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Validity and Practicality of Ethnoprinting Media for Inventorying Fern Diversity in West Kalimantan

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Abstract: Ferns grow abundantly in humid and suitable areas in the land of West Kalimantan. However, the problem is that students have not been able to differentiate the classification of ferns and distinguish what cormus plants and thallus plants are. Therefore, one of the media that supports students' understanding of ferns is ethnoprinting. The purpose of this study was to determine the diversity of West Kalimantan ferns and to determine the feasibility of ethnoprinting learning media, seen from the validity and practicality of the product. This study used the ADDIE development model, and the sampling technique used purposive sampling, with a small-scale sample of 20 people and a large-scale sample of 59 people. The results of the study showed that the diversity of ferns found was 29 species, consisting of 3 classes and 16 families, and the results of the development of ethnoprinting fern products from the percentage of media experts were 84 % and material experts were 81% with very valid criteria, while the practicality response on a small scale was 81% and the practicality response on a large scale was 82% with very practical criteria. Therefore, these results indicate that the development of ethnoprinting products is valid and practical and can be used for teaching fern material.

Keywords: Ethnoprinting; Ferns; Learning Media; West Kalimantan

Introduction

Indonesia's natural resources are an important asset that must be maintained for human survival. Conservation of natural resources can be achieved through maintenance and utilization. West Kalimantan is a province in Indonesia that has beautiful forests, and several plants are found and widely utilized by the community. Ferns grow abundantly in humid areas and are suitable for the land of West Kalimantan, usually living in tropical, aquatic, or epiphytic areas. Ferns undergo alternation of generations with the help of spores, and this plant is classified as a type of cormus plant (Natalsiani et al., 2024; Luckita et al., 2021) . However, based on research (Darwati et al., 2023) Environmental conditions can influence the diversity of ferns in their habitat. These environmental factors include soil moisture, pH, air temperature, and light intensity. The people of Kalimantan often also call them ferns, or midding.

Ferns can usually be used as food, some species can be used as medicines, and raw materials for handicrafts (Pradipta et al., 2020). Learning about ferns is often found in schools and universities, especially for prospective biology teachers, so students are already familiar with ferns. However, in reality, based on a problem questionnaire distributed to prospective biology education students in the 2nd semester of Universitas PGRI Pontianak, several obstacles faced by students are (1) not being able to differentiate between cormus plants and thallus plants. (2) not knowing the classification of ferns. Meanwhile, the problems found in prospective teacher students in the 4th and 6th semesters are (1) limited textbooks discussing ferns, (2) not recognizing many types of ferns in the surrounding area,

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and (3) Learning is still conventional. (4) Difficulty distinguishing morphology at different levels of ferns.

This can hinder students' cognitive and psychomotor understanding, in line with research (Firdaus & Wisanti, 2021) that Students' understanding of a concept is crucial during the learning process. This problem serves as a benchmark for researchers in packaging learning and conveying material concepts that still need to be improved. To support understanding of ferns, appropriate learning media are needed based on learning needs. Learning media is a means of conveying messages in learning, which can assist learning activities so that students are able to obtain teaching materials according to competencies (Hasan et al., 2021).

Based on a media needs questionnaire distributed to prospective biology teacher students at PGRI Pontianak University in semesters 2, 4, and 6. Statements that have high desires are students want media that is easy to learn, portable, and innovative. In the current era, learning media often have various forms according to the function and needs of material delivery, learning media such as digital, utilization of used goods, and fashion, can be applied in learning and can improve student competencies (Trisiana, 2020; Firmansah, 2021; Farihah et al., 2024).

Learning media that can be developed to improve students' understanding and creativity in learning are learning media that integrate material with content in everyday life (Tangio et al., 2023) . One innovative media that can be developed and integrated with everyday life is ethnoprinting. Ethnoprinting is a learning media that links natural elements and community culture, which are applied in the form of fabric patterns that have elements of preservation. In line with the problems found by students, the preservation and introduction of ferns can be applied in the form of patterned fabric media (*ethnoprinting*) that is innovative and easy to carry anywhere. This is in line with research (Rini & Wahyuningsih, 2023) which developed the Kendil batik motif with the source of the Deer Horn Fern (*Platycerium Bifurcatum*) plant, which can be an educational media about the introduction of ferns. Based on this background, it is hoped that ethnoprinting media can help student teachers in understanding the material and problem-solving skills.

Method

The method for achieving the expected goals through the ADDIE *Research and Development* model. This ADDIE model was chosen based on its simple and systematic nature, so that it is easy to understand (Herditiya et al., 2020) .

This research was conducted at PGRI Pontianak University. The population in this study was students of the Biology Education Study Program. The sampling was done by *purposive sampling*, with the provision that students had taken the lower-level plant systematics course in semester III and semester V.

ADDIE is one of the most commonly used models in the field of instructional design. The research and development procedure uses the following five stages. In this model, each stage is interrelated and undergoes testing before continuing to the next stage (Branch, 2009).

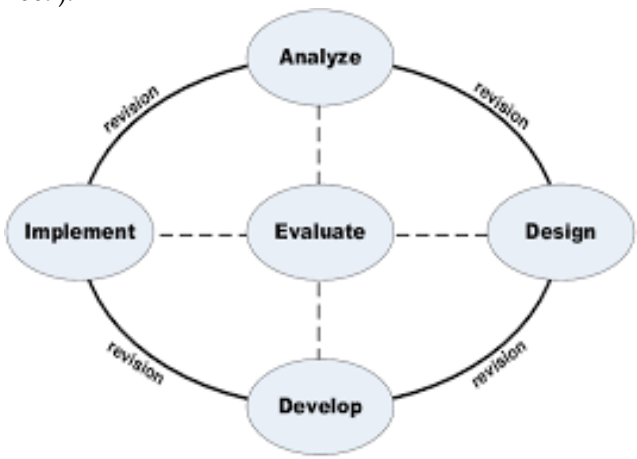


Figure 1. ADDIE development model

Analysis Stage

The analysis stage is carried out to identify initial problems and efforts to find solutions to these problems. The analysis stage includes: analyzing local potential through exploration techniques conducted in Bengkayang Regency, Lumar District, located in Riam Madi, and Sanggau Regency, Bonti District, located in Tampar Forest.

Analysis of the learning process through observation, problem questionnaires, and needs analysis through media needs questionnaires conducted on prospective teacher students of the Biology Education Study Program, PGRI Pontianak University.

Design Stage

The second stage is Design, which includes several steps, namely: identifying ferns, planning teaching materials, and preparing initial sketches of ethnoprinting.

Develop Stage

The third stage, Development, involved validation testing and a limited-scale trial. The validation test was conducted with six experts, including three media experts and three material experts. A small-scale product trial was conducted with 20 third-semester

students. The results of the validation and small-scale trials informed media improvements for larger trials.

Implementation Stage

The fourth stage is implementation, which includes large-scale testing. The large-scale testing was conducted on 59 fifth- and seventh-semester biology students to gauge their response to practicality.

Evaluation Stage

The final stage is Evaluation (*Evaluate*). At this stage, formative evaluation and summative evaluation are carried out. (Cahyadi, 2019) . Formative evaluation is conducted to identify the strengths and weaknesses of the product as well as its effectiveness, while summative evaluation is conducted to measure learning outcomes on the material presented (Aldobee, 2015).

The data collection technique for fern analysis used exploration, while validity and practicality used indirect communication. The data collection tools in this study used a fern identification sheet, a media validation questionnaire, a material validation questionnaire, and a practicality questionnaire. Data analysis of the fern identification results was conducted through a literature review of relevant journals, plant taxonomy books, and other official websites. The validity and practicality data analysis was calculated using the formula

$$Percentage\ value = \frac{\Sigma \text{ obtained scores}}{\Sigma \text{ maximum score}} \text{ x } 100\% \qquad (1)$$

The calculation of the next value is categorized based on Table 1.

Table 1. Criteria validity

Percentage (%)	Category
81-100	Very valid
61-80	Valid
41-60	Quite Valid
21-40	Less Valid
0-20	Not Valid

Astuti et al (2023)

Table 2. Criteria Practicality

Percentage (%)	Category
80 < Response Value ≤ 100	Very Practical
60 < Response Value ≤ 80	Practical
40 < Response Value ≤ 60	Quite Practical
20 < Response Value ≤ 40	Weak
0 < Response Value ≤2	Impractical

Manisa & Sari (2025)

Results and Discussion

The results of this research are learning media in the form of Ethnoprinting plant nails. Product development is carried out in ADDIE 's design own several stages, among them *Analysis, Design, Development, Implementation, and Evaluation*.

Analysis Stage

The analysis stage was carried out to identify problems that exist at the research location. The results of the problem identification were: (1) Students cannot yet differentiate between cormus plants and thallus plants. (2) Students do not yet know much about the classification of ferns in the surrounding area. (3) Many local potentials in West Kalimantan need to be recognized by the community, especially in the types of ferns. (4) Learning is still conventional and has not honed problem-solving skills. (5) Students want media that is easy to learn, carry anywhere, and has innovative value. (6) There are not many media that integrate plants and ethnoprinting. Based on this analysis, an analysis of the local potential of ferns in West Kalimantan was carried out.

Table 3. Results of fern identification

Class	Species	Habitus
Polypodiopsida	*Asplenium* sp	Epiphytes
	Diplazium esculentum	Terrestrial
	Pleocnemia irregularis	Terrestrial
	Blechnum oriental L.	Terrestrial
	Stenochlaena palustris	Terrestrial
	Sphaeropteris glauca	Terrestrial
	Pteridium aquilinum	Terrestrial
	Trichomanes javanicum	Terrestrial
	Lygodium circinnatum	Terrestrial
	Lygodium japonicum	Terrestrial
	Lygodium longifolium	Terrestrial
	Lygodium microphyllum	Terrestrial
	Nephrolepis biserrata	Terrestrial
	Pyrrosia piloselloides	Epiphytes
	Drynaria quersifolia	Epiphytes
	Goniophlebium persicifolium	Epiphytes
	Lecanopteris sinuosa	Epiphytes
	Platycerium bifurcatum	Epiphytes
	Acrostichum aureum	Terrestrial
	Maidenhair trapeziforme	Terrestrial
	Haplopteris sp	Epiphytes
	Lindsaea sp.	Terrestrial
	Tectaria angulata	Terrestrial
	Tectaria brookii	Rocks
Equisetopsida	*Equisetum debile*	Terrestrial
	Gleichenia linearis	Terrestrial
Lycopodiopsida	*Palinhaea cernua*	Terrestrial
	Selaginella plana	Terrestrial
	Selaginella ciliaris	Epiphytes

(Gempong, 2023; Efendi & Iswahyudi, 2020; Christenhusz et al., 2011).

The results of the fern exploration were in Bengkayang Regency, specifically in Riam Madi and

Sanggau Regency in Tampar Forest. This was carried out by circling along the river flow area and yards, and subsequently, identification was carried out, starting from classification, roots, stems, leaves, sori, and their habitus. The results of the exploration found 29 species of ferns, consisting of 10 species found in Bengkayang Regency and another 19 species found in Sanggau Regency. This number indicates that the West Kalimantan region has a relatively high level of fern diversity (Aldiansyah et al., 2024).

After identification, the ferns were classified into three classes and 16 families. These findings then became the basis for developing ethnoprinting products. Ferns are often found around us, often in damp places (hygrophytes), in various water bodies (hydrophytes), and attached (epiphytes) to the surfaces of rocks, soil, and trees. (Ulfa, 2017). The results of the exploration of ferns found were mostly from the Polypodiopsida class. This is also in line with the results of research (Darwati et al., 2023), which found many true ferns (Polypodiospida) in the Bengkayang nature reserve area. The identification results can be seen in Table 3.

Figure 2. Types of ferns found

Design Stage

The second stage is **Design**, the stage where planning and designing the product to be developed as a learning medium. Based on the problem analysis, the product to be developed is an ethnoprinting learning medium. Unlike previous research that generally only utilized local potential in the form of modules or printed media, this research developed an ethnoprinting medium that combines elements of science and local culture, thus having innovative value. (Rajapaksha et al., 2024) that ferns not only have ecological benefits, but also require sustainable conservation to prevent their disappearance in the future.

This ethnoprinting design is derived from the results of fern identification, by displaying several varieties of ferns combined with symbolic fern motifs on Dayak tribal cloth, scientific names, and locations where plants were taken in West Kalimantan. Through this ethnoprinting, students not only recognize ferns comprehensively but also recognize ferns as part of the local wisdom contained in Dayak tribal motifs or carvings. According to (Andira & Akbar, 2025; Nihayat et al., 2025), local wisdom-based learning can help strengthen multicultural education, become contextual, relevant, and interesting to learn. The ethnoprinting design is as follows.

Figure 3. Ethnoprinting design of ferns from Bengkayang Regency.

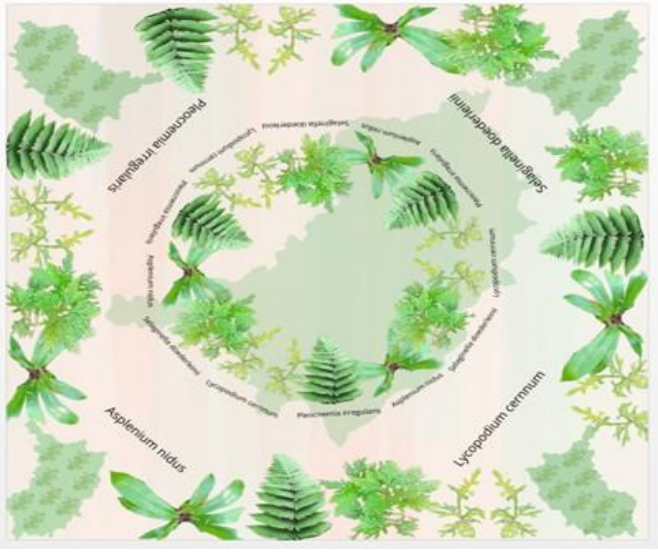


Figure 4. Ethnoprinting design of ferns in Sanggau Regency

Ferns are a common motif found on traditional Dayak cloth. According to Anita (2025), ferns are a popular batik motif in Bengkayang Regency because they are abundant in the area. For the locals, climbing ferns symbolize the ups and downs of harmonious social life, especially for the people of Bengkayang Regency. According to Zulkipli et al. (2022), ferns are interpreted as the precursor to new life.

Develop Stage

Develop stage is for product validation and testing of ethnoprinting products as learning media. Validation results are seen from media validation and material validation. Media validation aims to determine whether the developed product meets learning media indicators. Media validation was carried out by three learning media experts. The following is a summary of the media experts' work.

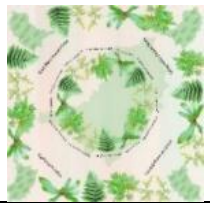
Table 4. Recapitulation of Media Expert Validity

Indicator	Results	Criteria
Visible	83	Very Valid
Interesting	87	Very Valid
Simple	80	Valid
Useful	90	Very Valid
Accurate	80	Valid
Legitimate	73	Valid
Structured	80	Valid
Average	84	Very Valid

Modification (Kristanto, 2016)

The validation results of the ethnoprinting media showed a percentage of 84% with a very valid category. This high validity value indicates that the ethnoprinting media have met the criteria for good learning media. Indicators that have a high percentage are the level of usefulness for students at 90% and the level of interest at 87%. This is because the ethnoprinting media not only provides conceptual understanding but also provides an alternative new learning media through a visual and contextual approach based on local wisdom, which is something new for students. The solution to the ethnoprinting learning media that has been created can be useful. for students to study ferns. In line with research (Nururrohmah et al., 2025), local wisdom can make learning more engaging, holistic, and meaningful, while also supporting child development. Several inputs and suggestions were provided from the media expert validation results for more relevant media improvements. The expert validation results are shown in the following table.

Table 5. Product revisions based on expert comments

Before	After	Comment
		Symbolism can be further clarified, especially in terms of color and layout.
		Two background colors are missing seen

Furthermore, the ethnoprinting learning media were also validated, a crucial step considering that learning media serve as a tool for delivering material (Masitoh & Utomo, 2024). The validation was conducted by three experts. A summary of the expert validation can be seen in Table 6.

Table 6. Recapitulation of material expert validity

Indicator	Results	Criteria
Compliance material with CPMK	78	Valid
Accuracy of Material	78	Valid
Material Update	82.2	Very Valid
Compliance with The Development Student	88	Very Valid
Compliance with language rules	77	Valid
Average	81	Very Valid

The validation results showed a percentage value of 81%, categorized as very valid. The validator's suggestions and comments became material for improving ethnoprinting, including clarifying cultural symbols and fern nomenclature. The highest indicator was the suitability of the media to student development at 88%. This is because the ethnoprinting media created was tailored to the learning outcomes of ferns. Students learned about ferns from simple concepts to being able to group ferns based on morphological characteristics. This is what makes it appropriate for student understanding.

Based on the media and material validation results, ethnoprinting media demonstrated highly valid criteria, allowing the developed learning media to be tested in the classroom. According to (Masitha et al., 2022), the purpose of validation, in addition to producing a viable and valid product, is also to identify the shortcomings and weaknesses of the developed product, resulting in a final product that is suitable for widespread student use.

Next, a product trial was conducted to measure the practicality and effectiveness of the developed media (Af'idah et al., 2023). The trial was conducted on a small scale with 20 students. The small trial is part of an evaluation aimed at gathering information to improve product quality (Anggreni et al., 2020). The results of the small-scale practicality test can be seen in Table 7.

Table 7. Small Scale Recapitulation

Aspect	Indicator	Percentage	Criteria
Presentation material	Clarity delivery material	84	Very Practical
	Convenient understanding material	79.4	Practical
	Effectiveness in remembering material	77.9	Practical
	Data accuracy	85	Very Practical
Linguistics	Compliance with EYD	84	Very Practical
	Conveniently understand information which delivered	79	Practical
	The clarity of the sentence Which served	79	Practical
Design	Use type, size And color letter	75	Practical
	Clarity placement layout (*layout*)	79	Practical
	Use of color	76	Practical
	The clear picture Which served	81	Very Practical
	Clear information on every picture	76.5	Practical
	Image accuracy	86.8	Very Practical
	Ease of using symbols Which served	91.2	Very Practical
Benefit	Easy is used as a source Study	76.5	Practical
	Instruction use easy understood	76	Practical
	Easy accessible anywhere and at any time	76	Practical
	Increase motivation Study	82	Very Practical
	Usefulness in add outlook	83.8	Very Practical
Empowerment Skills	Understand problem	82	Very Practical
Solution to the problem			
	Make something, and how to solve it	76.5	Practical
	Carry out the plan	73.5	Practical
	Review all the steps taken	75	Practical
Average		80	Practical

Modification from the Ministry of National Education (2008)

Based on the results of practicality on a small scale, an average percentage of 80% was obtained, categorized as practical. Several aspects measured included material presentation, language, design, usability, skill empowerment, and problem-solving. This practicality test is crucial, as according to Ramadhani & Izzati (2023), practicality aims to determine the product's usability and acceptance by students. The indicator with the highest percentage was the ease of use of symbols. Which presented at 91.2%. This is because the ethnoprinting media contains illustrations of fern areas, Dayak cloth motifs, and district maps as characteristics of the ferns.

Implementation Stage

Next, at the stage *of* ***Implementation,*** a large-scale trial was conducted by giving the product to 59 students, consisting of semesters 5 and 7. The results of the large-scale response test on the use of ethnoprinting products in the classroom are seen in Table 8.

Table 8. Large Scale Recapitulation

Aspect	Indicator	Percentage	Criteria
Presentation material	Clarity delivery material	86	Very Practical
	Convenient understanding material	83	Very Practical
	Effectiveness in remembering material	80	Very Practical
	Data accuracy	81	Very Practical
Linguistics	Compliance with EYD	85	Very Practical
	Conveniently understand information which delivered	83	Very Practical

Aspect	Indicator	Percentage	Criteria
	The clarity of the sentence Which served	82	Very Practical
Design	Use type, size And color letter	81	Very Practical
	Clarity placement layout (*layout*)	81	Very Practical
	Use of color	83	Very Practical
	The clear picture Which served	81	Very Practical
	Clear information on every picture	82.2	Very Practical
	Accuracy picture	80.9	Very Practical
	Ease of using symbols Which served	85	Very Practical
Benefit	Easy is used as a source Study	80	Very Practical
	Instruction use easy understood	81	Very Practical
	Easy accessible anywhere and at any time	79	Practical
	Increase motivation Study	82	Very Practical
	Usefulness in add outlook	82	Very Practical
Empowerment Skills Solution to the Problem	Understand problem	82	Very Practical
	Make something, and how to solve it	80	Very Practical
	Carry out the plan	80	Very Practical
	Review all the steps taken	80	Very Practical
Average		82	Practical

Modification from the Ministry of National Education (2008)

Based on Table 5 above, a large-scale practicality test is crucial. The average practicality percentage of 82% indicates practicality criteria. The results of this study align with research by Maulana et al. (2024), which stated that practical products with percentages of 81.25 and 82.75 can be used as learning media. Clarity indicators delivery. The material had a high percentage of 86%, while the indicator of usefulness in increasing insight had a percentage of 82%, which is in line with the results of media validation that showed ethnoprinting media provided benefits for students. Good practicality indicates that the media is not only theoretically feasible but also effectively applied in real learning contexts (Nurjannah et al., 2025).

Evaluation Stage

The final stage is *Evaluate*. At this stage, it is not only carried out at the end of the media development process, but at each ADDIE stage to manage the assessment results and draw conclusions (Safitri & Rakhmawati, 2024; Rustandi & Rismayanti, 2021). In line with research conducted by (Sugihartini & Yudiana, 2018), the evaluation that occurs at each of the four stages above is called formative evaluation, which aims to make improvements as quickly as possible. In this study, a formative evaluation was also carried out to identify the advantages and disadvantages of the product. The advantages of the product developed are (1) Ethnoprinting of ferns as a learning medium is useful for students in studying the diversity of ferns. (2) The developed ethnoprinting is the result of the exploration of ferns in West Kalimantan. (3) The use of media is very valid, practical, and easy to learn. While the disadvantages of the product are (1) Not yet able to be used as a material for evaluating student learning outcomes. (2) The quality of the dyes and materials is not yet optimal (3) Not all identified ferns are included in ethnoprinting (4) The results of fern identification have not yet reached the level of local regional naming.

Conclusion

This study shows (1) exploration of ferns that have been found in Bengkayang Regency, with as many as 10 species, and Sanggau Regency, with as many as 19 species. After identification, the results of the identification of ferns consist of 3 classes and 16 families. These results then become the basis for the development of ethnoprinting products. (2) The results of product development seen from the validity of media experts are 84% with a very valid percentage, and material experts are 81% with a very valid percentage, while small-scale practicality is 80% with practical criteria, and large-scale is 82% with practical criteria. So it can be concluded that learning media can be used as learning media in the classroom and is useful for students in understanding ferns. Learning using ethnoprinting then needs to be tested for learning outcomes, to determine the effectiveness of ethnoprinting media. And it needs to be reintroduced at the school level with more varied motifs. In addition, further research is needed to find out the latest types of ferns in the area. The weakness of this learning media is that this media has not been tested for media effectiveness on learning outcomes.

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Author Contributions

First author Herditiya contributed to initial data collection, exploration, and identification of fern diversity, as well as journal publication. Second author Tesa Manisa contributed to instrument preparation, product trials, and data analysis.

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Conflicts of Interest

There is no conflict of interest in this research.

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