Vygotsky: Jurnal Pendidikan Matematika dan Matematika
6 (2) August 2024, pp. 119 - 130
E-ISSN: 2656-5846 P-ISSN: 2656-2286
Journal Page is available to
https://jurnalpendidikan.unisla.ac.id/index.php/VoJ

E-Module for Problem-Based Learning Integrating Batak Toba Culture (PBL BTC) to Improve Problem-Solving Ability

Ita Pratiwi Simangunsong[1*], Elvis Napitupulu[1], Asrin Lubis[1], Ika Trisni Simangunsong[2]

[1] Mathematics Education, State University of Medan, Indonesia
[2] Physics Education, Universitas Musamus, Indonesia

**Email Correspondence:* itapratiwi88@gmail.com

ARTICLE INFO

Article History

Received	:	27 May 2024
Revised	:	25 Jun 2024
Accepted	:	20 Aug 2024
Available Online	:	31 Aug 2024

Keywords:
E-module Development
ADDIE Model
Problem-Based Learning
Batak Toba Culture
Problem-Solving Ability

Please cite this article APA style as:
Simangunsong, I. P., Napitupulu, E., Lubis, A. & Simangunsong, I. T. (2024). E-Module for Problem-Based Learning Integrating Batak Toba Culture (PBL CTL) to Improve Problem-Solving Ability. *Vygotsky: Jurnal Pendidikan Matematika dan Matematika*, 6(2), pp. 119-130.

ABSTRACT

This research aims to analyze: 1) the validity, practicality and effectiveness of the PBL e-module based on Batak Toba Culture (PBL BTC) which was developed to increase students' problem-solving abilities at SMP Negeri 1 Simanindo; 2) increasing students' problem-solving abilities through the developed e-module. This research is using the ADDIE. From the tested of class IX 2 was obtained: 1) the PBL BTC e-module have the criteria of being valid, effective, and practical; 2) Increased problem-solving abilities using the PBL BTC e-module as seen from the N-gain value is 0.506, it is in the "medium" category. This research recommendations might be made the E-Module with mathematical problem-solving tasks on the topic of congruency should be continued for future effectiveness evaluations.

1. Introduction

Education is a legitimate endeavor to generate exceptional individuals, hence it contributes to an important role in defining a nation's existence. Understanding the significance of education motivates everyone, particularly legislators and educators, to strive for the greatest education possible. Throughout Indonesia, the intention of developing top-notch human resources is still being actively pursued. Indonesia's mathematics score is still below the global average,

E-ISSN: *2656-5846*
P-ISSN: *2656-2286*

according to the PISA (Program for International Student Assessment) results. PISA is an international survey program that evaluates students' literacy in reading, mathematics, and science at the age of fifteen. Indonesia is placed 69 out of 81 participating nations in the 2022 PISA inquiries, with a common score of 366, whilst the average score for all countries is 472 (*PISA 2022 Results (Volume I)*, 2023). It is anticipated that the national education system will bring about change and support students in acquiring problem-solving, adaptive, and learning skills.

It is necessitate to teach mathematics at all educational levels, including elementary, middle, high school, and college. This is so that learners can be ready for their future employment, as mathematics is a fundamental subject. In the twenty-first century, sophisticated thinking skills are the primary concern of the teaching of math in schools. When non-routine problem-solving is incorporated into mathematics evaluations, students' HOTS are stimulated, leading to a variety of solutions to fundamental technical problems that cannot be solved just by conventional approaches. One should not undervalue the significance of being able to answer non-routine mathematical issues. In the twenty-first century, it is becoming more and more important to be able to handle non-routine cases, which are those that require analysis, synthesis, and creativity and are incapable of being resolved using previously established strategies or formulas (Azid et al., 2022).

That is, a challenge involving a circumstance for which one or more suitable solutions have not yet been developed for the person or group involved. Fundamentally, for children to be resilient in the face of continuously changing circumstances in life and the outside world, mathematics education in schools must prepare them to think critically, logically, carefully, honestly, and successfully. In elementary and secondary education, students should be able to: (1) utilize patterns as hypotheses in solving problems and get competent to reach interpretations based on existing conditions or details; (2) use rational thought on things, carrying out logical manipulations both in simplifying as well as analyzing previous parts in addressing issues; and (3) explain concerns, logical thinking, and compiling statistical proof thru written representations, graphs, charts, or any other means to clear tasks or specific situations. This is stated in Indonesian Education and Culture Regulation Number 58 of 2014 as the objectives of mathematics education.

Four steps for problem-solving processes were proposed by Polya (Fitriani et al., 2022): working backward, drawing a figure, generalization, analogy, and trial-and-error. Students would gain from practicing these procedures since it encourages them to analyze problems, make and carry out strategies, and determine whether or not the strategy produces the desired results. Students could effectively address mathematical and practical problems using this technique. Previous research revealed that employing the Polya stage in solving a problem is very useful for students. When students reach the understanding stage of the problem, they can recognize and comprehend the known elements of the problem. When a plan is being created, the subject has a method for handling the issue. In the following step, the subject applies the previously created plan to tackle the problem. In order to confirm the outcomes, the subject reexamines them in the final step (Murtiyasa & Wulandari, 2022).

Digital textbooks and modules significantly improve education by giving learners and educators fresh perspectives. The main purpose of creating

E-ISSN: 2656-5846
P-ISSN: 2656-2286

electronic math learning materials is to enhance HOTS, alternative learning resources, and mathematical literacy for today's learners (Wijaya et al., 2022). This e-module learning media is allowed by the National Education Standards Regulation Number 19 Article 19 (1) of 2005 of the Indonesian Government, which suggests it implementing in schools should be interactive, inspiring, fun, and challenging, with students encouraged to participate actively.

Designing teaching materials that are appropriate to the local cultural context is an alternative source of student learning. E-modules will assist students in recognising culture and diversity because they may be presented more attractively through instructional videos, audio, visual aids, and appealing designs. As a result, e-modules must be built with both display design and convenience of access in mind in order to pique students' interest and motivate them to learn (Latif & Talib, 2021).

According to several research, junior high school students can improve from adopting e-modules that employ Flip Pdf Professional software to learn mathematics (Aulia & Prahmana, 2022; Tania & Siregar, 2022; Yunianta et al., 2023). The outcomes of his investigation, the created mathematics e-module product was legitimate and appropriate for use in the classroom. For that reason about it to be useful utilized as a substitute for other learning tools for mathematics. With the help of Flip PDF Professional, you can create interactive flipbooks with chapters that include images, questions, flash, MP4, audio, and YouTube videos, among other types of information (Seruni et al., 2020).

Mathematics and culture are intimately intertwined. D'Ambrosio developed Ethnomathematics as a solution based on the way mathematics has been taught in schools and his reflections on how mathematics evolved. Ethnomathematics is a means of learning and integrating concepts, methods, and approaches that have been created and employed by people from many sociocultural backgrounds (Prahmana et al., 2021). Conforming to Borba, ethnomathematics is the application of mathematical ideas unique to a culture to the relational and spatial facets of daily life (Yeni D. Fonataba et al., 2023). Previous research verified the effectiveness of integrating cultural lessons into mathematics education (Latif & Talib, 2021; Wahyu Sintiya et al., 2021). Research on the development of culture-based e-modules on mathematical lessons showed positive outcomes for junior high school students (Nurfadilah et al., 2023; Utami et al., 2018).

The electronic module with the PBL anchored in Batak Toba Culture is expected to serve space of learners with educating and cultivating the way they learn, with the hope that change the paradigm from teacher-centered learning to student-centered instruction. Based on Batak Toba culture, this research creates digital teaching materials (e-modules) that will be implemented in Ambarita Village, Samosir Regency, North Sumatra Province.

2. Method

The subjects in this research were students of SMP Negeri 1 Simanindo class IX 1 for development trial and students of class IX 2 for implementation. After students have finished learning with the lesson plan, the quality of their learning outcomes is evaluated using the learning ability test instrument. The problem-solving skills of the participants were assessed using essay-style questions as the learning capacity test in this research.

E-ISSN: *2656-5846*
P-ISSN: *2656-2286*

The reasons and considerations for going for the subjects of this study were based on Piaget's concepts of levels of intellectual development, with children aged 11 and up having entered the formal operational stage. The object of the current research is a digital module (e-module) regarding similarity and congruence material.

This form of research is Research and Development, thereby implements the ADDIE. The steps of the ADDIE process are explained in the chart below.

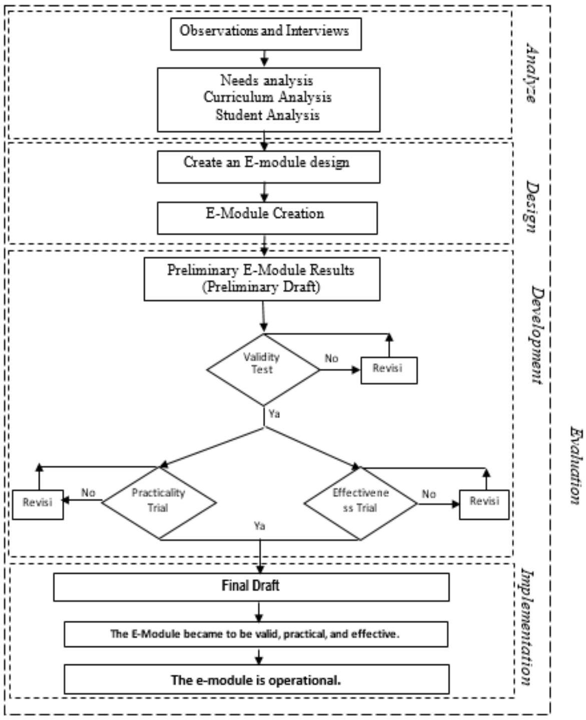

Figure 1. The ADDIE Methodologies for Research

Instruments for research can be classified into three categories: validity, practicality, and e-module effectiveness. Expert Validation will conduct two types of analysis: media analysis from one validator who is an ICT instructor and content analysis (material) from two validators who are mathematics lecturers. With the criteria according to (Sagala & Widyastuti, 2021), as shown in Table 1.

Table 1. The Criteria of Validity

No	Quality score	Statement quality aspect validitas
1.	$3,26 < \bar{x} \leq 4,0$	most valid
2.	$2,51 < \bar{x} \leq 3,26$	Valid
3.	$1,76 < \bar{x} \leq 2,51$	Adequate
4.	$1,00 < \bar{x} \leq 1,76$	Less

Validity methods for data analysis are carried out if the PBL BTC e-module generated has a minimum level of validity achieved validity level is valid ($2,51 \leq Va < 3,26$). The process of calculating the learning implementation observation score is as follows:

 E-ISSN: 2656-5846
P-ISSN: 2656-2286

$$O_k = \frac{\sum_{j=1}^{m} P_i}{m} \tag{1}$$

with: O_k= average learning implementation observation score
P_i= average score of learning implementation observations at each meeting
m = number of meetings

After collecting the data, the average total score is established by the results of observations of learning implementation. The value of ($\boldsymbol{O_k}$) with categories as in Table 2.

Table 2. Learning Implementation Level Criteria

No.	Level of Learning Implementation	Criteria
1.	$1 \leq O_k < 2$	not implemented
2.	$2 \leq O_k < 3$	not well implemented
3.	$3 \leq O_k < 4$	well implemented
4.	$O_k = 4$	very well implemented

The PBL BTC e-module is considered practical if its average learning implementation falls within the 'Well executed' category ($3 \leq O_k < 4$). The BTC PBL e-module fits the effective category in terms of: (1) Classical achievement of students requirements specifically a minimum of 85% of students who participate in the learning can achieve a score ≥75; (2) 80% of students responded positively to the BTC PBL e-module.

In this research, the growth in students' problem-solving skills may be analyzed as follows:

$$n - gain = \frac{score\ postest - score\ pretest}{score\ ideal - score\ pretest} \tag{2}$$

The values of Equation 2 have categories as in Table 3.

Table 3. Learning Implementation Criteria

No.	Value of Learning Implementation	Level
1.	$g > 0.7$	high
2.	$0.3 < g \leq 3$	medium
3.	$g \leq 0.3$	low

3. Results and Discussion

3.1. Results

Data analysis and study outcomes from each development step are described here.

3.1.1. Analyze

Several issues were identified based on the requirements analysis data, encompassing: 1) Students in class IX at SMP Negeri 1 Simanindo have poor problem-solving skills; 2) Students are less active in following lessons, because teachers tend to apply the lecture method during learning; 3) Inadequate use of technology in mathematics education, causing students to struggle with complex concepts; 4) Students' textbooks are difficult to understand whilst learning maths.

 E-ISSN: 2656-5846
P-ISSN: 2656-2286

Curriculum analysis data is assessed as part of the instructional lesson plan. In the section on learning activity phases, the teacher does not differentiate between teacher and student activities in depth. According to interviews, teachers claimed that they have not yet constructed courses of action based on students' requirements or traits, resulting in learning activities that are not ideal. Some ideas, such as instructing pupils to learn to find out, have not been properly applied, and teachers are the sole source of learning. This is the focus that researchers must pay attention to in order to identify the scope of material coverage that is appropriate to the conditions that exist and are implemented by the school.

Based on cultural background, pupils of SMP Negeri 1 Simanindo are predominantly Batak Toba. All students live in the Batak Toba tribe's villages of Ambarita, Tomok, Unjur, and Tuktuk. Several different classifications apply to a variety of tangible manifestations of Batak Toba culture: (1) mentifact: *dalihan na tolu*, *suhi ni ampang na opat*, Batak script, Batak numbers, kinship, *partururan* (a greeting custom based on genealogy), *turi-turian* (regional stories), Batak songs (*O Tano Batak*), the Batak tribe's life goals (*hamoraon-hagabeon-hasangapon*), *umpasa* (rhymes), *umpama* (garnish), and *lapet* (tradisional food); (2) sociofacts include *tarombo* (genealogy), Batak language, *marsiadapari* (cooperative work), *tortor* Batak (dance), *marria raja* (democracy); (3) artefacts: Ruma Batak or *Ruma Bolon* (traditional house), *tugu* (king's monument), *sigale-gale* (puppet), *ulos* (woven cloth), *sor tali*, *gorga* (calligraphy), *uning-uningan* (Batak drum), *rere* (woven seating/mats), and *tandok* (woven for rice containers).

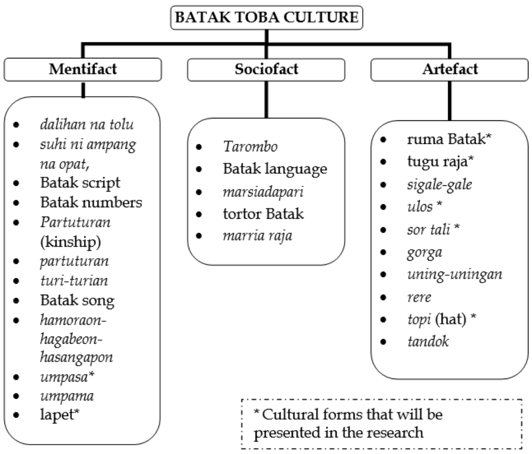

Figure 2. Batak Toba Culture

3.1.2. Design

The main components of the PBL BTC e-module are the cover, concept map, usage instructions, learning activities, and bibliography. Based on the analytical findings from the analyze stage, the PBL model e-module based on Batak Toba culture appears. The Canva application was used to design the cover of the Batak Toba culture-based PBL model e-module, which was then programmed in the Flip Book Professional application. The designed cover features several illustrations related to the material of congruence and similarity in the context of the Toba Batak tribe, as well as the title of the material. This is to make sure that the e-module's learning subjects engage students.

E-ISSN: 2656-5846
P-ISSN: 2656-2286

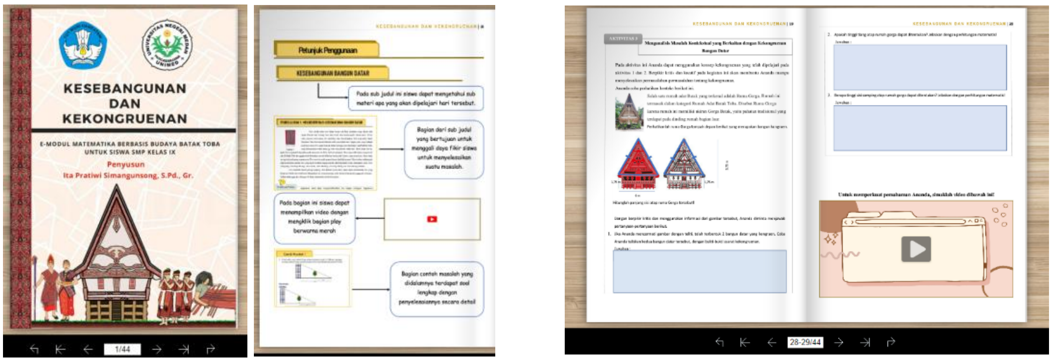

Figure 3. E-module Mathematics with Batak Toba Culture Context

3.1.3. Development

Research tools and student e-modules are verified by practitioners and subject-matter experts. The average value of the results obtained from practitioners and professionals validating e-modules and research instruments is: 1) E-modules have a score of 3.97; 2) Tests of problem-solving skills have met the standards for reliability and validity as evaluation.

Table 4. Validity of Problem-Solving Ability Pre-test Question Items

Items	R_{xy}	t_{count}	t_{table}	Interpretation
1	0,814	7,422	2,048	Valid
2	0,684	4,958	2,048	Valid
3	0,638	4,385	2,048	Valid
4	0,575	3,720	2,048	Valid

Table 5. Validity of Problem-Solving Ability Post-test Question Items

Items	R_{xy}	t_{count}	t_{table}	Interpretation
1	0,529	3,302	2,048	Valid
2	0,729	5,627	2,048	Valid
3	0,847	8,421	2,048	Valid
4	0,856	8,749	2,048	Valid

The reliability of the pre-test mathematical problem solving ability is 0.618 (high category) and the post-test mathematical problem solving ability is 0.741 (very high category). Following an analysis of the learning implementation, the average score was 2.93, falling into the category of not well implemented ($2 \leq O_k < 3$). This score falls short of the requirements for proving the e-module's feasibility in terms of learning implementation. Trial 1's classical completion of the students' problem-solving abilities came up with a score of 40,63%, which was insufficient to satisfy the requirements for classical completeness. With 93.34% of responds, the average student reaction fell into the "positive response" category. These served as the trial 1 efficacy indicators. Data that pointed out that the students' e-modul could not be deemed to be useful and effective was acquired after trial I's e-modul analysis. For this reason, the e-module was modified.

When completing first trial, adjustments were made to create an e-module that met all of the practical and effective criteria established. The findings of the adjustments by first trial were then retested on the same students, with a focus on areas of practicality and effectiveness that had not been met. The outcomes

E-ISSN: 2656-5846
P-ISSN: 2656-2286

results of trial II were: The average observation score for learning implementation was 3.33 in the "well implemented" category. The total of 90,625% students completed the classical completeness. As a result, it was determined that a final draft was valid, practical, and effective to implement in class IX-2.

3.1.4. Implementation

The observation findings of the learning implementation exercise were 3.64, indicating a "well implemented" category. The outcomes of tested in class IX-2 revealed the following efficacious indicators: 1) The second trial's problem-solving skills of the students received a classical completeness score of 87.5% (being able to the criterion "have met classical completeness"); 2) The average student respond to was 94.62% of the total, falling into the "positive response" category. The average N-gain obtained during implementation in class IX-2 was 0.506, it means medium criteria.

3.1.5. Evaluation

Various unavoidable limitations, such as the following, mean that this research has imperfections and limitations. When discussion groups are formed, only gender and the distribution of upper, middle, and lower groups are taken into consideration. Because researchers neglected to consider student compatibility, group interactions between students were hindered. The e-module in this study are exclusively appropriate for use with students who belong to the Batak Toba ethnic tribe.

Table 6. Level of Reaching in Mathematical Problem-Solving Ability

Classification	*Pre-test*		*Post-test*	
	quantity of students	**Classical Achievement Percentage**	**quantity of students**	**Classical Achievement Percentage**
Complete	6	18,75%	28	87,50%
Incomplete	26	81,25%	4	12,50%
Total	32	100%	32	100%
Class Average	54,55		77,53	

According to the classical student accomplishment criterion, at least 85% of students who took the problem-solving ability test achieved a score of ≥75. Thus, the results of the pre-test and post-test of mathematical problem-solving ability met the traditional achievement requirements. As a result, the application of the PBL B3T model e-module developed meets the classical achievement needs.

3.2. Discussion

According to the results of a pre- and post-test assessment of those capabilities in class IX-2, skills in solving mathematical problems have improved. The average scores that students received for their pre- and post-test problem solving demonstrate this growth in their problem solving skills. The average score for pupils' problem-solving skills increased from 54.55 to 77.53. The average normalized gain was also used to measure the increase in problem solving ability scoring 0.506 (0.30 < n-gain ≤ 0.70). The results also reveal that students' ability to solve mathematical problems increased as a result of using a e-module PBL

E-ISSN: 2656-5846
P-ISSN: 2656-2286

BTC.

In order encourage students to accurately identify the various facets of Batak Toba culture, this research sets up e-modules to teach about tugu (traditional monuments), Ruma Gorga/Ruma Bolon (traditional dwellings), ulos, hats, sortali (traditional apparel), and lapets (typical food). Because the issues were applicable to their everyday lives, students were willing to face the obstacles posed by the local cultural setting in this study, which enhanced their capacity for problem-solving. Other problem given in this e-module is the roof design concept for Ambarita Harbor, which bases its design on the roof of Ruma Bolon. The Ambarita Harbor point arose from the harbor's proximity to the domiciles and schools of SMP Negeri 1 Simanindo children, who are familiar with the appearance of the harbor's roof.

Instructor scaffolds allow them to dynamically support students' requirements for motivation. Established task value, mastery objectives, belonging, emotion management, expectancy for success, and autonomy are the six goals that should be promoted by motivation-enhancing scaffolds in PBL, all of which are backed by motivation theories (Belland, et. al, 2013). Similarly, instruction utilizing the e-module PBL BTC supports similar direction. Scaffolding and work examples help with e-modules. Every meeting, students are required to present the outcomes of their group discussions and problem-solving efforts, and the teacher offers constructive criticism. In addition, the e-module offers substitute problem solving on sample topics that might serve as an example for solitary study.

The outcomes of the post-test showed that students who received instruction through problem-based learning possessed high competencies in problem-solving. Participants who are able to accurately and fully translate spoken language into mathematical language are able to demonstrate that they comprehend the problem by answering the questions in the problem. The approach selected for alternate responses is noted by students in the indicator of planning to solve the problem. Next, using a rigorous and logical approach, students can formulate solutions, perform precise calculations, and reach conclusions regarding the probability of properly handling the problem. The application of this PBL approach validates all problem-solving indicators, (Saragih & Habeahan, 2014), who found that PBL learning produced superior student response patterns than conventional instruction.

Increasing students' problem-solving abilities cannot be separated from the Toba Batak culture-based PBL model used. The learning activities follow Dewey's and Bruner principles (Rézio et al., 2022). An alternative way to learning is to apply the Problem Based Learning model (I. P. Simangunsong et al., 2022; I. T. Simangunsong et al., 2023). PBL focuses on two concepts: John Dewey's autonomous learning, which emphasizes learning in response to real-life situations, and Jerome Bruner's concept of epistemic motivation, which is an internal force that helps people comprehend things better. In order to develop their problem-solving skills, students learn by working through mathematics issues within their cultural environment.

According to their traditional wisdom, students working in groups must encourage one another: "*tinaon* barakbak*, dapotsa papaluan; lehet masioloan, unang masipamaluan*" translates to "support each other, don't embarrass your friends." In addition, "*bisuk songon ulok, marroha songon darapati*," or "be as clever as a snake

E-ISSN: 2656-5846
P-ISSN: 2656-2286

and wise as a dove," was another piece of advice from the Batak *umpasa*. All of these ancestor messages are beneficial for raising bright, morally upright offspring. "*Manat unang tartuktuk, dadap unang tarrobung*" (slow down so as not to trip, be careful so as not to fall) is an example of *umpasa*, or Batak Toba cultural values reminding pupils to work carefully when given an assignment to solve a problem. The phrase "*manatap tu jolo, manaili tu pudi*"—which translates to "looking to the future but don't forget the past"—is repeated to students after every accomplishment. It is emphasized to students that looking back at past events can help them solve difficulties in the future.

The findings of this investigation are consistent to (Saragih et al., 2017), who found that using instruments for advanced mathematical thinking skills in conjunction with student-centered learning grounded in local cultural models is a valid and effective approach for teaching mathematics in junior high schools. (Putri et al., 2023) mentioned in their study that e-module PBL with local cultural quite effective to assist students in improving their problem-solving abilities. Mathematics based on social arithmetic materials. This study also closely aligns with the other assertion that the Plomp development model produced valid, useful, and efficient findings when used to construct a problem-based learning model based on Batak culture (PBL-BC) (Sinaga, 2014). The Batak Toba cultural system *dalihan na tolu* is integrated into mathematics education through Bornok Sinaga's research. In the meantime, tugu (monuments), Ruma Gorga/Ruma Bolon, ulos, hats, sortali, and lapets are the part of Batak Toba cultures that is covered by this research. The current study is the outcome of Bornok Sinaga's research employing the ADDIE model, which has been modified for the demands of 21st-century digitalization. The Batak tribe produces digital textbook products (e-modules) that can be used in the environment by Toba junior high school students with a Batak Toba cultural context.

The PBL BTC e-module can be utilized as a guide when integrating it into other teaching resources to help students at the same or various educational unit levels enhance their ability to solve mathematical problems. Additionally, other academics can utilize this e-module product, which is based on Batak Toba culture, as a reference for developing e-modules with a particular cultural context.

4. Conclusions

Primarily conclusions from the above discussion, it is possible to conclude that the e-module PBL BTC is valid (supported by research instruments and e-module validation results), practical (supported by learning implementation observation results), and effective (supported by positive student responses and the ability to be problems solver). The research's conclusions and findings allow for the formulation of the following recommendations: 1) All classes and schools should continue to use the E-Module that was tested; 2) It is recommended to proceed with the E-Module containing mathematical problems on congruency in order to conduct additional effectiveness evaluations.

Author Contributions

Building the e-module media and gathering the information were contributions made by the first author. The other two authors evaluated the appropriateness of the descriptions of the assessment outcome. The fourth author in order to help

E-ISSN: *2656-5846*
P-ISSN: *2656-2286*

refine it.

Acknowledgment
We would like to thankfull everyone who helped with this research, particularly the expert validator from State University of Medan and the teachers at SMP Negeri 1 Simanindo.

Declaration of Competing Interest
All authors confirm that this research is writing that does not have the potential to cause problems both scientifically and socially.

References
Aulia, E. T., & Prahmana, R. C. I. (2022). Developing interactive e-module based on realistic mathematics education approach and mathematical literacy ability. *Jurnal Elemen*, *8*(1), 231–249. https://doi.org/10.29408/jel.v8i1.4569

Azid, N., Ali, R. M., El Khuluqo, I., Purwanto, S. E., & Susanti, E. N. (2022). Higher order thinking skills, school-based assessment and students' mathematics achievement: Understanding teachers' thoughts. *International Journal of Evaluation and Research in Education*, *11*(1), 290–302. https://doi.org/10.11591/ijere.v11i1.22030

Fitriani, F., Hayati, R., Sugeng, S., Srimuliati, S., & Herman, T. (2022). Students' Ability To Solve Mathematical Problems Through Polya Steps. *Journal of Engineering Science and Technology Special Issue on ICMScE2022*, 25–32.

Latif, N. S., & Talib, A. (2021). *Development of Ethnomathematics E-Modules Based on Local Wisdom to Improve Students' Cultural and Civic Literacy*. http://bookcreator.com,

Murtiyasa, B., & Wulandari, S. (2022). Problem Solving Ability According to Polya on System of Linear Equations in Two Variables Based on Student Learning Styles. *Jurnal Didaktik Matematika*, *9*(2), 261–279. https://doi.org/10.24815/jdm.v9i2.26328

Nurfadilah, Z., Hamidah, D., & Wulan, E. R. (2023). Pengembangan E-Modul Matematika Berbasis Matematika Realistik Bernilai Budaya Kediri pada Materi Perbandingan. In *Academic Journal of Math* (Vol. 05, Issue 01). http://journal.iaincurup.ac.id/index.php/arithmetic/index

PISA 2022 Results (Volume I). (2023). OECD. https://doi.org/10.1787/53f23881-en

Prahmana, R. C. I., Yunianto, W., Rosa, M., & Orey, D. C. (2021). Ethnomathematics: Pranatamangsa system and the birth-death ceremonial in yogyakarta. *Journal on Mathematics Education*, *12*(1), 93–112. https://doi.org/10.22342/JME.12.1.11745.93-112

Putri, L. S., Setiani, Y., & Santosa, C. A. H. F. (2023). E-Modul Matematika Berbasis Problem Based Learning Bermuatan Pengetahuan Budaya Lokal untuk Meningkatkan Kemampuan Pemecahan Masalah. *Jurnal Educatio FKIP UNMA*, *9*(2), 880–890. https://doi.org/10.31949/educatio.v9i2.5002

Rézio, S., Andrade, M. P., & Teodoro, M. F. (2022). Problem-Based Learning and Applied Mathematics. *Mathematics*, *10*(16). https://doi.org/10.3390/math10162862

Sagala, P. N., & Widyastuti, E. (2021). *Development of Junior High School Mathematics E-Modules Based on Project Based Learning Integrated by Merdeka Belajar*.

E-ISSN: *2656-5846*
P-ISSN: *2656-2286*

Saragih, S., & Habeahan, W. L. (2014). Journal of Education and Practice www.iiste.org ISSN. In *Online)* (Vol. 5, Issue 35). https://www.researchgate.net/publication/314116485

Saragih, S., Napitupulu, E. E., & Fauzi, A. (2017). Developing Learning Model Based on Local Culture and Instrument for Mathematical Higher Order Thinking Ability. *International Education Studies*, *10*(6), 114. https://doi.org/10.5539/ies.v10n6p114

Seruni, R., Munawaroh, S., Kurniadewi, F., & Nurjayadi, M. (2020). Implementation of e-module flip PDF professional to improve students' critical thinking skills through problem based learning. *Journal of Physics: Conference Series*, *1521* (4). https://doi.org/10.1088/1742-6596/1521/4/042085

Simangunsong, I. P., Simangunsong, I. T. (2022). *Penerapan Model Pembelajaran Problem Based Learning untuk Meningkatkan Kemampuan Pemecahan Masalah Matematis Siswa*. *4*(2), 840–851.

Simangunsong, I. T., Panjaitan, J., & Panggabean, D. D. (2023). Problem Based Learning On Students' Concept Mastery And Problem Solving Skills. *Natural Science: Jurnal Penelitian Bidang IPA Dan Pendidikan IPA*, *9*(2), 156–166.

Sinaga, B. (2014). Inovasi Model Pembelajaran Berbasis Budaya Batak. *Jurnal Generasi Kampus*, *7*(2), 187–208.

Tania, W. P., & Siregar, N. (2022). The Development of E-book Based on Realistic Mathematics Education (PMR) Approach to Improve Mathematical Communication Skills in Class VIII Junior High School Students. *Journal of Medives : Journal of Mathematics Education IKIP Veteran Semarang*, *6*(1), 91. https://doi.org/10.31331/medivesveteran.v6i1.1910

Utami, R. E., Nugroho, A. A., Dwijayanti, I., & Sukarno, A. (2018). Pengembangan E-Modul Berbasis Etnomatematika Untuk Meningkatkan Kemampuan Pemecahan Masalah. *Jurnal Nasional Pendidikan Matematika)*, *2*(2), 268–283.

Wahyu Sintiya, M., Puji Astuti, E., & Yudi Purwoko, R. (2021). Pengembangan E-modul Berbasis Etnomatematika Motif Batik Adi Purwo untuk. In *Siswa SMP JPMR* (Vol. 06, Issue 01). https://ejournal.unib.ac.id/index.php/jpmr

Wijaya, T. T., Zhou, Y., Houghton, T., Weinhandl, R., Lavicza, Z., & Yusop, F. D. (2022). Factors Affecting the Use of Digital Mathematics Textbooks in Indonesia. *Mathematics*, *10*(11). https://doi.org/10.3390/math10111808

Yeni D. Fonataba, Ronaldo Kho, Bettisari Napitupulu, Irfan Wahyudi, & Happy Lumbantobing. (2023). Ethnomathematics at TIFA Yapen as A Source for Learning Mathematics. *Hipotenusa: Journal of Mathematical Society*, *5*(2), 132–146. https://doi.org/10.18326/hipotenusa.v5i2.536

Yunianta, T. N. H., Herman, T., Wizhar, B. Al, & Kurniawan, M. A. F. (2023). Development of Mathematics E-Module Using Kodular and Flipbook for Junior High School Students: Differences. *Jurnal Didaktik Matematika*, *10*(1), 1–16. https://doi.org/10.24815/jdm.v10i1.29730