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Development of Integrated Natural Science Practicum Guide Integrated Inquiry Approach to Improve Student Learning Outcomes

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Abstract

This study aims to obtain a practicum guide for Integrated Natural Sciences in SMP integrated with guided inquiry approach. This research is a research and development research and experiment. The population in this study were all students of class VIII SMP Negeri 2 Padangsidimpuan. The instrument used was a feasibility questionnaire based on the National Education Standards Agency, a feasibility questionnaire based on conformity with the guided inquiry learning model, cognitive test instruments, critical thinking skills test instruments, and skills observation sheets. The research data were analyzed using independent sample T-test and correlation test with SPSS 21 for windows at a significance of 0.05 with tcount> ttable and rcount> rtable. The results showed that: the Integrated Natural Science book in schools still has shortcomings so that it needs to be developed, the practicum manual that has been developed in Integrated Natural Science learning class VIII semester I is feasible based on the National Education Standards Agency and is in accordance with the model Guided inquiry learning, students' skills are more developed than students using Integrated Natural Science books in schools, student learning outcomes are better than student learning outcomes using Integrated Natural Science books in schools, thinking ability level The critical thinking ability of students is higher than the critical thinking skills of students using the Integrated Natural Science book in schools, there is a significant relationship between skills and the improvement of student learning outcomes and there is a significant relationship between the level of critical thinking skills of students with an increase in student learning outcomes.

Keywords
practicum guide, Integrated Science, guided inquiry, critical thinking skills

I. Introduction

Learning is essentially a teacher's activity in teaching students, which means making students in learning conditions. The learning process carried out in the classroom is an activity to transform knowledge, attitudes and skills (Nurfajriani, Noviza, R., & Murniaty, S., 2018). Education is an important means of improving the quality of human resources (HR) in ensuring the sustainability of a nation's development because education is the main instrument of human resource development. Human resource development is not only based on the quality of a person in mastering a particular skill, but even more so that he can become a desirable person. Humans and education cannot be separated, because education is the key to a human future that is equipped with a mind. Education has an

important role in ensuring the development and survival of a nation, because education is a vehicle for enhancing and developing competent and quality human resources. To form humans to be reliable, knowledge is needed that plays a role in shaping

Natural Science Learning is a learning process that emphasizes natural symptoms and their relationship between these symptoms, so that in the learning process Natural Science does not only emphasize the cognitive aspects, but also includes attitudes, processes, products and applications that must be carried out in a manner thorough. (Mutveia and Mattssonb, 2014). A system of the sciences of nature, or natural sciences, taken interrelatedly and as a whole. Natural science is one of the three fundamental fields of scientific knowledge of nature, society, and thought. It is the theoretical basis of industrial and agricultural technology and medicine, as well as the natural scientific foundation of philosophical materialism and the dialectical understanding of nature.

The learning process always involves teachers and students. Nurfajriani and Nasution (2015) explain that teachers must be able to stimulate and provide encouragement and reinforcement to dynamize student potential, activities and motivation so that the teaching and learning process will be more attractive to create good learning achievement.

The most useful learning outcomes include a verb that describes an observable action, a description of what the learner will be able to do and under which conditions they will be able to do it, and the performance level they should be able to reach.According to Utomo (2020) education aims to make students happy and make the lives of students better in the future and to achieve happiness in the world and the hereafter based on faith, knowledge, and charity. Resien (2020) stated that Learning is the process of changing behavior due to interactions among individuals and the environment. Changes in behavior include changes in knowledge, understanding, attitudes, skills, motivation, interests, thinking abilities and so on. One of the efforts to improve the quality of education is through improving the teaching and learning process, which contains a series of teacher aand student actions on the basis of reciprocal relationships that take place in educational situations to achieve certain goals in the learning process. Suparman in Sitorus (2019), argues that "learning is a process of behavior change that can be observed by others including by teachers". Dwidayani in Sitorus (2019) states that, "Learning outcomes are measures of success or failure of students after taking teaching and learning activities both in terms of effective, psychomotor, and cognitive which includes knowledge (memory, understanding, application (application)". Learning outcomes are a form of achievement students as well as a symbol of the success of educators in learning students (Yusuf in Sitorus (2019).

The goals of natural science are twofold: (1) to discover the essence of natural phenomena and their laws and, on this basis, to foresee or to create new phenomena; and (2) to reveal the potential for utilizing in practice the known laws, forces, and substances of nature. It may be said that the cognition of truth (that is, of the laws of nature) is the direct or most immediate goal of natural science and that facilitating the practical use of such laws is the ultimate goal of natural science. The regular patterns of natural science are those which are characteristic of any science but take into account the specific nature of the subject being studied, including the following features. (1) Dependence upon practice (in the final analysis). (2) Relative independence, which is manifested in the fact that the practical solution of the problems that arise may be implemented only by attaining, in conformity with its own logic, particular stages in the very process of cognition of nature, a process that is accomplished from phenomena to essence and from a less profound to a

more profound essence. (3) Continuity in the development of the ideas and principles of natural science, its theories and notions, and methods and techniques of investigation; and the inseparability of all knowledge of nature. (4) Gradual development of natural science with the alternation of periods of relatively placid evolutionary development and periods of abrupt revolutionary breakthroughs in its theoretical bases, the entire system of the concepts and principles of natural science, and the entire natural-scientific picture of the world. The content of previous knowledge of nature is further developed and generalized; previous universalization and absolutization of laws and principles, which in reality have only a limited and relative character, are surmounted. (5) The interaction of all sciences and the interconnection of all branches of natural science, whereby one subject is studied simultaneously by many sciences (that is, using their methods) and the method of one science is applied to the study of subjects of other sciences. (6) The contradictory nature of the development of natural science approximating a division into ostensibly in-compatible concepts, whereby, as a means of resolving their conflict, an essentially new concept replaces the contending, one-sided old ones, the new concept embracing the subject as a whole, dialectically. (7) The recurrence of ideas, concepts, and conceptions with continual returns to that which has come before (including the point of departure for scientific development); hence, the comparison of scientific development with a "circle of circles," with movement along a spiral.

Based on research conducted by Nurfajriani and Dyah, T, R (2016) teaching materials in the context of learning are an important component because teaching materials are components that must be studied, studied, studied, and used as materials that must be mastered by students and can provide guidelines in learning. and is one of the factors that can strengthen student motivation.

Mince (2011) states that the inquiry learning strategy is an alternative for guiding students to an investigative situation or scientific process that can develop scientific attitudes. Meanwhile, according to Myers and Burgess (2003), it explains that practicum in an inquiry-based laboratory can also improve students' ability to design experiments and analyze the data obtained. Hasan (2012) states that guided inquiry learning has a significant effect on increasing academic achievement.

Based on the description above, the researcher developed a product in the form of an Integrated Natural Science practical guide integrated guided inquiry. The practicum guide developed with a systematic and integrated arrangement of guided inquiry is expected to help students gain knowledge and skills independently and can overcome difficulties in learning Integrated Natural Sciences.

II. Review of Literatures

2.1 Research and Development

Development research is research that leads to the production of a product, studying a process of occurrence or taking place of certain events, circumstances and objects. With regard to products, various products have been developed, such as teaching materials, for example modules, pictorial teaching materials, interactive teaching materials, online teaching materials, and so on. In relation to processes, for example the process of plant reproduction, the process of pregnancy, the process of childbirth, and so on. Educational research and development, which we are more familiar with the term Research and Development (R&D). Borg and Gall in Setyosari (2012) state that development research is a process used to develop and validate educational products.

2.2 Practicum Guide on Integrated Science Learning

Practicum guides are defined as teaching materials that contain guidelines for carrying out practicum activities in the laboratory with the aim of creating optimal practicum activities in a learning process. In the learning process, practicum is an important activity in the teaching and learning process. This activity is carried out in order to support the achievement of learning goals that cannot be achieved in learning or have an effect on learning outcomes (Khulthau, 2010).

III. Research Methods

The type of research used in this research is research and development. The product developed in this study is a guide to an integrated natural science practicum. The research procedure includes the ADDIE model stage as follows; (1) Analysis Phase, (2) Planning, (3) Development, (4) Implementation and (5) Evaluation.

The data collection instrument used in this study was a questionnaire containing the eligibility / validation standards based on the National Education Standards Agency, a test instrument containing questions to determine the improvement in student learning outcomes, tests of critical thinking skills, observation sheets of students' skills.

To see the validation criteria in the analysis of the results of the calculation of the average score obtained from a questionnaire distributed to expert validators and students, see table 1.

Table 1. Average Validation Criteria

Average	Criteria Variable
4,21-5,00	Very Valid and does not need revision
3,41-4,20	Valid and does not need revision
2,61-3,40	Sufficiently valid and does not need revision
1,81-2,60	Less Valid, some need revision
1,00-1,80	Invalid and must be totally revised

This research was conducted at SMP Negeri 2 Padangsidimpuan. The sample in this research is 2 books of Integrated Natural Sciences class VIII SMP from different publishers in circulation. Teachers and lecturers (as validators for the practicum guide developed), while the sample of students was the experimental class I and experiment II. The experimental class I used the practical manual for the development results and experiment II used the books in the school. The sample was determined by using purposive sampling technique.

In this stage the research used the pretest-posttest control group design shown in Table 2.

Table 2. Research Design

Sample	Pretest	Treatment (Independent Variable)	Posttest
Experiment Class I	T_1	X	T_2
Experiment Class II	T_1	Y	T_2

Information:
T1 = initial test (pretest)
T2 = final test (posttest)
X = Learning using an integrated science practicum guide, guided inquiry approach
Y = Learning using books in school

The data collection instrument used in this study was a questionnaire containing the eligibility / validation standards based on the National Education Standards Agency, a test instrument containing questions to determine the increase in student learning outcomes, tests of critical thinking skills, observation sheets of student skills.

IV. Results and Discussion

This research was developed after conducting an initial analysis of 2 books of Integrated Natural Sciences used in schools. a practicum guide developed and made a practicum guide based on a guided inquiry learning model. Components that are included or added in the developed practicum manual include: (1) Laboratory rules; (2) Occupational safety in the Integrated Natural Science laboratory (laboratory work safety instructions, work safety equipment, first aid for laboratory accidents); (3) Engineering work in the Natural Science laboratory; (4) Natural Science laboratory equipment; (5) Chemical symbols in the laboratory; (6) Experiment developed.

Results of Practicum Guide Validation

Based on the validation results of the feasibility test of an inquiry-based practicum guide guided by expert validators and Natural Science teachers, the results of the analysis obtained an average value in the practical coverage (4.30), the presentation system (4.42), containing productive insights (4.33)), stimulates curiosity (4.58), develops skills (4.33), design (4.31), language (4.35). with an average score of 4.38 with very valid criteria, which means that the practicum guide is feasible and does not need to be revised. The results of the feasibility test can be seen in Figure 1.

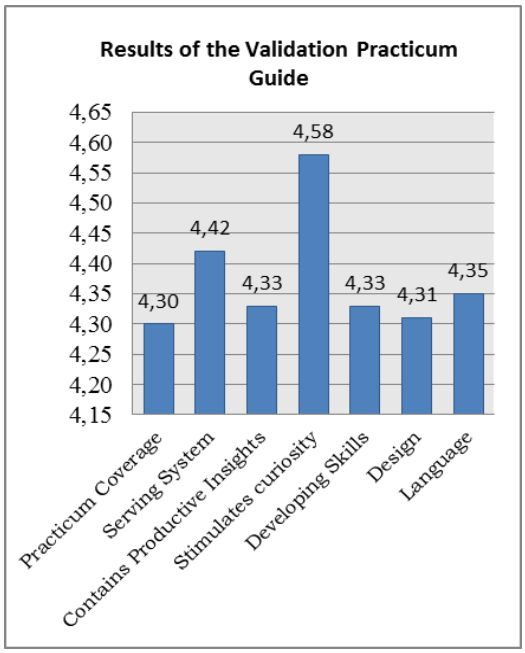

Figure 1. *Validation Results for Practicum Guide*

4.1 Results of the Development Results Practicum Guide Trial

The average pretest score in experiment-1 was 35 and experiment-2 obtained an average value of 37.33. Whereas for the posttest in experiment-1 obtained an average value of 83.17 and experiment-2 obtained an average value of 75.50. Based on the results of the pretest and posttest, it can be seen that the level of understanding of students by calculating the normalized gain (N-gain). The normalized gain value in experiment-1 and experiment-2 was 73.6% (high category) and 60.0% (medium category), respectively. So it can be concluded that the practicum guide that has been developed is effective in improving student learning outcomes. So that with the development of an innovative Integrated Natural Science practicum guide, it can improve learning outcomes. The results of improving learning can be seen in Figure 2.

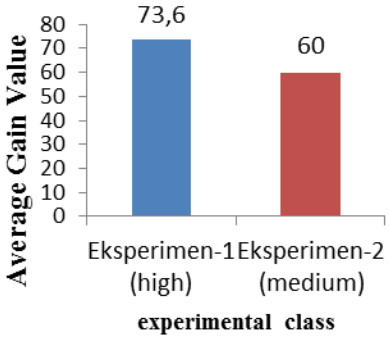

Figure 2. *Results of Average Gain Value*

4.2 Discussion

The development of an Integrated Natural Science practicum guide has been successfully developed, an assessment of the practicum guide that has been developed in this study was carried out using a feasibility questionnaire based on the modified National Education Standards Agency and a questionnaire on the suitability of the practicum guide with the guided inquiry learning model.

Based on the results of the overall practicum guide assessment, an average score of 4.38 is obtained with very valid criteria and does not need revision, which means that the lecturers (experts) and teachers of Integrated Natural Sciences agree with the practical guidebook that has been developed which is very suitable for use.

Overall students who were taught using the Integrated Natural Science practicum guide integrated with the Inquiry Approach for class VIII odd semesters obtained a higher N-gain (0.736) with a 73.6% percent increase in learning outcomes while students who were taught using books Integrated Natural Sciences in schools obtained an increase in learning outcomes (0.60) with a percentage of an increase in learning outcomes of 60.0%. For the results of students' critical thinking skills in the experimental class-1 obtained an average value of 82 with very critical criteria, while for the experimental class-2 the average score was 71.83 with critical criteria. Based on the results of the observation of the skills of the participants during the practicum process, the average score for the skills of students in the experimental class-1 was 83.33 with very good criteria, while in the experimental class-2 it was 76.97 with good criteria. This is because students who use the development results of the Integrated Natural Science practicum guide have learned about the use of existing laboratory work tools and techniques guided by the development results of the Integrated Natural Science practicum.

V. Conclusion

Based on the results of the analysis of the Integrated Natural Science practicum guide that has been developed, it is more feasible to use than the Integrated Natural Science book in schools.

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