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# Ecolinguistic-Based Development of General Linguistics Materials Using Phonological and Lexical Variations of Angkola Batak

Eli Marlina Harahap<sup>1</sup>, Marhamah<sup>2</sup>, Yunus Sulistiyono<sup>3</sup>, Harun Joko Priyono<sup>4</sup>, Atiqa Sarbadila<sup>5</sup>

<sup>1</sup>Universitas Muhammadiyah Tapanuli Selatan, North Sumatra, Indonesia

<sup>1,2,3,4,5</sup>Universitas Muhammadiyah Surakarta



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## ABSTRACT

**Objective:** This study develops ecolinguistics-oriented General Linguistics teaching materials grounded in Angkola Batak phonological and lexical variation to support contextualized learning and local language preservation in Indonesian universities. **Method:** Using an R&D approach with the ADDIE model (analysis, design, development, implementation, evaluation), the product was validated and tested with five expert validators, two General Linguistics lecturers, and 60 Indonesian Language and Literature Education students at Universitas Muhammadiyah Tapanuli Selatan. Instruments included expert validation sheets, lecturer and student practicality questionnaires, and pre-post achievement tests. Data were analyzed descriptively and inferentially using the Content Validity Index (CVI), Cronbach's Alpha, N-Gain, and a paired-sample t-test. **Results:** The teaching material showed very high validity (CVI = 0.91), strong reliability ( $\alpha = 0.86$ ), and high practicality (overall practicality = 91%). Effectiveness results indicated a significant improvement in learning outcomes, with mean scores increasing from 70.27 (pre-test) to 88.56 (post-test) and an N-Gain of 0.60 (moderate-high;  $p < 0.05$ ). The material enhanced students' analytical skills in phonology and lexicon while fostering ecolinguistic awareness of regional linguistic diversity. **Novelty:** The study offers a replicable framework for operationalizing applied ecolinguistics in linguistic pedagogy through local language data.

## INTRODUCTION

Language is one of the most vital components sustaining human culture and knowledge. Currently, around 7,000 living languages exist worldwide, with more than 40 percent facing the threat of extinction, while on average one language disappears every two weeks an alarming indication of a global linguistic vitality crisis (UNESCO, 2023). The loss of local languages directly damages the ecosystem of knowledge and culture, as each language embodies a unique conceptual system, social norms, and collective heritage of its community (World Economic Forum, 2023). The shift toward dominant languages has weakened the intergenerational transmission of minority languages and hindered the preservation of traditional knowledge within formal education systems. Indonesia, home to more than 700 local languages, is recognized as one of the most linguistically diverse countries in the world. However, approximately 425 of these languages are now classified as endangered, positioning Indonesia among nations facing a significant risk of linguistic loss (Seasia, 2025). Higher education institutions hold a strategic role in linguistic preservation by fostering ecolinguistic awareness that integrates language, society, and cultural environment into curriculum development and teaching materials. The introduction needs to relate to the problems or issues being recognised and eventually leading the research questions. The structuring of the introduction part may vary. This section discusses the results and conclusions of previously published studies, to help explain why the current study is of scientific interest.



The ecolinguistic paradigm defines language as a component within an ecological system that interconnects humans, society, and their natural cultural environment (Zhang et al., 2022). The principles of holism and dynamism emphasized in ecolinguistic studies assert that language teaching does not merely transmit linguistic systems but also fosters awareness of the interrelationships between language, social structures, and cultural environments (Brown, 2022). Recent research highlights a shift from purely environmental discourse analysis toward sustainability-oriented and contextual educational frameworks, such as the transformative approach to **language teaching for sustainability** (Maijala et al., 2023). The integration of local language sustainability values through the development of General Linguistics teaching materials based on an ecolinguistic approach offers significant potential to strengthen the relevance of linguistic education and support the preservation of linguistic diversity.

The need for locally relevant teaching materials remains unfulfilled in General Linguistics instruction at Indonesian universities, as most language education content continues to rely heavily on Western linguistic theories and provides minimal engagement with students' local contexts (Madkur et al., 2024; Nataprawira & Carey, 2020). This condition has reduced the relevance of learning materials to students' sociocultural environments and weakened their sensitivity toward regional linguistic diversity, ultimately impeding the development of contextual and critical linguistic awareness. Addressing this issue requires the development of locally grounded teaching materials that utilize phonological and lexical variations of regional languages so that linguistic learning remains connected to the realities of Indonesian and local languages, while reinforcing the relationship between linguistic theory and students' language experiences.

The Angkola Batak dialect, spoken in the Tapanuli Selatan Regency including the Padangsidempuan area, exhibits significant phonological and lexical variations. Recent studies identified the consistent placement of stress on the first syllable in Angkola declarative utterances (Nadra et al., 2024), while comprehension of cultural lexicon items reached only 39.13%, with the remaining items classified as endangered based on a survey of 207 lexical entries among adult Angkola speakers (Syarfina et al., 2023). These variations reflect active socio-geographical interactions and dynamic cultural adaptation within the community, aligning with the ecolinguistic framework that conceptualizes language as part of an interconnected socio-linguistic ecosystem rather than an isolated entity. The utilization of Angkola phonological and lexical diversity in developing General Linguistics teaching materials offers an opportunity to bridge linguistic theory with empirical local data, enhance the contextual relevance of student learning, and support the preservation of linguistic diversity as an integral component of sustainability-oriented higher education.

These documented conditions indicate that the challenge is not merely the absence of local examples in linguistics instruction, but the limited pedagogical mechanism to transform local linguistic vulnerability into structured learning experiences. In the Angkola Batak context, phonological variation across regions and the endangerment of cultural lexicon signal an ongoing ecological shift in language use and transmission. When such empirical realities are not integrated into General Linguistics courses, students are trained to treat language as an abstract system detached from their socio-cultural environment. Therefore, ecolinguistics-oriented teaching materials grounded in Angkola phonological and lexical data are needed to bridge theory with authentic local



evidence, strengthen analytical competence, and simultaneously support sustainable local language preservation within higher education.

This study aims to develop General Linguistics teaching materials oriented toward ecolinguistics by utilizing the phonological and lexical variations of the Angkola Batak language as an authentic source of local data. The development is intended to produce a learning resource that is not only valid and pedagogically effective but also functions as a medium for strengthening ecological language awareness and preserving regional linguistic values within academic settings. The research focuses on the conceptual design of ecolinguistics-based teaching materials, expert validation and implementation testing processes, as well as the analysis of their theoretical relevance to linguistics instruction in higher education. The findings are expected to contribute to the enrichment of applied ecolinguistic theory, the development of contextual linguistic learning models, and the enhancement of students' capacity to understand language phenomena from social, cultural, and ecological perspectives.

## RESEARCH METHOD

This study employed a Research and Development (R&D) approach using the ADDIE model (Analysis, Design, Development, Implementation, and Evaluation). The ADDIE model was selected for its systematic and adaptive characteristics, allowing the integration of ecolinguistic dimensions with instructional design principles at each stage of development. This approach is not merely descriptive of linguistic phenomena but is oriented toward the production of validated, practical, and effective teaching materials. Within educational research, ADDIE is considered highly relevant for local-context studies, as it provides reflective space across development phases to ensure that instructional products are contextually grounded and sustainable (Aldoobie, 2023; Branch, 2021).

The study was conducted in Tapanuli Selatan Regency, the primary distribution area of the Angkola Batak language. This region was selected due to its rich phonological and lexical variation, which represents dialectal conditions highly relevant to an ecolinguistic approach. The research subjects consisted of three groups: (1) experts in linguistics, ecolinguistics, and instructional design who served as validators; (2) lecturers teaching General Linguistics courses; and (3) students of the Indonesian Language and Literature Education Program who participated as trial respondents. Participants were selected through purposive sampling, considering academic competence, involvement in linguistics learning, and regional representation.

The research procedure followed the five stages of the ADDIE model. During the analysis stage, needs data were collected through classroom observations, interviews with lecturers, and an examination of deficiencies in existing teaching materials. At this stage, Angkola linguistic data were also analyzed, encompassing phonological and lexical variation based on a 200-word Swadesh list, which is commonly used to examine basic vocabulary retention and structural variation across speech communities (Crowley & Bower, 2010; Swadesh, 1955). Linguistic data were collected from eight Angkola-speaking areas, namely Tantom Angkola, Aek Natas, Aek Latong, Panobasan Dolok, Sisundung, Sipirok, Pargarutan Julu, and Sayur Matinggi.

Informants were selected purposively based on the following criteria: (1) native speakers of Angkola Batak who actively use the language in daily communication, (2) long-term residence in the local community, and (3) willingness to participate



voluntarily in the research. This selection strategy aligns with established practices in dialectology and field linguistics to ensure the authenticity of linguistic data (Bower, 2008; Chambers & Trudgill, 1998). Lexical elicitation was conducted orally in relatively quiet environments to minimize external interference. All responses were audio-recorded and supplemented with brief field notes when contextual clarification was required.

The recorded data were transcribed using the International Phonetic Alphabet (IPA) to capture segmental and relevant suprasegmental features (Association International Phonetic, 1999). Phonological analysis focused on identifying systematic variations such as vowel alternation, consonant deletion, and phoneme substitution across regions, while lexical analysis examined synonymic variation and distributional patterns of basic vocabulary items. To ensure data credibility, unclear forms were re-elicited, and transcription results were cross-checked prior to their integration into the instructional material design, following recommended validation procedures in qualitative linguistic research (Miles, Huberman, & Saldaña, 2014).

The design stage focused on constructing the framework of ecolinguistics-oriented teaching materials, including the formulation of learning indicators, structuring of module content, and design of learning activities grounded in local linguistic data. The development stage involved producing the initial teaching material, conducting expert validation covering material, language, media, and ecolinguistic aspects, and revising the product based on expert feedback. The implementation stage was carried out through both limited and large-scale trials in General Linguistics classes, accompanied by the collection of responses from students and lecturers. The evaluation stage was conducted formatively at each phase of development and summatively at the final stage through pre-post learning achievement tests and reflective interviews.

Data collection techniques comprised observation, interviews, and linguistic analysis. Observation and interviews were employed to explore learning needs and perceptions of linguistics instruction. Linguistic analysis involved phonetic transcription, mapping of phonological variations, and comparison of lexical items across regions. Expert validation was conducted using assessment sheets with a five-point Likert scale covering aspects of content, language, presentation, and integration of ecolinguistic values. Practicality and effectiveness tests were administered using student questionnaires, lecturer observation sheets, and pre-post learning achievement tests to measure improvements in students' linguistic understanding.

Quantitative data were analyzed using descriptive and inferential statistics. The validity of the teaching materials was assessed based on feasibility percentages, categorized as highly valid when scores reached  $\geq 80\%$ . Practicality was determined from the average responses of students and lecturers, while effectiveness was measured using the Normalized Gain (N-Gain) and paired-sample t-test. Qualitative data were analyzed through a thematic analysis approach, examining expert comments, student reflections, and interview results. Quantitative and qualitative findings were then triangulated to comprehensively assess the acceptability of the developed teaching materials (Cohen et al., 2022; Sugiyono, 2021).

The content validity of research instruments was established through expert judgment involving three to five specialists. Instrument reliability was tested using Cronbach's Alpha coefficients ( $\geq 0.7$ ) to ensure internal consistency. Research ethics were upheld through informed consent, confidentiality of data, and respect for the



cultural rights of local language speakers. The research outputs included a phonological and lexical description of the Angkola dialect, an ecolinguistics-oriented General Linguistics teaching material, and validated evidence of the product's validity, practicality, and effectiveness, which together form the empirical foundation for scholarly contributions in Applied Linguistics and Language Education.

## RESULTS AND DISCUSSION

### Results

#### Analysis Stage

The needs analysis revealed a persistent gap between the theoretical orientation of General Linguistics instruction and students' linguistic realities. Interviews with lecturers and classroom observations indicated that most teaching materials remain grounded in Western theoretical frameworks and rely on examples drawn from foreign languages or formal Indonesian, thereby underrepresenting local linguistic phenomena. This situation reduced the relevance of learning for students in North Sumatra and limited their ability to connect linguistic concepts with regional sociocultural realities.

Qualitative evidence from student reflections further reinforced the need for contextualization. One student wrote that the course examples "often feel distant from the way we actually speak at home, so the concepts stay abstract" (Student Reflection, S12). Another student noted that "when the examples come from Angkola, I can finally see how phonological processes work in real life" (S27). Students also linked the learning experience to ecolinguistic awareness; as one reflection stated, "it made me realize that variations across villages are part of our identity and should not be treated as 'wrong' forms" (S41). A lecturer similarly emphasized that "local language data helps students grasp core concepts faster while building respect for linguistic diversity" (Interview, L1). Collectively, these responses indicate that both lecturers and students require contextualized teaching materials grounded in local language data to foster ecolinguistic awareness and support local-language sustainability.

The initial linguistic analysis of the 200-word Swadesh list collected from eight Angkola dialect regions Tantom Angkola, Aek Natas, Aek Latong, Panobasan Dolok, Sisundung, Sipirok, Pargarutan Julu, and Sayur Matinggi revealed rich phonological and lexical variations. Most core vocabulary items such as *aek* 'water', *sada* 'one', *batu* 'stone', and *tano* 'soil' demonstrated lexical stability across regions, whereas salient phonological variation was observed in final vowel alternation (*tajam* ~ *tajom*), initial consonant deletion (*hisap* ~ *iccop/hirup*), and iconic reduplication (*lom-lom* 'black', *mok-mok* 'fat') that serves to intensify meaning. Assimilation and consonant gemination were also identified in forms such as *tukkot/tokkat/tukkat* 'stick', along with pronominal diphthong variation (*au/auu/aa* 'I') indicating phonetic shifts. From the lexical perspective, several semantic equivalents exhibited differentiation in lexical choice, such as *anjing/biang* 'dog', *burung/unggas/pidong* 'bird', and *dengan/dohot/rap* 'with', reflecting the interplay between linguistic variation and socio-geographical factors. These findings provide empirical evidence that the Angkola dialect holds substantial potential as a linguistic data source for teaching phonological, lexical, and language variation analysis through an evidence-based linguistic learning framework.



**Table 1.** Patterns of Phonological and Lexical Variation in the Angkola Dialect

No	Type of Variation	Example	Linguistic Description
1	Final vowel alternation /a ~ o/	<i>tajam ~ tajom</i>	Variation in vowel quality at the final syllable
2	Deletion of initial /h/	<i>hisap ~ iccop/hirup</i>	Reduction of initial phoneme due to phonotactic shift
3	Iconic reduplication	<i>lom-lom 'black', mok-mok 'fat'</i>	Semantic emphasis through syllable repetition
4	Consonant gemination	<i>tukkot/tokkat/tukkat 'stick'</i>	Prosodic stress and articulatory reinforcement
5	Diphthong and vowel length variation	<i>au/auu/aaU 'I'</i>	Variation in vowel length and diphthongization
6	Lexical substitution (synonymic alternation)	<i>anjing/biang; burung/unggas/pidong</i>	Lexical substitution based on regional distribution

These findings indicate the need for teaching materials that integrate local linguistic data into the instructional structure. Students expressed that they require materials providing clear guidance for phonetic analysis and cross-regional form comparison, complemented by activities involving phonological variation mapping and cultural reflection. Therefore, the design of the teaching materials must address three main focuses: (1) the analysis of authentic linguistic data from the Angkola dialect; (2) the reinforcement of awareness regarding the relationship among language, society, and the environment; and (3) the development of analytical skills in phonology and lexicon through an ecolinguistic approach. The integration of user needs and the potential of regional linguistic variation serves as the foundational basis for the Design Stage in the ADDIE model.

### Design Stage

The design of the teaching materials was based on the results of the needs analysis and linguistic data, which revealed the richness of phonological and lexical variations in the Angkola dialect. This stage aimed to construct a systematic instructional design that explicitly integrates ecolinguistic concepts into every component of the General Linguistics teaching materials. Guided by the principles of instructional design, the process began with determining the learning objectives, analyzing student characteristics, and formulating learning outcomes oriented toward analytical and critical thinking competencies as well as language ecology awareness. The design approach followed the second stage of the ADDIE model the design phase which emphasizes the alignment among learning objectives, content, instructional strategies, and assessment (Benavides et al., 2020; Branch, 2021).

The structure of the teaching materials was developed into six learning units representing the core aspects of General Linguistics, namely: (1) the fundamental concepts of linguistics and ecolinguistics, (2) the sound system and phonology, (3) phonological variations of the Angkola dialect, (4) lexical structure and meaning, (5) inter-district lexical variation, and (6) ecolinguistic reflection on local language preservation. Each unit was designed to include four main components: a concise theoretical introduction, analytical activities based on local linguistic data, ecolinguistic reflection, and formative evaluation. For instance, in Unit III, students are tasked with conducting phoneme mapping using variation data such as *tajam ~ tajom* or *hisap ~ iccop*, while Unit V guides students in constructing lexical variation maps for basic vocabulary such as *anjing/biang* ('dog') or *burung/unggas/pidong* ('bird'). This approach



enables students to practice phonetic analysis skills, understand the concept of language variation, and simultaneously cultivate appreciation toward the local linguistic ecology (Anggayana, 2023).

The learning media were developed in both printed and interactive digital module formats to support flexible use in classroom and online learning environments. The visual design of the module features dialect distribution maps, sound comparison diagrams, and evidence-based linguistic task sheets. Elements of local cultural values such as distinctive expressions and lexical items that reflect Angkola wisdom were incorporated to strengthen the dimension of sociocultural ecology, as recommended in ecolinguistically oriented language education (Dervin, 2024; Huszka et al., 2024). Formative evaluation was conducted through feedback from experts in linguistics, ecolinguistics, and course instructors to refine the initial design before proceeding to the development phase.

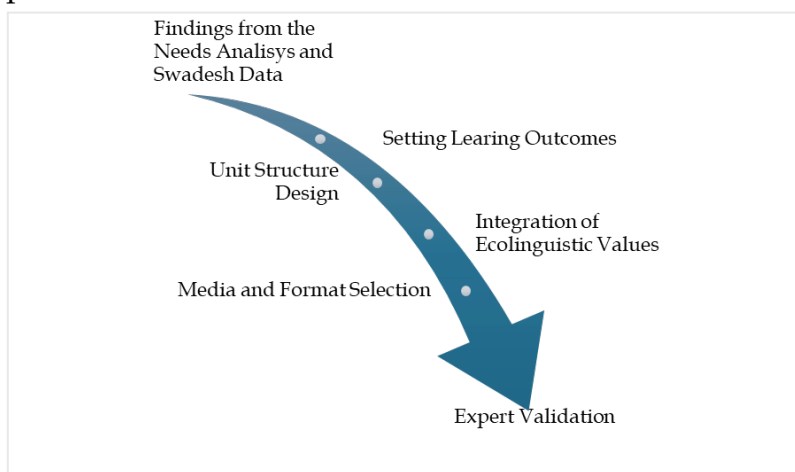


Figure 1. Flowchart for Designing Ecolinguistically Oriented Teaching Materials (ADDIE Model)

Table 2. Structure and Components of Ecolinguistics-Oriented Teaching Material Units

Unit	Unit Title	Learning Focus	Type of Analytical Activity
I	Basic Concepts of Linguistics and Ecolinguistics	Introduction to linguistic theory and language ecology	Text discussion and concept mapping
II	Sound System and Phonology	Phonemes, allophones, and sound distribution	IPA transcription and <i>minimal pair</i> analysis
III	Phonological Variation in the Angkola Dialect	Analysis of segmental and suprasegmental variation	Sound mapping and cross-regional comparison
IV	Lexical Structure and Meaning	Relationship between form, meaning, and lexical categories	Classification of cultural lexicon
V	Inter-Regional Lexical Variation	Comparison of synonyms and lexical isoglosses	Lexical variation mapping and semantic analysis
VI	Ecolinguistic Reflection	Evaluation of ecological values in language	Reflective essay writing

This design ensures that each component of the teaching material not only develops students' analytical competence in linguistics but also fosters ecological awareness of the role of local languages in maintaining cultural identity. The integration of ecolinguistic values within the structure and activities of the module aligns the design with the goals of modern sustainable linguistic education while



simultaneously supporting local language preservation policies within the framework of Multilingual Education for Sustainability (UNESCO, 2024).

### Development Stage

The development stage represents a crucial phase in the ADDIE model, as all conceptual designs produced during the design phase are implemented into a tangible product ready for testing. The development process in this study consisted of three main activities: (1) creating a prototype of the ecolinguistics-oriented General Linguistics teaching material, (2) conducting expert validation by specialists in relevant fields, and (3) revising the product based on feedback obtained from the validation results.

The initial version of the teaching material was developed in both printed and digital module formats, consisting of six learning units as established during the design stage. Each unit includes a concise theoretical introduction, analytical activities based on linguistic data from the Angkola dialect, and ecolinguistic reflections aimed at fostering awareness of local language diversity. The material was written in communicative academic language and enriched with contextual examples and maps illustrating phonological and lexical variations across the eight research regions. The combination of printed and digital media was intended to ensure flexibility, enabling the material to be used effectively in both face-to-face and online learning environments (Ali et al., 2024).

The validation process was conducted by five experts consisting of two linguistics specialists, one ecolinguistics expert, one instructional design expert, and one educational media expert. Each validator assessed four aspects of feasibility: (1) content/material, (2) language, (3) presentation, and (4) visual design and ecolinguistic value. The validation instrument employed a five-point Likert scale with categories ranging from “very inadequate” to “highly appropriate.” The validation results indicated that the overall mean score reached 91.37%, placing it in the “highly appropriate” category for use in the learning process. Details of the expert evaluation are presented in Table 3 below.

**Table 3.** Expert Validation Results of the Ecolinguistics-Oriented Teaching Material

Evaluated Aspect	Mean Score (%)	Category
Content/Material Feasibility	93.12	Highly Appropriate
Language	89.76	Appropriate
Presentation and Content Organization	90.84	Highly Appropriate
Visual Design and Media	91.75	Highly Appropriate
Integration of Ecolinguistic Values	91.37	Highly Appropriate
Overall Mean	91.37%	Highly Appropriate

Following the validation results, revisions were made to strengthen the linguistic components and task instructions. The validators recommended that local terminology be accompanied by an academic Indonesian glossary and that a reflection section be added at the end of each unit to assess students’ levels of ecolinguistic awareness. Additional revisions included refinements to the layout and color scheme to enhance readability in accordance with instructional material design principles. These revisions resulted in a finalized version of the teaching material, ready to be tested during the Implementation Stage.



The quality of the developed teaching material demonstrated conformity with the criteria for effective instructional material development as proposed by Branch (2021) and the feasibility evaluation by Aldoobie (2023), in which a validity level of  $\geq 80\%$  indicates alignment between content, objectives, and user context. These findings also support (Sudarsi et al., 2025; Tazhitova et al., 2024), who emphasized that integrating local cultural elements into material design significantly enhances learning relevance and student engagement. Therefore, this development and validation stage confirms that the resulting teaching material possesses strong content quality, communicative language use, attractive visual presentation, and ecolinguistic values consistent with the goals of sustainable linguistic education.

### Implementation Stage

The implementation stage served as the trial phase for applying the ecolinguistics-oriented General Linguistics teaching material that had previously been rated as "highly appropriate" during the validation stage. The trials were conducted in two phases: a limited trial and a large-scale trial. The limited trial was carried out in a small class of 20 students, while the large-scale trial involved 60 students from the Indonesian Language and Literature Education Program at Universitas Muhammadiyah Tapanuli Selatan. The primary objective of this stage was to assess the practicality level of the teaching material based on user feedback (lecturers and students) while also observing the implementation of learning activities and the acceptance of ecolinguistic concepts within the context of linguistics instruction.

The limited trial was conducted over three class meetings focusing on the first two units *Sound System and Phonology* and *Phonological Variation in the Angkola Dialect*. Students were given opportunities to perform phonetic transcriptions of local data such as *tajam ~ tajom* and *hisap ~ iccop*, as well as to compare lexical variations such as *anjing/biang* ('dog') and *burung/pidong* ('bird'). These activities encouraged students to analyze the linguistic realities of their own environment while fostering ecological awareness of local language diversity. Observation results indicated an increase in students' active participation in linguistic analysis activities, with more than 85% of participants demonstrating accurate phonemic classification according to the instructor's criteria.

The large-scale implementation stage focused on evaluating the practicality of the developed teaching material. Practicality was assessed using a questionnaire consisting of five main indicators: ease of use, clarity of instructions, visual appeal, material relevance, and contribution to improving students' understanding of linguistic concepts. The response data from both lecturers and students are presented in Table 4 below.

**Table 4.** Practicality Evaluation Results of the Teaching Material by Lecturers and Students

Practicality Aspect	Lecturers (%)	Students (%)
Ease of use	92.3	88.6
Clarity of instructions	93.7	90.1
Visual appeal	90.4	87.8
Relevance of material to local context	95.6	91.5
Contribution to conceptual understanding	94.2	89.7
Overall Mean	93.24	89.54



The overall mean scores of 93.24% (lecturers) and 89.54% (students) indicate that the teaching material is categorized as highly practical, as all indicators scored above 85%, meeting the “very good” criterion established by (Plomp & Nieveen, 2013). Lecturers reported that the structure of the material facilitated the learning process, particularly in bridging theoretical concepts of general linguistics with the practical analysis of local language data. Students appreciated the clarity of the instructions and the relevance of the material to their daily linguistic experiences, which were perceived to enhance their learning motivation and engagement. Classroom observations also showed that the use of this material strengthened interaction between lecturers and students, as local data-based learning activities encouraged reflective and collaborative discussions.

The effectiveness of the implementation was also examined through indicators of learning feasibility, which included media readiness, time allocation, and student participation. The feasibility score reached 95%, categorized as excellent, indicating that the teaching material could be implemented without any significant technical difficulties. Qualitative assessments obtained from post-implementation interviews revealed that students felt “they better understood phonological concepts because they directly analyzed the language used in their daily communication,” while lecturers observed that “the ecolinguistic values embedded in the material strengthened students’ awareness of the importance of preserving local languages.”

The findings of this stage are consistent with Ifenatuora et al. (2025), who demonstrated that the use of contextual teaching materials based on local languages enhances both the relevance and depth of students’ understanding of linguistic theory. Furthermore, the high level of practicality obtained in this study supports the perspective of Hamuddin et al. (2025), who argued that the integration of cultural values and environmental sustainability into learning materials enriches the learning process while fostering socio-linguistic awareness and responsibility.

### Evaluation Stage

The evaluation stage was conducted to assess the overall quality of the ecolinguistics-oriented General Linguistics teaching material and to measure its effectiveness in improving students’ understanding of linguistic concepts. The evaluation was carried out through two approaches: formative evaluation, implemented throughout each development phase, and summative evaluation, conducted after the implementation of the final product.

The formative evaluation involved continuous revisions at each phase of the ADDIE model based on feedback from validators and users. The results of these revisions indicated that the material became increasingly communicative, systematic, and better integrated with the local context. The addition of an academic glossary for local terms and ecolinguistic reflection sheets at the end of each unit served as key enhancements to reinforce the sustainability values of regional language and culture. Furthermore, classroom observations during the implementation phase revealed that students not only comprehended phonological and lexical theories but also began to connect linguistic phenomena with their social and cultural environments as an indication of developing language ecology awareness.

The summative evaluation focused on measuring the effectiveness of the teaching material on students’ learning outcomes. Effectiveness was assessed by comparing pre-



test and post-test scores evaluating students' ability to analyze phonological features, classify lexical items, and apply ecolinguistic principles. Quantitative data showed a significant increase in students' average scores, as presented in Table 5 below.

**Table 5. Learning Effectiveness Test Results**

Description	N	Mean Pre-test	Mean Post-test	N-Gain	Sig. (t)
Phonological analysis ability	60	71.23	88.71	0.60	0.001 *
Understanding of lexical variation	60	69.45	87.62	0.58	0.002 *
Ecolinguistic awareness	60	70.12	89.35	0.63	0.000 *
Overall mean	60	70.27	88.56	0.60	-

The results of the paired-sample t-test showed a significance value of ( $p < 0.05$ ), indicating a statistically significant difference between students' learning outcomes before and after using the teaching material. The average N-Gain value of 0.60, categorized as moderate to high, demonstrates that the material made a substantial contribution to improving students' linguistic comprehension. Qualitative responses from students reinforced this finding; they reported that abstract concepts such as phonemes, allophones, and lexical variation became easier to understand when learned through concrete examples of local languages familiar to them.

Lecturers' reflections indicated that the teaching material served a dual function: as a contextual tool for linguistic instruction and as an educational medium for local language preservation. Activities such as analyzing Swadesh list data and mapping phonological variations stimulated critical discussions about language change, national language dominance, and the threat of local language extinction. These findings are consistent with Stibbe (2021) and Benavides et al. (2020), who emphasized that the application of ecolinguistic principles in education fosters language ecological awareness and sociolinguistic responsibility among students. From an educational implementation perspective, the results also align with García (2024), who found that the integration of local culture and language into teaching materials positively influences learning motivation and conceptual understanding. Collectively, these findings provide strong evidence that the developed ecolinguistics-oriented General Linguistics teaching material demonstrates high effectiveness both cognitively, in enhancing students' analytical linguistic abilities, and affectively, in fostering awareness of local language preservation.

**Instrument Validity and Reliability**

Validity and reliability tests were conducted to ensure that all research instruments used in developing the ecolinguistics-oriented *General Linguistics* teaching material possessed high levels of accuracy and consistency. The instruments evaluated included the expert validation sheets, practicality questionnaires, and students' learning achievement tests. The analysis was carried out using IBM SPSS Statistics, employing two main statistical procedures: the Content Validity Index (CVI) and Cronbach's Alpha Reliability Test.

**Table 6. Results of Instrument Validity and Reliability Tests**

Instrument Aspect	Number of Items	CVI	Cronbach's Alpha
Expert Validation (Content, Language, Presentation, Media, Ecolinguistic Value)	28	0.91	0.87



Instrument Aspect	Number of Items	CVI	Cronbach's Alpha
Student Practicality Questionnaire	20	0.90	0.85
Lecturer Practicality Questionnaire	20	0.89	0.83
Learning Achievement Test (Pre-Post Test)	15	0.92	0.88
Overall Mean	-	0.91	0.86

The average Content Validity Index (CVI) of 0.91 indicates that all instrument items fall within the “highly valid” category, exceeding the minimum threshold of 0.80 (Polit & Beck, 2022). This result demonstrates that each item accurately measures its intended construct covering aspects of content, linguistic clarity, presentation, and integration of ecolinguistic values. Meanwhile, the Cronbach's Alpha coefficient of 0.86 confirms that the instruments possess high reliability, meaning that the items yield consistent results when applied repeatedly within the same context (George & Mallery, 2020). All  $\alpha$  values above 0.80 further indicate that variations among respondents did not significantly affect measurement stability.

### Discussion

This study demonstrates that the developed ecolinguistics-oriented General Linguistics teaching material effectively fulfills the core criteria of instructional material quality within a Research and Development (R&D) framework. The high validity and practicality scores indicate strong alignment between content, learning objectives, and user context, confirming that the material is pedagogically feasible and contextually responsive. This finding supports the feasibility criteria proposed by Kurpayanidi et al. (2021) and aligns with Aldoobie (2023), who emphasizes that instructional products developed through the ADDIE model achieve higher effectiveness when they are systematically adapted to local educational and cultural contexts.

Beyond technical feasibility, the integration of Angkola Batak phonological and lexical data strengthens the contextual dimension of the teaching material. The high level of practicality reflects lecturers' and students' positive responses toward learning activities grounded in authentic local language data. This supports prior findings that contextual teaching materials rooted in local linguistic resources enhance relevance, engagement, and conceptual depth in linguistics learning (Ifenatuora et al., 2025; Pratama, 2022). In this regard, the ADDIE-based development process not only ensured instructional clarity but also enabled the systematic incorporation of ecolinguistic values into course design.

The effectiveness of the teaching material is further evidenced by lecturers' reflections and learning outcome improvements, which indicate that the material functions dually as an instructional medium and as a tool for fostering ecolinguistic awareness. Learning activities such as analyzing Swadesh list data and mapping phonological variations encouraged students to critically reflect on language change, dominance of national languages, and the vulnerability of local languages. These outcomes align with studies highlighting that ecolinguistics-based education promotes sociolinguistic responsibility and awareness of language sustainability (Bortoluzzi, 2021; Micalay-hurtado & Poole, 2022). From an instructional perspective, the integration of local language and cultural content also supports increased learning motivation and deeper conceptual understanding, as noted by (Mardiani & Baharuddin, 2023).



Collectively, these findings suggest that the effectiveness of the developed teaching material lies not only in improving students' cognitive linguistic competencies but also in cultivating affective dimensions related to local language preservation. The study thus extends the application of ecolinguistics from descriptive linguistic analysis toward a practical pedagogical framework, demonstrating how R&D-based instructional design can operationalize local linguistic ecology as a sustainable learning resource in higher education.

## CONCLUSION

**Fundamental Finding :** This study successfully developed an ecolinguistics-oriented General Linguistics teaching material based on the phonological and lexical variations of the Angkola Batak language. Using the Research and Development (R&D) approach with the ADDIE model covering analysis, design, development, implementation, and evaluation the study produced a contextual, valid, practical, and effective learning resource for higher education. The material achieved very high content validity (CVI = 0.91), strong reliability ( $\alpha = 0.86$ ), and high practicality ratings (above 89%). The learning effectiveness test further indicated a significant improvement in students' analytical competence, with mean scores rising from 71.23 to 88.71 (*N-Gain* = 0.60, moderate high category). These findings affirm that integrating ecolinguistic values into linguistic teaching materials enhances students' conceptual understanding while fostering ecological awareness of linguistic diversity. **Implication :** This study strengthens applied ecolinguistics by moving beyond discourse analysis toward contextual linguistic pedagogy using local language data. At the national-policy level, the module can be directly aligned with SN-Dikti and CPL/KKNI (OBE) requirements for higher education, providing an evidence-based prototype to integrate local-language preservation into General Linguistics learning outcomes and assessment. **Limitation :** The study was limited to the Angkola Batak dialect and involved a specific group of participants within one higher education institution. The product validation and implementation were conducted over a single semester, which may not fully capture long-term impacts on students' ecolinguistic awareness and linguistic competence. Furthermore, the focus on phonological and lexical aspects did not yet encompass broader linguistic domains such as morphology, syntax, or discourse. **Future Research :** Future studies are encouraged to extend the application of this model to other dialects or linguistic subfields to verify its adaptability and scalability. Further research could also develop interactive digital and multimedia-based versions of the material to enhance accessibility and engagement in blended or online learning environments. Longitudinal studies examining behavioral and attitudinal changes in students' ecolinguistic awareness over time would also provide deeper insights into the sustainability of ecolinguistics-based education.

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## REFERENCES

- Aldoobie, N. (2023). Educational design models: Revisiting ADDIE for local context adaptation. *International Journal of Instructional Design*, 16(2), 45–60.
- Ali, A. A., AlQarni, K., Migdadi, H. F., Aldosemani, T. I., & Alshraah, S. M. (2024). Addressing the Challenge of Hybrid Learning Environment in Foreign Language Education: Training Lecturers for Blended Teaching Approaches. *Theory and Practice in Language Studies*, 14(5), 1582–1594. <https://doi.org/10.17507/tpls.1405.32>
- Anggayana, I. W. A. (2023). Integrating Linguistic Theories into English Language Education in Tourism Sectors: A Comprehensive Framework. *Jurnal Manajemen Pelayanan Hotel*, 7(2), 891–918. <https://doi.org/10.17509/ijal.v10i2.28610>
- Association International Phonetic. (1999). *Handbook of the International Phonetic Association: A guide to the use of the International Phonetic Alphabet*. Cambridge University Press.
- Benavides, L. M. C., Arias, J. A. T., Serna, M. D. A., Bedoya, J. W. B., & Burgos, D. (2020). Digital Transformation in Higher Education Institutions: A Systematic Literature Review. *Sensors (Basel, Switzerland)*, 20(11), 1–22. <https://doi.org/10.3390/s20113291>
- Bortoluzzi, M. (2021). *Ecolinguistics. Language, Ecology and the Stories We Live By*. XIX(21), 109–111. <https://doi.org/10.17456/SIMPLE-177>
- Bowern, C. (2008). *Linguistic fieldwork: A practical guide*. Palgrave Macmillan.
- Branch, R. M. (2021). *Instructional Design: The ADDIE Approach*. Springer.
- Brown, K. (2022). Linguistic ecology and multilingual education. *Eesti Haridusteaduste Ajakiri*, 10(10), 29–47.
- Chambers, J. K., & Trudgill, P. (1998). *Dialectology* (2nd ed.). Cambridge University Press.
- Cohen, L., Manion, L., & Morrison, K. (2022). Research methods in education. In *Routledge* (9th editio). Routledge.
- Crowley, T., & Bowern, C. (2010). *An introduction to historical linguistics* (4th ed.). Oxford University Press.
- Dervin, F. (Ed.). (2024). *The Routledge handbook of critical interculturality in communication and education*. Routledge.
- García, I. A. (2024). *The Impact of a Cultural Approach in English Teaching on Secondary School Students' Motivation and Linguistic Ferformance*.
- Hamuddin, B., Ningrum, F. S., & Ramadhani, M. R. (2025). Mapping the Functions and Contributions of Applied Linguistics in Higher Education: Insights from Contemporary Research. *Journal of The Association for Arabic and English*, 11(1), 17–33.
- Huszka, B., Stark, A., & Aini, I. (2024). Linguistic Sustainability: Challenges and Strategies of Preserving Minority and Indigenous Languages-The Case of Indonesia. *International Journal of Arts and Social Science*, 7(6), 147–160. [www.ijassjournal.com](http://www.ijassjournal.com)
- Ifenatuora, G. P., Awoyemi, O., & Atobatele, F. A. (2025). A Conceptual Framework for Contextualizing Language Education Through A Conceptual Framework for



Contextualizing Language Education Through Localized Learning Content. *Iconic Research and Engineering Journals*, 5(1).

- Kurpayanidi, K., Nabiyeva, N., Akhunova, S., & Tukhtasinova, M. (2021). Analysis of the State's Macroeconomic Policy. *Revista Gestão Inovação e Tecnologias*, 11(4), 4669–4680. <https://doi.org/10.47059/revistageintec.v11i4.2495>
- Madkur, A., Syihab, M., Prayogo, A., Sunarwan, A., Siregar, S., Harya, T. D., & Irwansyah, D. (2024). Context-responsive pedagogy in English language teaching in Indonesian Islamic boarding schools. *Journal of Education and Learning (EduLearn)*, 18(3), 626–638. <https://doi.org/10.11591/edulearn.v18i3.21085>
- Maijala, M., Gericke, N., Kuusalu, S., Heikkola, L. M., Mutta, M., Mäntylä, K., Rose, J., Maijala, M., Gericke, N., Kuusalu, S., & Heikkola, L. M. (2023). Conceptualising transformative language teaching for sustainability and why it is needed. *Environmental Education Research* ISSN: <https://doi.org/10.1080/13504622.2023.2167941>
- Mardiani, & Baharuddin, F. (2023). Literature-Based Efl Instruction: Benefits For Language Skills Development, Learning Motivation, and Cultural Understanding. *LLT Journal: A Journal on Language and Language Teaching*, 26(2), 796–811. <https://doi.org/10.24071/llt.v26i2.6366>
- Micalay-hurtado, M. A., & Poole, R. (2022). Eco-critical language awareness for English language teaching (ELT): Promoting justice, wellbeing, and sustainability in the classroom. *Journal of World Languages*, 8(2), 371–390.
- Nadra, N., Marnita, R., & Amini, K. A. (2024). Assimilation of the Batak Angkola Language in Pintu. *JURNAL ARBITRER*, 11(1).
- Nataprawira, H., & Carey, M. D. (2020). Towards developing colloquial Indonesian language pedagogy: a corpus analysis Towards developing colloquial Indonesian language pedagogy: A corpus analysis. *INDONESIAN JOURNAL OF APPLIED LINGUISTICS*, 10(2), 382–396. <https://doi.org/doi.org/10.17509/ijal.v10i2.28610>
- Plomp, T., & Nieveen, N. (2013). Educational design research: An introduction. *Netherlands Institute for Curriculum Development: SLO*, 1–206. <http://www.eric.ed.gov/ERICWebPortal/recordDetail?accno=EJ815766>
- Polit, D. F., & Beck, C. T. (2022). *Nursing research: Generating and assessing evidence for nursing practice* (11th editi). Wolters Kluwer.
- Pratama, A. (2022). Contextual Teaching and Learning Using Local Content Material on Students' Reading Comprehension at a Junior High School in Indonesia. *SALEE: Study of Applied Linguistics and English Education*, 3(2), 184–194. <https://doi.org/10.35961/salee.v3i2.494>
- Seasia. (2025). *Indonesia tops Asia in endangered languages: 425 at risk of disappearing*. <https://seasia.co/2025/05/20/indonesia-tops-asia-in-endangered-languages-425-at-risk-of-disappearing>
- Stibbe, A. (2021). *Ecolinguistics: Language, ecology, and the stories we live by* (2nd editio). Routledge.
- Sudarsi, E. T., Mangoki, D., Wahyuni, S., Allo, M. D. G., & Irianto, T. U. (2025). Integrating Local Culture-Based Learning Media in Multilingual Classrooms: An Analytical Study of Implementation and Educational Impact. *Nationally Accredited Journal Decree*, 9(10), 61–78.
- Sugiyono. (2021). *Metode Penelitian Kuantitatif, Kualitatif, dan R&D* (Edisi 2). Alfabeta.



- Swadesh, M. (1955). Towards greater accuracy in lexicostatistic dating. *International Journal of American Linguistics*, 21(2), 121–137. <https://doi.org/10.1086/464321>
- Syarfina, T., Hasibuan, A. S., & Sinaga, L. (2023). Stress in Angkola Batak Language: An Acoustic Phonetic Approach. *Linguistik Terjemahan Sastra (LINGTERSA)*, 4(2), 46–53. <https://doi.org/10.32734/lingtersa.v4i2.13451>
- Tazhitova, G., Kurmanayeva, D., Zhalelova, G., Kassymbekova, N., & Kadirsizova, S. (2024). Impact of Local Culture-Based Materials on the EFL Communication Skills of University Students in Kazakhstan. *International Journal Of Society, Culture & Language*. <https://doi.org/10.22034/ijsc.2024.2043500.3750>
- UNESCO. (2023). *World Atlas of Languages: Global language vitality report*. <https://unesdoc.unesco.org/ark:/48223/pf0000380132>
- UNESCO. (2024). *Indonesia - Intangible Cultural Heritage*. UNESCO. <https://ich.unesco.org/en/state/indonesia-ID>
- World Economic Forum. (2023). *Nearly half of the world's language diversity is at risk*. World Economic Forum. <https://www.weforum.org/stories/2023/04/research-on-2-400-languages-shows-nearly-half-the-world-s-language-diversity-is-at-risk/>
- Zhang, W., Road, W., District, T., Road, W., & District, T. (2022). Language , Culture , and Ecology : An Exploration of Language Ecology in Pragmatics. *English Language Teaching*, 15(6), 80–87. <https://doi.org/10.5539/elt.v15n6p80>

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**\*Eli Marlina Harahap (Corresponding Author)**

Faculty of Teacher Training and Education ,  
Muhammadiyah University of South Tapanuli / Muhammadiyah University of Surakarta ,  
St. Mohd Arief Street No. 32 Padangsidempuan, North Padang Sidempuan District, Padang  
Sidempuan City, North Sumatra Province , Indonesia  
Email: [eli.marlina@um-tapsel.ac.id](mailto:eli.marlina@um-tapsel.ac.id)

**Marhamah**

Faculty of Teacher Training and Education ,  
Muhammadiyah University of Surakarta ,  
Ahmad Yani Pabelan Street, Kartasura, Surakarta, Central Java 57169 , Indonesia  
Email: [mar274@ums.id](mailto:mar274@ums.id)

**Yunus Sulistiyono**

Faculty of Teacher Training and Education ,  
Muhammadiyah University of Surakarta ,  
Ahmad Yani Pabelan Street, Kartasura, Surakarta, Central Java 57169 , Indonesia  
Email: [ys122@ums.id](mailto:ys122@ums.id)

**Harun Joko Priyono**

Faculty of Teacher Training and Education ,  
Muhammadiyah University of Surakarta ,  
Ahmad Yani Pabelan Street, Kartasura, Surakarta, Central Java 57169 , Indonesia  
Email: [harun.prayitno@ums.ac.id](mailto:harun.prayitno@ums.ac.id)

**Atiqa Sarbadila**

Faculty of Teacher Training and Education ,  
Muhammadiyah University of Surakarta ,  
Ahmad Yani Pabelan Street, Kartasura, Surakarta, Central Java 57169 , Indonesia  
Email: [as193@ums.ac.id](mailto:as193@ums.ac.id)

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