STUDENTS' AND TEACHERS' PERCEPTIONS OF LEARNING AND E-LEARNING MEDIA ON PTERIDOPHYTES

[1]**Jonanda Fattah Anugerah**,[2]**Munawir Yusuf**,[3]**Roemintoyo**

[1,2,3]Educational Technology, Faculty of Teacher Training and Education, Universitas Sebelas Maret, Surakarta, Indonesia

Author's email:
[1]jonandafattah@student.uns.ac.id; [2]munawiryusuf@staff.uns.ac.id; [3]roemintoyo@staff.uns.ac.id

Corresponding author: jonandafattah@student.uns.ac.id

Abstract. *The need for students and teachers for e-learning media becomes an urgency during the distance learning period, especially in Biology materials that are not possible to access directly due to several conditions. One of them is Pteridophyta material. This material will be more meaningful if taught directly by observing the concrete object. However, access to direct objects is not easy. Therefore, it is necessary to develop e-learning. How the perception of the needs of students and teachers related to e-learning media on Pterydophyta material needs to be known to be the basis of development, so it is necessary to conduct a survey. This study aims to determine the perception of the needs of high school teachers and students related to e-learning media on Pteridophyta learning. The instrument used consists of 18 Likert scale questionnaire items 1-4 with indicators, namely expected conditions, actual conditions, and solutions. The student survey was given to 246 students in grades X and XI of three randomly selected schools. Meanwhile, the survey to teachers was given to 6 Biology teachers from the same three schools. The three schools are located close to the KGPAA Mangkunagoro I Forest Park which is one of the Pteridophyta conservation sites. Based on Rasch analysis, the instrument was considered valid and reliable. The results showed that students and teachers consider that Pteridophyta material is difficult to understand so they need Pteridophyta e-learning media in their learning. Students prefer a web design that has complete features, specifications and images.*

Keywords: *E-learning Media, Pteridophyta, Web Design*

1. INTRODUCTION

21st century biology learning often supported by technology, one of them is learning media. Learning media is anything that can convey messages through various channels, can stimulate the thoughts, feelings, and will of students so that it can encourage the creation of a learning process to add new information to students so that learning objectives can be achieved (Abi Hamid et al., 2020). The functions of learning media include helping to improve students' understanding of material concepts, presenting interesting and reliable data, facilitating data interpretation, and summarizing data needed by students (Dadi, Redhana, & Juniartina, 2019).

According to Rasyid, Azis, & Saleh (2016), learning media can be grouped into audio media such as radio, *tape recorders*, and telephones, visual media such as books, pictures, and posters, audio-visual media, and multi-media. Learning media can also be grouped according to technological developments. According to Norra (2020), there are traditional media such as photos, posters, slides, and videos and the latest media such as applications, *gaming learning*, teleconferencing, and *websites*.

Learning media is one way to achieve competence in Curriculum 2013 (Rakhmawati et al., 2016). Curriculum 2013 changes the learning paradigm from teacher center to student center. Teachers only act as facilitators and validators in learning while students act as learning subjects. Therefore, learning media can be a support in the learning process carried out by students actively and independently. Learning media should be created and developed following the development of technology and information, so that students not only learn the concept of material but also can have skills in accordance with the times (Labib & Yolida, 2019).

One of the learning media that follows the development of technology and information is *e-learning* media that utilizes computers and the internet in the learning process

(Sadikin & Hakim, 2019). *E-learning* media as other learning media also has advantages and disadvantages. Some of the advantages include that it can be used anywhere and anytime and provides a unique and memorable student learning experience, and so on. Some of the disadvantages include making and developing it takes a long time and is very dependent on the internet (Daud & Rahmadana, 2015).

Pteridophyta material in the 2013 Curriculum for High School Biology is found in KD 3.8 and 4.8 and is taught in the even semester of class X SMA. Based on some research results, it is known that students still find it difficult to understand *Pteridophyta* material which is indicated by the low student learning outcomes in *Pteridophyta* material. According to Novana, Sajidan, & Maridi (2014), the results of data analysis of the national exam (UN) scores for the 2008/2009 academic year in Surakarta City showed that the level of achievement of the Graduate Competency Standards (SKL) 4 moss and fern material was low. The same thing is also proven by the results of research conducted by Langgeng, Sajidan, & Prayitno (2017) which shows that the results of the analysis of national exam data (UN) in the 2009/2010 academic year of public and private high schools in Surakarta City also still show that the level of achievement of Graduate Competency Standards (SKL) 4 moss and fern material is low. The difficulty is motivated by various factors such as learning that has not been contextualized because it uses lecture and question and answer methods (Guntur, 2015). In addition, the absence of innovative and creative learning media to assist learning activities because using conventional and simple learning media such as images is also a factor in difficulty in understanding the material (Muslimah, Yeni, & Titin, 2020). Therefore, a problem solution is needed to answer learning difficulties in *Pteridophyta* material. One solution to the problem is *e-learning* media on *Pteridophyta* material which is expected to help students understand the material (Nurani, 2016).

The hallmark of Biology learning is contextual learning. According to Suryawati & Osman (2018) contextual learning can not only improve student understanding but also skills and attitudes. Contextual learning can be applied to all components of Biology learning, including learning media. Learning media can be made contextually by utilizing local potential. Local potential-based learning media is learning media that utilizes the resources of a region as a learning resource (Situmorang, 2016). Local potential can be used as a learning resource by analyzing the suitability of resources with Core Competencies (KI) and Basic Competencies (KD) in the 2013 Curriculum (Annisha, Ibrohim, & Rochman, 2020). One of the local potentials that can be utilized as a learning resource for *Pteridophyta* or fern material is TAHURA (Taman Hutan Raya) KGPAA Mangkunagoro I as a conservation area in Karanganyar, Central Java. However, the creation and development of *e-learning* media must go through a needs analysis to determine the suitability between the needs of students and teachers with *e-learning* media design (Arifuddin & Bahri, 2019).

In order to create the good e-learning media that answer the students and teachers' need, the researcher can find out the answer by comparing the real condition and the solution using a questionnaire (Feldman, Monteserin, & Amandi, 2014). The purpose of this study is to analyze the perceptions of teachers and students towards Pteridophyta e-learning media, as well as to determine the quality of measurement instruments in mapping the perceptions of students and teachers using Rasch Analysis. The results of this study can be used as guidelines in making Pteridophyta e-learning media and hopefully can improve students' understanding of Pteridophyta material.

2. LITERATURE REVIEW

E-learning, or electronic learning, is defined as the use of electronic technologies to access educational curriculum outside of a traditional classroom. It can involve various formats, including online courses, webinars, and digital resources that facilitate learning through the internet and other digital platforms. A study highlighted that e-learning serves as a complementary medium in education, particularly during the COVID-19

pandemic, where it became essential for continuity in learning processes (Hermawan, 2021). By this way, learning activities can be carried out anytime and anywhere (Hoerudin et al., 2023).

E-learning media refers to the various digital tools and resources used to facilitate the process of learning and teaching through electronic means. This encompasses a wide array of formats and technologies that enhance educational experiences, making them more engaging and accessible. E-learning media includes any digital resource that supports the educational process. This can range from traditional materials like e-books and PDFs to more interactive formats such as videos, podcasts, online courses, and simulations.

An example of e-learning media is a web-based e-learning media. Web-based learning media refers to digital platforms and tools that facilitate educational processes through the internet. These media serve as resources for delivering content, engaging learners, and assessing understanding. The flexibility and accessibility of web-based learning make it a popular choice among educators and students alike. The benefits of using this kind of media are can help students access information related to their syllabus from anywhere, fostering independent learning, and enhance students' understanding and retention of concepts (Nababan et al., 2023).

Web-based learning media serves as a powerful tool for enhancing educational experiences across various levels of education. By offering flexible access to resources and fostering interactive learning environments, these platforms significantly boost student engagement and achievement. The adaptability of web-based learning allows educators to tailor content to meet diverse learning styles and needs, making education more inclusive. As technology continues to evolve, ongoing research will be essential in optimizing these tools, ensuring they effectively address the changing landscape of educational demands and enhance the overall learning experience for all students.

3. RESEARCH METHODS

To map the perceptions of teachers and students, this study used a quantitative approach, namely a survey. The population used in this study were students and teachers of grade X and grade XI MIPA of SMA Negeri 1 Karanganyar, SMA Negeri 2 Karanganyar, and SMA Negeri Karangpandan with a total number of 2318 students and 6 teachers. The research sample was determined based on the Krejcie and Morgan Table with an error rate of 10% (Alwi, 2015). Based on the Krejcie and Morgan Table, the research samples used in this study were students and teachers of class X and class XI MIPA SMA Negeri 1 Karanganyar, SMA Negeri 2 Karanganyar, and SMA Negeri Karangpandan with a total number of 246 students and 6 teachers. The selection of school samples was carried out by purposive sampling, while the sampling of students and teachers used proportionate stratified random sampling, so that 41 students were selected from each school.

Quantitative data in the form of student and teacher perceptions were obtained using a Likert Scale questionnaire instrument consisting of 18 items, Likert Scale with details of scale 1 (disagree), 2 (disagree), 3 (agree), and 4 (strongly agree). The Likert Scale questionnaire instrument was made in the form of Google Form and given to students and teachers. Students' and teachers' perceptions were measured using 5 items of expected condition indicators, 4 items of actual condition indicators, and 9 items of solution indicators. Expected conditions contain questions related to learning media that can make it easier for students to understand Pteridophyta material, accessed anywhere, anytime, displaying concrete objects, presenting Pteridophyta collections from the KGPAA Mangkunegoro I Forest Park, and being able to train students' science process skills. Meanwhile, the actual condition indicator contains questions related to the difficulties and obstacles of students in learning Pteridophyta material during the survey. The solution indicator contains questions related to learning media such as what students expect, what media platform, how media accessibility,

what material coverage, and media design layout (students and teachers were given four alternative web views, namely Bioman Biology: The Fun Place to Learn Biology!, The Biology Corner, iBiology, and Biology-Art).

Rasch analysis was used to check the quality of the instrument and at the same time map the perceptions of students and teachers. Rasch fulfills five objective measurement criteria, namely providing a linear measure with equal intervals, performing an appropriate estimation process, finding misfit or outliers, overcoming missing data, and producing replicable or independent measurements of the parameters under study (Sumintono & Widhiarso, 2013). Rasch analysis will produce a logit value (log odd ratio). Rasch modeling can be done with the help of Winsteps version 3.73. The Output Table will display values such as Mean (M) and Standard Deviation (SD) of the logit value. Values such as Mean (M) and Standard Deviation (SD) of the logit value can be used to determine the results of the questionnaire answer analysis. The criteria for logit values are low, medium, and high which can be seen in Table.

Table 1. Logit Values Criteria

Criteria	Logit Value
Low	>M+1SD
Middle	M+1SD>Logit>M-1SD
High	>M-1SD

4. RESULTS AND DISCUSSION

The results of analyzing the quality of instruments with Rasch Modeling produce various kinds of output tables, namely the Summary Statistic Table. Summary Statistic Table is used to analyze the instrument in more detail in the form of statistical summaries and test information functions so that it can assist researchers in making appropriate, logical, and scientific decisions based on a complete and in-depth analysis.

A. Results of student questionnaire data analysis

1) Expected Condition

SUMMARY OF 246 MEASURED (EXTREME AND NON-EXTREME) Person

	TOTAL SCORE	COUNT	MEASURE	MODEL ERROR	INFIT MNSQ	INFIT ZSTD	OUTFIT MNSQ	OUTFIT ZSTD
MEAN	12.2	4.0	3.25	1.96				
S.D.	1.7	.0	3.25	.75				
MAX.	16.0	4.0	9.86	2.71				
MIN.	7.0	4.0	-5.05	1.02	.01	-1.4	.01	-1.4
REAL RMSE	2.47	TRUE SD	2.11	SEPARATION	.85	Person RELIABILITY	.42	
MODEL RMSE	2.10	TRUE SD	2.48	SEPARATION	1.18	Person RELIABILITY	.58	
S.E. OF Person MEAN = .21								

Person RAW SCORE-TO-MEASURE CORRELATION = .98
CRONBACH ALPHA (KR-20) Person RAW SCORE "TEST" RELIABILITY = .81

Figure 1. Summary Statistic Table of Measured Person

SUMMARY OF 5 MEASURED (NON-EXTREME) Item

	TOTAL SCORE	COUNT	MEASURE	MODEL ERROR	INFIT MNSQ	INFIT ZSTD	OUTFIT MNSQ	OUTFIT ZSTD
MEAN	713.8	246.0	.00	.14	.97	-1.4	.95	-1.5
S.D.	68.5	.0	1.24	.00	.67	5.7	.68	5.6
MAX.	758.0	246.0	2.43	.14	2.29	9.9	2.29	9.6
MIN.	579.0	246.0	-.81	.14	.51	-6.1	.46	-6.2
REAL RMSE	.16	TRUE SD	1.23	SEPARATION	7.90	Item RELIABILITY	.98	
MODEL RMSE	.14	TRUE SD	1.23	SEPARATION	8.86	Item RELIABILITY	.99	
S.E. OF Item MEAN = .62								

UMEAN=.0000 USCALE=1.0000
Item RAW SCORE-TO-MEASURE CORRELATION = -1.00
1220 DATA POINTS. LOG-LIKELIHOOD CHI-SQUARE: 1578.63 with 970 d.f. p=.0000
Global Root-Mean-Square Residual (excluding extreme scores): .4571

Figure 2. Summary Statistic Table of Measured Item

Based on Figure 1, the results of the analysis of the expected conditions aspect question items resulted in a mean value of 11.8, indicating that the average student answered in the affirmative to all questions. This is also supported by the resulting person measure value, which is +2.63 logit. The logit value is the average value of the tendency of the person or respondent's answer. The resulting logit value shows an average value of> 0.0 logit, so it can be seen that more people or respondents are more likely to answer agree on all questions. The resulting Cronbach's Alpha value is 0.81 which indicates that overall there is a sufficient relationship between person and item.

Based on Figure 2, the resulting person reliability value is 0.11 and the resulting item reliability value is 0.98. The person reliability value shows that the consistency of answers from students is weak and the item reliability value shows that the quality of the items in the reliability aspect of the instrument is excellent.

From the two descriptions above, it can be concluded that students hope that with the Pteridophyta e-learning media, students can understand the material quickly and easily. This is in accordance with the results of research conducted by Rahmat, Mursyida, Rizal, Krismadinata, & Yunus (2019) which states that the latest learning media can make students understand the material quickly and easily because it has characteristics such as presenting material in audio and visual form which makes students faster and easier to remember the material studied. Pteridophyta e-learning media also allows students to learn the material anywhere and anytime. Internet accessibility and the development of devices are expected to make students facilitated to be able to learn Pteridophyta material anywhere and anytime. In addition, students become closer to the object of learning. Pteridophyta e-learning media is expected to enable students to at least see the object of learning, namely examples of Pteridophyta found in TAHURA KGPAA Mangkunagoro I so as to increase student knowledge about Pteridophyta biodiversity. Furthermore, students can also be more familiar with local potential-based learning resources. Pteridophyta e-learning media featuring Pteridophyta found in TAHURA KGPAA Mangkunagoro I has many added values, one of which can also improve students' science process skills (Sriyati, Ivana, & Pryandoko, 2021).

2) Real Condition

SUMMARY OF 246 MEASURED Person

	TOTAL SCORE	COUNT	MEASURE	MODEL ERROR	INFIT MNSQ	INFIT ZSTD	OUTFIT MNSQ	OUTFIT ZSTD
MEAN	14.9	6.0	-.25	.66	1.02	-.1	1.00	-.1
S.D.	1.4	.0	.61	.03	.88	1.2	.86	1.2
MAX.	19.0	6.0	1.79	.75	6.04	4.2	5.96	4.2
MIN.	9.0	6.0	-2.69	.62	.03	-3.7	.03	-3.7
REAL RMSE	.75	TRUE SD	.00	SEPARATION	.00	Person RELIABILITY		.00
MODEL RMSE	.66	TRUE SD	.00	SEPARATION	.00	Person RELIABILITY		.00
S.E. OF Person MEAN = .04								

Person RAW SCORE-TO-MEASURE CORRELATION = 1.00
CRONBACH ALPHA (KR-20) Person RAW SCORE "TEST" RELIABILITY = .00

Figure 3. Summary Statistic Table of Measured Person

SUMMARY OF 6 MEASURED Item

	TOTAL SCORE	COUNT	MEASURE	MODEL ERROR	INFIT MNSQ	INFIT ZSTD	OUTFIT MNSQ	OUTFIT ZSTD
MEAN	612.5	246.0	.00	.10	.99	-.3	1.00	-.2
S.D.	32.2	.0	.34	.00	.31	3.6	.33	3.8
MAX.	664.0	246.0	.44	.11	1.42	4.6	1.45	4.8
MIN.	570.0	246.0	-.55	.10	.61	-4.8	.60	-5.0
REAL RMSE	.11	TRUE SD	.32	SEPARATION	2.96	Item RELIABILITY		.90
MODEL RMSE	.10	TRUE SD	.32	SEPARATION	3.16	Item RELIABILITY		.91
S.E. OF Item MEAN = .15								

UMEAN=.0000 USCALE=1.0000
Item RAW SCORE-TO-MEASURE CORRELATION = -1.00
1476 DATA POINTS. LOG-LIKELIHOOD CHI-SQUARE: 2756.19 with 1223 d.f. p=.0000
Global Root-Mean-Square Residual (excluding extreme scores): .6258

Figure 4. Summary Statistic Table of Measured Item

Based on Figure 3, the results of the analysis of the actual condition aspect question items resulted in a mean value of 14.9 which indicates that the average student answered disagree on all questions. This is also supported by the resulting person measure value of -0.25 logit so that it can be seen that people or respondents are more or more likely to answer disagree on all questions. The resulting Cronbach's Alpha value is 0.00 which indicates that overall there is a poor relationship between person and item.

Based on Figure 4, the resulting person reliability value is 0.00 and the resulting item reliability value is 0.90. The person reliability value shows that the consistency of answers from students is weak and the item reliability value shows that the quality of items in the reliability aspect of the instrument is good.

From the two descriptions above, the picture of Pteridophyta learning in high school is that there are indications that students have difficulty in understanding Pteridophyta material. According to Sari, Ritonga, & Gultom (2019) students have difficulty in understanding Pteridophyta material due to several factors including lack of learning media, difficulty in understanding school handbooks, too much Latin, learning material seems abstract, and students have difficulty understanding explanations from teachers. Students also have limited space and time in learning Pteridophyta material. Pteridophyta material is structurally included in Plantae material or in other words, the time allocation to study Pteridophyta material is very limited. During this time, students stated that they were not brought closer to the object of learning Pteridophyta material. Students stated that so far, they have used learning media but almost all of them are only in the form of pictures of Pteridophyta. Students cannot see the learning object directly. Students tend to only recognize Pteridophyta according to Pteridophyta pictures. According to Nurmaningsih, Jekti, & Jamaludin (2013) students still find it difficult to distinguish between the Pteridophyta group and the Spermatophyta group because students also tend to only recognize the types of Pteridophyta or ferns that are often found around them. In addition, students are also not introduced to local potential-based learning resources on Pteridophyta material. Students stated that so far the learning media used were not made by utilizing local potential-based learning resources. This statement is not only based on empirical evidence but also theoretical evidence. Not a single learning media for Pteridophyta material was found that was developed in online form and there were only about 50% of learning media for Pteridophyta material that utilized local potential-based learning resources. This fact further strengthens students' statements that students are not introduced to local potential-based learning resources for Pteridophyta material. This statement has a relationship with the expected conditions so that the development of Pteridophyta e-learning media can help solve the problems that have occurred in Pteridophyta learning in high school.

3) Solution

SUMMARY OF 246 MEASURED (EXTREME AND NON-EXTREME) Person

	TOTAL SCORE	COUNT	MEASURE	MODEL ERROR	INFIT MNSQ	INFIT ZSTD	OUTFIT MNSQ	OUTFIT ZSTD
MEAN	28.8	9.0	3.52	1.05				
S.D.	3.3	.0	2.55	.30				
MAX.	36.0	9.0	9.11	1.87				
MIN.	18.0	9.0	-2.75	.61	.04	-2.8	.03	-2.8
REAL RMSE	1.19	TRUE SD	2.26	SEPARATION	1.89	Person RELIABILITY	.78	
MODEL RMSE	1.09	TRUE SD	2.31	SEPARATION	2.12	Person RELIABILITY	.82	
S.E. OF Person MEAN = .16								

Person RAW SCORE-TO-MEASURE CORRELATION = .99
CRONBACH ALPHA (KR-20) Person RAW SCORE "TEST" RELIABILITY = .89

Figure 5. Summary Statistic Table of Measured Person

SUMMARY OF 9 MEASURED (NON-EXTREME) Item

	TOTAL SCORE	COUNT	MEASURE	MODEL ERROR	INFIT MNSQ	INFIT ZSTD	OUTFIT MNSQ	OUTFIT ZSTD
MEAN	788.1	246.0	.00	.18	.97	-.5	.90	-.9
S.D.	21.5	.0	.72	.01	.35	3.0	.47	2.9
MAX.	825.0	246.0	1.39	.19	1.60	4.5	1.89	4.8
MIN.	745.0	246.0	-1.26	.17	.44	-5.7	.27	-5.7

REAL RMSE	.19	TRUE SD	.69	SEPARATION	3.58	Item RELIABILITY .93
MODEL RMSE	.18	TRUE SD	.69	SEPARATION	3.79	Item RELIABILITY .93
S.E. OF Item MEAN = .25						

UMEAN=.0000 USCALE=1.0000
Item RAW SCORE-TO-MEASURE CORRELATION = -1.00
2043 DATA POINTS. LOG-LIKELIHOOD CHI-SQUARE: 1785.21 with 1806 d.f. p=.6316
Global Root-Mean-Square Residual (excluding extreme scores): .3598

Figure 6. Summary Statistic Table of Measured Item

Based on Figure 5, the results of the analysis of the solution aspect question items produce a mean value of 28.2 which indicates that the average student who answers agrees on all questions. This is also supported by the resulting person measure value of +3.05 logit. So, it can be seen that more people or respondents or more likely to answer agree on all questions. The resulting Cronbach's Alpha value is 0.89 which indicates that overall there is a very good relationship between person and item.

Based on Figure 6, the resulting person reliability value is 0.70 and the resulting item reliability value is 0.93. The person reliability value shows that the consistency of answers from students is sufficient and the item reliability value shows that the quality of the items in the reliability aspect of the instrument is very good.

From the two descriptions above, it can be concluded that students agree with the design of Pteridophyta e-learning media offered by researchers. Students need Pteridophyta e-learning media to help understand the material, learn material anywhere and anytime, bring students closer to learning objects, and introduce students to local potential-based learning resources. Students also need online-based learning media or in accordance with the characteristics of e-learning media and need learning media that can be accessed from various devices without the installation process or in accordance with the process of using e-learning media. Moreover, students need learning media that displays illustrations, text, photos, and videos, stimulates student learning activities, and provides student evaluation materials.

B. Results of student questionnaire data analysis

1) Expected Condition

SUMMARY OF 6 MEASURED (EXTREME AND NON-EXTREME) Person

	TOTAL SCORE	COUNT	MEASURE	MODEL ERROR	INFIT MNSQ	INFIT ZSTD	OUTFIT MNSQ	OUTFIT ZSTD
MEAN	13.7	4.0	1.79	.99				
S.D.	1.5	.0	1.29	.43				
MAX.	16.0	4.0	4.15	1.87				
MIN.	12.0	4.0	.57	.66	.35	-1.1	.35	-.9

REAL RMSE	1.20	TRUE SD	.46	SEPARATION	.39	Person RELIABILITY .13
MODEL RMSE	1.08	TRUE SD	.70	SEPARATION	.65	Person RELIABILITY .30
S.E. OF Person MEAN = .58						

Person RAW SCORE-TO-MEASURE CORRELATION = .98
CRONBACH ALPHA (KR-20) Person RAW SCORE "TEST" RELIABILITY = .13

Figure 7. Summary Statistic Table of Measured Person

SUMMARY OF 4 MEASURED (NON-EXTREME) Item

	TOTAL SCORE	COUNT	MEASURE	MODEL ERROR	INFIT MNSQ	INFIT ZSTD	OUTFIT MNSQ	OUTFIT ZSTD
MEAN	20.5	6.0	.00	.73	.89	.0	.95	.1
S.D.	1.7	.0	.77	.14	.43	.7	.54	.8
MAX.	22.0	6.0	1.06	.87	1.44	.9	1.51	.9
MIN.	18.0	6.0	-.73	.54	.46	-.6	.42	-.7

REAL RMSE	.78	TRUE SD	.00	SEPARATION	.00	Item RELIABILITY .00
MODEL RMSE	.74	TRUE SD	.18	SEPARATION	.24	Item RELIABILITY .05
S.E. OF Item MEAN = .44						

UMEAN=.0000 USCALE=1.0000
Item RAW SCORE-TO-MEASURE CORRELATION = -.99
20 DATA POINTS. LOG-LIKELIHOOD CHI-SQUARE: 32.71 with 10 d.f. p=.0003
Global Root-Mean-Square Residual (excluding extreme scores): .6713

Figure 8. Summary Statistic Table of Measured Item

Based on Figure 6, the results of the analysis of question items in the expected conditions aspect resulted in a mean value of 13.2, indicating that the average teacher answered agree on all questions. This is also supported by the resulting person measure value of +1.32 logit. The logit value is the average value of the tendency of the person or respondent's answer. The resulting logit value shows an average value of> 0.0 logit, so it can be seen that more people or respondents are more likely to answer agree on all questions. The resulting Cronbach's Alpha value is 0.13 which indicates that overall there is a poor relationship between person and item.

Based on Figure 7, the resulting person reliability value is 0.00 and the resulting item reliability value is also 0.00. The person reliability value shows that the consistency of the teachers' answers is weak and the item reliability value shows that the quality of the items in the reliability aspect of the instrument is also weak.

From the two descriptions above, it can be concluded that teachers really hope that with the e-learning media Pteridophyta, teachers can explain the material quickly and easily. One of the advantages of modern learning media is that it allows teachers to visualize material so that it can be better understood by students (Astuti et al., 2017). Pteridophyta e-learning media can also be used to teach material anywhere and anytime. Teachers can add learning materials, add learning evaluations, and even communicate with students through Pteridophyta e-learning media. All of that can be done as long as the teacher is connected to the internet. In addition, Pteridophyta e-learning media can bring students closer to the learning object. Not always the teacher must bring students to the object of learning but the teacher can also bring the object of learning into the classroom. According to Maulana, Suryani, & Asrowi (2019), the use of technology to display learning objects can improve contextual learning. More than that, e-learning media for Pteridophyta material can introduce students to local potential-based learning resources. Now teachers are required not only to develop learning models but also learning media. According to Mumpuni, Susilo, & Rohman (2013), local potential-based learning resources can improve students' science literacy.

2) Real Condition

SUMMARY OF 6 MEASURED Person

	TOTAL SCORE	COUNT	MEASURE	MODEL ERROR	INFIT MNSQ	INFIT ZSTD	OUTFIT MNSQ	OUTFIT ZSTD
MEAN	16.3	6.0	.75	.78	.96	-.1	.95	-.1
S.D.	.9	.0	.57	.04	.60	1.2	.62	1.0
MAX.	18.0	6.0	1.79	.86	1.92	1.5	2.07	1.5
MIN.	15.0	6.0	-.03	.75	.19	-1.8	.17	-1.4
REAL RMSE	.86	TRUE SD	.00	SEPARATION	.00	Person RELIABILITY		.00
MODEL RMSE	.78	TRUE SD	.00	SEPARATION	.00	Person RELIABILITY		.00
S.E. OF Person MEAN = .26								

Person RAW SCORE-TO-MEASURE CORRELATION = 1.00
CRONBACH ALPHA (KR-20) Person RAW SCORE "TEST" RELIABILITY = .00

Figure 9. Summary Statistic Table of Measured Person

SUMMARY OF 6 MEASURED Item

	TOTAL SCORE	COUNT	MEASURE	MODEL ERROR	INFIT MNSQ	INFIT ZSTD	OUTFIT MNSQ	OUTFIT ZSTD
MEAN	16.3	6.0	.00	.80	.94	-.1	.95	-.1
S.D.	4.3	.0	3.25	.13	.27	.7	.30	.7
MAX.	22.0	6.0	3.49	.99	1.45	1.0	1.42	1.0
MIN.	11.0	6.0	-4.67	.65	.61	-1.1	.55	-1.1
REAL RMSE	.83	TRUE SD	3.14	SEPARATION	3.77	Item RELIABILITY		.93
MODEL RMSE	.81	TRUE SD	3.15	SEPARATION	3.87	Item RELIABILITY		.94
S.E. OF Item MEAN = 1.45								

UMEAN=.0000 USCALE=1.0000
Item RAW SCORE-TO-MEASURE CORRELATION = -.98
36 DATA POINTS. LOG-LIKELIHOOD CHI-SQUARE: 50.75 with 23 d.f. p=.0007
Global Root-Mean-Square Residual (excluding extreme scores): .5214

Figure 10. Summary Statistic Table of Measured Item

Based on Figure 9, the results of the analysis of the actual condition aspect question items resulted in a mean value of 16.3 which indicates that the average teacher answers agree on all questions. This is also supported by the resulting person measure value of +0.75 logit so that it can be seen that more people or respondents are more likely to answer agree on all questions. The resulting Cronbach's Alpha value is 0.00 which indicates that overall there is a poor relationship between person and item.

Based on Figure 10, the resulting person reliability value is 0.00 and the resulting item reliability value is 0.93. The person reliability value shows that the consistency of answers from students is weak and the item reliability value shows that the quality of the items in the reliability aspect of the instrument is very good.

From the two descriptions above, the description of Pteridophyta learning in high school is that there are indications that teachers have difficulty in explaining Pteridophyta material. One example is that teachers still use the lecture method which is not in accordance with the characteristics of science learning (Aprilia, 2011). Teachers also have limited space and time in explaining Pteridophyta material (Roziaty et al., 2016). The large amount of material and the inadequate presence of Pteridophyta around the school add to the limitations of place and time in explaining Pteridophyta material. So far, teachers stated that they have brought students closer to the learning objects of Pteridophyta material. In addition, teachers have also introduced students to local potential-based learning resources on Pteridophyta material. If this statement is associated with the results of the student questionnaire analysis, then there is a significant difference between the opinions of students and teachers regarding learning objects and learning resources. One of the conditions that may occur in the field is that teachers feel that they have brought students closer to learning objects and introduced students to learning resources, but students have not felt the learning experience during learning Pteridophyta material. According to the teacher needs questionnaire, so far, the teacher has used learning media but only in the form of Pteridophyta pictures. The statement is positively correlated with the students' statement that the learning media used so far in learning Pteridophyta is Pteridophyta pictures. Teachers have not used other learning media, especially e-learning media.

3) Solution

SUMMARY OF 6 MEASURED (EXTREME AND NON-EXTREME) Person

	TOTAL SCORE	COUNT	MEASURE	MODEL ERROR	INFIT MNSQ	INFIT ZSTD	OUTFIT MNSQ	OUTFIT ZSTD
MEAN	32.2	9.0	8.64	1.31				
S.D.	3.9	.0	5.15	.49				
MAX.	36.0	9.0	13.92	1.86				
MIN.	27.0	9.0	1.97	.69	.09	-.9	.06	-.8
REAL RMSE	1.41	TRUE SD	4.96	SEPARATION	3.53	Person RELIABILITY	.93	
MODEL RMSE	1.40	TRUE SD	4.96	SEPARATION	3.54	Person RELIABILITY	.93	
S.E. OF Person MEAN = 2.31								

Person RAW SCORE-TO-MEASURE CORRELATION = 1.00
CRONBACH ALPHA (KR-20) Person RAW SCORE "TEST" RELIABILITY = .92

Figure 11. Summary Statistic Table of Measured Person

SUMMARY OF 9 MEASURED (NON-EXTREME) Item

	TOTAL SCORE	COUNT	MEASURE	MODEL ERROR	INFIT MNSQ	INFIT ZSTD	OUTFIT MNSQ	OUTFIT ZSTD
MEAN	21.4	6.0	.00	1.87	.43	-.4	.29	-.4
S.D.	1.3	.0	3.77	.74	.44	.5	.29	.5
MAX.	23.0	6.0	5.29	2.66	1.12	.5	.84	.4
MIN.	19.0	6.0	-5.07	.68	.06	-.8	.04	-.9
REAL RMSE	2.01	TRUE SD	3.19	SEPARATION	1.59	Item	RELIABILITY	.72
MODEL RMSE	2.01	TRUE SD	3.19	SEPARATION	1.59	Item	RELIABILITY	.72
S.E. OF Item MEAN = 1.33								

UMEAN=.0000 USCALE=1.0000
Item RAW SCORE-TO-MEASURE CORRELATION = -.96
36 DATA POINTS. LOG-LIKELIHOOD CHI-SQUARE: 14.36 with 22 d.f. p=.8882
Global Root-Mean-Square Residual (excluding extreme scores): .3354

Figure 12. Summary Statistic Table of Measured Person

Based on Figure 11, the results of the analysis of the solution aspect question items produce a mean value of 30.3 which indicates that the average teacher who answers agrees on all questions. This is also supported by the resulting person measure value which is quite high, namely +9.00 logit. So, it can be seen that more people or respondents or more likely to answer agree on all questions. The resulting Cronbach's Alpha value is 0.92 which indicates that overall there is a very good relationship between person and item.

Based on Figure 12, the resulting person reliability value is 0.94 and the resulting item reliability value is 0.72. The person reliability value shows that the consistency of answers from teachers is very good and the item reliability value shows that the quality of the items in the reliability aspect of the instrument is sufficient.

From those descriptions above, it can be concluded that teachers agree with the design of Pteridophyta e-learning media offered by researchers. Teachers need Pteridophyta e-learning media to help explain the material, teach material anywhere and anytime, bring students closer to learning objects, and introduce students to local potential-based learning resources. Teachers also need online-based learning media or in accordance with the characteristics of e-learning media and need learning media that can be accessed from various devices without the installation process or in accordance with the process of using e-learning learning media. Moreover, teachers need learning media that displays illustrations, texts, photos, and videos, stimulates student learning activities, and provides evaluation materials as a benchmark for student understanding.

Based on the two results of the analysis of the two research objects above, it can be seen that students and teachers need e-learning media that can help students understand Pteridophyta material quickly and easily, help students learn Pteridophyta material anywhere and anytime, bring students closer to learning objects in Pteridophyta material with examples of Pteridophyta plant biodiversity in their natural habitat, and introduce students to local potential-based learning resources. One of the local potentials that can be utilized is TAHURA KGPAA Mangkunagoro I, Karanganyar, Central Java.

Students and teachers need e-learning media that not only displays images of Pteridophyta plants, but also illustrations of the growth and development of Pteridophyta plants, text explaining Pteridophyta material, and videos of the metagenesis process of Pteridophyta plants. Students and teachers need learning media that provide experiences with independent and simple practicum designs on Pteridophyta material. One of the independent and simple practicum designs on Pteridophyta material is the practicum of making dry herbarium of ferns or Pteridophyta by utilizing ferns or Pteridophyta that can be found in the surrounding environment. Students and teachers also need learning media that provide evaluation questions to measure students' abilities on Pteridophyta material. According to the results of the analysis above, e-learning media is expected to train creative thinking skills. One way to train creative thinking skills is by conducting a project-based learning process. This is in accordance with the previous point which states that students and teachers need e-learning media that provides experience with practicum or project design on Pteridophyta material.

An example of e-learning media that can be made is website-based e-learning media. Web-based e-learning media can be used to learn Pteridophyta material quickly and easily anywhere and anytime. The contextuality of the material can be fulfilled by utilizing local potential, namely TAHURA KGPAA Mangkunagoro I as a learning resource. Students can do practicum by following the practicum guide provided on the website. Students can also measure their ability by trying to answer evaluation questions provided on the website. Web-based e-learning media answers the needs of students and teachers for innovative and creative learning media for Pteridophyta material in the 21st century. Based on examples of biology learning web designs shown

to students and teachers, students are more likely to choose The Biology Corner website design because it is more complete in terms of features, specifications, and images. While teachers prefer Bioman Biology website design: The Fun Place to Learn Biology! The website design developed adopts The Biology Corner website design because the use of learning media is more student-centered and not teacher-centered. In further research, the development of Pteridophyta e-learning media will be carried out until the effectiveness test stage to improve students' understanding of Pteridophyta material.

CONCLUSION

Based on the results of the research, students and teachers consider that Pteridophyta material is difficult to understand because learning so far is only based on textbooks. So, the existence of e-learning media is needed. The desired and preferred e-learning media are those that can display complete specifications, features and images that represent Pteridophyta objects, and have a platform that can be accessed through gadgets owned by students. Students and teachers also consider that e-learning media is expected to make it easier for them to learn materials and concepts, as well as train skills in the application of the science process. Based on the results of the mapping of student and teacher perceptions of Pteridophyta e-learning media and learning, it is necessary to develop website-based media that can connect students and teachers with concrete objects of material, and can be used flexibly through internet access.

REFERENCES

Abi Hamid, M., Ramadhani, R., Masrul, M., Juliana, J., Safitri, M., Munsarif, M., Jamaludin, J., & Simarmata, J. (2020). *Media Pembelajaran*. Kita Menulis.

Alwi, I. (2015). Kriteria Empirik dalam Menentukan Ukuran Sampel pada Pengujian Hipotesis Statistika dan Analisis Butir. *Jurnal Formatif*, *2*(2), 140–148.

Annisha, D., Ibrohim, & Rochman, F. (2020). Handout Biologi Berbasis Potensi Lokal Pantai Ujong Blang untuk Siswa SMK Perairan dan Kelautan. *Jurnal Pendidikan*, *5*(5), 693–699. https://doi.org/http://dx.doi.org/10.17977/jptpp.v5i5.13571

Aprilia, E. (2011). Kelayakan Flipbook Sub Materi Tumbuhan Paku (Pteridophyta) di Kelas X SMA. *Jurnal Pendidikan Dan Pembelajaran Khatulistiwa*, *10*(12), 1–11.

Arifuddin, M., & Bahri, A. (2019). Analisis Kebutuhan Pengembangan Aplikasi M-Learning Berbasis Android pada Materi Jaringan Hewan. *Biology Teaching and Learning*, *2*(1), 34–49. https://doi.org/https://doi.org/10.35580/btl.v2i1.10812

Astuti, I. A. D., Sumarni, R. A., & Saraswati, D. L. (2017). Pengembangan Media Pembelajaran Fisika Mobile Learning Berbasis Android. *Jurnal Penelitian & Pengembangan Pendidikan Fisika*, *3*(1), 57. https://doi.org/10.21009/1.03108

Azimi, H. M., & Rahmani, R. (2013). Importance of Needs Assessment for Implementation of E-learning in Colleges of Education. *International Journal of Information and Computation Technology*, *3*(5), 377–382.

Dadi, I. K., Redhana, I. W., & Juniartina, P. P. (2019). Analisis Kebutuhan Untuk Pengembangan Media Pembelajaran IPA Berbasis Mind Mapping. *Jurnal Pendidikan Dan Pembelajaran Sains Indonesia (JPPSI)*, *2*(2), 70. https://doi.org/10.23887/jppsi.v2i2.19375

Daud, F., & Rahmadana, A. (2015). Pengembangan Media Pembelajaran Biologi Berbasis E-Learning pada Materi Ekskresi Kelas XI IPA 3 SMAN 4 Makassar. *Bionature*, *16*(1), 28–36. https://doi.org/https://doi.org/10.35580/bionature.v16i1.1566

Feldman, J., Monteserin, A., & Amandi, A. (2014). Detecting Students' Perception Style by Using Games. *Computers and Education*, *71*, 14–22. https://doi.org/10.1016/j.compedu.2013.09.007

Guntur. (2015). Efektivitas Metode Guided Discovery Terhadap Hasil Belajar pada Materi Plantae di SMAN 9 Pontianak. *Jurnal Pendidikan Dan Penelitian Khatulistiwa*, *4*(1), 1–12.

Hermawan, D. (2021). The Rise of E-Learning in COVID-19 Pandemic in Private University: Challenges and Opportunities. *IJORER : International Journal of Recent Educational Research*, *2*(1), 86–95. https://doi.org/10.46245/ijorer.v2i1.77

Hoerudin, C. W., Syafruddin, S., Mayasari, A., Arifudin, O., & Lestari, S. (2023). E-Learning as A Learning Media Innovation Islamic Education. *QALAMUNA: Jurnal Pendidikan, Sosial, Dan Agama*, *15*(1), 723–734. https://doi.org/10.37680/qalamuna.v15i1.4466

Labib, U. A., & Yolida, B. (2019). Pengembangan Aplikasi berbasis Android yang Terintegrasi dengan Website sebagai Media Pembelajaran Biologi. *Jurnal Bioterdidik: Wahana Ekspresi Ilmiah*, *7*(5), 33–42. http://jurnal.fkip.unila.ac.id/index.php/JBT/article/view/17868

Langgeng, Sajidan, S., & Prayitno, B. A. (2017). Pengembangan Model Pembelajaran Inkuiri Kolaboratif Berbasis Potensi Lokal dan Implementasinya pada Materi Tumbuhan Lumut dan Paku. *Jurnal Inkuiri*, *6*(1), 1–16.

Maulana, I., Suryani, N., & Asrowi, A. (2019). Augmented Reality: Solusi Pembelajaran IPA di Era Revolusi Industri 4.0. *Proceedings of The ICECRS*, *2*(1), 19–26. https://doi.org/10.21070/picecrs.v2i1.2399

Mumpuni, K. E., Susilo, H., & Rohman, F. (2013). Potensi Tumbuhan Lokal Sebagai Sumber Belajar Biologi. *Prosiding Seminar Nasional XI Pendidikan Biologi FKIP UNS*, 825–829.

Muslimah, N., Yeni, L. F., & Titin. (2020). Pengaruh Media Flashcard Terhadap Hasil Belajar Siswa Pada Materi Plantae Kelas X MIA 2 MAS Darul Ulum. *Jurnal Pendidikan Dan Pembelajaran*, *9*(7), 1–12.

Nababan, D., Wijayanti, A. P., Rico, Nashrallah, M. N., & Sari, W. A. S. (2023). Web-Based Learning Media for Distance Education: A Review. *Jurnal Penelitian Pendidikan IPA*, *9*(12), 1342–1353. https://doi.org/10.29303/jppipa.v9i12.5827

Norra, B. I. (2020). Pemetaan Kebutuhan Media Pembelajaran Biologi di SMP dan SMA. *Bioilmi*, *6*(2), 94–102. https://doi.org/https://doi.org/10.19109/bioilmi.v6i2.6964

Novana, T., Sajidan, S., & Maridi, M. (2014). Pengembangan Modul Inkuiri Terbimbing Berbasis Potensi Lokal pada Materi Tumbuhan Lumut (Bryophyta) dan Tumbuhan Paku (Pteridophyta). *Jurnal Inkuiri*, *3*(Ii), 108–122. https://doi.org/10.20961/inkuiri.v3i2.9720

Nurani, I. (2016). Analisis Kebutuhan Pengembangan Media Audio Visual Pokok Bahasan Sintesis Protein Untuk SMA. *Varia Pendidikan*, *28*(1), 90–95. https://doi.org/10.23917/varidika.v28i1.1961

Nurmaningsih, Jekti, D. S. S., & Jamaludin. (2013). Pengembangan Media Animasi Biologi dan Efektivitasnya Terhadap Peningkatan Minat Serta Hasil Belajar Siswa SMA Negeri 7 Mataram. *Jurnal Pendidikan Matematika Dan Sains*, *1*(1), 91–100. https://doi.org/10.21831/jpms.v1i1.12485

Rahmat, R. F., Mursyida, L., Rizal, F., Krismadinata, K., & Yunus, Y. (2019). Pengembangan Media Pembelajaran Berbasis Mobile Learning pada Mata Pelajaran Simulasi Digital. *Jurnal Inovasi Teknologi Pendidikan*, *6*(2), 116–126. https://doi.org/10.21831/jitp.v6i2.27414

Rakhmawati, S., Muspiroh, N., Azmi, N., Pd, S. I., Tadris, J., Biologi, I., Bypass, J. P., & Cirebon, S. (2016). Analisis Pelaksanaan Kurikulum 2013 Ditinjau Dari Standar Proses Dalam Pembelajaran Biologi Kelas X di SMA Negeri 1 Krangkeng. *Scientiae Educatia: Jurnal Sains Dan Pendidikan Sains*, *5*(2), 156–164.

Rasyid, M., Azis, A., & Saleh, A. (2016). Pengembangan Media Pembelajaran Berbasis Multimedia Dalam Konsep Sistem Indera Pada Siswa Kelas XI SMA. *Jurnal Pendidikan Biologi*, *7*(2), 69–80. https://doi.org/http://dx.doi.org/10.17977/um052v7i2p69-80

Roziaty, E., Agustina, P., & Nurfitrianti, R. (2016). Pterydophyta Epifit Kawasan Wisata Air Terjun Jumog Ngargoyoso Karanganyar Jawa Tengah EFRI ROZIATY, PUTRI AGUSTINA, RIZKA NURFITRIANTI. *Bioedukasi*, *9*(2), 76–78. https://doi.org/10.20961/bioedukasi-uns.v9i2.8586

Sadikin, A., & Hakim, N. (2019). Pengembangan Media E-Learning Interaktif Dalam Menyongsong Revolusi Industri 4.0 Pada Materi Ekosistem Untuk Siswa SMA. *Biodik*, *5*(2), 131–138. https://doi.org/10.22437/bio.v5i2.7590

Sari, N. F., Ritonga, N., & Gultom, H. S. B. (2019). Analisis Kesulitan Belajar Siswa SMP Negeri di Kecamatan Medan Kota pada Materi Biologi Melalui Peta Konsep dan Angket. *Jurnal Pembelajaran Dan Biologi Nukleus*, *5*(2), 40–48. https://doi.org/10.36987/jpbn.v5i2.1331

Situmorang, R. P. (2016). Analisis Potensi Lokal untuk Mengembangkan Bahan Ajar Biologi di SMA Negeri 2 Wonosari. *Jurnal Pendidikan Sains Universitas Muhammadiyah Semarang*, *4*(1), 51–57. https://jurnal.unimus.ac.id/index.php/JPKIMIA/article/view/1938/1978

Sriyati, S., Ivana, A., & Pryandoko, D. (2021). Pengembangan Sumber belajar Biologi Berbasis Potensi lokal Dadiah untuk meningkatkan Keterampilan Proses Sains Siswa. *Jurnal Pendidikan Sains Indonesia*, *9*(2), 168–180. https://doi.org/10.24815/jpsi.v9i2.18783

Sumintono, B., & Widhiarso, W. (2013). *Aplikasi Model Rasch Untuk Penelitian Ilmu-ilmu Sosial*. Trim Komunikata Publishing House.

Suryawati, E., & Osman, K. (2018). Contextual learning: Innovative Approach towards the Development of Students' Scientific Attitude and Natural Science Performance. *Eurasia Journal of Mathematics, Science and Technology Education*, *14*(1), 61–76. https://doi.org/10.12973/ejmste/79329