

PRACTICUM GUIDELINES DEVELOPMENT ON HORMONAL IN HUMAN REPRODUCTION MATERIAL OF CLASS XI OF SENIOR HIGH SCHOOL WITH A MODIFIED OPEN INQUIRY APPROACH

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Abstract. The learning process on Hormone in Human Reproduction material of XI class of senior high school has employed Merdeka Curriculum. After the content of the Merdeka Curriculum book was analyzed, it was determined that the practicum activities were limited to hormones in the menstrual cycle and did not meet the requirements of phase F learning achievement. During practicum activities at school, teachers exclusively employ textbooks. The practicum guidelines in textbooks have not been able to comprehensively guide the students to complete the practicum activities, resulting in a lack of comprehension. The objective of this research was to generate a practicum guide that was valid, feasible, convenient, and effective. This research was a development study that employs the Plomp model (preliminary stage, prototype stage, and assessment stage). The validity test was assessed by three lecturers. The feasibility test was administered to three students with varying abilities (High, Moderate, Low), and six students were randomly selected. The practical guide convenience test was administered to one teacher and 45 students. The data was processed using a modified percentage formula from Ridwan (2013). The validity value was 88.68% (very valid), the feasibility test for three students was 96.11% (very feasible), and the feasibility of six students was 89.58% (very feasible). The convenience test administered by the teacher yielded results of 98.5% (very easy) and 84.34% students (very easy). The effectiveness for skill test yielded results of 81.14% (very effective) and the effectiveness for attitude yielded 91% (very effective), which were processed using the modified percentage formula from Sudijono (2006). Thus, the practicum guide developed for hormone material in human reproduction of XI class of senior high school is valid, feasible, convenient, and effective in the use of the learning process.

Keywords: development, easy and effective, feasible, practicum guide that is valid

INTRODUCTION

It is essential to have a learning resource to ensure the success of the learning process, such as teaching materials or materials. Teaching materials are a critical component of the educational process and a significant factor in the achievement of learning objectives. Teaching materials are one of the components that must exist in the learning process and have an important role for teachers and students. Therefore, teachers must be creative in order to compile teaching materials that are innovative, varied, interesting, contextual, and tailored to the students' needs (Prastowo, 2015). One of the teaching materials required is a practicum guide for conducting practicum activities, which are a requirement in the Merdeka curriculum for science learning. Through practicum activities, students can enhance their science process skills and performance skills (Susanti, 2013). Nevertheless, there are still a significant number of students who are deficient in both performance skills and science process skills. Pane et al., (2021) stated that the practicum guide must be developed in accordance

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with the material and learning objectives. A practicum guide can direct students in the execution of the correct procedures for conducting experiments. Consequently, it is imperative that practicums be implemented in schools, as they have the potential to enhance students' thinking skills and comprehension of the material.

Complete learning and laboratory facilities are available at SMA N 1 Koto XI Tarusan, Pesisir Selatan Regency, West Sumatra. These facilities include equipment, materials, chairs, tables, storage containers, electricity, and tap water, all of which are suitable for practicum activities. Nevertheless, biology practicum activities are conducted by teachers in class XI IPA on a very infrequent basis. Additionally, teachers have not conducted practicum activities in a manner that is consistent with the curriculum's requirements and the needs of students. Additionally, teachers do not have a practicum guide that students can utilize during practicum activities. One of the challenges in conducting Biology practicum activities at the school is the use of textbooks as reference materials for learning, and the practicum available in the library does not completely contain the steps of practicum activities that can guide students in carrying out practicum activities. Concurrently, the practicum necessitates a practicum guide (Permatasari et al., 2021). The practicum guide is designed to assist and direct students in conducting their work in a structured manner. Salirawati et al. (2011) emphasized the significant role of practicum guides in the science learning process. Rahmi and Silvina (2019) asserted that the use of practicum guides can facilitate the completion of practicum activities for students and teachers. Aprilia et al. (2020) deemed practicum guides to be one of the most critical practicum facilities.

Not all teachers possess practicum guides that are compatible with the curriculum and student requirements. Students require teacher guidance during the practicum activities, as Ningsi et al. (2021) contend that the current practicum guides are not in alignment with the curriculum. Specifically, practicum activities must be capable of enhancing students' scientific learning abilities. However, the current practicum guides continue to instruct students to complete the practicum by simply adhering to the guide's procedures. Azzahra and Supriatno (2023) also noted that the design of practicum activities in printed books is still flawed and requires improvement in the areas of conceptual, practical, and knowledge construction. They also noted that the practicum activities are not well-suited to the learning objectives, and the work steps used are incorrect. The practicum guide is a necessary facility for practicum activities. However, Masruri (2020) discovered that the primary issue in schools is the absence of infrastructure and facilities to facilitate practicum activities.

It is imperative to create a practicum guide for learning, as it also contributes to the development of students' attitudes and science process skills. This is in line with Waluyo & Parmin (2014) who agreed that a practicum guide is essential for the successful execution of practicum activities. The development of students' scientific attitudes and performance is influenced by practical guidelines. Practicum guides are a critical component of the learning process, as they can serve as a learning resource that supports learning during experiments, fosters student interest in practicum, and helps students comprehend the mechanics of practicum. Additionally, they can help students learn the systematic nature of composing practicum reports. This is in line with Rahmadani (2022) who asserted that practicum guidelines are the most critical components that must be prepared.

Students find one of the science materials in class XI SMA that addresses hormones in human reproduction to be challenging due to its inclusion of numerous intricate organs. It delves into the mechanism of action of hormones, the function of hormones in reproduction, the relationship between organ structures in the reproductive system, and the abnormalities that are observed in the reproductive

system of both men and women. Each sub-material is more likely to result in observations regarding the mechanism of action of hormones, the function of hormones in reproduction, and the relationship between organ structures in the reproductive system. Therefore, it is crucial for students to participate in a practicum to gain a comprehensive understanding of the mechanism of action of hormones, the function of hormones in reproduction, and the relationship between organ structures in the reproductive system.

The results of interviews with students regarding their preferences for biology learning with practicum activities revealed that 88.88% of students enjoyed practicum activities, 89.47% of students had participated in practicum activities at least once, and as many as 78.94% of students used textbooks equipped with practicum guides. However, no special books were used, and as many as 100% of students required teacher guidance when conducting practicums. Therefore, it is crucial to develop a guide for practicum guidelines that is applicable both within and outside the laboratory, based on the data that has been collected.

It is necessary to implement an appropriate approach during the classroom learning process in order to ensure that the practicum is conducted effectively. The Modified Open Inquiry Approach is one of the appropriate approaches, as it is in alignment with the current curriculum, which necessitates students to be more engaged in the learning process. Students continue to receive guidance through this modified open inquiry approach. However, it prioritizes their autonomy in problem-solving, enabling them to accomplish learning objectives through the formulation of queries or problems. According to Damopolii *et al.* (2014), the modified open inquiry approach generates increased student engagement during the practicum. It has the potential to encourage students to work independently in order to solve problems and to think critically and in integrative manner about the issues presented at the outset of practicum activities, which require students to possess science skills in order to conduct experiments.

Nurhadi *et al.* (2021) have also demonstrated that the modified open inquire approach in the animal structure practicum guide has facilitated the development of student skills, including dissection and drawing abilities. It is anticipated that the research offers science teachers solutions to facilitate the effective and efficient implementation of practicum learning.

METHOD

This research was a Research and Development with the Plomp Model consisting of three stages, namely preliminary studies, prototypes, and assessments (Plomp & Nieveen, 2013). The research was reported until the prototype stage, namely until the product feasibility aspect. The research was conducted in class XI of SMA N 1 Koto XI Tarusan, Pesisir Selatan Regency in October 2023-January 2024, with the product development trial subject being class XI IPA second semester.

Preliminary studies began with analyzing the learning needs and problems, curriculum content analysis, and content of biology print books for class XI SMA / MA. To obtain basic information on learning problems, observations of the learning process and interviews with teachers and students were conducted. Analyzing the curriculum was carried out by reviewing the contents of the current curriculum, then comparing the current curriculum with the curriculum at school. Analyzing the content of the book was conducted through analyzing the content of the regulatory process material in plants in the book used by the teacher in learning, with aspects of analysis; (a) suitability of learning outcomes, elements, learning objectives (b) breadth of material based on the suitability of the material with all learning outcomes (c) depth of material in the book seen from pictures, tables, and graphs, and (d)

factual, conceptual, and procedural material and current material. The book analyzed was written by Solihat, (2022) Ministry of Education, Culture, Research and Technology. Biology SMA/MA Class XI.

Additionally, the prototyping stage was implemented, which was an iterative design phase that was designed to enhance and perfect the product. The practicum guide for reproduction material in human was designed by integrating the components of the guide with the phases of modified free inquiry. Subsequently, a validation test was conducted with a validator to evaluate the validity of the content, linguistic, didactic, and graphical components of the practicum guide by utilizing modified open inquiry material on the reproductive process in human. Additionally, the revision 1 prototype was used to continue the validated teaching materials. This prototype was subjected to individual feasibility testing on three students with varying abilities, including high, medium, and low. The feasibility test was conducted on the revised prototype 2 with a small group of six randomly selected students. The chart in Figure 1 illustrates the Plomp model's stages.

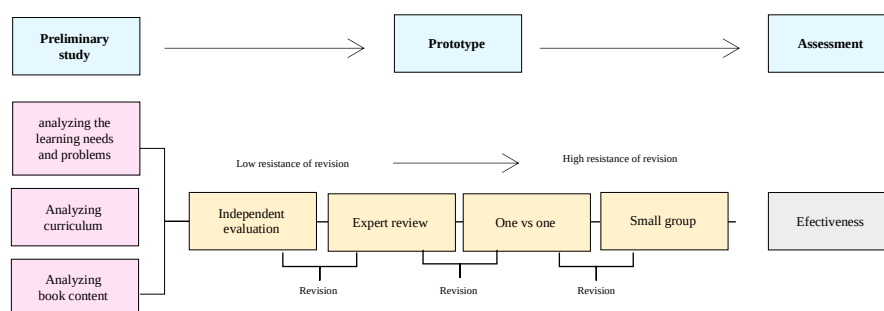


Figure 1. Diagram of Development Procedures of Plomp Model (Plomp & Nieveen, 2013)

Validity and feasibility assessments were conducted using validity questionnaires and feasibility questionnaires. The questionnaire was structured with statements using a Likert scale. The data in this study were processed with a percentage formula modified from Riduwan, (2013) and included in the validity/feasibility criteria according to Table 1. The results of validity and feasibility data processing were then analyzed descriptively.

$$SM = JN \times JI \times ST$$

Note:

SM = Maximum Score

JN = Total of Validators/users

JI = Total of Indicators

ST = Highest Score

The formula to determine the value of validity and feasibility obtained is as follows.

$$Nx = \frac{\text{Total scores obtained}}{\text{Maximum score}} \times 100\%$$

Note :

X = Validity and Feasibility

Table 1. Criteria of validity and feasibility of practicum guidelines developed

Score %	Criteria	
	Validity	Feasibility
81- 100	Very Valid	Very Feasible
61-80	Valid	Feasible
41-60	Fairly Valid	Fairly Feasible

Score %	Criteria	
	Validity	Feasibility
21-40	Less Valid	Less Feasible
0-21	Invalid	Not Feasible

Modified from Riduwan (2013)

RESULTS AND DISCUSSION

Assessment results were acquired from three experts at this stage, who served as validators of content, language, didactic, and graphic aspects. The results are shown in Table 2.

Table 2. Value of validity of practicum guidelines on hormonal in human reproduction material

No	Aspect	Validity			JSP	JSM	NV (%)	Criteria
		V1	V2	V3				
1	Content	59	-	-	59	65	90,76	Very valid
2	Language	34	30	35	99	105	94,28	Very valid
3	Didactic	-	60	-	60	70	85,71	Very valid
4	Graphics	-	-	63	63	74	84	Very valid
		Mean					88,86	Very Valid

Note: V1=content validity, V2= didactic validity, V3= learning media validity, JSP= Total Score Obtained, JSM = Total of Maximum Score, NV = Validity Value

The content aspect yields a validity test score of 90.76%. The evaluation demonstrates that the description of hormone material in human reproduction is very valid and aligns with the learning objectives of the Merdeka curriculum, thereby satisfying the requirements of phase F's learning objectives and outcomes. Ritonga et al. (2022) posited that teaching materials contain information, are organized in a detailed manner, and demonstrate the overall competence of the learning outcomes. This can pique students' interest in learning and assist them in the implementation of the learning process.

The practicum guide's linguistic aspects underwent a validity test that yielded a score of 94.28%. This evaluation demonstrates that this practicum guide complies with language regulations that are both effective and efficient. This demonstrates that the comprehension of the material by students is significantly influenced by the use of simple language in teaching materials. Grammar (words and sentences), vocabulary (including terms), spelling, and meaning are the language rules that must be taken into account, as stated by Sarah (2022). Furthermore, the teaching materials must contain language that is appropriate for the students' language development. If the language employed is appropriate, students will be more likely to comprehend the material.

A validity test of the didactic aspects of the practicum guide yielded a score of 85.71%. These results indicate that the presentation of material in the developed practicum guide has referred to phase F learning outcomes, which include elements of biological understanding, elements of science process skills, and learning objectives arranged systematically according to the components of the practicum guide. The practicum guide comprises the following components, as per Setiawan et al. (2021): the cover, preface, practicum title, practicum objectives, theoretical basis, tools and materials, and practicum procedures. The graphical aspects of the practicum guide were found to be 84% valid in the validity test, with very valid criteria. Therefore, the practicum guide that has been created is visually appealing in terms of its size, font, layout, content, image display, color, and cover. This is consistent with Magdalena's (2020) opinion that the preparation of instructional materials must prioritize the consistency of fonts, spaces, and layouts. Additionally, Handayani et al.

(2019) have determined that the teaching materials are considered valid due to their compliance with the graphic aspects, which include the selection of fonts, the use of font size, the accuracy of image selection and layout, theme display, and color selection. Figure 2 illustrates the practicum guide prototype.

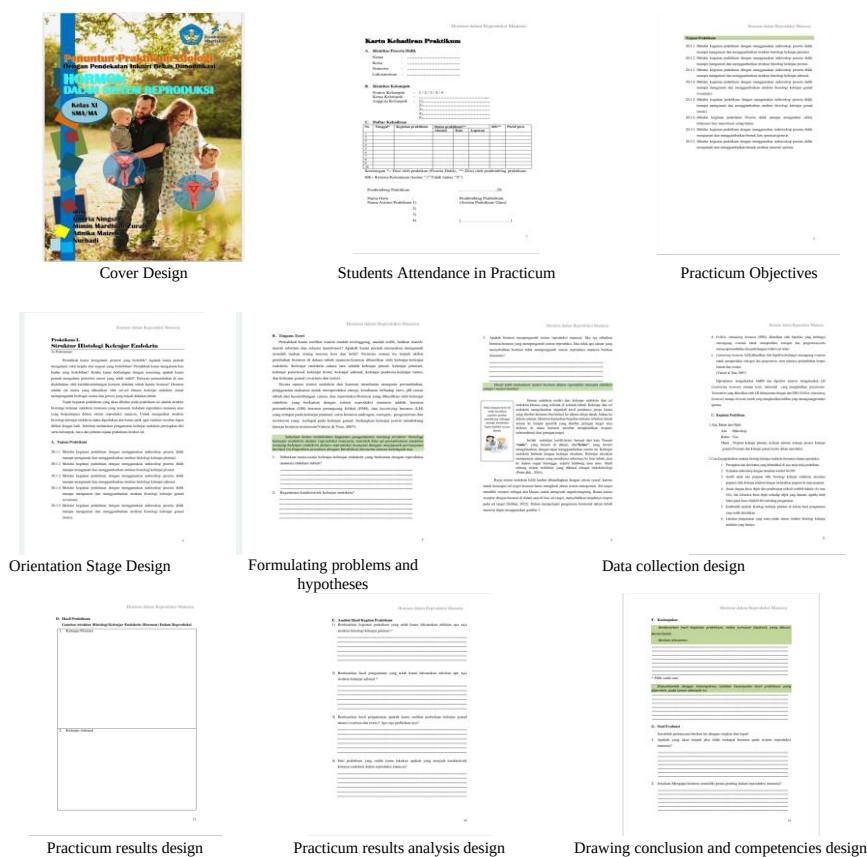


Figure 2. Prototype of the practicum guideline for hormones in human reproduction with the modified open inquiry approach

Following the validity value and revision, the practicum guide's feasibility test was conducted in terms of readability. The readability aspect comprised six indicators and ten questions. Table 3 and Table 4 contain the results of the feasibility test of practicum guides conducted by small groups and individuals.

Table 3. Results of feasibility test of practicum guidelines by individual

Aspect	Feasibility			JSP	JSM	NL (%)	Criteria
	P1	P2	P3				
Images appearances and colors	20	19	17	56	60	93,33	Very Feasible
Font type and size	10	9	10	29	30	96,67	Very Feasible
Layout	5	5	5	15	15	100	Feasible
Material presentation	4	5	4	13	15	86,67	Feasible
Language	5	5	5	15	15	100	Very Feasible
Appearance	5	5	5	15	15	100	Very Feasible
Mean						96,11	Very Feasible

Note: P1= students 1, P2= students 2, P3= students 3, JS = Total Score Obtained, JSM = Maximum Score, NL = Feasibility Value

Table 4. Results of feasibility test of practicum guidelines by small group

Aspect	Feasibility						JSP	JSM	NL (%)	Criteria
	P1	P2	P3	P4	P5	P6				
Images appearances and colors	17	18	20	19	18	17	109	120	90,83	Very Feasible
Font type and size	9	9	10	8	9	9	54	60	90	Very Feasible
Layout	5	5	4	5	4	4	27	30	90	Feasible
Material presentation	5	4	5	4	4	4	26	30	86,67	Very Feasible
Language	5	5	4	4	5	4	27	30	90	Very Feasible
Appearance	5	5	4	4	5	4	27	30	90	Very Feasible
Mean									89,58	Very Feasible

Note: P1= student 1, P2= student 2, P3= student 3, P4= student 4, P5= student 5, P6= student 6, JS = Total Score Obtained, JSM = Maximum Score, NL = Feasibility Value

Table 3 and 4 illustrate the feasibility test results, which yielded criteria that were very feasible, with an assessment range of 80-100%. These findings suggest that the practicum guide that has been developed is very feasible. Based on these findings, it is evident that the practicum guide for hormone material in human reproduction is suitable for educational purposes, as it meets very feasible standards, particularly in terms of its feasibility. According to Gustina *et al.* (2021), the readability of well-written text, as well as the attractiveness of the book cover's colors and images, can boost students' interest in reading.

The feasibility questionnaire analysis results indicate that the development of a practicum guide on hormone material in human reproduction, which was tested at the revision prototype stage 2, namely one-to-one, achieved an average score of 96.11% with very feasible criteria. Then, the revised prototype stage 3, which was a small group, was implemented, and an average score of 89.58% was achieved with criteria that were very feasible. The practicum guide's feasibility test encompassed a variety of factors, including the selection of image and image color, the type and size of the font used, the layout, the presentation of the material, the use of language, and the overall appearance. This is in line with Saputra *et al.* (2022) who stated that the overall practicum guide will be visually appealing if the design is consistent and organized in its display of the image layout.

CONCLUSION

The practicum guide with a modified open inquiry approach on Hormones in Human Reproduction material can assist and facilitate the process of practicum activities in terms of validity, feasibility, and convenience of use, as indicated by the results of this study. The practicum guide is very valid and very feasible for implementation during practicum activities.

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