

# Development of The Morning Pteridophyta Based on The Local Potential of Mangkunagoro I Forest Park for Grade X Students

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**Abstract.** The Pteridophyta is one of the topics studied by the tenth graders, which is also included in the National Final Examination for High School. Based on several related studies, student's scores on this material were still low. One effort to overcome this problem is to make innovative learning media. In this study, we explore the development of the Morning (Mobile learning) App about Pteridophyta by utilizing the local potentials and Pteridophyta diversity found in Mangkunagoro I Forest Park. Purpose: This research was aimed to 1) develop the Morning (mobile learning) App about Pteridophyta for the tenth grader based on the local potentials found in Mangkunagoro I Forest Park; 2) determine the feasibility of the morning app as learning media, 3) find out the student's responses toward the app. Methods: This research was research and development. The ADDIE development model was used as the method. It consisted of (1) Analyze, (2) Design, (3) Development, (4) Implementation, and (5) Evaluation. The data were collected by using questionnaires for content (subject matter) experts, media experts, and teachers. Data were analyzed by using descriptive analysis and RASCH analysis for student responses. The population of this study was all tenth graders at Surakarta 7 High School academic year 2019/2020. Samples were taken using the purposive sampling technique. Result: The results showed that 1) Morning app for Pteridophyta has been developed according to ADDIE procedures arranged by incorporating the local potentials and diversity of Pteridophyta found in the Mangkunagoro I Forest Park, 2) Morning app for Pteridophyta was qualified as "very feasible" by the media expert and practitioners (teachers), and "feasible" by subject matter expert, 3) Students' responses toward the Morning app were analyzed by using the Rasch analysis and were classified as feasible based on the statistical results. Conclusion: The Morning (mobile learning) app for Pteridophyta based on local potentials found in Mangkunagoro I Forest Park was feasible as the learning media for class X high school students.

**Keywords:** Morning Media, Pterydophyta. Mangkunagoro Forest Park.

## INTRODUCTION

Biology learning places great emphasis on the direct learning experience (Slavia et al., 2018). This is due to the biology learning process which is often faced with several materials that are abstract and outside the daily experiences of students. This condition makes it difficult for the teacher to deliver the material and students find it difficult to understand the material presented by the teacher so that learning objectives will also be difficult to achieve.

One of the materials in learning biology that is still difficult for students to understand is material about ferns. This material is the material taught to class X students in the even semester and is one of the materials contained in the SMA National Examination. Based on the results of research (Novana et al., 2014) data on the results of the

National Examination (UN) from 4 high schools in the Surakarta Municipality, the material of moss and ferns for class X students is still low. This is also supported by several other studies such as research (Perwita, 2015) and (Mauliza, 2016) which show that the students' average score of ferns at the school understudy is still low.

So far, learning about ferns in schools has tended to rely solely on textbooks as a learning resource. The teacher has difficulty bringing various types of ferns into the classroom as a contextual learning medium. According to (Fitriyana, 2016), based on the results of her research, the hardest part of this material, in general, is to explain the characteristics and metagenesis or rotation of the offspring of ferns. Another difficulty lies with the concept of classification because there are many scientific names in it. In addition, the number of lesson hours that are sometimes insufficient to explain the fern material is also an obstacle in the learning process of the material.

One of the efforts to overcome the difficulty of understanding biology learning on ferns is to use learning media. The use of learning media will allow learning to be more efficient (Birch & Burnett, 2009). (Slavin, 2008) added that the use of media will also streamline the learning process. In addition, the use of learning media can also increase student motivation (Arsyad, 2011). Along with technological developments, especially in the 21st century, it demands contextual and technology-based learning. One of the technology-based learning media innovations that are becoming a trend in society is mobile learning.

Mobile learning (m-learning) is a learning concept using technology and mobile devices. These devices can be in the form of cell phones, tablet PCs, laptops, PDAs, and so on. The m-learning application can enable users to access learning content anytime and anywhere, without having to visit a certain place at a certain time. So, users can access educational content regardless of time and space (Brown, 2005). So, m-learning is considered to be beneficial because of the availability of teaching materials that can be accessed at any time and the visualization of interesting material as an alternative learning medium.

The use of learning media is more useful if the media is designed based on local potential and by the conditions in the field. The media developed to help overcome problems in learning ferns is the Pteridophyta Morning Application (m-learning). The material in this application is prepared by utilizing the diversity of ferns found in Mangkunagoro I, Ngargoyoso Forest Park, as one of the local potentials in the Karanganyar Regency. The types of ferns planted in Mangkunagoro I Forest Park are very diverse and some of them are types of ferns that are often mentioned or described in textbooks on the classification of ferns. The potential for nail diversity found in Mangkunagoro I Forest Park can be used by teachers as a source and contextual learning media because students can see directly the types of ferns that exist.

## METHOD

The research was conducted at KGPA Magkunagoro I Tahura for a sampling of ferns as a learning resource for ferns in the Pteridophyta Morning (Mobile learning) application that has been developed. Furthermore, the feasibility test of the class X Science class of SMAN 7 Surakarta was carried out. This research was conducted from February - July 2020.

This type of research is Research and Development (R&D). The media development research procedure was adapted from the ADDIE model by (Branch, 2009). This research procedure includes analysis, design, development, implementation, and evaluation.

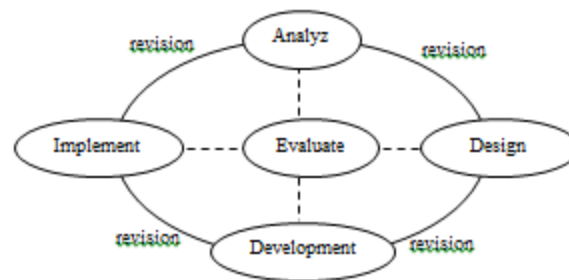


FIGURE 1. Research Procedure (ADDIE Model)

The type of data in this research is qualitative data and quantitative data. The qualitative data includes comments and suggestions for improvement from experts (1 material expert, 2 media experts, 1 learning expert, and 2



teachers). Quantitative data were obtained from the scoring scores of all experts and 66 students of class X IPA at SMAN 7 Surakarta. Quantitative data analysis for the results of the expert questionnaire used percentage descriptive analysis, while for the questionnaire analysis the evaluation of students' perceptions used the Rasch model. To collect and analyze research data, the mechanism for collecting research data can be seen in **TABLE 1**.

TABLE 1. Research Data Collection Mechanism

Data	Information	Subject	Instrument	Technique	Analyze
<b>Preliminary data (School)</b>	Students Performance Gap	- X Grade Science Students of SMAN 7 Ska - Biology Teachers (2)	Observation and interview sheet	Observation and Interview	Data reduction
<b>Pre liminary data (Tahura)</b>	Name list and picture of fern species for the media content	Ferns at Ferns Conservation Garden at M.I Forest Park	Observation sheet	Observation and Identification	Identification
<b>Expert Judgement Validations</b>	Assessment and advice from experts	- 2 Media Experts - 1 Subject Matter Expert - 1 Learning Expert - 2 Biology Teachers	Questionnaire sheet (Likert Scale 1-4)	Questionnaire	Deskriptive precentage by (Riduwan, 2008)
<b>Students Evaluate Perception</b>	Perceptions or responses from students	66 students of X Grade Science Student of SMAN 7 SKA	Questionnaire sheet (Likert Scale 1-4)	Questionnaire	RASCH Model (Sumstat Tabel)

## RESULT AND DISCUSSION

### *Utilization of Local Potential of Mangkunagoro I Forest Park*

The Morning Pterydophyta learning media developed utilizes the local potential of Tahura KGPA Mangkunagoro I, in Ngargoyoso, Karanganyar, as a source of contextual learning. Researchers visualized the existing potential in the Morning Pterydophyta learning media, such as by utilizing the diversity of species of ferns in the Ferns Conservation Garden. The species of ferns in Mangkunagoro I Forest Park are displayed in the form of pictures/photos on the developed media so that students can see the morphology of each species of ferns. In addition, the "Menu Keanekaragaman" is also equipped with additional information such as classification, morphological description, special characteristics, and the role of each species.

Images or photos of these species are displayed on the "Menu Klasifikasi" and the "Menu Keanekaragaman" of ferns so that they are expected to help students better understand the fern material with the developed media. Several species of ferns are displayed in the application, including *Adiantum cuneatum*, *Adiantum trapeziforme*, *Cyathea sp*, *Deparia petersenii*, *Dipazium accedens*, *Diplazium caudatum*, *Dryopteris carthusiana*, *Dryopteris hirtipes*, *Ellaphoglossum callifolium*, *Lindsaea odorata*, *Nephrolephis biserrata*, *Pteris biaurita*, *Pteris longipinnula*, *Tectaria vasta*, dan *Thelypteris disease*. The developer created a special menu, namely "Profil Tahura" in the application which aims to further introduce Mangkunagoro I Forest Park as one of the local potentials to students. There is also a "Menu Peta TKP(Taman Konservasi Paku)" which contains a track for teachers and students if they want to do outdoor learning in the Ferns Conservation Garden Mangkunagoro I Forest Park.

*Development of The Morning Pteridophyta Application*

The Morning Pteridophyta application is an application with the concept of Android-based mobile learning developed using Android Studio. The product of this research is an application media that is formatted in .apk. The Morning Pteridophyta applications can be run on android mobile phone devices, with minimum memory storage of 28Mb with a minimum resolution of 480x800px with or without an internet connection. There are 6 main menus in this application, namely: Menu Profil Tahura, Menu Materi, Menu Keanekaragaman, Menu Evaluasi, Menu Peta TKP (Taman Konservasi Paku), Menu Project (Making Herbarium). In addition, there are also 2 support menus, namely: the Menu About and the Menu Help. The design of the Morning Pteridophyta application can be seen in **FIGURE 2.**

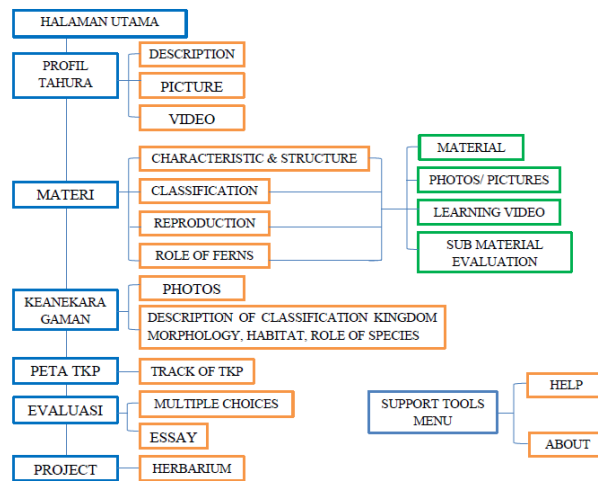


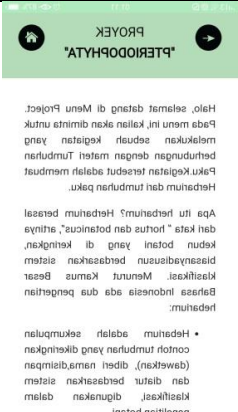
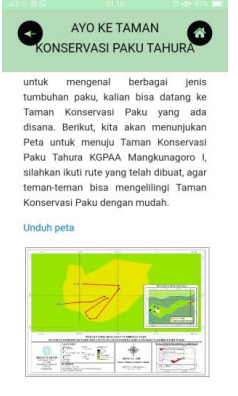


FIGURE 2. The design of Morning Pteridophyta Application

TABLE 2. Menus on the Morning Pteridophyta Application

Menu	Description	Purpose	Picture
Profil Tahura	Description profile and history of Tahura, pictures and video about Mangkunagoro I Forest Park	aiming for students to get to know Mangkunagoro I Forest Park as one of the local potentials	
Materi	This menu contains learning materials that will be delivered by the teacher by existing KI and KD. The Material Menu has 4 subject sub-menus	The teacher can use the menu to divide the meeting on learning according to sub-topics. Can be used by students to study independently at home to better understand	



Keanekaragaman	Contains the diversity of ferns species which is in Mangkunagoro I Forest Park	Can be used by the teacher when explaining the classification material for ferns and to increase students' insight into the diversity of ferns	 <p>MARI MENGENAL PAKU DI TAHURA</p> <p>Adiantum cuneatum</p>
Evaluasi	contains questions about the ferns material that has been previously presented There are 2 types of evaluation, namely multiple-choice, totaling 25 questions, and an essay totaling 5 questions in the description.	Can be used as a teacher as a substitute final evaluation daily tests, to measure student fern material.	 <p>EVALUASI "PTERIDOPHYTA"</p> <p>Pilihan Ganda</p> <p>Esai</p>
Proyek	Contains the project of making ferns herbarium for students	Can be used by teachers as a tool for assessing the students' psychomotor skills	 <p>PROYEK "PTERIDOPHYTA"</p> <p>Halo, selamat datang di Menu Project. Pada menu ini kalian akan diminta untuk melakukan sebuah kegiatan yang berhubungan dengan materi Tumbuhan Paku. Kegiatan tersebut adalah membuat Herbarium dari tumbuhan paku.</p> <p>Apa itu herbarium? Herbarium berasal dari kata "herba" dan "botanicus", yang berarti herbarium adalah koleksi tumbuhan yang dikeringkan, dipres, dan disimpan dalam lembaran kertas. Menurut Kurnia Beata, herbarium Indonesia ada dua herbarium herbarium.</p> <p>Herbarium adalah kumpulan contoh tumbuhan yang dikeringkan (dewet) dan disimpan dalam lembaran kertas. Herbarium adalah metode penelitian</p>
Peta TKP	Contains a description of the Ferns Conservation Gardenat Mangkunagoro I and a track/tracking map when visiting or doing outdoor learning at the Ferns Conservation Garden	Can be used by teachers and students as a guide when doing outdoor learning activities at Ferns Conservation Gardenof Mangkinagoro I Forest Park	 <p>AYO KE TAMAN KONSERVASI PAKU TAHURA</p> <p>Untuk mengenal berbagai jenis tumbuhan paku, kalian bisa datang ke Taman Konservasi Paku yang ada disana. Berikut, kita akan menunjukkan Peta untuk menuju Taman Konservasi Paku Tahura KGPAA Mangkunagoro I, silahkan ikuti rute yang telah dibuat, agar teman-teman bisa mengellilingi Taman Konservasi Paku dengan mudah.</p> <p><a href="#">Unduh peta</a></p>

The development of the Morning Pteridophyta application is by the mandate of the National Education System Law which states that curricula at all levels and types of education are developed with the principle of diversification by the educational unit, regional potential, and students, by paying attention to the diversity of regional and environmental potentials (Permen RI 2005). Learning by utilizing the existence of local potential in Morning Pteridophyta media provides students with the opportunity to observe good local potential conditions so that students can observe directly the diversity of fern species (Novana et al., 2014).

The concept of mobile-based learning can support a student-centered learning process. This causes students to be actively involved in the learning and observation process. The Morning Pteridophyta application can accommodate or facilitate students who are slow in the learning process or capture information because the media developed can create a more conducive and effective learning climate or atmosphere individually. In addition, the Android-based Morning Pteridophyta learning media can overcome the limited time for the delivery of material by the teacher in the classroom.

Biology learning activities on fern material using Morning Pteridophyta media can develop science process skills through students' psychomotor skills. These include, among others, the skills of observing an object (ferns), the skills to use tools (when doing a fern herbarium project), and communication skills such as presentation skills. Science process skills can be a liaison for students in building a concept. Students can develop their understanding of the fern material, so that knowledge and processes can be well integrated. This will allow students to be able to grasp meaning or concepts more flexibly. Morning Pteridophyta learning media can create an interactive and fun learning atmosphere for students in the learning process. This condition is very supportive to create education that is by educational standards. The Morning Pteridophyta learning media developed have several characteristics, including 1) the application developed by mobile learning concept, 2) the application utilizing a local potential, which is a Mangkunagoro I Forest Park, 3) App are used individually and be equipped with students project, 4) there are indicators and learning objectives and sub material evaluation in each material sub-menu.

#### **Validation of The Morning Pteridophyta Application**

The stage that is taken after the media is made is to validate the media to experts to determine the feasibility of the morning pteridophyta application. Validation was carried out by 1 material expert, 2 media experts, 1 learning expert, 2 biology teachers.

The following are the results of validation that have been carried out by experts:

TABLE 3. Validation Result By Experts

<b>Validator</b>	<b>Percentage</b>	<b>Result Average</b>	<b>Interpretation</b>
Media Experts	90,27% 91,67%	90,97%	Very good/ very feasible
Material Expert	73,61%	73,61%	Good/ Feasible
Biology Teachers	95,23% 96,42%	95,825%	Very good/ very feasible
Learning Expert	89,28%	89,28%	Very good/ very feasible

The results of the assessment of the two instructional media experts produced an average percentage value of 90.97%, and when interpreted qualitatively, according to the two learning media experts, the Morning Pteridophyta media developed was said to be very feasible with some suggestions and inputs. Meanwhile, the results of the validation from material experts, the results of the assessment based on the calculation of the questionnaire that had been given obtained a final percentage value of 73.61%. Based on the quantitative assessment interpretation table to be qualitative, the material on the Morning Pteridophyta media developed is said to be good or feasible, with some suggestions and input. Meanwhile, for the assessment of biology practitioners/teachers, based on the results of calculations from the two teachers, the average percentage value is 95.825%. The results of the validation of the learning experts got a percentage value of 89.28% which indicates that the lesson plans made to make it easier for teachers to apply the media in learning ferns are said to be very good or very feasible. The assessment of all experts states that the Morning Pteridophyta application that has been developed is good and feasible for use as a learning media on ferns material.



Validation was also carried out by 66 students of class X science at SMAN 7 Surakarta. The aspect used in the evaluation of the Morning Pterydophyta application by students is the student's perspective or response. Students are given an assessment questionnaire consisting of 15 items. The results of the questionnaire were then analyzed using the Rasch model.

The reason for choosing Rasch as a data analysis technique is because until now Rasch is the only measurement/analysis model that meets objective measurement requirements, namely: providing a linear measure, overcoming missing data, carrying out the correct estimation process, finding the wrong one. / misfit or uncommon / outliers, providing a measurement instrument that is independent of the parameter under study. In addition, the resulting score is a true score that has been free from measurement errors, not a raw score (Sumintono & Widhiarso, 2013).

The questionnaire given to students is one of the measurement techniques with a Likert scale with a scale of 1 to 4, where the data is polytomi data. The use of Rasch analysis can verify the ranking assumptions used in the questionnaire with the Likert scale. In Rasch modeling, the quantity used is called the logit value. The logit value generated after data analysis is a value that depends on the response pattern given by the respondent, in this case, the students. The output table used in the Rasch analysis is the Summary Statistical Table. The summary statistical table is one of the output tables of the Rasch analysis which will display information about the quality of the respondent, the quality of the item, and the relationship or interaction between the two.

TABLE 4. Result of Student Perception Evaluation with Rasch Model

<b>Information</b>	<b>Logit Value</b>
<i>Person Measure</i>	+1,73 logit
<i>Alpha Cronbach</i>	0,72 logit
<i>Person reliability</i>	0,67 logit
<i>Item reliability</i>	0,81 logit

The results of the analysis based on the Summary statistical table for the Person measure obtained a logit value of +1.73. This value shows an average value of more than 0.0 logit, meaning that respondents answered more agreeably on each questionnaire item. The value of person reliability and item reliability based on the analysis results are 0.67 and 0.81. Based on the results of data interpretation, the person reliability value of 0.67 shows the consistency of the answers from the respondents which is quite good, and the item reliability value of 0.81 indicates that the quality of the items in the questionnaire is also good. Other information contained in the Summary statistical table is the value of Cronbach's Alpha, which is 0.72. Based on the criteria according to (Sumintono & Widhiarso, 2013), this value indicates a very good interaction between respondents and items. With Cronbach's Alpha value, which is high and the interpretation results show a good interaction value, it can be concluded that the quality of Morning Pterydophyta's media is good and feasible based on the evaluation of students' perceptions with Rasch analysis.

## CONCLUSION

The Morning Pterydophyta application is an android-based application with the concept of mobile learning which was developed as an effort to help overcome learning problems in ferns. The Morning (mobile learning) application for Pteridophyta based on local potentials found in Mangkunagoro I Forest Park was feasible as the learning media for class X high school students. The application can be used as an additional instructional media option for teaching about the fern material.

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