How the teacher’s teaching is? the guided-inquiry-worksheets to enhance science process skills

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Abstract. This study aims to develop guided-inquiry-based worksheet by reviewing the validity, practicality, and effectivity of the product to improve the process skills and concept understanding of SMPN 2 Porong’s students. Developed student worksheet is expected to link and reflect the “educator” to “learners” harmoniously, well-balanced, creativity inducing, and filled with fun learning activities. Learning with developed student worksheet integrates learning from real experience to form hands-on activities and minds-on activities in every student. The data collected by giving questionnaire and practical observation sheets, and study result test is analyzed by t-test. The result of student worksheet development shows score of 3.78 which is very valid to be used in learning. The uses of student worksheet shows score of 3.73 which means very good. The results of the practical observation and study results showed the score of 0.000 <0.05 which is significantly different from conventional student worksheet. Thus, for teachers who want to improve the process skills and concept understanding of students, it is suggested to use the student worksheet developed in this study.

1. Introduction

The meaning of learning is not just about teacher transferring knowledge to students, but also making students seek, arrange and find knowledge actively. Learning is not just about learning facts, concepts, and principles, but also processes during learning. It requires one knowledge and procedures to gain brand new knowledge. Investigation and discovery develop meaning in memory[1] because knowledge is personal and students construct meanings through their social interactions [2]. Therefore, teachers have to provide flexibility for students to actively move, investigate, collect, test and analyze the problems together [3].

This statement is supported by research results of [4] whose research reveals that inquiry-based learning can improve students achievement through series of scientific activities. Study conducted by [5] shows that the application of gaming based problem based on inquiry enable students to improve the skill of integrated science process and reflect on deeper information processing.

Learning concept from 21st century is directed towards which students progressively construct the meaning over what they learn. However, patterns used by teachers in schools still rely on lectures and discussions with few media supports such as textbooks and student worksheets. Based on the results
during practical activities, some students was seen to be less serious, in fact some were playing around with their tools and materials used in practical activities. Low interests showed in science subject learning at SMPN 2 Porong is one of many evidence for low KKM (minimum criteria of mastery learning) scores. If this problem remains unresolved for a long period, it will spread to another students across Indonesia. Concrete evidence based from the data of national examination results of junior high schools / MTs in 2016-2017 shows decrease in the average scores in some subjects, based on [6] which as follows.

| Subjects   | 2016 | 2017 | Average score decrease |
|------------|------|------|------------------------|
| Indonesian | 78.30| 70.20| 8.10                   |
| English    | 65.96| 49.08| 16.87                  |
| Science    | 53.39| 47.75| 5.64                   |
| Mathematics| 60.98| 51.97| 9.01                   |

The low average scores of junior high school national examination is certainly related to the quality of teachers teaching their students and their selection of materials, methods, strategies and even learning approaches used. Based on 2011’s TIMSS and 2012’s PISA results in 2012, the achievement of Indonesian students' on science subject is ranked 63rd out of 64 participating countries [7]. These facts indicate that Indonesian students' science subject skills must be improved on all aspects with teachers must be able to create and establish conducive learning atmosphere which enable their students to determine what and how they learn, investigate phenomenon currently happening, and take initiative on what will be learned. Science subject learning should emphasize on efforts to help students solve real life problems in society [3][8]. Thus, it is necessary to develop appropriate student worksheets and settle students' learning needs in school.

Science is a systematic, tentative, dynamic, empirical, provable study, process and product, and solution to discover natural phenomena [9]. Science learning in school is advised to provide context-rich problem and reduce context-poor problem [10] is about changing the learning environment and prepare students to study based on inquiry to solve problems. Teaching does not focus on how to teach, but it is more oriented on how to stimulate learning and learning how to learn [11]. Students’ understanding in learning is mental process of adaptation and knowledge transformation [12] arising from the results of self-evaluation and reflection [13].

Specifically, [14] state that there are three domains of learning planning, which are: a) setting goals and learning objectives, b) learning and evaluation planning, c) adaptation and learning evaluation. Implementation of the learning plan must be balanced with socialization to achieve the expected goals. Student worksheets is an integral part of the learning process. Student worksheets developed in a rudimentary way will have an impact on the low interest in student learning on subjects. The first planning needed before developing student worksheets are: 1) rational-linear planning model plan, 2) nonlinear planning model plan, 3) mental reflection [2].

Kibar[15] states the student worksheet contains daily life issues, planning and investigating, and summarizing the results. Learning by inquiry enable students to improve their process skills, including formulating problems, hypotheses, determining experiment variables, designing and executing experiments, collecting and analyzing data, and formulating conclusions [16]. Basic skills of process, including; observe, classify, interpret, measure, predict and communicate [17]. Scientific skill processing can be done individually or in groups [18] for students to gain long term memory understandings [19].

2. Methodology
This study is categorized in research and development (R&D) which is systemically done, beginning with requirement analysis, developing planning strategy to fulfill needs, then testing the designs, which
later evaluated for its effectiveness. Development of guided inquiry worksheets at each stage can be explained as follows: a) identify instructional goals; b) conduct instructional analysis; c) write performance objective; d) develop assessment instrument; e) develop instructional strategy; f) develop and select instructional materials; g) design and conduct formative evaluation of instruction; h) revisit instruction; and i) design and conduct summative evaluation [20]

3. Result and Discussion
The guided inquiry worksheets tested for the validity, practicability, and effectiveness. The validity criteria include: a) specific, b) pertinence, c) alignment, d) usability, d) reliability, and e) accuracy. Based on the results of validity, student worksheets divided into four sub-items with average score of 3.77. Thus the student worksheets applied is very valid.

The observation result guided-inquiry-worksheets obtained average score of 3.57 in very good category. Some items: 1) making conclusions and reflections 78%, and 2) 81% working safety. Thus, the use of student worksheets needs to be maximized by students in making of their own conclusions and reflections, as well as paying attention to safety procedures during the investigation process.

The said effectiveness is compared by the pre test and post-test scores of student practical activities, including: 1) students observing and collecting data; 2) grouping; 3) comparing; 4) writing the results in form of scale / graph / drawing; 5) paying attention to work safety; 6) summarizing the test results; and 7) preparing reports. The results of the students’ practical activity of T-Test groups showed a Sig (2-tailed) value of 0.000 <0.05.

These guided inquiry worksheets must be improved on all aspects with teachers create and establish conducive learning atmosphere which enable their students to determine what and how they learn, investigate phenomenon currently happening, and take initiative on what will be learned.

![Figure 1. The Guided Inquiry Worksheet about Heat and Temperature](image)

4. Conclusion
The novelty of this research is to develop guided inquiry worksheet aimed at producing new scientists in schools with proactively asking, searching, analyzing, verifying and building understanding over what they learn. The developed are transformed and adapted of learners and the context with characteristics.
The guided inquiry worksheets involve with students' situations themselves conducting investigations. The novelty of the developed worksheets is certainly able to introduce and train students on several skills, including:

a. Processing skills make students actively involved in scientific investigation.

b. Critical thinking is associated with active and purposeful thinking activities, characterized by three basic activities, which are: analysis, evaluation, and inference.

c. Creative thinking skills are always associated with novelty and value.

Therefore, students produce ideas, products, or processes that are beneficial to the students themselves and hopefully forming their habits in themselves, thinking various things that are also useful for the people around him and benefitting the world. This is the concept of learning of "departing from the classroom into space" which means education should shape students as a creative person who has value for themselves today, and also valuable to their world in the future.

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