

Development of the Acid-Base Microblogs Based on Malay Ethnochemistry to Preserve Culture

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Abstract: Perceiving culture in the globalization era is challenge for the Malay community. The best way to solve it is to integrate ethnochemistry into chemistry learning at the school. The research aims to develop acid-base microblogs based on the ethnochemistry of the Malay community. Three Stages Research and Development (TSRD) model was conducted in this study which consists of 3 steps: planning, development, and dissemination. The subjects of this research were the students of XI MIPA class at SMAN 11 Pontianak, SMA Muhammadiyah 1 Pontianak, and MAN 3 Pontianak. The validity assessment and response sheet were used to collect data in this study. The results of the acid-base microblogs based on the ethnochemistry of Malay culture obtained 0.85 of validity from the expert judgment in the very high category. An excellent response was given by the student to the microblog, with a percentage of 82.28%. Based on the study results, the ethnochemistry microblogs have been declared very valid to arouse preserving culture.

Keywords: Etnochemistry; Malay; Microblog; Preserveing culture; TSRD Development

Introduction

West Borneo, one of the provinces in Borneo Island, is inhabited by the three largest tribes, one of which is the Malay tribe. Preserving traditions such as Nikah Kawin, Tepuk Tepung Tawar, and Berkapur Sirih is challenging for the Malay community. The integrating Malay practices in chemistry learning, such as ethnochemistry, is the best effort that can be made for cultural successors.

Ethnochemistry is the knowledge based on local culture in everyday life viewed from the chemistry perspective (Asda, 2023; Singh & Chibuye, 2016). There have been ethnochemistry studies to identify the medicinal plants used by the people in Samadua, South Aceh (Gani et al., 2022) and Kalimantan (Maharani & Fernandes, 2021). The identification of local culture as a source of chemistry learning from the Baduy community in Banten (Nursaadah et al., 2017), Javanese in Bantul (Azizah & Premono, 2021), and Sasak in Lombok (Efendi & Muliadi, 2023; Wahyudiati & Fitriani, 2021) were utilized ethnochemistry approach. The collaboration

skills, responsibility, curiosity, social awareness, creativity, empathy, communication, self-confidence, love of the motherland, social and cultural awareness, leadership, environmental care, and scientific literacy of students can be improved by learning based on etnochemistry (Heliawati et al., 2022; Y. Rahmawati et al., 2017) Although a lot of chemistry learning was integrated by ethnochemistry, the references have yet to be found for integrating the Malay tradition into resources of chemistry studying.

Based on the interviews with chemistry teachers at SMA N 11 Pontianak, SMA Muhammadiyah 1 Pontianak, and MAN 3 Pontianak, the etnochemistry has yet to be applied in chemistry learning. Teaching a lot of content in a limited time, the teacher only used student worksheet, power point (ppt), and downloaded videos from previous years. As confirmed by the information from the students, the teachers had not associated with local content such as Malay tradition in studying chemistry. In addition, the students have only known Robo-robo, Meriam Karbit, Corak Insang, and

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Seprahan. The learning resources were utilized by the students only obtained from the teacher.

According to the Association of Indonesian Internet Service Providers (APJII) report, the Internet is a potential learning resource based on almost 70% of the users from Indonesia's population in 2021. Over 50% of internet users accessed Instagram 17 hours per month or 34.2 minutes daily. The microblog, one of the contents on Instagram, had utilized as a learning resource on cell material for the students in XI MIPA class at MAN 3 Jember with 92-96% validity and 89% practicality (I. P. Rahmawati et al., 2023; Veygid, 2021). The teacher who used microblogs to teach succeeded in making the students interested in learning of Arabic language, causing creative and innovative visual design (Tolinggi, 2021). The literature search has not found the research utilizing microblogs as studying resources based on ethnochemistry.

The limitation of the ethnochemistry integration in studying chemistry makes this research necessary. As the tradition saver, the students must understand and conserve the preservation of their ancestral culture. Instagram, one of the favorite social media of the students, can be utilized as a chemistry learning resource based on ethnochemistry. Through this learning resource, the students will be inspired to preserve the Malay culture.

Method

This research utilizes the Research and Development with Three Stages Research and Development (TSRD) model. The TSRD includes planning, development, and dissemination steps followed Anggraeni (2021), Citra (2021), Riza et al. (2020) and Tsuroyya et al. (2022) researchs. The planning stage consists of needs analysis, material analysis, and design development. The development stage comprises prototyping, participant rechecking, expert rechecking (material, media, and language), product development, and limited test. The dissemination stage is done by posting on Instagram, registering a HaKi certificate, and publishing an article in a scientific journal.

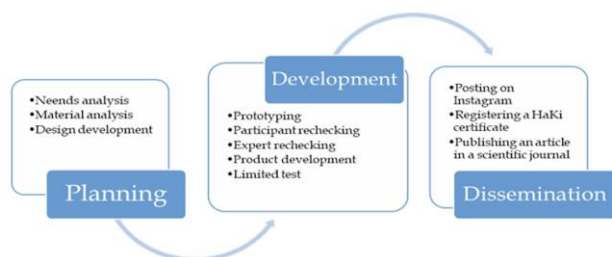


Figure 1. TSRD development model scheme

The interviews and indirect communication techniques were used in this study to collect the data. Interviews were conducted with the teachers and the students in XI MIPA class at SMAN 11 Pontianak, SMA Muhammadiyah 1 Pontianak, and MAN 3 Pontianak. Using a Likert scale with alternative answers of 4 categories, very inappropriate (STS), not suitable (TS), matching (S), and very matching (SS), the questionnaires were prepared for indirect communication technique (Riduwan, 2011).

The ethnochemistry microblogs were validated by six validators, two validators each for material, media, and language. Based on Table 1, the closer the Aiken index value is to 1, the better the item is because more relevant to the indicator (Retnawati, 2016). The ethnochemistry microblogs can be used as a learning resource if the value of the correlation coefficient is over 0.61.

Table 1. Validity Criteria (Aiken, 1985)

Correlation coefficient	Validity criteria
0.81 - 1.00	Very high
0.61 - 0.80	High
0.41 - 0.60	Enough
0.21 - 0.40	Low
0.00 - 0.20	Very low

$$V = \frac{\sum s}{n(c-1)} \quad (1)$$

Inf:

V = Index of expert consent regarding item validation

$\sum s$ = s1 + s2 + dst

C = Highest validation rating score

N = Multiple experts/validators (Ningsih & Kamaludin, 2023)

After the students were responsible for the ethnochemistry microblogs, the answers were recapitulated and analyzed to obtain the passion for preserving culture. The value was calculated by equation II and categorized by Table 2. The ethnochemistry microblog can be inspired the students to preserve the Malay tradition if the value is given above 60% (Mawarnis et al., 2023; Wicaksono, 2019).

$$\text{Total value} = \frac{\sum \text{response value}}{\text{maximum score}} \times 100\% \quad (2)$$

Table 2. Student Response Criteria

Intervals (%)	Criteria
81-100	Very good
61-80	Good
41-60	Pretty good
21-40	Not good
0-20	Very not good

Result and Discussion

Planning

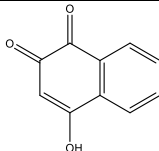
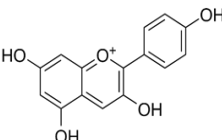
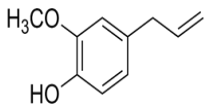
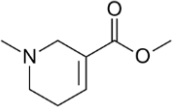
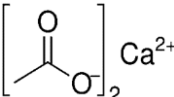
The needs analysis, the first step in the planning stage, was conducted by interviewing the chemistry teachers and students in the XI MIPA class at SMAN 11 Pontianak, SMA Muhammadiyah 1 Pontianak, and MAN 3 Pontianak. The power point (PPT), learning videos, worksheets (LKPD) were the chemistry studying resources that teachers utilized. Because the teachers only had two hours to teach chemistry in one meeting by a week, the preparation of the learning resources based on the local content could not be done. According to the government regulation of number 20 of 2003 clause 36 Act 3 about the national education system, local wisdom, including tradition, must be integrated into the learning. However, there needs to be integrated tradition in the learning resource of chemistry. Following the debriefing with chemistry teachers, the students have never received understanding combined with practice. The students expected the study resources using social

media such as Instagram because they accessed it for seven hours daily.

Besides the interview in school, the need analysis was performed through the interview with the royal family of the Kesultanan Kadriyah. Based on the interview result, the Malay tribe is one of the largest tribes in West Kalimantan Province. Nikah Kawin (Berinai), Tepuk Tepung Tawar, and Berkapur Sirih (Bersirih Pinang) are the abandoned tradition because of the practicality of the replacement material such as henna. To cover the continuity of the Malay culture, he conveyed the necessity to transfer knowledge to young people as the continuer of the tradition.

According to the interview results, Nikah Kawin (Berinai), Tepuk Tepung Tawar, and Berkapur Sirih tradition were focused on this research. The etnochemistry from Malay tradition was reviewed using local contents such as Daun Pacar, Bunga Mawar, Daun Sirih, Buah Pinang, and Kapuk. The material analysis, which explored the ingredients in Malay tradition, resulted from the theory, classification, and acid-base indicator presented in Table 3.

Table 3. Material Analysis

Malay Culture	Material	Acid-Base	Compound	Reason
Nikah Kawin (Berinai)	Daun Pacar (<i>Lawsonia inermis</i>)	Acid-Base Indicator		Containing lawson or 2-Hydroxy-1,4 naphthoquinone is caused the red color (Fouda et al., 2019; Lahsmin, 2016; Setiana & Singke, 2015; Tuan et al., 2022).
Tepuk Tepung Tawar	Bunga Mawar (<i>Rosa hybrid</i>)	Acid-Base Indicator		The red colour is caused pelargonidin (Hwang et al., 2022; Wulandari, 2014).
Berkapur Sirih	Daun Sirih (<i>Piper battle</i>)	Acid		Eugenol is phenolic compound which is classified in weakly acid. If dissolved in water, the hydroxyl group is resulted H ⁺ (Fatimah et al., 2022; Murflihah & Prabowo, 2017)
	Buah Pinang (<i>Areca catechu</i>)	Base		Containing nitrogen atom, arecoline is categorized base because of the electrons pair can provide it to the acid (Murwani et al., 2022; Novianti, n.d.)
	Kapuk (<i>Calcium hidroksida</i>)	Base		Based on the Arrhenius theory, Ca(OH) ₂ is the strong base because of resulted OH ⁻ in water (Nurnabila, 2011; Trisnawati et al., 2019)

In the design development step, the indicators were based on the basic competencies (KD) of acid-base in the Senior High School stage, according to the regulation of the Minister of Education and Culture of 2016, number 24. The design developments were composed in a structured and systematic way to facilitate the development process. The etnochemistry microblogs

were illustrated by an outline draft resulting from this process.

Development

Preparing materials for acid-base and Malay culture in Pontianak sourced from chemistry books and related journals were the first two steps in making the

prototypes in the development stage. Searching the relationship between acid-base and Malay tradition in Pontianak, drafting the drawing illustration from the literature, and making of ethnochemistry microblog by Canva were the following stages. The appearance of ethnochemistry microblog can be accessed on the following link

https://docs.google.com/forms/d/e/1FAIpQLSdb9g9Uq1VxEtfZAb6q8TaLaJy46VymO2zUIDUajRUUgZlJyw/viewform?usp=share_link.

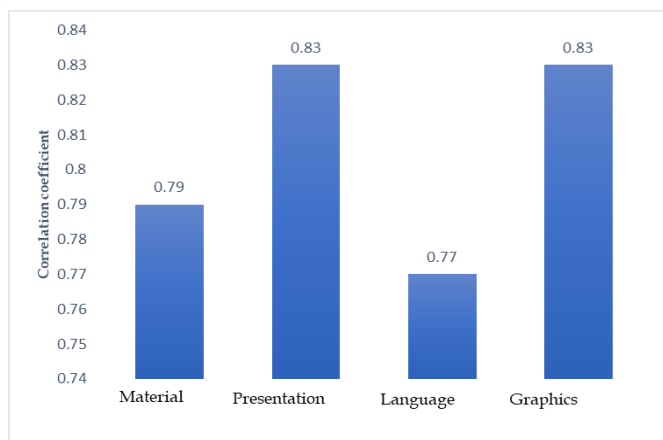


Figure 2. Participant recheck results

Three chemistry teachers in XI MIPA class at SMA N 11 Pontianak, SMA Muhammadiyah 1 Pontianak, and MAN 3 Pontianak participated in rechecking the ethnochemistry microblogs. Assessed the advisability aspects of content, presentation, language, and graphic, the average value of ethnochemistry microblogs were 0.80 with high criteria, presented in Figure 2. The teacher suggested harmonizing the writing and background color to make ethnochemistry microblogs more interesting.

Table 4. Validation Results

Aspect	Indicator	Results	Criteria
Material	Support educational goals	0.91	Very high
	Material truth	1.00	Very high
	Material coverage	1.00	Very high
	Stimulating curiosity	0.91	Very high
	Serving systematics	0.91	Very high
Image presentation	The appropriateness between image proportions and exposure language	0.83	Very high
	Clarity of pictures and illustrations	0.75	High
	Provisions in the use of images	0.77	High
Graphics	Microblog cover section	0.75	High
	Content section	0.88	Very high
	According to the level of development of students	0.83	Very high
Language and legibility	Writing criteria	0.83	Very high
	Conformity with the rules of the Indonesian language	0.83	Very high
	Use of terms and symbols	0.83	Very high

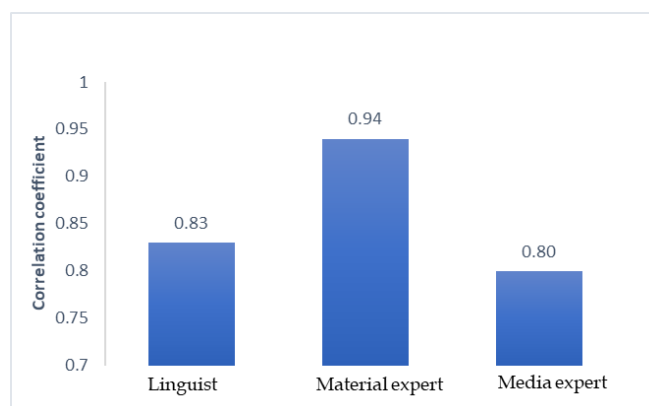



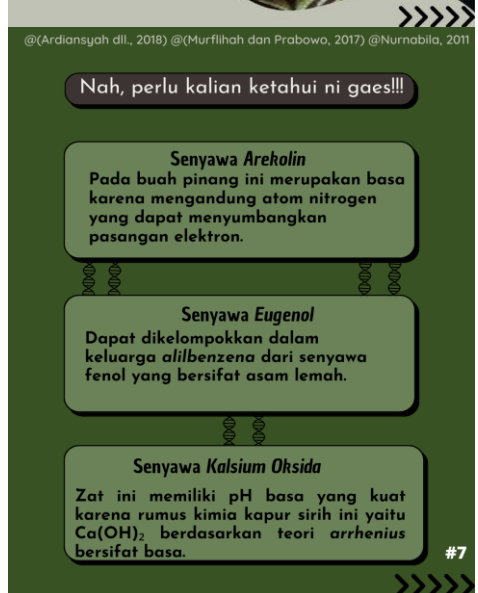
Figure 3. The validation results of material, media, and language experts

The rechecking of material, media, and language experts from six lecturers in Chemistry Education and Informatics Engineering of Universitas Muhammadiyah Pontianak and Sekolah Tinggi Agama Islam Al Ma'arif Sintang has been done by the ethnochemistry microblogs validating. Table 4 and Figure 3 show that the experts gave 0.85 with high content, image presentation, graphics, language, and readability criteria. The improvements were performed by repairing ethnochemistry microblogs based on the expert's suggestions in Table 5.

After the ethnochemistry microblog development step based on the expert suggestions finished, the limited trial was conducted for 90 students from class XI MIPA at SMAN 11 Pontianak, SMA Muhammadiyah 1 Pontianak, and MAN 3 Pontianak. The responses were given by students based on the usefulness, easiness, satisfaction, and appearance aspects of preserving tradition. Table 6 and Figure 4 shows that the students reacted very well to the ethnochemistry microblog, with an average value of 80.22 percent.

Table 5. The Improvements Based on the Validator Sugentions

Indicator	The Correction	The Improvements
Clarity of pictures and illustrations	References/citations may need to be added.	 <p>Tanaman pacar kuku (<i>lawsonia inermis L.</i>) memiliki banyak kandungan senyawa seperti <i>lawsone</i> yang merupakan senyawa pigmen atau penyebab warna. Senyawa lawson tersebut merupakan senyawa fenol yang dapat memberikan warna yang baik</p> <p>Daun pacar kuku dikenal sebagai tanaman yang memiliki zat warna alami karena daunnya dapat digunakan sebagai pewarna hitam sampai merah baik pada kuku, rambut, jari, tangan untuk memperindah penampilan dan juga dipakai dalam industri tekstil</p> <p>#8</p> <p>@jurnal KTI</p>
Provisions in the use of images	The image size is proportional, but the background is relatively bright, or there is a gradient.	 <p>Salah satu bahan yang digunakan pada tradisi tepuk tepung tawar ini yang dapat di jadikan indikator alami yaitu bunga mawar</p> <p>Bunga mawar mempunyai nama ilmiah <i>Rosa hybrid</i> yang mengandung senyawa <i>pelargonidin</i>. Senyawa <i>pelargonidin</i> adalah senyawa <i>antosianin</i>, yang merupakan jenis pigmen tanaman yang bertanggung jawab atas rona warna oranye-merah.</p> <p>#6</p> <p>(Ifadah dll., 2021)</p>
Cover section	Homogeneous, bold, italic, and underlined letters are not found for important information/material.	 <p>Pembelajaran Kimia Asam Basa Berbasis Etnokimia</p> <p><i>Tradisi Berkapur Sirih (Bersirih Pinang)</i></p> <p>#1</p>

Indicator	The Correction	The Improvements
Content section	Maybe the front cover needs to be added to image number 9	
Writing criteria	Distinguish the title font size, sub-headings, and contents of student response results.	

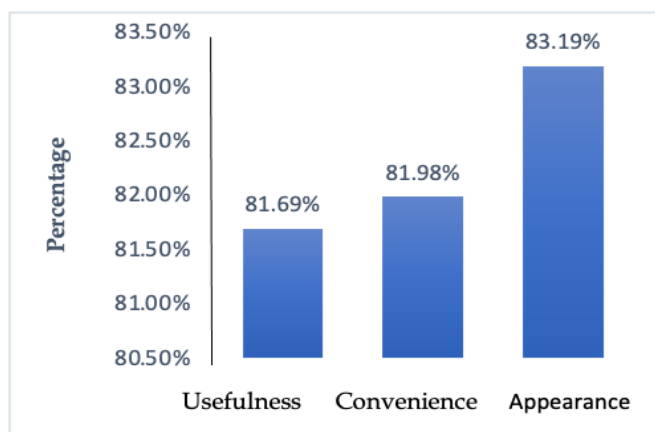


Figure 4. Student response results

The students assumed ethochemistry microblogs were interesting, with a percentage above 90, including perfect criteria. The balancing of fonts, colors, illustrations/pictures can be contributed an exciting and

aesthetic impression so that it is quickly captured by the eye (Iswandi, 2018). According to students' positive responses, the reading interest may be improved by the digital learning resources (Ruddamayanti, 2019), including ethochemistry microblogs.

The understanding, love, and curiosity of the culture of the students can be stimulated by the ethochemistry microblog. According to research (Nuralita, 2020), implementing local culture into chemistry learning can increase students' love for conserving tradition in every region of Indonesia. Containing the character education values, ethochemistry microblogs were following Kebijakan Nasional Pembangunan Karakter Bangsa Tahun 2010-2025. Not only can it be conveyed by the learning in the classroom, but character education can also be transferred by integrating it into studying resources (Purwanti, 2017).

Table 6. Results of the Enthusiasm of Preserving Student Culture Questionnaire

Aspect	Indicator	Grading item	Results (%)	Criteria
Usefulness	Cultural insight	The developed media can add insight into local culture	94.50	Very good
		Ethnochemical-based microblogging media makes me love culture more	95.70	Very good
	Cultural love	Ethnochemical-based microblog learning media fosters a sense of curiosity about local culture	94.00	Very good
		application	I can easily use ethnochemistry-based microblogging learning media	93.30
Convenience	access	Ethnochemical-based microblogging learning media can be used anywhere and anytime	93.50	Very good
		I can easily access the application to display the microblog	94.40	Very good
	Foster	After using microblog media based on ethnochemical, chemistry learning becomes more interesting	94.10	Very good
Appearance	enthusiasm	After using ethnochemistry-based microblog learning media, I am more enthusiastic about learning	93.60	Very good
		Interest	Interesting description of pictures and writing	94.80
		The appearance of the ethnochemistry-based microblog is exciting	91.10	Very good
		The writing used is easy to read	94.40	Very good

This microblog also contains material that can increase students' love for Pontianak's local culture. Students think reading this microblog increases curiosity, prefer to read, and become concerned about their environment. This microblog shows the educational values of love for the motherland, curiosity, love to read and care for the environment (Ministry of National Education, 2011).

Ethnochemical learning media can motivate students to learn and understand more about local culture, especially the Malay ethnicity found in the environment. Furthermore, increasing students' love for their homeland and the development of the times cannot destroy the existing culture. According to Nuralita's research (2020), implementing local culture into ethnochemical learning can increase students' love for local culture in every region of the Indonesian nation.

Disseminate

This stage was carried out by the posting of ethnochemistry microblogs on the author's Instagram account @utindian_a and tagging the lecturers of Chemistry Education of Universitas Muhammadiyah Pontianak, chemistry teacher and leader of XI MIPA class at SMA N 11 Pontianak, SMA Muhammadiyah 1 Pontianak and MAN 3 Pontianak. The Instagram posts can be accessed at <https://www.instagram.com/p/Cs1ENYbR16p/?igshid=MzRIODBiNWFIZA>, <https://www.instagram.com/p/Ctc9BUByHN3/?igshid=MzRIODBiNWFIZA> and https://www.instagram.com/p/Ctc9hX_yBj9/?igshid=MzRIODBiNWFIZA. All ethnochemistry microblogs have been registered at the Ministry of Law and Human Rights and certified with numbers 000474488, 000478254, and 00047853 publishing a scientific article in

the journal is the final step in disseminating ethnochemistry microblogs results.

Conclusion

Based on the result and discussion of the research, the ethnochemistry microblogs which Three Stages Research and Development (TSRD) model developed are valid by the judgment of material, media, and language experts. The ethnochemistry microblogs may stimulate the knowledge and enthusiasm for preserving the culture of the students. The students can access the ethnochemistry microblogs and appropriate learning resources for studying acid-base.

Authors Contributions

U.D.A, observations, conducting research, data collection and analysis; D.H, concepts, ideas, and writing-original draft preparation; R.F, methodology, validation, and procejt administration. All authors have read and agreed to the published version of the manuscript.

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Conflicts Interest

The authors declare no conflict of interest.

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