Preliminary Study of Providing Innovative Chemistry Learning Modules Based on Ethnopedagogy

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Abstract. Ethnopedagogy is ethnic-based learning, both used as a learning resource and learning media. According to regulation of Minister of Education and Culture Number 79 of 2014 year, learning in schools needs to include elements of local content in the form of basic competencies, syllabi and textbooks. This research aims to develop chemistry teaching materials based on local wisdom in the form of the natural, social, cultural and spiritual environment in the region. To achieve the goal, research was carried out on the development of a 4-D model with the stages of define, design, develop and disseminate. From the define stage, (1). Several local wisdoms in North Sumatra and Aceh have been identified which can be used to enrich teaching materials and chemistry learning strategies. Some of these typical plants are Haramonting (Rhodomyrtus tomentosa), Betel (Piper betle), Bangun-bangun (Coleus amboinicus), Frankincense (Styrax paralleloneurus PERK) and so on which can be used to teach several chemistry topics such as Acid and Base Solutions, Organic Chemistry. (2). The tradition of eating betel mixed with lime as part of the culture of several ethnic groups can be used to explain the variety of plants that can be used as natural indicators in Solution Chemistry teaching materials. (3). Frankincense that is burned produce a fragrant aroma can be used as additional teaching material for Organic Chemistry and Biochemistry regarding the existence of several organic compounds that can be obtained through relevant isolation methods. (4). The high school chemistry teaching materials currently used are considered appropriate according to the standards set by the National Education Standards Agency, BSNP, but need to be enriched according to the local wisdom of each region or ethnicity where the school is located.

Keywords: Ethnopedagogy, chemistry module, development.

1 Introduction

Ethnopedagogy is an ethnic-based learning model, both used as a learning resource and learning media. Ethnopedagogy is reflected in the inclusion of local wisdom in teaching

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teaching material. Ethnopedagogy is also the actualization of learning that is oriented towards instilling local wisdom values [1}. In an effort to improve learning outcomes, teachers always strive to look for innovation and creation, especially for topics that are difficult for students to understand. Likewise, for teaching chemistry, to improve learning outcomes, various efforts have been made through the application of research into learning

The application of the Ethnoscience-Based Chemistry Learning Model (MPKBE) can improve cognitive and critical thinking abilities because the learning model links classroom learning with what students encounter in everyday life and also encourages students to play an active role in the learning process. The application of ethnoscience in learning varies greatly depending on the environment in which a person lives. Therefore, educators who will apply ethnoscience in the classroom need to understand their respective local knowledge [2]. The application of guided inquiry model teaching materials integrated with local wisdom based on outcome based education through the use of online media has an effect on students' scientific literacy. The conclusion of this research shows that the application of guided inquiry model teaching materials integrated with local wisdom based on outcome based education through the use of online media has an effect on students' scientific literacy [3].

Chemistry is a science that is developing very rapidly along with technological developments and its application in everyday life. Chemistry lessons given at SMA/MA aim to ensure that students have the ability to understand chemical concepts, principles, laws and theories as well as their interrelationships and applications to solve problems in everyday life and technology. In chemistry, most of its concepts are abstract and require a high level of reasoning to understand them. Apart from that, chemical concepts also tend to be interconnected with each other, making it difficult for some students to understand [4, 5].

Based on data obtained from summative learning results, final school exams, college entrance selection, even mid-semester and final exam data for General Chemistry and other chemistry courses at Unimed, high school and university students still have many problems in understanding chemistry. Preliminary studies that have been carried out at several high schools/vocational schools in North Sumatra and Aceh in 2023, both for internship/PLP students, indicated that chemistry learning outcomes (cognitive, affective and psychomotor) were still low. Sometimes cognitive learning outcomes are high, but affective and psychomotor outcomes are still low [6, 7].

Regarding efforts to develop Android-based chemistry learning media, several studies have been carried out, including: Isma RL in 2015 concerning the development of Android-based chemistry learning media to increase learning motivation and cognitive achievement of high school students. Likewise, Situmorang, M has developed and implemented innovative project-based chemistry learning media to improve student performance [7, 8].

On the other hand, Indonesia is very famous for its various cultures and ethnicities, endemic plants and animals which are thought to produce biomolecules which are often used in ritual ceremonies, customs and culture, as local wisdom. Referring to Minister of Education and Culture Regulation No. 79 of 2014 Article 2 paragraph 2, that local content as referred to in paragraph (1) is taught with the aim of equipping students with the attitudes, knowledge and skills needed to: a. know and love the natural, social, cultural and spiritual environment in their area; and b. preserving and developing regional excellence and wisdom that is useful for oneself and the environment in order to support national development. Based on the

description above, this research was designed to explore the potential of local wisdom in high school chemistry teaching materials. This article is part of research, so to understand further what local wisdom is integrated in the chemistry module, you can see the related publication.

2 Method

To achieve the objectives, development research has been carried out using the 4-D research method, namely Define, Design, Develop and Disseminate {4,5]. The research results reported were obtained from the Define stage, which is also called needs analysis. Research activities are focused on finding data with local wisdom that has the potential to be used to enrich chemistry teaching materials (modules). Data sources were obtained from the community, village elders, schools in the North Sumatra Province and Aceh Province. Non-test instruments include open-ended interview sheets, questionnaires and observation sheets. Other data sources are related research articles published in journals. The data was analyzed descriptively and oriented to the potential of local wisdom in chemistry learning.

3 Result and Discussion

Based on data obtained from literature studies and surveys in several places with different ethnicities in North Sumatra Province and Aceh Province, it is known that there are various plants that are efficacious and can be used to enrich ethnopedagogy-based chemistry teaching materials.

3.1 Analysis of the Potential of Local Wisdom in Chemistry Learning

It has been previously mentioned that the Provinces of North Sumatra and Aceh are very rich in local wisdom which can be used in teaching chemistry through a contextual approach. Local wisdom is meant in the form of ethnic wealth, such as endemic plants that are typical in several regions, traditions or culture related to customs in traditional ceremonies, even related to beliefs in a particular area. For this purpose, researchers have carried out observations in several areas and also studied literature related to local wisdom.

3.1.1 Betel plants and the tradition of eating betel

Several local wisdoms in North Sumatra and Aceh have been identified which can be used to enrich teaching materials and learning strategies for chemistry. Betel (Piper betle), is an endemic plant that can be found growing abundantly in the Bukit Barisan Mountains region which stretches from North Sumatra Province and Aceh Province. Based on observations and interviews with several residents in several districts/cities such as Medan City, Humbang Hasundutan, Karo, Simalungun and Gayo Lues Regency in Aceh.

A

B

Fig. 1. Components of the traditional ritual of eating betel as local wisdom

In Figure 1, it can be shown that in the ritual of eating betel leaves as local wisdom, betel leaves are mixed with betel lime and then squirted in the mouth to produce a red liquid which is believed to increase stamina and maintain oral and dental health. Mothers in Karo Regency even mix betel leaves. , betel lime, tobacco and areca nut called "marsukkil". The tradition of eating betel leaves mixed with lime is also part of traditional ceremonies and even cultural rituals in several ethnic groups. The same thing is also found in the Papua region, only that what is generally used is not betel leaves but betel flowers. The belief that consuming Betel has the potential to maintain health, as conveyed by respondents as local wisdom, is strengthened by research results. The research results show that the betel plant (Piper betle L) has various benefits which can be used as antihypertension, antibacterial, antidyslipidemia, antioxidant, antiseptic, wound healing because there are secondary metabolite compounds which have medicinal effects and are mostly found in the leaves.

Local wisdom about eating betel can explain acid, base and salt solutions. Betel leaves can be used as a natural indicator to show acidic and alkaline properties by changing color from green to red in alkaline conditions. The color will become darker black if mixed with tobacco, which means there is the possibility of more than one path of change in the pH of betel extract in an alkaline environment. Meanwhile, the chemical content of betel leaves is efficacious as antihypertensive, antibacterial, antidyslipidemia, antioxidant, antiseptic, wound healing because it contains secondary metabolite compounds which have medicinal effects, can be used to enrich the root ingredients of Natural Materials, Biochemistry, Chemical Sciences. In everyday life.

The results of other studies also state that red betel leaves have antiseptic and antibacterial effects, according to There is a significant difference in the healing of perineal wounds in postpartum mothers who were intervened with 15% red betel leaf gel and 10% Povidone Iodine ointment. Perineal wounds that were intervened with red betel gel healed 15% faster as seen based on drying and tissue fusion [10, 11, 12].

3.1.2 Bangunbangun plant and its benefits for women who have just given after birth

Bangun-Bangun (Coleus amboinicus), or Cumin is also an endemic plant in the North Sumatra region. Based on the results of studies in several ethnicities and regions, consuming a decoction of wake-bang leaves is believed to improve health, especially for mothers who are

breastfeeding. This is in line with research results that wake-bangun leaves can increase the production of breast milk (ASI) and have high nutritional content, especially iron and carotene. Consuming wake-bang leaves has a significant effect on increasing the levels of several minerals such as: iron, potassium, zinc and magnesium in breast milk and can result in a significant increase in the baby's weight. According to the tradition of the Batak people in North Sumatra Province, wake-bangun leaves are believed to be able to increase breast milk production. 4 hours after administration of torbangun leaves will increase breast milk volume by 47.4% [9].

A B

Figure 2. Bangunbangun plant and the tradition of eating its vegetables for women after giving birth

In Figure 2 we can see the Bangunbangun plant)A) and its vegetables which are usually consumed by women who have just after giving birth. Long before research on the chemical content of this plant, the Toba Batak people believed that women who had just given birth who were given the Bangun Bangun vegetable could increase the nutrition of their milk. During a thanksgiving ceremony for the birth of a baby, guests are treated to eating this vegetable. Literature stating that the benefits of Bangun Bangun have an effect on increasing the levels of several minerals such as: iron, potassium, zinc and magnesium, can be used to enrich inorganic chemistry teaching materials, vitamin and mineral teaching materials, nutritional/food biochemistry. The green color of Bangun Wake extract turned yellowish after the vegetables were given coconut milk and tomatoes, showing that Bangun Wake leaf extract can be used as a natural indicator of acid-base materials.

3.1.3 Frankincense plant (Styrax paralleloneurus) and the ritual of burning Frankincense

Frankincense (Styrax paralleloneurus) is also an endemic plant in several districts in North Sumatra. Burned Frankincense produces an aroma indicating that Frankincense contains several organic compounds that smell good and can be obtained through relevant isolation methods. In the time of Rasulullah SAW, burning incense was something that already existed

and was done by the companions and tabi'in with the aim of scenting a room or fighting the unpleasant odor of an object or place.

A B C

Fig. 3. Frankincense plant, Frankincense sap and the ritual of burning Frankincense

In Figure 3 it can be seen that Frankincense is a hardy plant (A0, the sap is white which sticks to the bark when tapped (B). Traditionally, the burning ritual of Frankincense (C) is used as a mixture of incense in Toba Batak rituals and even Kejawen is believed to be able to act as a The fragrant smell of burning Frankincense incense indicates that this material contains various chemicals or all chemicals that smell good (aromatic). There are secondary metabolites as toxic and non-toxic substances that function as antioxidants and antibacterials, such as alkaloids, flavonoids, safonins, steroids, terpenoids and tannins [13]. Organic, Biochemistry, Analytical and Separation Chemistry

3.2 Feasibility Analysis of Teaching Materials used in Schools

An initial analysis of the need for teaching materials has been carried out at Kuta Panjang State High School, Gayo Lues Regency, Aceh Province. The reason for choosing this school is the local wisdom and religious nature of the people here. Analysis of the teaching materials used by the school uses an assessment instrument in the form of a BSNP questionnaire. The teaching materials analyzed were 1 (one) class XI chemistry textbook used by the school. The results of the feasibility analysis of chemistry teaching materials for SMA Class XI MIPA students can be seen in Figure 4.1. The teaching materials used are chemistry books for SMA/MA class XI students in the mathematics and natural sciences specialization group.

Based on the picture of the initial analysis results, the suitability of the teaching materials used by the school is quite good and meets BSNP standards. It can be seen from the content feasibility score obtained at 3.30 (feasible), language feasibility obtained at 3.87 (decent), presentation feasibility obtained at 3, 82 (feasible), and graphical feasibility obtained 3.56 (feasible). However, there are several things that need to be considered and developed. Based on the results of the analysis, a development plan can be summarized and designed, which can be seen in Figure 4.

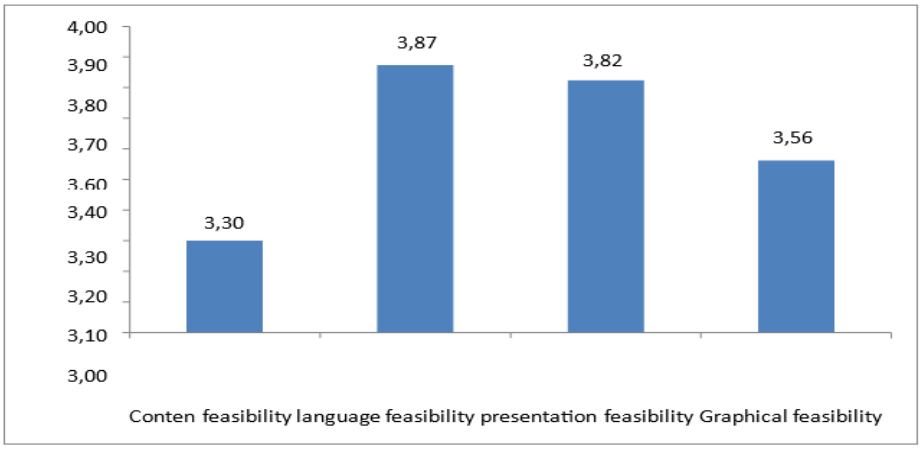

Fig. 4. Graph of feasibilities analysis of teaching materials currently used in schools based on BSNP eligibility criteria

Based on an analysis of the high school chemistry teaching materials currently used in schools, it is considered appropriate to refer to the standards set by the National Education Standards Agency, BSNP, but needs to be enriched according to the local wisdom possessed by each region or ethnicity.

4 Conclusion

Based on explanation before, the are 4 conclution, those are :

1) Several local wisdoms in North Sumatra and Aceh have been identified which can be used to enrich teaching materials and chemistry learning strategies. Some of these typical plants are Haramonting (Rhodomyrtus tomentosa), Betel (Piper betle), Bangun-bangun (Coleus amboinicus), Frankincense (Styrax paralleloneurus PERK) and so on which can be used to teach several chemistry topics such as Acid and Base Solutions, Organic Chemistry.
2) The tradition of eating betel mixed with lime as part of the culture of several ethnic groups can be used to explain the variety of plants that can be used as natural indicators in Solution Chemistry teaching materials.
3) Frankincense that is burned produce a fragrant aroma can be used as additional teaching material for Organic Chemistry and Biochemistry regarding the existence of several organic compounds that can be obtained through relevant isolation methods.
4) The high school chemistry teaching materials currently used are considered appropriate according to the standards set by the National Education Standards Agency, BSNP, but need to be enriched according to the local wisdom of each region or ethnicity where the school is located

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