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Development of A Guided Inquiry-Based Practicum Guide E-Book In Biology Learning

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ARTICLE INFO	ABSTRACT
	Biology learning can take the form of practical activities that require practical instructions as activity guides. Practical instructions formed in the E-book model will provide advantages in terms of practicality and efficiency. The aim of this research is to make students more active in the biology learning process. This type of research is Research and Development (R&D). The development design used is ADDIE. This research data collection used interview and questionnaire methods. The results of the development of the guided inquiry-based interactive practical e-book were validated by media experts 93% (very feasible), material experts 96% (very feasible), and learning methodology experts 95% (very feasible). From the three validators, an average score of 94% can be taken, so that the guided inquiry-based interactive practicum guide E-book can be declared "Very Eligible" for testing. The results of the readability test for biology teachers received a score of 100% with the criteria "Very Eligible". Meanwhile, for students in class XI MIPA, 20 students were used, namely 10 students in class XI MIPA 5 and 10 students in class.

Pengembangan E-Book Petunjuk Praktikum Berbasis Inkuiri Terbimbing Pada Pembelajaran Biologi

***ABSTRAK:** Pembelajaran biologi dapat berupa kegiatan praktikum yang membutuhkan petunjuk praktikum sebagai panduan kegiatan. Petunjuk praktikum yang dibentuk dalam model E-book akan memberikan kelebihan dalam hal kepraktisan dan efisien. Tujuan penelitian ini adalah membuat siswa lebih aktif dalam proses pembelajaran biologi. Jenis penelitian ini adalah Research and Development (R&D) desain pengembangan yang digunakan adalah ADDIE. Pengumpulan data penelitian ini menggunakan metode wawancara dan angket. Hasil pengembangan E-book petunjuk praktikum interaktif berbasis inkuiri terbimbing di validasi oleh ahli media 93% (sangat layak), ahli materi 96% (sangat layak), dan ahli metodologi pembelajaran 95% (sangat layak). Dari ketiga validator dapat diambil nilai rata-rata sebesar 94%, sehingga E-book petunjuk praktikum interaktif berbasisi inkuiri terbimbing dapat dikriteriakan "Sangat Layak" untuk diujikan. Hasil uji keterbacaan pada guru biologi mendapatkan skor 100% dengan kriteria "Sangat Layak". Sedangkan pada siswa kelas XI MIPA menggunakan 20 siswa yaitu 10 siswa kelas XI MIPA 5 dan 10 siswa kelas XI MIPA 6 mendapatkan hasil nilai rata-rata 80% dengan kriteria "Layak" untuk digunakan.*

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INTRODUCTION

A learning resource is something that functions to channel messages or information stored in learning materials (Priadi et al., 2023);(Alobaid, 2020). One of the learning resources in the form of books that teachers often use to improve practical learning is practical manuals (Saragih & Tanjung, 2023);(Haka et al., 2024). Practical manuals are books designed to facilitate the implementation of practical activities which contain activity titles, objectives, theoretical basis or background, tools and materials, and questions related to the learning material (Aswirna & Ritonga, 2020);(Muhammad Yusuf, 2023). The function of the practical manual is as a teaching material that can help the teacher's role, make students more active and gain useful knowledge, enable students to think creatively and train their hands to be skilled, and also make it easier for teachers to carry out learning activities in the laboratory (Tang et al., 2020);(Simanjuntak et al., 2021);(Artun et al., 2020).

According to Mohzana et al. (2023), practical activities in the laboratory include many objectives, one of which is training students to look for problems, designing experiments to solve problems, and solving these problems. Benefits: Practicum activities can improve skills in solving problems and increase students' understanding regarding practical learning (Mustika & Hasby, 2022).

Guided inquiry-based practicum instructions in practicum activities can be a supporting factor in learning process activities (Lestari & Cintamulya, 2022);(Juniar et al., 2021). Guided inquiry is included in the learning model which makes students move little by little starting from finding problems, providing hypotheses, finding problem formulations, collecting problem data, proving results, and determining conclusions with guidance from the teacher (Maknun, 2020);(F. D. Sari et al., 2023).

Based on the results of pre-research conducted by researchers at Senior High School in Semarang, it was carried out in two forms, namely interviews with biology teachers and distributing questionnaires analyzing student needs. The results of an interview with the biology teacher conducted on April 12 2023 stated that the main problems students had when studying biology were firstly, they were less active and less diligent, and they were often late in submitting assignments. This is in line with Kritzinger et al. (2021) researchers, that the lack of student activity is a problem in biology learning. The second is the students' lack of understanding of the material that will be carried out during the practicum because they have not studied and read the practicum instructions given by the teacher. Mohzana et al. (2023) argue, that practicum will run well if you can master work procedures. Third, there is a lack of students' skills in using laboratory equipment. Fourth, the biology lesson scores obtained by students have reached the Minimum Completeness Criteria with a score of 75, although there are some students who have not reached the Minimum Completeness Criteria with an average score of 60. The five guided inquiry learning models are rarely implemented in class XI MIPA 5 and XI MIPA 6.

The student needs analysis questionnaire was used on samples of classes XI MIPA 5 and XI MIPA 6 because of the entire population, classes XI MIPA 5 and 5% of students are lazier about studying biology because there are too many theories related to explanations of material in biology learning. Second, as many as 93% of students said that the learning media and facilities were inadequate in the laboratory, therefore students were still relatively unfamiliar with laboratory equipment and therefore were not skilled in using them.

The needs analysis questionnaire of 91.2% of students also showed that students used e-books more often to search for learning-related information than regular

books. Another problem for students during practicum is that students are less active when practicum activities are carried out (Kim, 2020). One solution to overcome this problem can be using an e-book for guided inquiry-based biology practicum instructions which is used to help and facilitate students directly in the guided inquiry model learning process (Rokhayati et al., 2022). In this learning, the teacher has a role to facilitate students' needs (Handoko et al., 2024);(Puspita et al., 2022). During practical activities, students must discover concepts through instructions from the teacher to solve problems (Shana & Abulibdeh, 2020). Students in solving problems can look for references from smartphones (Putranta et al., 2020).

According to Iqbal & Bhatti (2020) electronics in the form of smartphones can increase students' knowledge about technological advances. Students can find a lot of information with gadgets, for example when looking for information about material that is considered difficult (Nami, 2020). One of the electronic learning media that students use when looking for information is in the form of e-books. Some of the advantages of E-books are that they don't get damaged quickly, are easy to use, easy to store, interactive, and quick to publish.

METHOD

The results of the research that will be developed will be an interactive e-book based on guided inquiry. The development design uses the ADDIE model design. Effective ADDIE learning design centers on authentic task implementation, complete knowledge, and genuine problems (Branch, 2009). The evaluation results obtained at each learning step can improve learning development to the next phase (Hardiansyah & Mulyadi, 2022). The data used in this research are quantitative data and qualitative data. Quantitative data takes the form of numbers obtained from validation results from validators and student and teacher responses, which are

ultimately used to determine product suitability. Qualitative data is written in descriptive form containing criticism and suggestions. The results of the analysis of qualitative data are used as a reference to improve the product being developed (Nassaji, 2020).

Data collection can be done in various ways or techniques, whereas this research uses techniques, namely interviews, questionnaires, observations and a combination of the three. This research uses guided interviews, namely the interview process is based on an interview guide which contains questions prepared by the researcher consisting of things deemed necessary in the research. Observations or observations in this research are very important, because they are to estimate and understand the needs of teachers and students during practical learning. Questionnaires are used to test feasibility, test validity, and test readability of responses from experts, teachers and students. The assessment of questionnaire data in this research will be processed by presenting percentages using a Likert scale as a measurement scale (Yusuf, 2016). The Likert scale is a measurement scale used to measure a person's attitudes, opinions and perceptions about social phenomena and is also the measurement scale most widely used in research (Sugiyono, 2015). The following is Table 1.

Table 1. Response Scores

No.	Answer	Score
1.	Strongly Agree	5
2.	Agree	4
3.	Less Disagree	3
4.	Disagree	2
5.	Strongly disagree	1

Source : (Sugiyono, 2018)

The data analysis techniques in this research were analyzed using qualitative

and quantitative data analysis techniques. In qualitative testing, it can be determined using the formula:

$$\text{Percentage} = \frac{\text{Number of scores obtained}}{\text{Number of ideal highest scores}} \times 100\%$$

This research will go through the feasibility test stage of learning media with the criteria in Table 2 as follows:

Table 2. Learning Media Eligibility Criteria

No.	Valuation (%)	Category
1.	81-100	Highly Worthy
2.	61-80	Proper
3.	41-60	Quite Decent
4.	21-40	Not Eligible
5.	0-20	Very Unworthy

RESULTS AND DISCUSSION

The practical instructions developed are validated by experts to see the feasibility of the practical instructions developed. The material expert validator is Mrs. Mirtaati Na'ima, M.Sc. Validation is carried out by looking at several aspects, namely aspects of appropriateness of content, appropriateness of presentation and appropriateness of language (Ennouamani et al., 2020). Validation of the design of practical instructions will be validated by a media expert, namely Mrs. Dian Tauhidah, S.Pd., M.Pd. In the media assessment, the indicators used are cover design, cover font design, content design for practical instructions, and interactive. The validator, expert in learning methodology, independent practicum instructions, was validated by Mrs. Eka Vasia Anggis, M.Pd. Validation pays attention to the learning steps used in the practicum instructions, namely using the guided inquiry learning model (Yulianti et al., 2021). Therefore, the indicators that must be met in the assessment are the steps of the guided inquiry learning model which consists of questions, procedures and results (Susilawati et al., 2020);(Popova & Jones, 2021).

Testing the readability of this interactive practicum guide E-book product is carried out in the following way; (1) Provide response sheets to biology teachers regarding products that are suitable for testing. (2) The practical product trial was carried out online via Google Form, which was tried by 20 students from two classes, namely 10 students from class XI MIPA 5 and 10 students from class XI MIPA 6. After students understand the contents of the practical instructions, students are then asked to provide an assessment of the suitability of the E-book practical instructions using a Google form which contains several questions to understand the content, media and suitability of the learning model used. The results of the validation recapitulation scores from all experts can be seen in Table 3 below:

Table 3. Recapitulation of Expert Validation

Expert	Aspects	Score (%)
Media	Graphic Qualifications	93
Material	Content, presentation and language eligibility	96
Learning Methodology	Guided inquiry learning model steps	95
Average Score		**94**

Media expert validation results show a score of 93% with the criteria "Very Eligible". The process of determining media suitability is determined from several aspects that are assessed, namely the graphic feasibility aspect of the practicum guide product which includes assessment items, namely the cover design of the practicum guide, the font design on the cover, the content design of the practicum guide, and interactive. Material expert validation results show a score of 96% with the criteria "Very Eligible". The process of determining the suitability of the content of the material refers to the assessment points, namely completeness of the material, suitability of the material, depth of the material and up-to-date of the material (Perria & Sieder, 2020). The content suitability aspect is guided by the

assessment points, namely completeness of material, suitability of material, depth of material, and up-to-date material. The aspect of appropriateness of presentation is guided by the assessment points, namely presentation techniques and support (Situmorang et al., 2020). Meanwhile, Munazilah & Yulianto (2021) argue, the aspect of language appropriateness is guided by the assessment items, namely straightforwardness, communicativeness and interactive. The validation results from learning methodology experts show a score of 95% with the criteria "Very Eligible". The process of determining the feasibility of a learning methodology refers to several aspects that are assessed from the steps of the guided inquiry learning model applied in the content of the practicum instructions, which include aspects of questions that refer to assessment items, namely problem formulation, making hypotheses, designing experiments, conducting experiments, collecting data and analyzing data, making conclusions (Khoiron et al., 2020).

The readability test of the practicum instructions product was carried out on biology teachers and students of class XI MIPA 20 students from classes XI MIPA 5. Readability test on the biology teacher at SMA N 15 Semarang, namely Mr. Sukisroyi M.Pd. This is done by filling in response questions regarding the E-book product, guided inquiry-based interactive biology practicum instructions. The results of the readability test scores by biology teachers can be seen in Table 4 below:

Table 4. Recapitulation of Biology Teacher Readability Test Results

Aspects	Score (%)	Criterion
Media, Materials, Methodology and Interactive	100	Highly Worthy

These results are worth testing with several suggestions and criticism from biology teachers, including; additional KD material on the circulation system that can be

included. The small-scale student readability test on students is viewed from several aspects, namely material aspects, media aspects, and learning method aspects which consist of several questions. Below in Table 5 are the results of the readability test assessment for class XI MIPA students.

Table 5. Recapitulation of Readability Test Results for Class XI MIPA Students

No.	Responden	Class	Score	Percentage (%)
1.	A	XI MIPA 5	40	100
2.	B	XI MIPA 5	30	75
3.	C	XI MIPA 5	38	95
4.	D	XI MIPA 5	30	75
5.	E	XI MIPA 5	34	85
6.	F	XI MIPA 5	30	75
7.	G	XI MIPA 5	29	72
8.	H	XI MIPA 5	30	75
9.	I	XI MIPA 5	40	100
10.	J	XI MIPA 5	36	90
11.	K	XI MIPA 6	30	75
12.	L	XI MIPA 6	30	75
13.	M	XI MIPA 6	30	75
14.	N	XI MIPA 6	30	75
15.	O	XI MIPA 6	30	75
16.	P	XI MIPA 6	30	75
17.	Q	XI MIPA 6	33	82
18.	R	XI MIPA 6	30	75
19.	S	XI MIPA 6	33	82
20.	T	XI MIPA 6	35	87
Nilai Rata-rata				**80%**

The results of the readability test on 20 students of class. The average score of the readability test for 20 students was 80% with the criteria "Decent". The small-scale feasibility test on students is reviewed from aspects, namely material aspects, media aspects, and learning methodology aspects. The results of the development of this biology practicum guide e-book are also based on guided inquiry which is useful for making students more active during the learning process. One learning model that can be used to improve student activity and learning outcomes is the guided inquiry learning model, where the learning process is student-oriented which can stimulate other students to be active in teaching and learning activities (Xia, 2020)

The following is a graph of the results of the experts' eligibility recapitulation in Figure 1:
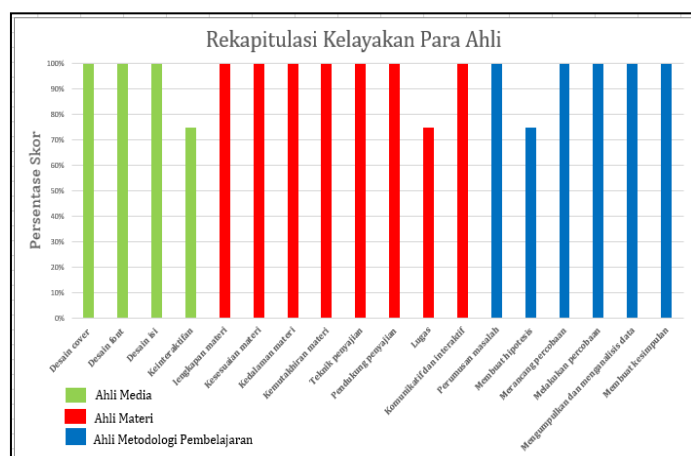

Figure 1. Graph of Recapitulation of Expert Eligibility

The validation results from media experts obtained the highest score for the content design, cover design and font design indicators, namely 100% because the design created was quite good. Research conducted by Fatthurrahma & Anas (2023) explained that learning media design greatly influences students' interest in learning. This has been proven by the effectiveness tests that have been carried out with the average result being that 80% of students no longer get bored during the learning process. Meanwhile, the lowest score was obtained for the interactive indicator, namely 75% because the product made only contained one piece of information and did not provide feedback to students. Hadi et al., (2022) states that learning media can be said to be interactive if a teaching material is combined with various multimedia such as audio, video text, or interactive graphics which are packaged into one media and provide feedback from students. Research from Purba (2020) and Liliana et al. (2020) shows that interactivity in learning media can make students more active and improve student learning outcomes, this is proven by an increase in experimental class learning outcomes higher than the control class.

Validation results from material experts have the highest score on the indicators of material completeness, material up-to-date, material depth, material suitability, presentation techniques, presentation support, and interactive communicativeness, namely 100% because the products made are appropriate for biology learning materials, in research from Almunawaroh (2020) and Sari et al. (2022) stated that the application and use of E-books is higher than the application and use of books because E-books can offer features that can help readers understand the material, therefore the material in E-books must also be complete and according to the learning material. Research from Pratiwi et al. (2022) and Himawan et al. (2024) proves that students can train critical thinking and make students more active in reading because in the E-book product there is material that is in accordance with basic competencies and objectives which is presented systematically and coherently, arranged efficiently, and equipped with an inquiry model. guided. Meanwhile, the lowest value was obtained for the straightforward indicator, namely 75% because the straightforwardness of the products made was still lacking. Based on research conducted by Suastra & Menggo (2020), it shows that students' interest and understanding in reading will decrease if the selection and writing of words or sentences do not comply with the clarity of the Indonesian language, therefore it is very important to pay attention in writing. This is also supported by Setiawan et al. (2023) who explains that the good and correct use of Indonesian is a very important factor in learning activities, of course in this case students need special attention in terms of using Indonesian well and correctly.

The validation results from learning methodology experts obtained the highest score for the indicators of problem formulation, designing experiments, conducting experiments, collecting and analyzing data, and making conclusions, namely 100% because the product created included indicators from the guided inquiry learning steps. In Anisah & Nasrudin

(2023) and Haub et al. (2020) research, the results showed that guided inquiry-oriented learning sessions would inspire students' basic knowledge and develop problem-solving skills with critical thinking, apart from that it could also improve student learning outcomes. According to Khasawneh et al. (2023) also states that guided inquiry learning is oriented towards student activities and the possibility that when students learn they can utilize all types of learning resources, which means that not only teachers are used as learning resources. Students will be actively involved in their mental processes through observing, measuring and collecting data to draw conclusions. Meanwhile, the lowest value was obtained for the indicator for making a hypothesis, namely 75% because there is a possibility that students make a hypothesis that is not in accordance with the formulation of the problem presented. According to Leatherbee & Katila (2020) in making hypotheses by students, teachers give students the opportunity to share their opinions in forming hypotheses. Apart from that, teachers must also guide students in determining hypotheses that are relevant to the problem and prioritizing which ones are the priority for investigation. Likewise, Priadi et al. (2023) suggested that hypotheses can be prepared based on a strong theoretical basis and supported by relevant research results. Students must understand the content and steps in formulating a research hypothesis, so that the hypothesis is in accordance with the problem formulation.

Based on research by Almekhlafi (2021) the use of e-books for biology practicum instructions in biology learning can increase students' interest in doing practicums and be more active in class during the learning process. According to Handoko et al. (2021) what supports students' positive responses is the design of attractive instructions in the form of illustrations or pictures at the beginning of each material which can increase students' motivation in learning the material by using clear instructions, thus making it easier for students to carry out practical activities. Using these practical instructions makes student learning more focused, and can make biology learning less boring.

As a result of the research study and literature review, it can be seen that the guided inquiry-based biology practicum guide e-book product can make it easier for students to carry out practicum activities. The application of the guided inquiry learning model is also able to make students active in learning (Yusuf et al., 2023). so, it is hoped that this guided inquiry-based biology practicum guide e-book product can become teaching material that can accompany students in the learning process.

CONCLUSIONS AND RECOMMENDATIONS

The results of the development of a guided inquiry-based practical e-book were validated by media experts 93% (very feasible), material experts 96% (very feasible), and learning methodology experts 95% (very feasible). From the three validators, an average score of 94% can be taken, so that the guided inquiry-based practical guide E-book can be rated as "Very Eligible" for testing. Meanwhile, the results of the readability test for biology teachers in the Media, Material, Learning Methodology and Interactivity aspects received a score of 100% with the criteria "Very Eligible". Meanwhile, for students in class XI MIPA SMA, 20 students were used, namely 10 students in class XI MIPA 5 and 10 students in class.

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