especially in the nose) so that it often has a certain psychological effect (Nambiar & Matela, 2016; Sukardi et al., 2021; Szczepankiewicz, 2021)
4.	The process of heating the ingredients is done until boiling conditions, so boiling needs a large enough temperature because it is considered to be able to easily release the content of flavorful plants.	Boiling is also a benchmark for the community to stop heating with the pot closed. Heating for too long is also feared by the community to cause discomfort to the bride and groom because the conditions are too hot.	Water boiling of the ingredients takes quite a long time because the water will not exactly boil 100 degrees (or standard conditions) due to the presence of dissolved substances so that the boiling point of the water will increase. This condition is known as one of the colligative properties of solutions (boiling point rise = a concept in physical chemistry that refers to the increase in temperature at which a solution begins to boil compared to the boiling temperature of the pure solvent (Petrucci et al., 2011)
5.	After the process of boiling the *Batimung* material, the pot is then lowered from the stove and the bride is then smoked with the steam from the pot. While being smoked, the bride's body is covered by a cloth/mat/blanket that can cover the whole body except the face.	During the vaporization process, the lid of the pot is not opened completely but is opened slowly or little by little (the result of the stew). This situation is done so that the bride does not feel excessive heat considering that the stew is still very hot so as to avoid adverse effects on the skin if the lid of the pot is immediately opened.	Research (Sari et al., 2021) found that the greater the temperature, the more essential oil is obtained so that high heating has the potential to release more active substances (essential oils). Then, the use of mats aims to prevent heat transfer because mats are insulators or have low heat conductivity so that heat or heat transmission does not easily move from high to low temperatures. This technique is also relevant to distillation techniques in chemical practice terminology (Giancoli, 2015). With the basic ingredients of leaves, essential oils are obtained more with prolonged heating compared to logs (e.g. cinnamon sticks) (Nambiar & Matela, 2016; Sari et al., 2021; Sukardi et al., 2021; Yamaguchi & Atsuta, 2013)
6.	The process of evaporation with the pot open little by little is done gradually. After a few minutes (about 5-10 minutes) then the lid is opened again and so on.	This gradual evaporation is considered by the community so that the ingredients can be absorbed by the body slowly into the skin and so that the bride feels relaxed and comfortable during be *Batimung* (Noortyani et al., 2023; Susanto et al., 2024)	High temperature will cause disturbances in the body's metabolism and also have a negative impact on the skin. It carries great energy so that the vapor pressure of the material will also exert great pressure resulting in particle friction on the skin. Research (Balakrishnan et al., 2014) found that essential oils in lemongrass have antimicrobial activities that can inhibit pathogenic bacteria and free radicals, anti-oxidants (Anggraeni et al., 2018; Pan et al., 2022) that the content of lemongrass aroma can reduce stress levels.

No	Tradition/ Activity Indigenous Science	Indigenous Knowledge	Scientific Knowledge
7.	Next, the evaporation process is stopped when the steam no longer comes out of the pot. After that, the pot is reheated like the boiling process at the beginning and this treatment is usually done 3 times.	The frequency of *Batimung* depends on the endurance of the bride-to-be. Sometimes there are those who can only do *Batimung* once. The effect of comfort and relaxation is one of the indicators needed so it is important to make someone comfortable in the *Batimung* process.	The process of boiling many times will certainly be the potential for more ingredients to be produced (Sari et al., 2021; Sukardi et al., 2021). The content of essential oils includes Citral α, Citral β, Nerol Geraniol, Citronellal, Terpinolene, Geranyl acetate, Myrecene and Terpinol Methylheptenone) flavonoids and phenolid compounds, which contain luteolin, isoorientin 2'-O-rhamnose, quercetin, kaempferol and apigferinin (Nambiar & Matela, 2016). In addition to the findings of Daiane et al., (2021) that the content of lemongrass aroma can reduce stress levels. Plants with active components such as essential oils (EO) can have a calming effect (Szczepankiewicz, 2021). Essential oils are used as a treatment for someone who is depressed. This situation is due to various mechanisms including monoamine regulation, induction of neurotopic factor expression, regulation of the endocrine system, and increased neurogenesis (Szczepankiewicz, 2021).

The bride and groom are observed to be sweating after the concluding stage. Sweating is also a highly desirable aspect of the *Batimung* tradition in the community's original conception. The perspiration that is expelled is regarded as a poison that is present in the bride's body. Consequently, the *Batimung* is used to eliminate the sweat. The essential oil content in the bride's body replaces the perspiration that is expelled, ensuring that the bride remains fresh and radiant without excessive sweating, despite the traditional clothing being quite tight and hot. On the wedding day, the bride-to-be's visage will radiate beauty and charm as a result of the relaxing effect of *Batimung*.

The epidermis area is large enough, approximately 2 square meters in scientific terms, to facilitate the absorption of essential oils throughout the body (Basicmedicakey, 2024). The body will discharge fluids and oils when it sweats. In this case, the body has access to essential oils that are fat-soluble. The result is that essential oils can be sequestered in their constituent molecules or stored separately in the body. The skin becomes more moisturized and fresher as a result of the hydrating influence of essential oils in the body, which can last for an extended period. The Anxiolytic effect, an antidepressant agent that induces psychological tranquility, is undoubtedly responsible for the calming effect. Additional effects include: blood pressure control (controlled blood pressure); anxiolytic effect; respiratory relaxation (relaxed respiration as a result of the aroma); blood biochemistry; and increased neurogenesis, which influence mood and emotions (Liang et al., 2023; Szczepankiewicz, 2021).

The research results can serve as a foundation for the reform of science education, as the integration of cultural elements in the curriculum has a paradigm-shifting effect on students (Barke et al., 2012), cognitive transformation (Mezirow, 1991; Mezirow et al., 2019), formation of scientific mental structures and models (Barke et al., 2009, 2012; Schwedler & Kaldewey, 2020; Suja et al., 2020; Taylor & Sobel, 2011b; van Berkel et al., 2009), motivation (Barke et al., 2012; Gagne, 1970; Taylor & Sobel, 2011b), and problem solving (Bruce et al., 2022; Gagne, 1970; Popova & Jones, 2021; Rodriguez et al., 2020;

Taylor & Sobel, 2011b).The materials that are relevant to this research are collegative properties of solutions, basic organic chemistry, synthetic organic chemistry, school chemistry 2, and basic chemistry. In practice, this research can be extended to encompass a diverse array of cultural and social phenomena, which are subsequently employed as diagnostic tools to establish a tangible understanding of the behavior and requirements of students in preparation for their eventual roles as teachers.

CONCLUSION

The integration of *Batimung* culture into science education is a revitalization of the learning process, as the scientific and social contexts are interconnected. The results are also a novel approach to the design of science learning, particularly in the university setting, where students are a critical component of acquiring new knowledge and attaining quality education through the lens of cultural portraits. The results indicated that 59% of students selected the topic of "how the environment affects others" as the most desired subject to be discussed. This indicates that students desire diversity to be a topic of discussion in science education. The interview results also indicated that students concurred with the necessity of cultural integration in the study of science to acquire a comprehensive understanding and identify solutions to problems that arise. In addition, the *Batimung* tradition can be incorporated into the study of chemistry and other scientific subjects to facilitate the interpretation of material through the lens of cultures like *Batimung*. The colligative properties of solutions are the chemistry content that is most pertinent to *Batimung* culture. This research demonstrates that a cultural lens can serve as a knowledge bridge, facilitating a paradigm shift for the best and rendering the science learning process significantly more meaningful.

REFERENCES

Afifah, A. F. (2022). Nilai sosial dalam kearifan local dengan tradisi *Batimung* pengantin. *Pusat Publikasi Pemberlajaran*, *1*(1), 1–8.

Almubarak, & Saadi, P. (2023). *INTEREST focused-learning sebuah desain pembelajaran abad ke-21 berbasis minat untuk melatih keterampilan sosial dan interaksi lintas budaya calon pengajar kimia*. CV Banyubening.

Anggraeni, N. I., Hidayat, I. W., Rachman, S. D., & Ersanda. (2018). Bioactivity of essential oil from lemongrass (Cymbopogon citratus Stapf) as antioxidant agent. *AIP Conference Proceedings*, *1927*. https://doi.org/10.1063/1.5021200

Balakrishnan, B., Paramasivam, S., & Arulkumar, A. (2014). Evaluation of the lemongrass plant (Cymbopogon citratus) extracted in different solvents for antioxidant and antibacterial activity against human pathogens. *Asian Pacific Journal of Tropical Disease*, *4*(S1). https://doi.org/10.1016/S2222-1808(14)60428-X

Barke, H.-D., Harsch, G., & Schmid, S. (2012). Essentials of chemical education. In *Angewandte Chemie International Edition, 6(11), 951–952.* Springer.

Barke, H.-D., Hazari, A., & Yitbarek, S. (2009). *Misconceptions in chemistry (addresing perceptions in chemical education)*. Sense Publisher. https://doi.org/10.1007/978-3-540-70989-3_2

Basicmedicakey. (2024). *How essential oils enter the body*. Fastest Basicmedical Insight Engine. https://basicmedicalkey.com/how-essential-oils-enter-the-body/#s0070

Bruce, M. R. M., Bruce, A. E., & Walter, J. (2022). Creating representation in support of chemical reasoning to connect macroscopic and submicroscopic domains of knowledge. *Journal of Chemical Education*, *99*(4), 1734–1746. https://doi.org/10.1021/acs.jchemed.1c00292

Creswell, J. W., & Clarck, V. L. P. (2007). *Designing and conducting mixed methods*

research. SAGE Oublications.

Dittrich, L., Aagaard, T., & Hjukse, H. (2022). The perceived affordances of simulation-based learning: online student teachers' perspectives. *International Journal of Educational Technology in Higher Education*, *19*(1). https://doi.org/10.1186/s41239-022-00366-2

Fuentes-Vilugrón, G., Mansilla, E. A., Carrasco, I. B., Hernández, R. L., & Mella, E. R. (2023). Analysis of school educational spaces: A challenge for spatial relevance in contexts of sociocultural diversity. *International Journal of Multicultural Education*, *25*(1), 53–80. https://doi.org/10.18251/ijme.v25i1.3363

Gagne, R. M. (1970). *The conditions of learning* (2nd ed.). Holt, Reinehart & Winston Inc.

García, A. J., Froment, F. A., & Bohórquez, M. R. (2023). University teacher credibility as a strategy to motivate students. *Journal of New Approaches in Educational Research*, *12*(2), 292–306. https://doi.org/10.7821/naer.2023.7.1469

Giancoli, D. C. (2015). *Physics (Principles with applications)* (Global Edi). Pearson Education, Inc.

Harianingsih, H. H. (2018). Optimasi proses sintesis sitronelal dari sereh wangi (cymbopogon winterianus) dengan bantuan gelombang mikro menggunakan pelarut metanol dan n-heksan. *Eksergi*, *15*(1), 1. https://doi.org/10.31315/e.v15i1.2227

Kemdikbud. (2023). *MERDEKA BELAJAR eps 26: Transformasi standar nasional dan akreditasi pendidikan tinggi*. Kemdikbud.Go.Id. https://www.youtube.com/watch?v=vNTmG4OIQZ4&t=1730s

Ken, J. (2022). *Lemon Vs Lemongrass*. Daily Detox Hacks. https://dailydetoxhacks.com/lemon-vs-lemongrass/

Liang, J., Zhang, Y., Chi, P., Liu, H., Jing, Z., Cao, H., Du, Y., Zhao, Y., Qin, X., Zhang, W., & Kong, D. (2023). Essential oils: Chemical constituents, potential neuropharmacological effects and aromatherapy - A review. *Pharmacological Research - Modern Chinese Medicine*, *6*. https://doi.org/https://doi.org/10.1016/j.prmcm.2022.100210

Mezirow, J. (1991). *Tranformative dimensions of adult learning*. Jossey-Bass.

Mezirow, J. (1997). Transformative learning: Theory to practice. *New Directions for Adult and Continuing Education*, *1997*(74), 5–12. https://doi.org/10.1002/ace.7401

Mezirow, J., Cottafava, D., Cavaglià, G., Corazza, L., Raikou, N., Chu, S. Y., Garcia, S., Schnitzler, T., Pappamihiel, N. E., Moreno, M., Mensah, F. M., Vatalaro, A., Szente, J., Levin, J., Buechner, B., Dirkx, J., Konvisser, Z. D., Myers, D., Peleg-Baker, T., … Wikan, G. (2019). Culturally responsive teaching efficacy beliefs of in-service special education teachers. *Journal of Hispanic Higher Education*, *10*(2), 993–1013. https://doi.org/10.1108/IJSHE-05-2019-0168

Nambiar, V. S., & Matela, H. (2016). Potential functions of lemon grass (cymbopogon citratus) in health and disease. *International Journal of Pharmaceutical & Biological Archives*, *3*(5), 1035–1043.

NGSS. (2013). *Next generation science standards: For states, by states*. National Academies Press.

Noortyani, R. (2024). *Budaya Batimung*.

Noortyani, R., Mu, F., & Amelia, R. (2023). *Symbolic Communications in the Traditional Wedding Rituals of the Banjar Ethnic Community , Indonesia*. *10*(10), 154–178.

NSES. (1996). *National Committee on Science Education Standards and Assessment, National Research Council*. National Academies Press.

Pan, D., Machado, L., Bica, C. G., Machado, A. K., Steffani, J. A., & Cadoná, F. C. (2022). In vitro evaluation of antioxidant and anticancer activity of lemongrass (cymbopogon citratus (D.C.) Stapf). *Nutrition and Cancer*, *74*(4), 1474–1488.

https://doi.org/10.1080/01635581.2021.1952456

Petrucci, R. H., Harwood, W. S., Herring, G. F., & Madura, J. D. (2011). *Kimia dasar (prinsip-prinsip dan aplikasi modern)* (A. Safitri (ed.)). Erlangga.

Popova, M., & Jones, T. (2021). Chemistry instructors' intentions toward developing, teaching, and assessing student representational competence skills. *Chemistry Education Research and Practice*, *22*(3), 733–748. https://doi.org/10.1039/d0rp00329h

Rahman, A., Suharyat, Y., Ilwandri, I., Santosa, T. A., Sofianora, A., Gunawan, R. G., & Putra, R. (2023). Meta-analisis : Pengaruh Pendekatan stem berbasis etnosains terhadap kemampuan pemecahan masalah dan berpikir kreatif siswa. *Innovative: Journal Of Social Science Research*, *3*(2), 2111–2125. https://doi.org/10.31004/innovative.v3i2.545

Rahmawati, Y., Jakarta, U. N., & Sastrapraja, A. R. (2017). Empowering students ' chemistry learning : the integration of ethnochemistry in culturally responsive teaching empowering students ' chemistry learning : the integration of ethnochemistry. *Chemistry: Bulgarian Journal of Science Education*, *26*(813–830).

Rahmawati, Y., Ridwan, A., Faustine, S., & Mawarni, P. C. (2020). Pengembangan soft skills siswa melalui penerapan culturally responsive transformative teaching (crtt) dalam pembelajaran kimia. *Jurnal Penelitian Pendidikan IPA*, *6*(1). https://doi.org/10.29303/jppipa.v6i1.317

Rahmawati, Y., Ridwan, A., Rahman, A., & Kurniadewi, F. (2019). Chemistry students' identity empowerment through etnochemistry in culturally responsive transformative teaching (CRTT). *Journal of Physics: Conference Series*, *1156*(1). https://doi.org/10.1088/1742-6596/1156/1/012032

Rodriguez, J. M. G., Stricker, A. R., & Becker, N. M. (2020). Exploring the productive use of metonymy: Applying coordination class theory to investigate student conceptions of rate in relation to reaction coordinate diagrams. *Journal of Chemical Education*, *97*(8), 2065–2077. https://doi.org/10.1021/acs.jchemed.0c00496

Roth, W.-M. (2016). Becoming & Belonging. In L. Avraamidou (Ed.), *Studying science teacher identity: Theoritical, methodological and empirical exploration* (p. 295). Sense Publisher.

Saefuddin, S., & Maryadi, S. (2018). Dayak meratus di kalimantan selatan *batimung* healing tradition of the banjarese and dayak meratus community in south kalimantan. *Naditira Widya*, *12*(2), 147–158.

Sari, J. A., Wusnah, W., & Azhari, A. (2021). Pengaruh suhu dan waktu terhadap proses penyulingan minyak sereh wangi (Cimbopogon Nardus L.). *Chemical Engineering Journal Storage (CEJS)*, *1*(1), 22. https://doi.org/10.29103/cejs.v1i1.1493

Schwedler, S., & Kaldewey, M. (2020). Linking the submicroscopic and symbolic level in physical chemistry: How voluntary simulation-based learning activities foster first-year university students' conceptual understanding. *Chemistry Education Research and Practice*, *21*(4), 1132–1147. https://doi.org/10.1039/c9rp00211a

Setyaningsih, E., Agustina, P., Anif, S., Ahmad, C. N. C., Sofyan, I., Saputra, A., Salleh, W. N. W. M., Shodiq, D. E., Rahayu, S., & Hidayat, M. L. (2022). PBL-STEM modul feasibility test for preservice biology teacher. *Indonesian Journal on Learning and Advanced Education (IJOLAE)*, *4*(2), 118–127. https://doi.org/10.23917/ijolae.v4i2.15980

Suja, I. W., Redhana, I. W., & Sudria, I. B. N. (2020). Mental model of prospective teachers on structure and properties correlation of organic compounds. *Journal of Physics: Conference Series*, *1503*(1). https://doi.org/10.1088/1742-6596/1503/1/012034

Sukardi, Setyawan, H. Y., Pulungan, M. H., & Ariy, I. T. (2021). Ekstraksi minyak atsiri

rimpang lengkuas merah (Alpinia purpurata, K.Schum.) metode destilasi uap dan air. *Teknologi Pangan : Media Informasi Dan Komunikasi Ilmiah Teknologi Pertanian*, *13*(1), 19–28. https://doi.org/10.35891/tp.v13i1.2741

Susanto, D., Maulida, S., Karimah, R., & Fatmawati, N. (2024). Kearifan lokal kabupaten banjar. *Jurnal Manajemen Pendidikan*, *4*(1), 7–23. https://doi.org/10.31602/jmpd.v3i2.14079

Szczepankiewicz, A. (2021). Therapeutic effect and mechanisms of essential oils in mood disorders: interaction between the nervous and respiratory systems. *International Journal of MOlecular Sciences*, *22*(9), 4844. https://doi.org/https://doi.org/10.3390%2Fijms22094844

Taylor, S., & Sobel, D. (2011a). *Culturally responsive pedagogy: teaching like our students' lives matter*. Emerald Group Publishing LImited.

Taylor, S., & Sobel, D. (2011b). *Culturally responsive pedagogy: teaching like our students' lives matter*. Emerald Group Publishing Limited.

Trans7. (2018). *Bantimung, perawatan kecantikan khas suku banjar*. https://www.youtube.com/watch?v=_ZhlEJjBmMU

Trilling, B., & Fadel, C. (2009a). *21st century skill: learning for life in our times* (First (ed.)). Jossey-Bass.

Trilling, B., & Fadel, C. (2009b). *21st century skills: learning for life in our times*. Jossey-Bass.

van Berkel, B., Pilot, A., & Bulte, A. M. W. (2009). Micro–macro thinking in chemical education: why and how to escape. In J. Gilbert K & D. Treagust (Eds.), *Multiple Representations in Chemical Education, Models and Modeling in Science Education* (pp. 31–54). Springer. https://doi.org/10.1007/978-1-4020-8872-8_3

Wikipedia. (2024a). *Kalimantan Selatan*. Wikipedia. https://id.wikipedia.org/wiki/Kalimantan_Selatan

Wikipedia. (2024b). *Sereh Wangi*. Wikipedia. https://id.wikipedia.org/wiki/Serai_wangi

Winarti, A., Almubarak, A., Saadi, P., Ijirana, I., Aminah, S., & Ratman, R. (2022). Culturally responsive chemistry teaching (crct) of college students as a novice teacher: does it matter? *JTK (Jurnal Tadris Kimiya)*, *7*(2), 175–189. https://doi.org/10.15575/jtk.v7i1.20676

Yager, R. (1996). *Science/technology/society: As reform in science education*. State University of New York Press.

Yamaguchi, Y., & Atsuta, K. (2013). Isolasi dan identifikasi minyak atsiri dari minyak cengkeh. *Isolasi Dan Identifikasi Minyak Atsiri Dari Minyak Cengkeh*, *84*, 487–492. http://ir.obihiro.ac.jp/dspace/handle/10322/3933