The practicality of practicum guidance based guided inquiry approach on animals physiology course

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Abstract. Development of practical guide is based on the lack of activity, independence, and involvement of students in the implementation of the lab so difficult to construct the understanding of physiological concepts and processes according to the demands of learning achievement. This study aims to analyze the practicality of Practicum Guidance Based Guided Inquiry Approach on Animal Physiology Course. This study uses 4-D model, which consists of four stages, namely define, design, develop and disseminate. The practical analysis is one of the developing stages. Practicality analysis is based on results or data collected through a questionnaire of 62 students and 2 lecturers of Animal Physiology. The practical analysis includes aspects of ease of use, time of execution, interpretation, and equivalence. The results showed that the average of practicality percentage of lecturers was 79.47% and students were 77.00% and both were on practice criteria. The conclusion of the research is Guided Practicum Guidance Based Guided Inquiry on Animal Physiology Course practically used in the implementation of Physiology of Animal Practice in Biology Education Studies Program STKIP PGRI West Sumatra.

1. Introduction
Animal Physiology Course is a compulsory subject in Biology Education program STKIP PGRI West Sumatera. The learning outcome of the subjects require the students to be active and creative to find their knowledge independently in understanding the concepts, theories, principles, physiological mechanisms and regulations and to unravel, assemble, compare and modify physiological processes in relation to the fluctuation of environmental factors through practicum activities. To realize the achievement of learning, especially in the implementation of the lab, it is needed practical guidance used by students and lecturers. There are four main reasons for the importance of the implementation of practicum activities. 1) Practicum generates student learning motivation; 2) the lab develops the basic skills of carrying out experiments; 3) the lab becomes a vehicle for learning a scientific learning approach; 4) the practicum supports the understanding of the subject matter [1].

The practice of the course in Physiology aims to provide students with a comprehensive basic knowledge of differences and similarities in animal physiological processes at selected phylogeny levels by emphasizing the adaptive significance of animal life processes as a consequence of changes in environmental factors [2]. For example, students should develop questions and hypotheses to examine the relationship between activity, temperature change and respiration rate in live animals and
to answer the question the student group should be able to make observations using a modified manometer or respirometer. Based on this, the practicum guide was developed to give students the opportunity to be directly involved in experimental laboratory-based activities, using team strategies to answer questions about the physiological processes and mechanisms as well as the factors that influence them. Based on the results of previous research, has been obtained practicum guidance of animals’ physiology is valid and appropriate to be used as guidance in the implementation of the activities of students of Biology Education Studies Program STKIP PGRI Sumatera Barat [3]. To see the practicality of its use both by students and lecturers, it has been done research on practical practice guide analysis.

The practical guides were developed based on the results of student needs analysis [3] and curriculum analysis [4], guided inquiry guide based on guided inquiry approaches in the subject of Animal Physiology. Guided inquiry-based guidance development also refers to some previous research results, such as [2] research that students of the Department of Biology, Loyola College in Maryland who were taught by inquiry approach were more able to implement their knowledge and physiology and biology skills than with conventional learning, [5] the learning with a structured inquiry approach resulted in higher learning achievement and motivation from learning with traditional approaches and development, guided inquiry-based manuals were effective in optimizing the ability of hand on Physics students of Universitas Muhammadiyah Purworejo [6,7] studied the effects of guided versus structured investigations on high school students in Thailand, resulting in greater improvement in students with guided inquiry learning both in science content knowledge and science process skills. Student Worksheet with guided inquiry approach in environmental management material at SMPN 23 Purwokerto students, effective in realizing the students' learning mastery very well [8], Application of inquiry approach in the implementation of animal physiology practice can improve LO achievement of students' material understanding from 57% to 92% [9], Student Worksheet Ruminantia laboratory practice based on guided inquiry, effectively improving thinking skill critical and realize the mastery of high school students of Islam Ta'alumul Huda Bumiayu [10] and LKS based inquiry guided on the material structure and function of plant tissue in the SMP effectively activate students, realize the completeness of classical learning and increase the affective value of students SMP N 11 Semarang [11]. Guidance Instructional Guidance Initiative for Second Grade Students of Class VII Even Semester is valid, practical and effective in SMPN 25 Padang [12].

Guided inquiry learning aims to make students better understand basic concepts and ideas, assist in using memory and transfer to new learning situations, encourage students to be active, intuitive thinking, hard work and to formulate hypotheses independently and to give satisfaction which is intrinsic. [13] states that through the inquiry learning model, students are actively involved in observation, measurement, and data collection to draw conclusions. Acceptance-based learning assumes students learn to solve real problems by asking questions, analyzing problems, conducting investigations, collecting and analyzing data, making interpretations, creating explanations and drawing conclusions. The delivery process answers many thought and learning skills such as critical thinking, creative thinking, self-study skills, metacognitive skills and communication skills [14].

Guided inquiry learning has characteristics, such as 1) the ability of learners from specific observations to inference or generalization, 2) the goal is to strengthen the process of testing events or objects and then to the generalization in accordance with the results of observation, 3) the teacher controls the learning process, the data, the material or the object and acts as a class leader, 4) each student reacts and seeks to build a meaningful pattern based on his or her own observations and others in class, 5) class serves as a learning laboratory and 6 teachers motivate learners to communicate the generally they have generated to their classmates so as to benefit each student [15]. The guided inquiry steps are as follows: a) identification and mapping of the scope of the problem, b) planning and predicting outcomes, c) investigating data collection, d) interpreting data and developing conclusions, and e) reflecting [16]. Prior to seeing the effectiveness of the use of practical guidance in the lecture process, it is necessary to test the practicality of the use of the practicum guide developed, hence based on it has been done the practicality analysis to the guides of Physiology of Animal Laboratory
developed by two lecturers of Animal Physiology and the students of animal’s physiology of practicum. This practicality analysis aims to see that a valid animal physiology practitioner guide can be used easily by students and lecturers.

2. Method
This research uses Four-D development model developed by [17]. The 4-D model consists of 4 development stages, namely Define, Design, Develop and Disseminate or adapted into 4-P i.e., defining, designing, developing, and disseminating [18]. This research has been done until the stage of development and activities undertaken at this stage is the analysis of practicality of students and lecturers. Respondents from the student group consisted of 62 students of the Physiology practitioner of odd semester 2017/2018 on Biology Education Study Program STKIP PGRI Sumatera Barat and lecturer respondents consisted of two lecturers, namely the lecturer of Animal Physiology subject. Practicality analysis includes aspects of ease of use, time spent, interpreting and its equivalence with other teaching materials.

This practicality analysis is processed by using modified formulas [18], namely:

\[
\text{Practicality} = \left( \frac{\text{Mean Score}}{\text{Maximum Score}} \right) \times 100\% \quad (1)
\]

Evaluation of practice uses criteria from modified Riduwan results [19]:

- 86 – 100% = very practical
- 76 – 85% = practical
- 60 – 75% = quite practical
- 55 – 59% = less practical
- 0 – 54% = not practical

3. Result and discussion
Based on the results of the response of students and lecturers obtained through Lebaran questionnaire, the practicum value of practice based on guided inquiry approaches in the subject of Animal Physiology, as presented in Table 1 and Table 2.

| Table 1. Practical guidance practicum based guided inquiry approach on animals physiology course by student. |
|---|---|---|---|---|
| Num | Aspect of Practicality | Indicator | Percent per indicator (%) | Mean per aspect | Practicality (%) |
| 1 | Ease of use practicum guide | 1. Students can keep practical guides easily | 73.05 | 76.82 | 77.00 |
|  |  | 2. Practical guides are easy to use by students themselves | 78.39 |  |  |
|  |  | 3. The practice manual guide helps students in using the media. | 79.04 |  |  |
| 2 | The time required for the execution | Time provided in using the practicum guide. | 76.56 | 76.562 |  |
|  | Ease in interpreting | Easily interpreted by expert lecturers as well as by other biology study lecturers. | 77.93 | 77.93 |  |
| 3 | Has the same equivalent as other teaching materials | It has the same equivalent as other teaching materials. | 76.66 | 76.66 |  |

Table 1 shows the average practice practicum practitioners based on guided inquiry approaches in the subject of Animal Physiology by students, i.e. 77.00% with practical criteria. This value shows guided practicum guide based on guided inquiry approach in the subject of Animal Physiology can be used easily by students for the implementation of Physiology of Animal Practice in Biology Education
The highest response was found in the aspect of ease in interpreting, ie 77.93% with practical criteria. This means that students assess practical practice guides are interpreted so that students assisted in carrying out practicum activities independently without having to depend on lecturers or laboratory assistants because the guided practicum guide is equipped with the discourse and theories that can assist the students in understanding the practical materials and assist the students in interpreting the data obtained from their experimental activities so that the students can easily formulate the conclusions.

The lowest student response was found in the aspect of time required in the implementation, ie 76.56% with practical criteria, because the time allocated for practicum activities in STKIP PGRI West Sumatera only eight times 150 minutes [22], while the topics to be practiced according to the demand of learning objectives consist of ten topics so that in the implementation several meetings have two topics to work on. This makes students difficult to allocate the time available to work on all the assigned topics. [23] Practicum using guided inquiry-based guidance requires good timing and preparation because it has a lot of stages so it takes a lot of time, so there needs to be co-assistant laboratory training so that the lab runs as expected.

The low response of students to the time aspect required in the implementation is also due to the many group members and have heterogeneous resources both in terms of competent, attitude and skills, so that students difficult to manage group activities and take a long time. [24] there are five common challenges in designing inquiry-based learning: (a) motivating students to engage in inquiry-based learning; (b) students master investigative strategies (eg, interpreting problems, data collection and analysis); (c) includes sufficient content knowledge of topics for inquiry-based learning; (d) students managing and coordinating complex activities and resources in open, inquiry-based learning; (e) practical constraints of the learning context (lack of technology, large class size, and so on).

The same result also obtained by [12] that the result of practicality test through a questionnaire of teacher response showed that the practicum guide developed was included in the very practical category. The practicality of this practicum guide is due to the practical practicum guidance that is
practically used, interpreted and has a similar equivalent to other teaching materials, so as to facilitate and assist the lecturer or laboratory assistant in guiding the practicum implementation. This is in accordance with the proposed [25] considerations of practicality can be seen from the following aspects of ease of use include easy to set, stored, and can be used at any time, the time required for the implementation should be short, fast, and appropriate, tools of interest, easily interpreted by expert teachers and other teachers, have low cost characteristics and can be reached by teachers.

The learning with guided inquiry approaches can ease the lecturer's work in guiding and managing heterogeneous students and can be an alternative for difficult lecturers applying open inquiry with limited knowledge of students. This is consistent with [26] and [27] argued that the application of learning with guided inquiry approach is the ideal form for inexperienced teachers in open inquiry lessons. Practical assessment of lecturers to the practicum guide also caused by lecturers feels helpful in increasing their ability to improve the knowledge and understanding of students. This is consistent with those obtained by [14] and that guided inquiry learning enhances the ability of teachers to improve the knowledge and understanding of Saudi Arabian students on density materials. When teaching guided inquiry, teachers use more appropriate questioning strategies to support student accommodation from newly learned conceptions into their existing conceptual framework.

Table 2. Practical guidance practicum based guided inquiry approach on animal physiology course by lecturer.

| Num | Aspect of Practicality | Indicator | Percent Per Indicator (%) | Mean Aspect | Practicality (%) |
|-----|------------------------|-----------|---------------------------|-------------|-----------------|
| 1   | Ease of use practicum guide | 1. Ease laboratory guide during practice | 87.5 | 83.33 | 79.43 |
|     |                        | 2. The Practicum Guide is easy to use by lecturers. | 79.20 | | |
| 2   | The time required for the execution | Time provided in using the practicum guide | 75 | 75 | |
| 3   | Ease in interpreting | Easily interpreted by expert lecturers as well as by other biology study lecturers | 84.38 | 84.38 | |
| 4   | Has the same equivalent as other teaching materials | It has the same equivalent as other teaching materials | 75 | 75 | |

The low response of teacher to the time aspect required in the implementation is also due to the many group members and has heterogeneous resources both in terms of competent, attitude and skills, so it takes a long time to manage students in group work. This is in line with those of [24] that there are five common challenges in designing inquiry-based learning: (a) motivating students to engage in inquiry-based learning; (b) students master investigative strategies (eg, interpreting problems, data collection and analysis); (c) includes sufficient content knowledge of topics for inquiry-based learning; (d) students managing and coordinating complex activities and resources in open, inquiry-based learning; (e) practical constraints of the learning context (lack of technology, large class size, and so on). The low response of the lecturers to the product developed because the inquiry learning with the inquiry is not yet entrenched for the lecturers, so it is difficult to assume the time to implement the syntax of inquiry. The difficulty of applying inquiry in the classroom also differs between cultures. For example, a qualitative study conducted in Hong Kong indicates that many investigative strategies can only be applied superficially in Asian classrooms because of a strong teacher-centered teacher transmission model.

4. Conclusion
From practicality analysis, through questionnaire responses of students and lecturers can be concluded that the guidance guided inquiry approach on animals physiology course is practically used by lecturers and students of Biology education program. Based on these results, the research can be
continued at the effectiveness of its use in improving the results of teaching practicum of Animal Physiology.

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References
[1] Subiantoro A 2009 Pentingnya Praktikum Dalam Pembelajaran IPA Makalah Pelatihan Pengembangan Praktikum IPA Berbasis Lingkungan MGMP IPA SMP Kota Yogyakarta
[2] David B Rivers 2002 Using A Course-Long Theme for Inquiry-Based Laboratories Adv. In Physio. Edu. 26 4 p 317-326
[3] Widiana R, Susanti D dan Susanti S 2017 Student Needs to Pracicum Guidance in Physiology of Animals Based on Guided Inquiry J. of Phys. Conf. Series 895-012005
[4] Widiana R, Susanti D dan Susanti S 2017 Analisis kurikulum pada Pengembangan Penuntun Praktikum Berbasis Inkuiri Terbimbing Mata Kuliah Fisiologi Hewan Prosiding Semnas Bio-Edu I Prodi Pendidikan Biologi STKIP PGRI Sumatera Barat p 297-305
[5] Na Li 2012 Approaches to Learning Lit. Rev. (International Baccalaureate) p 45
[6] Arifah I, A Maftukhin and Fatmaryanti S D 2014 Pengembangan Buku Petunjuk Praktikum Berbasis Inkuiri Terbimbing Pada Materi Pengelolaan Lingkungan J. of Phys Conf. Series 895-012005
[7] Bunterm T, Lee K, Ng Lan Kong J, Srikoon S, Wangpoomyai P, Rattanavongsa J and Rachahoon G 2014 Do different levels of inquiry lead to different learning outcomes? A comparison between guided and structured inquiry. J. of Sci. Edu. 36 12 p 1937-1959
[8] Nurhidayat T, E S Rahayu dan N K T Martuti 2014 Pengembangan LKS Dengan Pendekatan Inkuiri Terbimbing Pada Materi Pengelolaan Lingkungan J. of Bio. Edu. 3 1 p 118-124
[9] Casotti G, Danner L R and Knabb M T 2008 Successful implementation of inquiry-based physiology laboratories in undergraduate major and nonmajor courses Adv. In Physio. Edu. 32 p 286-296
[10] Fatmasary A dan Supriyanto 2015 Pengembangan LKS Praktikum Identifikasi Proses Pencernaan Hewan Ruminansia Berbasis Guided Inquiry di SMA J. of Bio. Edu. 4 1 p 1-8
[11] Selviana D, R Susanti and R S Iswari 2016 Pengembangan LKS Berbasis Inkuiri Terbimbing Pada Materi Struktur Dan Fungsi Jaringan Tumbuhan Di SMP J. of Bio. Edu. 5 2 p 123-128
[12] Syamsu F D 2017 Pengembangan Penuntun Praktikum Ipa Berbasis Inkuiri Terbimbing untuk Siswa Smp Siswa Kelas VII Semester Genap BIO natural 4 2 p 13-27
[13] Suardana I K 2007 Penilaian Portopolio Dalam Pembelajaran Fisika Berbasis Inkuiri Terbimbing Di SMP Negeri 2 Singaraja J. Penl. dan Pe. Pend. 12 p 122-134
[14] Almuntasheri S R, Gillies M and Wright T 2016 The Effectiveness of a Guided Inquiry-based, Teachers’ Professional Development Programme on Saudi Students’ Understanding of Density Sci. Edu. Intern. 27 1 p 16-39
[15] Jufri W 2013 Belajar dan Pembelajaran Sains (Bandung: Pustaka Reka Cipta)
[16] Kemendiknas 2006 Peraturan Menteri Pendidikan Nasional Republik Indonesia Nomor 22 Tahun 2006 Jakarta
[17] Thiagarajan S, Semmel D S and Semmel M I 1974 Instructional Development for Training Teachers of Exceptional Children (Minneapolis, Minnesota: Leadership Training Institute/Special Education, University of Minnesota)
[18] Trianto 2010 Model Pembelajaran Terpadu (Jakarta: Bumi Aksara)
[19] Riduwa 2012 Skala Pengukuran Variabel-variabel Penelitian (Bandung: Alfabeta)
[20] Sanjaya W 2010 Strategi Pembelajaran Berorientasi Standar Proses Pendidikan (Jakarta: Kencana Prenada Media)
[21] Trautmann N, MaKinster J and Avery L 2004 What makes inquiry so hard? (And why is it worth it? Paper The annual meeting of the National Association for Research in Science Teaching (Vancouver, British Columbia)

[22] Pedoman Akademik STKIP PGRI Sumatera Barat Tahun Akademik 2017/2018 Padang

[23] Suprianto, S I Kholida dan H J Andi 2017 Panduan Praktikum Fisika Dasar 1 Berbasis Guided Inquiry Terhadap Peningkatan Hard Skills dan Soft Skills Mahasiswa Phys. Edu. J. 1 2 p 122-139

[24] Edelson D C, Gordin D N and Pea R D 1999 Addressing the challenges of inquiry-based learning through technology and curriculum design J. of the Learn. Sci. 8 3/4 p 391–450

[25] Sukardi 2003 Metodologi Penelitian Pendidikan (Jakarta: Bumi Aksara)

[26] Bybee R W and National Science Teachers A 2010 The teaching of science:21st-century perspectives (Arlington, VA: National Science Teachers Association)

[27] Trundle K C, Atwood R K, Christopher J E and Sackes M 2010 The effect of guided inquiry-based instruction on middle school students’ understanding of lunar concepts Res. in Sci. Edu. 40 3 p 451-478