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Ethnopedagogy Of Innovative Acid Base Book Based On Problem Based Learning Integrated Dekke Naniura The Local Wisdom Of Batak Toba

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Abstract
Indonesia, particularly North Sumatra Province, is rich in local wisdom, including traditional cuisine, customs and culture, and unique plants, but these have not been widely used to enrich chemistry teaching materials. This study aims to develop an electronic textbook for Acid-Base Chemistry based on Problem-Based Learning, PBL, and integrated learning. Dekke Naniura, a typical Batak Toba dish. To achieve the objectives, a development research was conducted referring to the 4D stages, namely define, design, develop and disseminate. The research location was carried out in several high schools in North Sumatra Province, using non-test instruments in the form of questionnaires, interview sheets and observation sheets, then the data was analyzed descriptively. The results of the study showed that (1). Respondents stated that they really need chemistry teaching materials enriched by local wisdom so that students can see that chemistry is close to the surrounding environment. (2) An innovative electronic textbook of Acid Base Chemistry based on PBL and integrated with local Batak Toba wisdom has been obtained. Dekke Naniurawhich contains features of chemical and ethnopedagogical aspects. (3). The innovative textbook that was compiled was considered very suitable because it had fulfilled the BNSP criteria regarding curriculum content coverage of more than 90.64% and learning media coverage of 88.06%. (4). From the results of the dissemination of readiness for use, the average response from Chemistry Teachers was 96.67% and from students 91.38%, which means that the innovative Acid Base textbook is based on PBL and integrates local wisdom of the Toba Batak. Dekke Naniurais ready to be used in Chemistry learning in high school.
Keywords: *innovative learning book; Acid Base, local wisdom, dekke naniura, problem based learning*

1. INTRODUCTION

Education is key to developing quality human resources. Quality education is the dream of all people because it will produce quality students. Many factors influence the implementation of quality education, including the availability of quality teachers and learning resources. Several sources state that the quality of Indonesian education remains below that of several neighboring countries. Based on PISA scores, Indonesia has not improved. Around 52% of Indonesian students participating in the 2018 PISA sample scored below average in literacy, mathematics, and science, significantly worse than neighboring countries (Puspa et al., 2023).

The skills studied in 21st-century learning competencies are skills for mastering Information Media and Technology (Wijaya et al., 2016). The development of technology and information in the 21st century has caused major changes in all aspects of life. In this 21st century, the development of superior human resources that meet high standards is urgently needed. Innovative, flexible, and strong human resources are essential for living life. The 21st century has witnessed major changes in many areas, including education. The education system in this country has changed to focus more on activities that help students develop their talents and direct their learning. As a result, the 21st-century education system places greater emphasis on student-centered learning. This aims to help students acquire modern thinking skills, or abilities known as "*The 4C Skills*" which was pioneered by *Framework Partnership of 21st Century Skills* (Mardhiyah et al., 2021).

Ethnopedagogy *Dekke Naniura* in Learning Chemistry

Chemistry is a natural science that encompasses facts, theories, principles, and laws of scientific processes. When studying chemistry, the material is very abstract, and students often struggle to understand it (Asmi et al., 2024). With each changing era, the quality of education changes to compete and evolve with advances in science and technology. Effectiveness, efficiency, and teaching methods are factors contributing to the low quality of education in Indonesia. This indicates that the material presented in the learning process is less effective in terms of learning. Therefore, to deliver material to students, innovative approaches are needed, such as teaching materials specifically designed for students (Murni et al., 2021).

Chemistry is a compulsory subject in the science section of high school. To teach chemistry, a teacher is required to have established hard and soft skills, combining theory and practice in learning. A survey conducted in 2023 in several high schools in North Sumatra Province showed that chemistry learning outcomes (both cognitive, affective, and psychomotor) are still lower than other subjects. One of the causes of low chemistry learning outcomes is the lack of learning media that can increase student motivation and learning. Chemistry teachers admitted to having difficulty teaching some chemistry materials that are considered abstract, such as atomic structure and chemical bonds, so they created Android-based chemistry learning media with *smart apps creator program* (Silaban et al., 2023). Android-based application programs are considered capable of increasing learning motivation, especially for chemistry material, which is abstract in nature. The use of Android applications in learning is considered feasible, considering that almost all high school students currently own mobile phones or smartphones, which are rarely used for learning activities (Kartini et al., 2020).

In addition to learning media, the limited resources that can guide students to see the chemical aspects of everyday life are also contributing to low chemistry learning outcomes. This is despite the Minister of Education Regulation No. 79 of 2014, which urges schools to integrate local wisdom into learning (ethnopedagogy), not being effectively implemented. By integrating local wisdom into learning, students will better understand the role of the knowledge they learn in their environment (contextual learning).

The provinces of North Sumatra and Aceh are known to be very rich in local wisdom, both traditional ceremonies/culture, unique animals and plants, traditional foods and so on, the tradition of eating betel, the tradition of burning incense, tapping pine resin, is considered to enrich Chemistry teaching materials. (Silaban, et all, 2024). From a preliminary survey, data was obtained that until now there is no Chemistry Textbook that integrates local wisdom. The integration of local wisdom into learning through enrichment of teaching materials is considered very appropriate to support the implementation of the Independent Curriculum to form the character of Pancasila Students. Betel Plant (*Betel plant*), one of the plants widely used in Batak cultural ceremonies, healing wounds and also washing teeth and mouth by eating betel mixed with lime to produce a red color. To teach Stoichiometry, research has been conducted and an electronic textbook based on Problem Based Learning integrated with local wisdom of betel has been obtained (Silaban, R. 2025)

Integrating local wisdom into learning can be achieved through the provision of teaching materials containing examples of phenomena, events, or community activities related to the chemistry subject being taught. Until now, local wisdom and chemistry teaching materials have been considered two distinct yet complementary aspects, allowing learning to impact cultural preservation in their respective regions (Muzakkir, 2021). It must be acknowledged that technological advances also impact the existence of local wisdom and, of course, the social fabric, which can serve as a constructive, long-term solution to address issues in a pluralistic society (Puspitasari & Resmalasari, 2023).

Dekke Naniura in Japan it is called Sashimi, a traditional food typical of the Toba Batak tribe, namely carp or tilapia fish, which is consumed without being cooked first. What is meant is soaking the fish meat in spices where orange is the main component. Usually, *Dekke Naniura* Served at traditional events or to special guests. As time goes by, especially fast food with national and international flavors, Dekke Naniura is no longer in demand (Nurhasanah, 2024). Through the integration of local wisdom *Dekke Naniura* into the learning of Acid-Base Chemistry, can increase science literacy and increase the love of culture in the Pancasila Student frame.

Considering the chemical composition of the raw materials and the process of making Dekke Naniura, this traditional food can be used as additional chemistry teaching materials for high school and vocational

schools. Figure 1 shows the ingredients for making Dekke Naniura. *Dekke Naniura* is Goldfish and *Jungga Orange*. As the main ingredients, the flavor-enhancing spices, namely andaliman, ginger, galangal, turmeric, garlic and shallots, candlenuts and chilies contain chemical substances that are acidic, basic, alkaloid, flavonoid, vitamin, and other secondary metabolites.

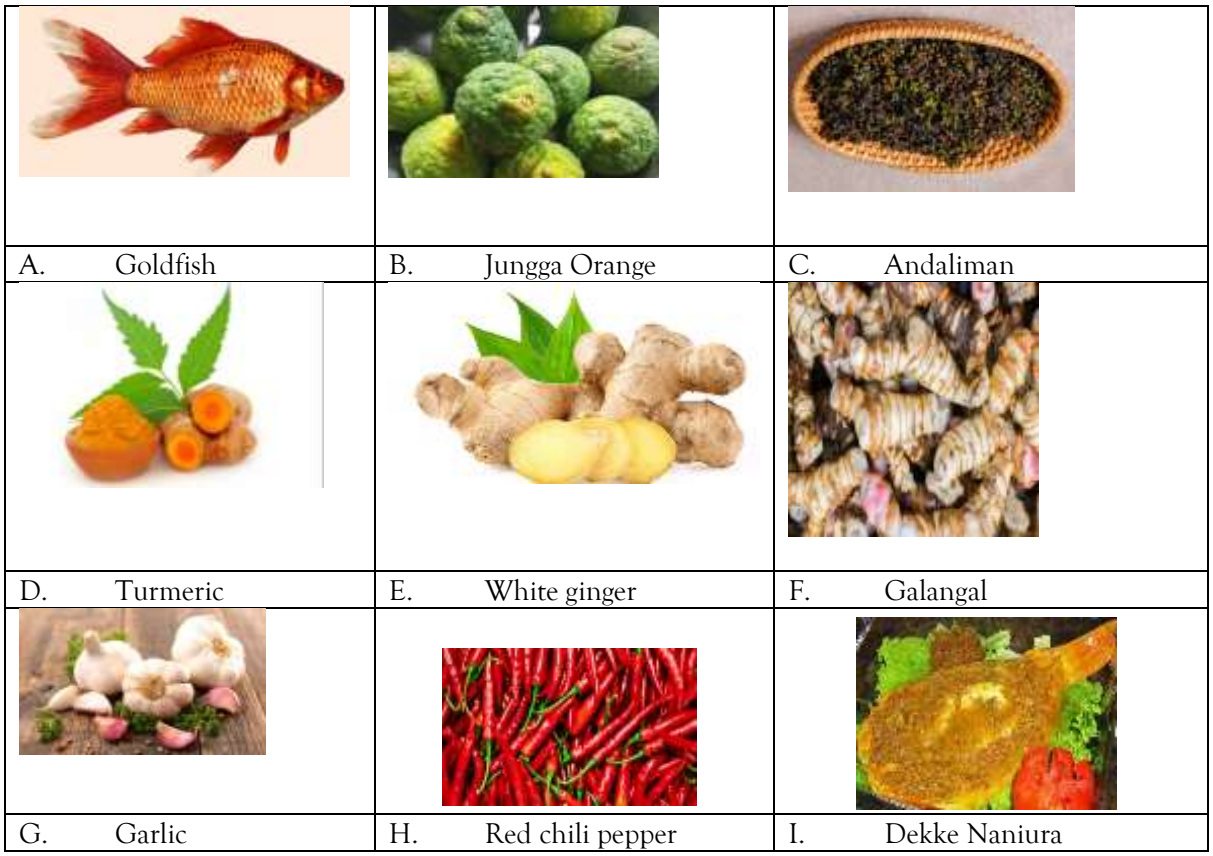

Figure 1. Raw materials *Dekke Naniura* using plants that are rich in chemical and nutritional aspects.

2. METHOD

2.1 Location and Time of Research

This research was conducted at SMA Negeri 1 and several other high schools in Lintongnihuta District, Humbang Hasundutan Regency, North Sumatra, involving 32 students and 3 chemistry teachers. This school was chosen as the research location because Lintongnihuta District is one of the areas with a high concentration of chemistry. rich in local wisdom, typical Batak Toba cuisine includes Dekke Naniura. Almost all the people here can provide Dekke Naniura for family needs or for sale. Furthermore, chemistry instruction at this school is well-implemented, covering both theory and practical work, but local wisdom has never been integrated. The type of research is development research using the 4-D Model (define, design, development and disseminate) (Silaban, et al. 2023). The research was conducted from September 2024 to April 2025.

2.2 Research Procedures

It has been mentioned previously that this research aims to obtain innovative teaching materials for Acids and Bases based on problem-based learning that integrates local wisdom of the Toba Batak.Dekke Naniura. Referring to the selected 4-D development model, the define, design, development and disseminate stages have been carried out sequentially as seen in Figure 1.

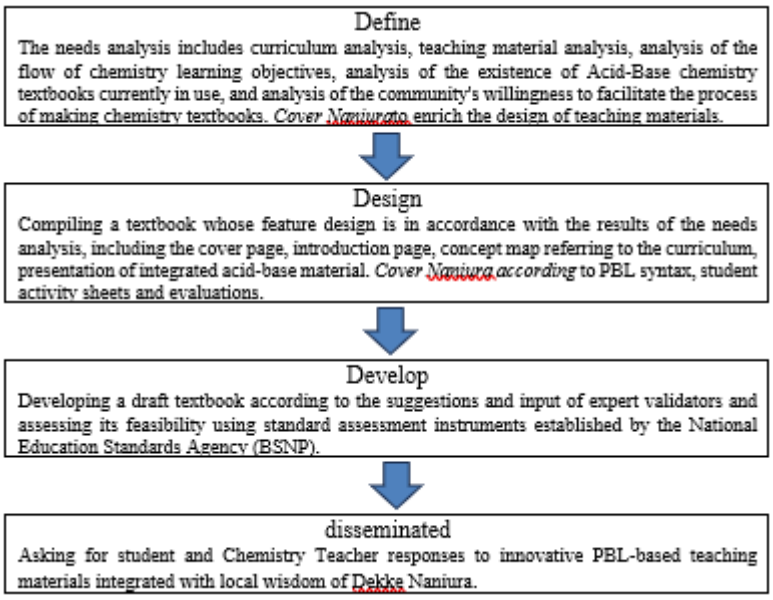

Figure 1. Stages of compiling an innovative PBL-based acid-base textbook integrated local wisdom of the Toba Batak Dekke Naniura (Silaban, R 2025)

2.3 Provision of Research Instruments

The research instruments were provided in accordance with the procedures required for the 4-D model development research in previous research (Silaban et al., 2023). All research instruments used were validated. For the define stage, the instruments used were interview sheets and questionnaires. Interviews were conducted with the community providing Dekke naniura regarding the required materials and the manufacturing process. For the design stage, the instruments used were the results of needs analysis, curriculum analysis, teaching materials analysis, chemistry learning objectives flow analysis, analysis of the availability of existing acid-base chemistry textbooks, and the manufacturing process. Dekke Naniura Both in the form of video links and barcodes. For the development stage, the instruments used are validation sheets and textbook feasibility assessment sheets established by the National Education Standards Agency (BSNP), Ministry of Education of Indonesia (Silaban, R. et al., 2022; Murni, AS et al., 2021).

2.4 Preparation Dekke Naniuraas' chemistry learning materials.

Raw material Dekke Naniura the dish is prepared according to instructions from those who regularly make it. Typically, the fish used is carp, with the flesh removed from the bones and scales. The main ingredient is very sour oranges, complemented by spices to taste. The process can be followed in the video tutorial.

2.5 Module Qualification Test Procedure by Member Validator

Data analysis of the validity sheet results using a modified BSNP eligibility questionnaire, obtained based on a Likert scale calculation from 1 to 4. The lowest score is 1 and the highest score is 4 (Silaban et al., 2022):

Table 1. Likert Scale

Score	Assessment Criteria
4	Strongly agree
3	Agree
2	Disagree
1	Very Disagree

The data from the acid-base module assessment results based on problem-based learning integrated with local wisdom of Batak Toba Dekke Naniura from expert validators obtained through a questionnaire sheet were then analyzed using the formula:

Percentage score = (Number of scores obtained)/ (maximum score) ×100%
The average feasibility criteria (validity) of the assessment results obtained by the acid-base module based on the local wisdom of the Toba Batak Dekke Naniura integrated with problem-based learning in accordance with BSNP, are shown in Table 2.

Table 2. Eligibility Criteria Percentage of Module Assessment

Percentage (%)	Eligibility Criteria (Validity)
81-100%	Very Valid (No Revision Needed)
61-81%	Valid (No Revision Needed)
41-60%	Valid Enough (Partial Revision)
40-21%	Less Eligible (Half Revision)
20-0	Very Less Valid (Replaced)

(Silaba et al., 2022)

2.6 Teacher and Student Response Data Analysis
The scoring data was analyzed in stages to determine teacher and student responses to the developed module. The scoring scale used was 1 to 5, with 1 being the lowest and 5 being the highest. The teacher and student response rates were calculated using the following equation:
Percentage score= (Number of scores obtained)/ (maximum score) × 100%
The research questionnaire answers used a Likert scale with the following choice categories:

Table 3. Likert Scale for teacher and student response

Score	Assessment Criteria
5	Strongly Agree
4	Agree
3	Less Agree
2	Disagree
1	Strongly Disagree

The scoring results are interpreted into the criteria contained in the table below.

Table 4. Score Interpretation Criteria for teacher and student response

Percentage (%)	Category
81-100	Very Good
61-80	Good
41-60	Fairly Good
21-40	Not Good
0-20	Not Very Good

(Kartini & Putra, 2020).

4. RESULT
Referring to the 4-D model development research that has been conducted, data and information related to the school's need for teaching materials enriched with local wisdom have been obtained. From the define stage, the results of the needs analysis were obtained including curriculum analysis, teaching material analysis, analysis of the flow of chemistry learning objectives, including responses to the Acid-Base chemistry textbook used by the school so far. From the design stage, an innovative Acid-Base Textbook based on PBL integrated with local wisdom containing the distinctive features and aspects of Dekke Naniura's Acid-Base chemistry has been obtained. From the develop stage, the level of feasibility is known to refer to the Indonesian BSNP standards for Textbooks, and from the dissemination stage it is known that the innovative textbook obtained can be used in learning. Regarding the results and discussions and conclusions can be seen in the following explanation.

1. Define Stage for need assement of innovative module
The define stage involves needs analysis, curriculum analysis, materials analysis, and learning objectives analysis. It was stated that, to date, chemistry teachers have never developed teaching materials or student

worksheets (LKPD) containing local wisdom. Teachers still use textbooks published by the government or other publishers, which of course still adopt national characteristics. The scope of acid-base teaching materials, according to the current Independent Curriculum specifications, can be seen in Table 5.

Table 5. Learning Objectives Flow from need assement analysis

Learning Objectives Flow
Acid-Base Concept
1. Students are able to explain the concept of acids and bases according to the Arrhenius, Brøwnsted-Lowry and Lewis theories.
2. Students are able to explain the properties of acids and bases according to the Brønsted-Lowry and Lewis theories.
3. Students can understand the concept of acids and bases and their application in everyday life.
Degree of acidity (pH)
4. Students can understand the concept of acidity (pH) and its application in everyday life.
5. Students are able to calculate the degree of acidity (pH) of acid or base solutions.
Acid-Base Indicator
6. Students are able to identify color changes in indicators in various solutions.
7. Students are able to explain natural materials that can be used as indicators.
8. Students are able to design experiments to make acid-base indicators from natural materials and report them.
9. Students are able to identify several acid-base solutions with several indicators.
10. Students are able to predict the pH of acidic or basic solutions based on acid-base indicators.

2. Design Stage to Explain the Description and Features of the Innovatif Module

This Chemistry module is structured on acid-base material consisting of three learning activities, namely the concept of acid-base, degree of acidity (pH) and acid-base indicators. These three learning activities use problem-based learning stages and are integrated with the local wisdom of Batak Toba Dekke Naniura. The chemistry module is equipped with instructions for using the module, concept maps, QR codes containing Naniura videos, practice questions for each learning activity, learning videos to understand acid-base material, a project to strengthen the Pancasila student profile, a summary, a competency test with answer keys, chemistry figures, self-reflection, a glossary, a bibliography and a periodic table of elements and an author profile.

Table 6. The description of the Innovatif Acid-Base Module Integrated of Batak Toba based- on PBL and Local Wisdom Dekke Naniura.

Acid-Base Materials	Integration of Batak Toba Local Wisdom Dekke Naniura into Problem-Based Learning Model
Acid-Base Concept	Naniura contains lactic acid bacteria In the manufacture of traditional Toba Batak food Dekke Naniura, carp is fermented or acidified using Batak oranges (jungga oranges) and mixed with spices or ingredients such as andaliman, rias, candlenut, turmeric, galangal, red chili, shallots, garlic and salt (Tambunan, 2021). The problem based learning is which ingredients or spices from Dekke Naniura are classified as acidic and basic? What is the process of making Naniura food?
Degree of Acidity (pH)	Naniura is made with Batak orange (jungga orange) to remove fishy odor and soften the fish. The degree of acidity affects the water binding capacity of fish meat, so an acidic pH will affect the tenderness of naniura carp meat. Acidic compounds can soften the meat due to a decrease in pH value resulting in the rupture of carbohydrates (Hang, 2021). The acidification process has the function of lowering the pH of the product to prevent spoilage, thus inhibiting the growth of bacteria and preserving food (O. R. Silaban & Sriyati, 2024). The problem based learning is how the pH acidity level results when fermented or

	acidified with different times? And what is the acidity level of naniura when fermented with lime, lemon, or other kinds of citrus?
Acid-Base Indicators	Turmeric is one of the spices in making dekke naniura. Turmeric is used as an acid-base indicator. Curcuminoids and essential oils are the main ingredients of turmeric rhizomes. According to research by the Spices and Medicinal Plants Research Center (Balittro), turmeric rhizomes have 10.92% curcumin. Curcumin is a yellow orange crystal that is insoluble in ether, soluble in oil, brownish red in alkali, and light yellow in acid. Curcumin can be used as an indicator because it changes color quickly with less than 5 seconds (Sundari, 2016). When turmeric is added to an alkaline solution, the color will become pink or bright red, but when used in an acidic solution, the color will become yellowish. Turmeric is a natural indicator that is more readily available and more environmentally friendly than synthetic chemical indicators such as phenolphthalein or bromothymol blue, which are often used in chemical experiments in laboratories (Solehah, 2024). Problem based learning submaterial acid-base indicator is turmeric, turmeric dominates the color of Naniura's food compared to other spices. Why is that? What is the color of turmeric in Naniura's food? Why can turmeric be used as an acid-base indicator?

Based on the results of the needs analysis, design and description of Acid-Base Teaching Materials, an Innovative Acid-Base Teaching Book based on PBL and integrated local wisdom of the Toba Batak Dekke Naniura has been compiled. The book can be a Print Book and an Electronic Book whose ISBN has been submitted. The appearance of the Book is compiled according to the rules of the level of eligibility of Textbooks and the eligibility of learning media referring to the criteria set by the National Education Standards Agency (BSNP), with a basic design of a yellow cover according to the typical color of Dekke Naniura which generally uses natural dye Turmeric. The front and back covers of the innovative Book that has been compiled can be seen in Figure 2.

Figure 2. Front cover and back cover view of the innovative PBL-based Acid-Base book and integrated local wisdom of the Toba Batak Dekke Naniura

Learning activities on acid-base material are made with problem-based learning stages and integrated with the local wisdom of Batak Toba dekke naniura with the relationship between naniura and spices in making naniura which is used as a statement to solve problems through questions included in the developed module. The design of the local wisdom of Batak Toba dekke naniura can be seen in Figure 2.

(a) (b) (c)

Figure 3. Some features/images in the innovative PBL-based Acids and Bases Textbook integrated local wisdom Batak Toba Dekke Naniura (a) Scope of the concept of acid base refers to the Independent Curriculum, (b) Degree of acidity (pH) and (c) Indicator acid base equipped with barcode.

3. Development Stage to Explain Feasibility and Validity Innovatif Acid Base Module

The feasibility level of the innovative acid-base module based on problem-based learning integrated with local wisdom of the Toba Batak *Dekke Naniura* conducted using an assessment instrument that refers to the National Education Standards Agency (BSNP) eligibility standards. The aspects of the assessment of the eligibility of the material as a learning resource, or eligibility as a learning medium, the results can be seen in Table 7 and Table 8. The results of the innovative acid-base module based on problem-based learning integrated with the local wisdom of the Toba Batak dekke naniura that has been developed are described in Table 7 and Table 8.

The feasibility of the material consists of aspects of content feasibility, presentation feasibility, and contextual feasibility. The results of the feasibility test for the innovative acid-base module material show an assessment of three main aspects, namely the aspect of content suitability, presentation feasibility, and contextual suitability. In the aspect of content feasibility, there are five components that are evaluated. The suitability of the material with learning outcomes and learning objectives obtained a percentage of 89.58%, the accuracy of the material reached 89.29% and the currency of the material obtained a score of 87.50%. Meanwhile, the components that encourage curiosity and problem-based learning each received the highest score of 93.75%. This indicates that the material developed is in accordance with learning objectives and is able to motivate students in the learning process.

In terms of presentation feasibility, four components were evaluated. Presentation techniques scored 87.50%, presentation support scored 88.28%, and learning presentation received a perfect score of 100%. Coherence and logical flow of thought achieved 87.50%. A perfect score for the learning presentation component indicates that the material was presented systematically and optimally, supporting student understanding.

The contextual feasibility aspect consists of two components: the contextual nature, which scored 90.63%, and the contextual component, with a score of 89.29%. A high score for the contextual aspect indicates that the material was developed with attention to context and relevance to everyday life, particularly in integrating the local wisdom of the Toba Batak Dekke Naniura.

Overall, the average percentage of material feasibility reached 90.64% with the criteria of "Very feasible/Very valid" in Table 5. These results indicate that the Innovative Acid-Base Module material based on Problem Based Learning integrated with the local wisdom of Batak Toba Dekke Naniura has met the feasibility standards, both in terms of content, presentation and contextual aspects. The high percentage of feasibility in the third aspect indicates that the material in this module is suitable for use as a learning resource on acid-base material.

Table 7. Results of the Material Feasibility Test for the Innovative Acid-Base Module Based on Problem-Based Learning Integrated with Local Wisdom of Batak Toba *Dekke Naniura*

Assessment	Eligibility Percentage (%)

Content Suitability Aspect	
Suitability of material with Learning Outcomes and Learning Objectives	89,58
Accuracy of Material	89,29
Update of Material	87,50
Encouraging Curiosity	93,75
Problem Based Learning	93,75
Presentation Feasibility Aspect	
Presentation Techniques	87,50
Presentation Support	88,28
Presentation of Learning	100,00
Coherence and Coherence of Thought	87,50
Contextual Feasibility Aspects	
Contextual Nature	90,63
Contextual Components	89,29
Avarange	90,64
Eligibility Criteria (Validity)	Very Eligible/Very Valid

In the media expert validation assessment, there are two aspects of feasibility that are tested or measured, namely the graphic feasibility aspect and the language feasibility aspect. From the assessment aspect, the feasibility test results of the Innovative Acid-Base Module Media Based on Problem Based Learning Integrated with Toba Batak Local Wisdom Dekke Naniura are 88.89%. Based on the results of the media feasibility test that has been carried out, an assessment of two main aspects is obtained, namely the graphic feasibility aspect and the language feasibility aspect. In the graphic feasibility aspect, there are three components that are assessed including the module size with a feasibility percentage of 84.38%, the module cover design of 86.88%, and the module content design obtained the highest score of 88.94%. These results indicate that visually, the developed module has met the expected feasibility standards according to the National Education Standards Agency (BSNP). Meanwhile, in the language feasibility aspect, there are six components that are evaluated. The flexibility (straightforward) component obtained a percentage of 91.67%, communicative 81.25%, followed by the dialogic and innovative components with a score of 90.63%, the component of suitability to student development reached 90.63%, the component with language rules reached 93.75% and the use of terms, symbols or icons obtained a score of 82.50%. The high value in the aspect of suitability with language rules indicates that this module was developed with language that is easy to understand and appropriate to the level of understanding of the user.

Overall, the average percentage of media feasibility reached 88.06% with the feasibility criteria of "Very Feasible/Very Valid" in Table 8. These results indicate that the innovative acid-base module based on problem-based learning integrated with the local wisdom of Batak Toba Dekke Naniura has met the feasibility standards of learning media, both in terms of graphics and language. The high percentage of feasibility in both aspects indicates that this module is worthy to be implemented as a learning medium in the teaching and learning process of acid-base material.

Table 8. Results of the Media Feasibility Test for the Innovative Acid-Base Module Based on Problem Based Learning Integrated with Local Wisdom of Batak Toba *Dekke Naniura*

Assessment	Eligibility Percentage (%)
Graphic Feasibility Aspects	
Module Size	84,38
Module Cover Design	86,88
Module Content Design	88,94
Language Eligibility Aspects	
Straightforward	91,67
Communicative	81,25
Dialogic and Interactive	90,63
Conformity to Student Development	90,63

Conformity with Language Rules	93,75
Use of terms, symbols or icons	84,38
Avarange	88,06
Eligibility Criteria (Validity)	Very Eligible/Very Valid

The product revision stage is carried out after the material expert validator and media expert validator provide suggestions and input on the module. The revised module is then sent to the material and media validator for further review. The product revision is complete if the validator states that the module is suitable/valid. Some of the steps taken include: 1) improving the concept map, 2) adding learning outcomes, 3) adding practice questions, 4) changing the wording of the Arrhenius acid-base theory definition to make it easier to understand, and 5) including a bibliography from cited journals in the module.

4. Dissemination Stage to know how Teacher and Student Response for innovative Acid Base.

The final stage is the dissemination or socialization of the innovative Acid-Base Book that has been obtained to several Chemistry Teachers and High School Students who have studied Acid-Base material. Dissemination is carried out to obtain information on readability, practicality and readability in the context of Scientific Literacy before the Book is applied to classroom learning. The innovative book was given in limited quantities along with its assessment instrument to respondents in Lintong Nihuta District, Humbang Hasundutan Regency. The assessment instrument for Teachers contains 2 assessment aspects, while for student respondents it contains 5 assessment aspects, and the results for Chemistry Teachers can be seen in Table 9, while for High School Students in Table 10.

Table 9. High School Chemistry Teachers' Responses to the Innovative Acid-Base Chemistry Textbook Based on PBL integrated local wisdom Batak Toba Dekke Naniura

No	Assessment Aspects	Average Percentage (%)
1	Textbook Appearance/Innovation	96,67
2	Presentation/completeness of material	96,67
Total Average Percentage (%)		**96,67**
Result Criteria		**Very good**

Table 9 shows that the average score for teacher response assessments is 96.67% for the appearance aspect and 96.67% for material presentation. Based on the analysis of teacher response assessments completed by one chemistry teacher, the criteria were "very good," so the module can be used as additional independent teaching materials for acid-base material. Meanwhile, Table 10 shows that student response assessments include aspects of language, clarity of writing, clarity of images, cover art, and color composition, with an average overall assessment of 91.28%, categorized as "very good."

Table 10. High school students' responses to the innovative integrated PBL-based acid-base chemistry textbook Local Batak Toba Wisdom Dekke Naniura

No	Assessment Aspects	Rate Rate (%)
1	The language used in the module	88,50
2	Clarity of writing in the module	91,88
3	Clarity of images in the module	94,13
4	Cover module	90,13
5	Color composition in the module	91,75
Total Average Percentage (%)		**91,28**
Result Criteria		**Very good**

DISCUSSION

The research entitled the development of an innovative acid-base module based on problem-based learning integrated with the local wisdom of the Toba Batak dekke naniura aims to produce a module teaching material based on problem-based learning integrated with local wisdom originating from the

Toba Batak tribe, namely the traditional food dekke naniura. The research and development procedure used is Research and Development (R&D) with a 4-D model consisting of the definition/analysis stage (define), the design stage (design), the development stage (development) and the dissemination stage (disseminate).

The initial step taken by the researcher in this study was the definition stage. The first step taken by the researcher in this study was to define. At this stage, the goal was to find and collect problems that needed to be solved. A needs analysis was conducted to identify and define problems in chemistry learning. To begin the study, the researcher interviewed chemistry teachers at SMA Negeri 1 Lintongnihuta to find out the teaching materials and media used by teachers in chemistry learning at school, especially acid-base material. The results of the interviews showed that chemistry learning in the classroom still uses textbooks in chemistry learning in the learning process and students think that chemistry material is difficult to understand and in learning has not used a learning model and it was found that in learning there is no use of teaching materials in the form of modules linked to local wisdom in the Batak area. This module was created to address existing problems and aims to preserve local wisdom, this is in line with research (Afiqoh et al., 2021) along with increasingly sophisticated and rapid technological developments, can result in the values of traditional Toba Batak local wisdom, including the typical Dekke Naniura food, increasingly eroded due to the ease of foreign culture entering through digital technology channels such as social media. Therefore, it is very important to minimize this influence through learning and applying it in everyday life and adapting to current developments without losing the authenticity of the local wisdom. Learning that is integrated with local wisdom makes it easier for students to understand and practice learning outcomes (Safitri Dwi, 2023). The module is created with PBL (Problem Based Learning) syntax: 1) introducing problems to students, 2) coordinating students to learn, 3) guiding students in individual or team investigations, 4) presenting and explaining findings and 5) evaluating the problem-solving process (Murtihapsari et al., 2022).

After the define stage is carried out, the next stage is the design stage. At this stage, the product, namely an innovative acid-base module based on problem-based learning integrated with the local wisdom of the Toba Batak dekke naniura, begins to be designed in its components. This begins with the preparation of a learning objective flow based on the independent curriculum and the creation of a draft teaching module designed in accordance with the syntax of problem-based learning and integrated with the local wisdom of the Toba Batak dekke naniura on the acid-base material. Then the selection of teaching materials and journals used as sources of material in the creation of the module.

The next stage is the development stage. At this stage, product validation was conducted by three expert validators: a chemistry lecturer from Medan State University and a chemistry teacher from Lintongnihuta 1 Senior High School. Based on the assessment results from the expert validators, the module's feasibility level was 90.64% for the material assessment and 88.06% for the media assessment. After validation, the teaching module was revised by the expert validators.

After the teaching module has been revised, the final step is the assessment of teacher responses to the learning module that has been developed. The average result of teacher response assessment based on the appearance and presentation of the material is 96.67% and the assessment of student responses from 32 students of SMA Negeri 1 Lintongnihuta class XI-F1 based on the language, clarity of writing, clarity of images, cover and color composition aspects of the teaching module is 91.28% with a very good category. The results of this study are relevant to research (Amaliyah et al, 2023) which developed a problem-based learning module with a very valid, practical category and has a potential effect in developing students' interests and learning outcomes. Related research (Syahril et al, 2023) states that the development of a problem-based learning module helps facilitate students' mathematical problem-solving skills. Based on the results of data analysis, the feasibility of the problem-based learning module was 3.75 with very valid criteria, while for student responses and small group tests, 87.91% were very practical criteria and the results of the response analysis in the field trial were 85.54% with very practical criteria. Based on this, the developed module can be used in the learning process.

5. CONCLUSION

Based on the description written above, the following conclusions were obtained:

1. Respondents stated that they really need chemistry teaching materials enriched with local wisdom so that students can see that chemistry is close to the surrounding environment.
2. An innovative electronic textbook on Acid-Base Chemistry based on PBL and integrated with the local wisdom of the Toba Batak Dekke Naniura has been obtained which contains features of chemical and ethnopedagogical aspects.
3. Textbook *innovatively designed* considered very suitable because it meets the criteria *BNSP about* curriculum content coverage is more than 90.64% and*coverage* learning media 88.06%.
4. From the results of the dissemination of readiness for use, the average response from Chemistry teachers was 96.67% and from students 91.38%, which means that the innovative Acid-Base textbook based on PBL and integrated with the local wisdom of the Toba Batak Dekke Naniura is ready to be used in Chemistry learning in high schools.

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