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Development of a Biology-Based Practical Guide *Modified Free Inquiry* to Grow *Teamwork Skill* Student

Muhammad Fauzi Romadhan[1], Agung Wijaya[2], Yulia Tri Samiha[3]

[1,2,3]Universitas Isalm Negeri Raden Fatah Palembang

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Abstract

The availability of a practicum guide is essential in fostering students' teamwork skills. Based on media needs analysis, it was concluded that the development of a practicum guide based on modified free inquiry is aimed at fostering students' teamwork skills. The objective of this research is to determine the validity, practicality, and effectiveness of the biology practicum guide based on modified free inquiry to enhance students' teamwork skills. This research is categorized as research and development (R&D) using the ADDIE development design (Analyze, Design, Development, Implementation, and Evaluation). The research population consists of biology education students at the State Islamic University of Raden Fatah Palembang. The sampling technique used in this study is purposive sampling. Data analysis for validity and practicality was conducted using Likert scale questionnaires, and effectiveness was measured based on observer questionnaires regarding students' teamwork skills. The validation results showed a media expert percentage of 88.1% with the criterion of very valid, a material expert percentage of 91% with the criterion of very valid, and a language expert percentage of 88.3% with the criterion of very valid. The field practitioners' assessment yielded an average response of 100% in all aspects, categorized as positive, leading to the conclusion that the guide is practical. The effectiveness of the practicum guide was derived from observer assessments, with a result of 83.3%, indicating a very frequent occurrence in fostering students' teamwork skills.

Keywords: *Practicum Guide, Modified Free Inquiry, Teamwork Skills*.

(*) Corresponding Author: fauzi05122002@gmail.com
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INTRODUCTION

The biology education study program is a study program that carries out teaching activities with a scientific vision of developing biology learning through generic skills based on biological scientific skills based on Islamic values and reinforced by the objectives of the biology education study program, namely; 1). Producing educators who have generic skills and biological scientific skills based on Islamic values, 2). Producing researchers who are able to solve various biology education problems that develop in society, and 3). Producing entrepreneurs in the field of biology education who are able to work together with the community in developing and producing goods or services. Based on the vision and mission of the biology education study program, students are expected to have excellence in skills.

Skills emphasized include observation, prediction, and scientific attitude (Panggabean et al., 2021; Debora et al., 2022; Sangkaen et al., 2023). Scientific attitude is an expression of systematic work or practical skills in biology learning, and one way to develop this scientific attitude is through practical

activities (Maryanti et al., 2021). Practicum is a laboratory activity that supports biology learning. The aim of practicum activities is to train and develop basic skills in using tools and materials, taking measurements, and observing or observing relevant phenomena (Syamsu, 2017; Mulyani, 2022; Sembiring et al., 2023; Sinaga et al., 2023). Through practicum activities, it is hoped that it can form students who have education, noble character, scientific insight and growth *soft skills* student.

Soft skill is a self-quality that includes internal and external aspects. This skill is invisible, meaning it cannot be seen directly (Daniati et al., 2022). *Soft skill* refers to indicators such as creativity, sensitivity, and intuition, which focus more on the personal qualities that underlie a person's behavior. Examples *soft skill* includes honesty, responsibility, justice, adaptability, communication skills, tolerance, respect for others, decision-making ability, problem-solving ability and the ability to work together (Suleman et al., 2023). Skills in practical activities really require collaboration skills. Teamwork skills or *teamwork skill* is the ability of individuals to work together to achieve common goals (Hutahaean, 2020; Rahmi et al., 2022). Everyone needs these skills to achieve their goals. Team work is more effective in practicum activities than working alone when the activities carried out require various skills, views and experiences working together (Vebriana & Rukmini, 2021).

Through activities *teamwork skill*, it is hoped that it can form students who have education, noble character and scientific insight. The aim is so that they can become part of a nation that is more blessed, dignified and responsible. The importance of moral values in character formation is recognized, because knowledge without morals is like blind knowledge, and vice versa. Humans, as the feet and hands that carry the direction of this nation, have a crucial role in shaping the path to goodness or vice versa. As stated in the letter QS. Al-Maʾidah verse 2 which means: "*And help each other in (doing) virtue and piety and do not help each other in committing sins and transgressions" [QS. Al-Ma'idah: 2]*.

This verse explains that Allah SWT orders His faithful servants to help each other in all forms of goodness (al-Birr) and orders them to help each other in avoiding all forms of evil, sin and falsehood. This is relevant to cooperation in practicum activities, where it is hoped that these activities can increase students' sense of togetherness and skills, in order to create superior and moral humans through positive activities. Based on the analysis, in improving superior skills, it is necessary to develop the practical learning process with the aim of increasing student interest and motivation. In the practicum context, the use of practicum guides is very important (Qanita, 2021; Agustina et al., 2021). The practicum guide acts as a learning medium that provides procedures that need to be followed during practicum activities, from preparation to reporting practicum results (Sastria et al., 2020). With a practicum guide, it is hoped that practicum activities can run smoothly, be directed, and help increase students' understanding and involvement in the learning process (Fitriani, 2019).

Improving the practicum guide by implementing a problem-based learning model has a positive impact on student success during the practicum. Factors such as responding to problems, developing problem-solving abilities, increasing learning motivation, contextual learning, and collaboration in discussions can

strengthen their learning experience. The integration of the problem-based learning model into the practicum guide not only provides practical meaning to learning, but also enriches student involvement in the problem solving process related to the practicum context (Samsu et al., 2020; Nisah et al., 2021). Practical guide with base *modified free inquiry* is free, guided inquiry with learning that encourages student activity through the method of exploring problems on their own, then discussing them, looking for hypotheses, and finally finding concepts (Rahma et al., 2020; Pencemaran et al., 2021; Suryaningsih & Mu'minah, 2022). Model advantages *modifies free inquiry* This means that students become more interactive in group learning activities on campus, can hone their discussion and discovery skills, so that they understand concepts better because they discovered them themselves. Apart from that, this model fosters an explorative attitude and supports students' problem solving abilities (Rumiati et al., 2022)

Based on the description of the problem, it is necessary to develop a biology-based practical guide *modified free inquiry* to grow *teamwork skill* student. The limitation of this research is the practical guide which was developed within the scope of the plant ecology course on plant population material. It is hoped that this practicum guide can develop collaboration or *teamwork skill* students in undergoing practicum and training them in carrying out scientific skill steps.\

Based on the description above, the aim of the research is to find out the validity, practicality and effectiveness of the biology-based practicum guide *modified free inquiry* to grow *teamwork skill* student.

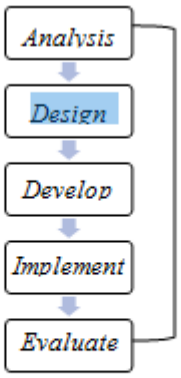
2. Benefits of Research

Biology-based practical guide *modified free inkuiry* to build *teamwork skill* Students can be used as a source of information that can be used to learn and improve their skills to become superior students. This guide provides instructions on practical steps in carrying out practicum activities, enriches students' understanding of the ethics of working together, and becomes a useful reference

METHOD

The research was carried out from the design stage from April to May 2024. Located at the Raden Fatah State Islamic University, Palembang, at the Faculty of Tarbiyah and Teacher Training, located on Jalan Prof. K. H. Zainal Abidin Fikri Km. 3, RW. 5.5 Ulu, Seberang Ulu I District, Palembang City, South Sumatra, Indonesia.

This research uses the Research and Development method (*Research and Development*) with a research design adapting the ADDIE development model (*Analyze, Dsign, Devlovment, Implemantation and Evaluation*) (Welty, 2007).



Gambar 1. Model Pengembangan ADDIE

Sumber: (Welty, 2007)

The population of this study were biology education students at Raden Fatah State Islamic University, Palembang. The sampling technique in this research is purposive sampling (*purposive sampling*), that is, when the trial required 18 biology education students as research subjects, it was carried out heterogeneously with the provisions of 6 students with the highest scores, 6 students with medium scores and 6 students with low scores.

Table 1. Research Procedures for Practicum Guide Development in ADDIE

No	Prosedur	Pernyataan
1	Analisis	Identifikasi kesenjangan kinerja, menentukan tujuan intruksional, mengkonfirmasi *intented audiensce*, identifikasi *required resources*, menentukan potensial *delivery system* dan membuat *project management plant* (Ghani & Daud, 2018; Widyastuti & Susiana, 2019; Dwitiyanti et al., 2020; Misesani et al., 2020).
2	Desain	Melakukan pembuatan bagian-bagian panduan praktikum meliputi tampilan media dengan berbantuan aplikasi canva (Budoya et al., 2019; Sembiring et al., 2024; Faghihi et al., 2024; Pratita, 2024). Sehingga pada penelitian ini, kriteria komponen panduan praktikum yang akan dikembangkan mengikuti sintak *modified free inquiry*.
3	*Develop* (Pengembangan)	Tahap penilaian produk panduan praktikum, diantaranya uji validitas (penilaian expert media, materi, dan bahasa) (Muruganantham, 2015; Siregar & Restuati, 2022; Pratita, 2024; Maxnun et al., 2024).
4	*Implement* (Penerapan)	Mahasiswa tersebut mengikuti kegiatan belajar secara praktikum memakai panduan praktikum dan pada tahap ini dilakukan uji praktikalitas panduan praktikum didapat dari hasil respon 18 mahasiswa dipilih sesuai dengan kriteria dengan pengisian angket respon (Stapa & Mohammad, 2019).
5	Evaluasi	Evaluasi dilakukan dengan uji evektifitas dilihat dari hasil observer terhadap *teamwork skill* mahasiswa (Durak & Ataizi, 2016).

Nowadays, information sources include observations, in-depth interviews and response questionnaires. Data processing uses:

1. Data Analysis of Practical Guide Validity

This analysis was obtained from the validation results of experts (validators) and analyzed using a Likert Scale (Arikunto.2006)

$$V = \frac{Jumlahskor}{Skor\ maksimal}\ x\ 100\%$$

Tabel 3. Tingkat Validasi Panduan Praktikum

Hasil Validitas (%)	Kriteria
81 – 100 %	Sangat valid
61 – 80 %	Valid
41 – 60 %	Cukup valid
21 – 40 %	Tidak valid
< 21 %	Sangat tidak valid

Source: (Arikunto, 2006)

2. Analysis of practicum guide practicality data

Based on the practicality questionnaire, it is tabulated in the practicality data analysis table for students and educators (Riduwan, 2012).

a. Responses written by students to positive answers will be given a score of 5 for a very appropriate response, a score of 4 for a response that is appropriate, and a score of 3 for a response that is quite appropriate. Meanwhile, for negative statements, the value given is 2 for an answer that is not appropriate and a value of 1 for a response that is not very appropriate.

b. The total answers from students on each indicator are calculated.

c. The percentage (%) of responses from students to each statement was calculated.

d. Responses from students were classified as positive or negative by comparing the average results with the positive criteria values listed in the table.

Tabel 4. Hasil Persentase Dengan Kriteria Positif

Nilai	Kriteria
3,5 < M < 4,0	Sangat positif
2,5 ≤ M < 3,5	Positif
1,5 ≤ M < 2,5	Kurang positif
M < 1,5	Tidak positif

Sumber: (Riduwan, 2012)

e. Menjumlahkan persenan (%) jawaban mahasiswa memakai rumus,

$$RS = \frac{n}{f}\ x\ 100\%$$

The designed activity guide is considered practical if at least 80% of all respondents give a very positive or positive response to it, so that the final average of responses from both groups is at least in the category

3. Data analysis of the effectiveness of the practicum guide

The effectiveness of the Biology practicum guide that was designed was analyzed through field observation data when the practicum activities were carried out. The effectiveness of the practicum guide is measured by seeing whether students carry out practicum activities according to the ticks on the observation sheet and then describe them.

Table 5. Questionnaire grid *teamwork skill* student

No	Indikator	Huruf Butir Item
1	Ketahanan pribadi (*consicentiousness*)	a)
2	Ekstraversi *(extraversion*)	b)
3	Keramahan (*agreableness*)	c)
4	Emosi stabil (*emotion stability*)	d)

Sumber: (Istikomah et al., 2010)

Then the results of the observer questionnaire are tabulated and calculated using the following formula:

After being analyzed using this formula, it is then described according to the following criteria table:

Tabel 6. Persentase kategori teamwork mahasiswa

Persentase Kemunculan	Kategori
100%	Selalu muncul
80% – 99%	Sangat sering muncul
51% – 79%	Sering muncul
50%	Cukup sering muncul
31% – 49%	Jarang muncul
1% – 30%	Sangat jarang muncul
0%	Tidak pernah muncul

RESULTS AND DISCUSSION

Results

Initial problem analysis activities show the importance of providing learning resources during the process of teaching and learning activities, especially in practicum activities. At the design stage, learning resources in the form of practical guides were designed using the Canva application. Then, at the development stage, validation of the practicum guide was carried out once by three validators consisting of media, material and language experts. The implementation stage involved providing practical guidance in the form of sheets to students and filling in response sheets by 18 students and the evaluation stage saw an assessment of effectiveness based on the results of observations during the practicum activities which were assessed by observers. Details of the data on

the validity, practicality and effectiveness of the practicum guide are in the following table:

Table 7. Media Validity Analysis by Validator

No	Indikator Penilaian	Skor
1	Cover (sampul) panduan praktikum	32
2	Prelimenaris (halaman pendahuluan) panduan praktikum	11
3	Text matter (bagian utama) panduanpraktikum	45
4	Postlimenaries (bagian penutup) panduanpraktikum	9
Jumlah skor diperoleh		97
Jumlah skor maksimal		110
Persentase validasi ahli media (V)		88,1 %
Kriteria		Sangat Valid

The results of the media expert's assessment of the practical guide for each indicator obtained an overall result of 88.1%, meaning it is very valid.

No	Indikator Penilaian	Skor
1	Materi	37
2	Konstruksi	38
3	Bahasa	16
Jumlah skor diperoleh		91
Jumlah skor maksimal		100
Persentase validasi ahli media (V)		91%
Kriteria		Sangat Valid

The validity of the material against the practicum guide for each indicator obtained an overall result of 99% which is in very valid criteria

Tabel 9. Analisis Kevalidan Bahasa oleh Validator

No	Indikator Penilaian	Skor
1	Kejelasan petunjuk penggunaan panduan praktikum yang digunakan	4
2	Panduan praktikum yang dikembangkan menggunakan bahasa yang komunikatif (bahasa mudah dipahami, baik, benar dan efektif)	5
3	Bahasa yang digunakan dalam panduan praktikum sesuai dengan tingkat perkembangan peserta didik	4
4	Panduan praktikum yang dikembangkan menggunkana Bhhasa Indoneisa yang baik dan benar sesuai denyan EYD edisi V	5
5	Panduan praktikum yang dikembangkan menggunakan bahasa inggir yang baik dan benar	5
6	Panduan praktikum yang dikembangkan menggunakan bahasa ilmiah yang baik dan benar	4
7	Ejaan yang digunakan dalam produk sudah sesuai dengan EYD	4
8	Pengguna an kalimat yang sederhana dan langsung kesasaran (lugas)	5
9	Struktur kalimat yang digunakan dalam panduan praktikum disusun mengikuti aturan EYD	4
10	Kata atau istilah yang digunakan dalam panduan praktikum sudah tepat dan konsisten	5
11	Pengguna an huruf kapital mengikuti EYD	4
12	Pengguna an huruf kecil mengikuti EYD	4
Jumlah skor diperoleh		53
Jumlah skor maksimal		60
Persentase validasi ahli media (V)		88,3 %
Kriteria		Sangat Valid

Linguist validation of the practicum guide for each indicator obtained an overall result of 96.6%, which is very valid.

Tabel 10. Analisis Praktikalitas Respon Mahasiswa

Kriteria Responden	Frekuensi	Persentase
Sangat Positif	18	100%
Positif	0	0
Cukup Positif	0	0
Tidak Positif	0	0
Jumlah	18	100%

The practicality of biology education study program students' responses to the practicum guide is in the very positive category with a percentage of 100%.

Tabel 11. Analisis Hasil Observasi terhadap *Teamwork Skill* Mahasiswa

Responden	Kemunculan Teamwork Skill
R1	-
R2	✓
R3	✓
R4	-
R5	✓
R6	✓
S1	✓
S2	✓
S3	-
S4	✓
S5	✓
S6	✓
T1	✓
T2	✓
T3	✓
T4	✓
T5	✓
T6	✓
Jumlah mahasiswa yang muncul *teamwork skill*	15
Persentase	83,3%
Kriteria	Sangat Sering Muncul

Analisis efektivitas berdasarkan hasil observasi mahasiswa terhadap *teamwork skill* berada pada kategori sangat sering muncul.

DISCUSSION

Validity of practicum-based guides *modified free inquiry* assessed through validation by media, material and language experts. Media validity aims to evaluate aspects such as appearance, arrangement of text and images, type and size of letters, color harmony, and choice of background (Mufidah & Habibi, 2022). The media validation process was carried out in one stage, with a media expert validation percentage of 88.1%. These results are then translated qualitatively, showing that the percentage range between 81-100% is included in the "very valid" category. Based on this category, it ensures that the practicum guide has an attractive and appropriate design quality. This includes the choice of color, layout, type and font size, as well as optimal arrangement of images and text. Good design can increase attractiveness and aesthetics, so that students are more interested and motivated to learn (Maisarah & Yogica, 2022).

This practicum guide measurement is carried out to ensure that the practicum guide complies with applicable educational standards. This includes alignment with the curriculum, learning objectives, and achievement. Valid media helps educators ensure that they meet expected educational requirements. Overall, validation by media experts ensures that the practicum guide is not only visually attractive but also functional, interactive, and effective in supporting the learning process (Siska Ismawati, 2022). This contributes significantly to educational success and satisfaction of all parties involved so as to produce superior graduates

Material validation aims to examine content aspects such as material content, construction and language (Dewimarni et al., 2022). Based on material expert assessment, the validation percentage reached 91%. These results are interpreted qualitatively, with accuracy as an indicator of validation success to support decision making. This percentage is in the range 81-

100%, which also falls into the "Very valid" category. Based on these categories, it ensures that the content presented in learning media is accurate, up-to-date, and in accordance with academic standards. This ensures that students receive correct and reliable information, which in turn improves their understanding of the material being taught.

Validation by material experts ensures that the practicum guide is in accordance with the applicable curriculum. This means that all topics and concepts that students must study are covered well in this media, thereby supporting the achievement of the set learning objectives. Overall, validation of the practicum guide by material experts ensures that the media is an effective, accurate, and appropriate tool to support student learning (Mulder et al., 2023). This contributes to improving the quality of education, ensuring the achievement of learning goals, and maximizing students' academic potential.

Language validation evaluates clarity, communicativeness, dialogic, interactive, as well as conformity with students and language norms (Atikah et al., 2018). Based on the assessment of language experts, the validity level reached 96.6%, which was also categorized qualitatively as "very valid". These categories ensure that the information conveyed through the practicum guide is accurate and clear. This is important to maintain the trust and credibility of the practicum guide in the eyes of the audience. The validation process helps reduce language errors, both in writing and oral delivery, thereby improving the quality of content

continuously (Widya et al., 2022; Sari et al., 2023). Overall, language validation with highly valid criteria provides many benefits for the media, from increasing the quality and credibility of content to communication effectiveness and media professional development. It also has a positive impact on students by providing accurate, clear and reliable information.

Product trial assessment by 18 students showed 100% "Very positive" response. These results were interpreted qualitatively, with practicum guidelines considered appropriate if at least 80% of respondents gave "positive" and "very positive" answers. Practical lab guides provide clear, easy-to-follow instructions, reducing confusion and ensuring that all students can understand the steps to follow (Zakiamani et al., 2020). With clear and practical instructions, students are more likely to feel a sense of accomplishment and success in completing the practicum, increasing their motivation to study further (Nurhamdiah et al., 2020). Overall, the practicality of the practicum guide is very important because it helps in the efficient, safe, and effective implementation of practicum activities. Good guidance not only makes things easier for students and instructors, but also improves the quality of learning and the results achieved.

The results of the effectiveness of the practicum guide on *teamwork skill* students in the very frequent category appear. This means that when carrying out practical activities, students play an active role and foster good cooperation with group members. By working in a team, tasks can be divided based on the skills and strengths of each member, so that work can be completed faster and more efficiently (Rahmawati & Supriyanto, 2020; Junita et al., 2022). Collaboration within the team ensures that the needs and expectations of practicum activities are better met through good coordination and holistic service delivery (Fitrah & Karmila, 2021). Overall, team working skills not only help in achieving common goals, but also improve individual abilities in various aspects. Developing these skills can make a person more competitive and superior in various areas of life

CONCLUSION

Based on the results of research conducted at the Biology Education Study Program, Raden Fatah State Islamic University, Palembang, the following conclusions can be drawn: **1)**Practical based guide *modified free inquiry* that was developed, media validity was 88.1% with very valid criteria, material validity was 91% with very valid criteria, language validity was 88.3% with very valid criteria. **2)**Practical guide *modified free inquiry* that was developed was concluded to meet the practical category because with a percentage of 100% of people giving very positive and positive responses, thus meeting the practicality criteria. **3)**Practical based guide *modified free inquiry* developed in this research improves students' collaboration skills. This is proven by the criteria for student collaboration skills which are very often seen, so that they are able to form a strong cooperative character in students.

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