Practicality of handout based on guided discovery method in process evaluation and learning outcomes of biology

S Nerita1*, Y S Hartati2, A Maizeli1 and A Afza1

1 Program Studi Pendidikan Biologi, Sekolah Tinggi Keguruan dan Ilmu Pendidikan Persatuan Guru Republik Indonesia Sumatera Barat, Jl. Gunung Pangilun, Padang 25173, Indonesia
2 Program Studi Pendidikan Bahasa dan Sastra Indonesia, Sekolah Tinggi Keguruan dan Ilmu Pendidikan Persatuan Guru Republik Indonesia Sumatera Barat, Jl. Gunung Pangilun, Padang 25173, Indonesia

*siskabio@gmail.com

Abstract. Process evaluation and learning outcomes of biology is a compulsory subject that discusses the process of evaluation in learning and application design and processing of learning outcomes. Some of the problems found in this subject are the students difficult to understand the material and the unavailability of learning resources that can guide students to gain knowledge. Therefore, it is necessary to develop handout based on guided discovery method which can guide and direct students to acquire their knowledge independently. The purpose of this research is to develop handout based on guided discovery method which practical. This type of research is a development research using a 4D model that is limited in the development stage is to see the practicality of the use of handout. Practicality data is taken through the handout practice by students and by lecturers. The instrument used was a questionnaire practicalities of students and lecturers. Data were analyzed by using the percentage formula. The results showed that the average value of the student practicalities questionnaire is 77.64% (practical), and the average value of the lecturer practicalities questionnaire is 93.23% (very practical). Can be concluded that handout based on guided discovery method have been practical.

1. Introduction
Process evaluation and learning outcomes of biology is a compulsory subject that discusses the evaluation process in learning and apply the design and processing of learning outcomes. This subject is very important to be mastered by educators because the processing of learning outcomes done will decide the position of learners for achievement in the learning process. Assessment of learning outcomes of learners is basically an integral part of the learning process. The goal is to improve the effectiveness of learning and assess the performance of learners [1]. Assessment really is the bridge between teaching and learning [2].

Some problems are found in process evaluation and learning outcomes of biology subject are that lecturers have not found the right method to guide the students to obtain their knowledge independently, the students have difficulties in understanding the material and the unavailability of learning resources that can guide and direct the students to gain their knowledge. The solution of the problem is to apply the guided discovery method. Guided discovery learning strategy is a learning situation in which the principal content of learning is not directly exposed by the teacher but left to be discovered by the
learners, making the teacher a guardian and students active participants in the learning process [3]. Discovery method is a teaching method that regulates teaching in such a way that students acquire knowledge that it has not yet been notified, partially or entirely found alone [4]. In the guided discovery method is student encouraged to think for themselves, analyze alone, so that it can find the concept, principles, or procedures based materials teach that teachers have provided [5].

Teaching by discovery method hopes that the students are really actively learning to find their own materials [6]. This method in accordance with the constructivist approach in which the students learn more effectively by constructing their own knowledge [7]. In science education, guided discovery method of teaching is believed to increase retention of materials learnt because the learner organizes the new information and integrates it with the information or knowledge that has already been accumulated and stored [8].

The learning activities that involve the students to learn actively is one of the characteristics of a qualified education [9]. Under the lecture in traditional instruction, knowledge is mostly acquired from a teacher’s direct lecture, and a teacher seldom interacts with students. Under such a method, learners are used to passive thinking and simply memorize the learned knowledge so that they could not flexibly apply the learned knowledge to solve problems in daily life. The teaching idea in discovery instruction is to have students independently explore answers in the learning context [10]. Students who actively engage with what they are studying tend to understand more, learn more, remember more, enjoy it more and be more able to appreciate the relevance of what they have learned, than students who passively receive what we teach them [11]. The best instructors provide high expectations, challenge students beyond their comfort zone [12].

Guided discovery methods can be converted into handout based on guided discovery method. In this subject, students will be guided in acquiring knowledge independently. One example is the material cognitive domain assessment on the circulatory system material. Before designing the test, students must first understand the material circulatory system that includes the structure and function of the circulatory organs, blood circulation mechanism, and abnormalities in the circulatory system. After that, students are guided in the making matrix guideline. Based on the matrix guideline then designed questions with levels C1 to C6 in accordance with Taxonomy Bloom. Handout based on guided discovery method that have been developed in previous research has produced a handout that valid. For that, the next test is to see the practicality of handouts. The purpose of this research is to produce handout based on guided discovery method which practical.

2. Method
This research uses Research and Development method by adopting 4D model that is limited in the development stage is to see the practicality of the use of handout [13]. The research instrument was a questionnaire practicalities of students and lecturers. Student practicality questionnaire consists of 2 indicators, namely ease of use handout and time required in the implementation. This questionnaire is filled by biology education department students of 2016 who has taken subject of process evaluation and learning outcomes of biology as many as 58 students. Questionnaire practicalities of lecturers consists of four indicators, namely ease of use, the time required in the implementation, easy to interpretation, and have equivalence. The questionnaire was filled by 2 lecturers who taught process evaluation and learning outcomes of biology subject, namely a lecturer from Universitas Negeri Padang and Sekolah Tinggi Keguruan dan Ilmu Pendidikan Persatuan Guru Republik Indonesia Sumatera Barat.

Data analysis using percentage formula [14].

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\text{Value of practicality} = \frac{\text{average score}}{\text{maximum score}} \times 100\%
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Based on the value obtained, then set the criteria of handout practices as follows [14].

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3. Results and discussion

3.1. Handout practicality by students

The result of handout practice by students can be seen in Table 2, shows that the average value of handout practice by students is equal 77.64% (practical). The average value of an indicator of ease in the use of handouts of 77.85% (practical), and the average value of time indicator required in the implementation of 77.63% (practical). This shows that handout based on guided discovery method are practically categorized.

| Interval (%) | Category     |
|--------------|--------------|
| 0 – 20       | very impractical |
| 21 – 40      | not practical |
| 41 – 60      | less practical |
| 61 – 80      | practical     |
| 81 – 100     | very practical |

**Table 2.** Handout practicality by students.

| Aspect                        | Practical Value (%) | Category     |
|-------------------------------|--------------------|--------------|
| Ease of use handout           | 77.85              | practical    |
| Time required in the implement | 77.63              | practical    |
| Average                       | 77.64              | practical    |

Handout is considered practical by the students in terms of its use because the handout is a learning resource that contains the material with clear, simple sentences and easy to understand. Handout based on guided discovery method directs students to be able to learn independently find the concepts of lecture materials, so that students can understand the material well. Handout have an important role in improving understanding of concepts before students learn in the classroom, so that students come in class with armed with the knowledge that has been learned through handout. The development of teaching materials that meet the needs of students and the material being studied is the best effort to improve conceptual understanding [15]. It can be concluded that students are easy to use handouts so that handouts are said to be practically used in the learning process. Practicalities of products can be seen from the perceptions of students, whether student also commented positively or not [16]. A product is said to be practical if the product is realistically usable [17].

In terms of time, handout based on guided discovery method can save time lectures. This is because students can directly use it with the direction of the lecturer without explaining the entire material, so that the lecture time becomes more effective.

3.2. Handout practicality by lecturers

The result of handout practice by lecturer can be seen in Table 3, shows that the average value of handout practice by lecturer amounts to 93.23% (very practical) which can be seen from 4 indicators. The average value of the ease of use indicator is 100% (very practical), the average value of the time indicator required in the implementation of 91.67% (very practical), the average value of the indicator is easy to interpretation by 93.75% (very practical), and the average value of the indicator has an equivalence of 87.5% (very practical).
Table 3. Handout practicality by lecturers.

| Aspect                          | Practical Value (%) | Category          |
|--------------------------------|---------------------|-------------------|
| Ease of use                    | 100                 | very practical    |
| Time required in the implementation | 91.67              | very practical    |
| Easy to interpretation         | 93.75               | very practical    |
| Have equivalence               | 87.5                | very practical    |
| Average                        | 93.23               | very practical    |

The results of questionnaires by lecturers state that handouts can be used easily. This means that handout as one learning resource can be easily used directly in the learning process and can help lecturers in explaining the material. Thus, the time required in the lecture process can be optimized. Handouts are easily interpreted or understood by lecturers teaching in this course, as well as in other subjects. The handout has been declared to have the same equivalence that can be used as a learning resource. In the process of filling in the questionnaire of practicality, the lecturer stated that there are some things that need to be revised related to the writing error but in general the handout has been stated practically. Learning instrument development products are said to be practical if they meet the expert assessment criteria / learning tool practitioners developed can be used with little revision [18].

4. Conclusion
The conclusions of this study is handout based on guided discovery method in process evaluation and learning outcomes of biology subject has been declared practical by students and lecturers.

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References
[1] Purnomo E and S Munadi 2005 “Evaluasi Hasil Belajar dalam Implementasi Kurikulum Berbasis Kompetensi di Sekolah Menengah Kejuruan,” *Jurnal Cakrawala Pendidikan* (2) p 259-272
[2] Wiliam D 2013 “Assessment: The Bridge between Teaching and Learning,” *Voices from theMiddle* 21 (2) p 15-20
[3] Olorode, J John, Jimoh, and A Ganiu 2016 “Effectiveness of Guided Discovery Learning Strategy and Gender Sensitivity on Student’s Academic Achievement in Financial Accounting in Colleges of Education,” *International of Academic Research in Education and Review* 4 (6) p 182-189
[4] Hasibuan, H, Irwan, and Mirna 2014 “Penerapan Metode Penemuan Terbimbing pada Pembelajaran Matematika Kelas XI IPA SMA N 1 Lubuk Alung,” *Jurnal Pendidikan Matematika* 3 (1) p 38-44
[5] Effendi L A 2012 “Pembelajaran Matematika dengan Metode Penemuan Terbimbing untuk Menciptakan Kemampuan Representasi dan Pemecahan Masalah Matematis Siswa SMP,” *Jurnal Penelitian Pendidikan* 13 (2) p 1-10
[6] Suherman E 2003 *Common TextBook Strategi Pembelajaran Matematika Kontemoper* (Bandung: JICA-Universitas Pendidikan Indonesia)
[7] Balim A G 2009 “The Effect of Discovery Learning on Students’ Success and Inquiry Learning Skills,” *Eurasian Journal of Educational Research* (35) p 1-20
[8] Akani O 2007 “Effect of Guided Discovery Method of Instruction and Students’ Achievement in Chemistry at the Secondary School Level in Nigeria,” *International Journal of Scientific Research and Education* 5 (2) p 6226-6234

[9] Suwono H, S Susanti and U Lestari 2017 “Guided Inquiry Facilitated Blended Learning to Improve Metacognitive and Learning Outcome of High School Student,” *Journal of Physic Conf. Series* 824

[10] Shieh C J 2016 “A Study on Information Technology Integrated Guided Discovery Instruction towards Student’s Learning Achievement and Learning Retention,” *Eurasia Journal of Mathematics, Science, & Technology Education* 12 (4) p 833-842

[11] Park C 2003 “Engaging Students in the Learning Process,” *Journal of Geography in Higher Education* 27 (2) p 183-199

[12] Paolini A 2015 “Enhancing Teaching Effectiveness and Student Learning Outcomes,” *The Journal of Effective Teaching* 15 (1) p 20-33

[13] Thiagarajan S, Dorothy S S and I S Melvyn 1974 *Instructional Development for Training Teacher of Exceptional Children* (Indiana: Indiana University)

[14] Riduwan 2009 *Belajar Mudah Penelitian Guru, Karyawan dan Peneliti Pemula* (Bandung: Alfabeta)

[15] Wulandari S, E Suarsini and Ibrohim 2016 “Pemanfaatan Sumber Belajar Handout Bioteknologi Lingkungan untuk Meningkatkan Pemahaman Konsep Mahasiswa S1 Universitas Negeri Malang,” *Jurnal Pendidikan:Teori, Penelitian dan Pengembangan* 1 (5) p 881-884

[16] Keing C, J Lo, P Lam and C McNaught 2007 “Summative eAssessments: Piloting Acceptability, Practicality and Effectiveness,” In C. Montgomery & J. Seale (Eds.), *ED-MEDIA 2007* (pp. 486–495). *Proceedings of the 19th annual World Conference on Educational Multimedia, Hypermedia & Telecommunications*, Vancouver, Canada, 25–29 June

[17] Plomp T 2007 “Educational Design Research: an Introduction,” *Proceedings of the Seminar Conducted at the East China Normal University, Shanghai (PR China)* November 23-26 p 9-36

[18] Nasution D, P S Harahap and M Harahap 2018 “Development Instrument’s Learning of Physic Through Scientific Inquiry Model Based Batak Culture to Improve Science Process Skill and Student’s Curiosity,” *Journal of Physic Conference Series* 970