Question-based inquiry module can be to increase science process skills on the study of humans digestive system

Desak Made Citrawathi¹ and Putu Budi Adnyana²

¹ Lecturer Department of Biology, Faculty of Mathematics and Natural Sciences, Universitas Pendidikan Ganesha
² Lecturer Department of Biology, Faculty of Mathematics and Natural Sciences, Universitas Pendidikan Ganesha

*E-mail: dskcitra@gmail.com

Abstract. This aims of this research is to determine the effect of question-based inquiry module to increase science process skills of junior high school students, learning activities and student responses to learning process using question-based inquiry module. This research used a non-equivalent group pretest-postes design. The sample of this research is grade 8th of junior high school that selected from the population through random sampling technique. The data of this research consist of quantitative and qualitative data. Quantitative data were obtained from the average of science process skills gain score that analyzed using the t-test. Qualitative data is description of responses and student learning activities. The results showed that the average increase in science process skills with learning using module based on questions is 75.95, with 90.0% students’ learning completeness. Student response to learning by using question-based inquiry module belongs to very good category with value 86.70. Student learning activity belongs to good category with value 85.30. The result of t-test on normalized gain score obtained significant difference of science process skill (p < 0.05) between students who learn to use question-based inquiry module with those who do not use question-based inquiry module. Thus, learning using question-based inquiry module on human’s digestion system has a significant effect on increasing science process and student learning process, and responded very well by the students.

1. Introduction

School is essentially a place where teachers and students learn and place of the development of human resources. Therefore, the teacher’s main role is as a learning agent to prepare a learning environment that enables students to learn actively to think and actively work. Learning is vital to developing knowledge and dealing with an increasingly complex life.

Learning science is learning the natural surroundings in scientific ways. For that students need to be given a learning experience that can develop thinking skills, process skills, and scientific attitudes. This is in accordance with the standard demands of the content of science subjects in junior high school. The learning process of science is expected to be carried out using inquiry learning to grow thinking ability, work and be scientific and also communicate it as an important aspect of life skills. [1], [2], [3] suggest that inquiry-based science learning can encourage literacy and science process skills, and also increase students activity and enhance the students’ concept. Therefore, science learning in junior high school emphasizes the provision of direct learning experiences through the use
and development of science process skills and scientific attitudes.

Asking is one of the activities used as a foundation to investigate and find the concepts and principles of science that learned by students. Asking is one of the very important techniques used by teachers in various learning objectives. The aims of teachers that use questions in learning are to provide instruction, develop students thinking skills, motivate students to learn, develop critical thinking skills and inquiry attitudes, and encourage students to hunt their own knowledge [4] [5]. Question is the core of inquiry-based learning, because questions can lead to an inquiry as a student's attempt at understanding the material being studied. Therefore, the skill of asking is very important to have by the teacher to be able to use inquiry strategy in learning process. Inquiry strategies can teach students about science process skills. Inquiry learning can be facilitated by using question-based inquiry module.

Science Process Skills is very important to applied in teaching and learning process so that students can practice to always ask, think critically, cultivate the physical and mental skills. Nevertheless, the reality that occurs in the education world, science process skills have not been developed in schools optimally, as happened in junior high school in Singaraja. The result of the research that has been done in junior high school in Singaraja are: (a) the questions expressed by the teacher are more convergent and dominated by low-level thinking questions, and the questions are less to provide experience in science process skills learning; (b) the teachers are less understand about the types of questions that encourage inquiry processes, (c) The ability of teachers to plan questions that train thinking skills needs to be improved, (d) Teaching materials such as question-based inquiry module do not yet exist in junior high school [6].

The problem in this research are:
1) How is the influence of question-based inquiry module on students' science process skills?
2) How is student learning activity in learning using question-based inquiry module?
3) How is the student's response to the use of question-based inquiry module?

The purpose of this research are:
1) To know the effect of using question-based inquiry module on students' science process skill
2) To know the learning activities of students in learning using question-based inquiry module
3) To know the student's response to the use of question-based inquiry module

2. Research Methods
This research was conducted in SMP Laboratorium Universitas Pendidikan Ganesha on September 2017. Sample of this research are students of grade 8th-3 as experiment group and student of grade 8th-2 as control group that selected use random sampling technique. The students of grade 8th-3 learned use question-based inquiry module and the students of grade 8th-2 learned not use question-based inquiry module. Design in this research is non-equivalent group pretest-postes design:

| Experiment | R | O | X1 | O’ |
|------------|---|---|----|----|

| Control    | R | O | X2 | O’ |
|------------|---|---|----|----|

Picture 1. Pretest-Posttest Control Group Design

R = Random; O = pretest; O’ = posttest  X1 = The lesson use question-based inquiry module; X2 = The lesson not use question-based inquiry module
(Adapted from Fraenkel & Wallen)[7]

The assessed process skills include observing, predicting, concluding, and communicating skills. The science process skills data were collected by using performance assessment and student responses to learning by using question-based inquiry module were obtained by using questionnaires, and
student learning activities were obtained with observation sheets. Research data are quantitative data and qualitative data. Quantitative data is the ability of students science process on learning with the main material of food digestion system, that normalized gains-score data. Normalized gains-score data were statistically analyzed using a t-test with a 5% confidence level. Qualitative data is data of student activity in learning and student response to learning analyzed descriptively.

Normalized Gains-score shows that process science skills is increase. The formula of normalized gain score is.

\[
\text{Gain (g-factor)} = \frac{(S_f) - (S_i)}{(S_{MI} - S_i)}
\]

Gain (g-factor) = normalized gain score  
$S_i$ = initial score (pre test)  
$S_f$ = final score (post test)  
$S_{MI}$ = Ideal maximal score [8]

3. Research and Discussion
The result of this research shows that the data of average of pretest, posttest, and normalized gains score presented in Table 1.

| Learning strategies | Learning outcomes | Test | Descriptive Statistic |
|--------------------|-------------------|------|-----------------------|
|                    |                   |      | Mean | Standard deviation | The highest score | The lowest value | Gain score |
| Do not use QBIM    | Science process   | Pretest | 45.16 | 03.85 | 60 | 20 | 0.21 |
|                    | skills            | Posttest | 59.84 | 08.17 | 85 | 35 |
| Use QBIM           | Science process   | Pretest | 42.26 | 03.46 | 60 | 20 | 0.63 |
|                    | skills            | Posttest | 75.95 | 06.09 | 90 | 65 |

QBIM = question-based inquiry module

Table 1 shows the average gain score of experiment class (0.63) was higher than the mean value of control class gain score (0.21). The improvement of science process skill in experiment class is 79.7%. In the control class obtained pretest average of 45.16 and mean of postest 59.84. The improvement of science process skill in control class is 32.5%. Gains score for classes using question-based inquiry module in the moderate category (0.63), and classes not using question-based inquiry module in low category (0.21).

Normalized gain score data for science process skills in the control class and the experimental classes are normal and homogeneous distributed. The next analysis is statistical analysis using t-test at 5% confidence level. The result of t-test on normalized gain score obtained significant difference of science process skill (p <0.05) between students who learn to use question-based inquiry module with those who do not use question-based inquiry module.

In learning process required appropriate learning media for effective learning. Choosing the right media can improve the success of teaching and learning. Module is one of the learning media that plays an important role in the learning process. With the module, more students can learn directed at home even though no teachers. Modules that are accompanied by pictures and examples in everyday life are expected to further increase students motivation to learn. The effectiveness of the use of modules in the learning process is evidenced in research [6],[9],[10], [11]. Learning strategies used that can involve students actively in the learning process causes students not bored, and then expected
to improve student success in learning.

Question-based inquiry module has a characteristic, which always begins with questions that aim to motivate and focus students attention on the concept to be studied. The question on the module also directs the student investigation to the inquiry process. Question-based inquiry module that equipped with question-based student work sheet will encourage students to conduct investigations and learn more independently. Such learning conditions can alter the learning process that usually teacher-centered learning to become student-centered. Teacher-centered learning processes tend to suppress student activity, creativity, and thinking skills. Teacher-centered learning is less suitable in achieving student achievement in knowledge, skill, and attitude so that it will produce low quality graduates.

Inquiry learning strategies can facilitate students in developing science process skills [12]. The question-based inquiry module that equipped with a questionnaire based student work sheet. By doing the student work sheet, students are trained to develop the skills of the science process, such as observing, predicting, concluding, and communicating their work. By doing student work sheet students are assisted for the stewardship of decisions in accordance with the objectives. The results of this study are supported by previous researches proposed by [13], [14], [15].

Student learning activities using question-based inquiry module with attention to enthusiasm, liveliness, and interaction between students, interaction with teachers, and interaction with learning resources included in the category either as much as 75.43%. Motivation is one that determines student learning activities. Psychologists define motivation as a process within an active individual, encouraging, giving direction, and maintaining behavior at all times. Motives that encourage students want to do learning activities. Learning science using question-based inquiry module encourages students to find out the answers to the questions presented at the beginning of the material to be learned or the beginning of the activities to be performed.

Interest also affects student learning activities. Interests mean high inclinations and enthusiasm or a great desire for something. Interests as well as intelligence and motivation, for giving effect to learning activities. Because if a person has no interest in learning, they will not be eager or even unwilling to learn. Therefore, in the context of classroom learning, a teacher or other educator needs to arouse students interest to be interested in the subject matter they will be studying. To engage students interest in learning, it can be done with proper questioning techniques.

Student's response to learning is very good (very positive), with a score of 85.1. The student's response is the behavior that arises from the stimulus the teacher has given him, or the response in learning something with pleasure. Student response is one important factor that helps determine the success of students in learning a concept. Agustanti [16] argued that inquiry learning makes the learning process conducive. Low student responses to the material learned can hamper the learning process. The low response of students to learning is not necessarily caused by the difficulty of teaching materials that are discussed, but can be caused by the ability of teachers in delivering these teaching materials with methods that are not appropriate, the voice of teachers who are too small, less assertive, making students afraid and strained to be less attractive and generate boredom on students. Less conducive learning atmosphere resulted in decreased student response.

Marzano and Pickering there are several strategies that can be used to get students to respond positively to learning [17]. Teachers have an important role in building an effective and fun learning atmosphere. If teachers are planning a mature learning with effective pauses and activities that keep students physically active, teaching with high spirits and building positive relationships with students, students will respond positively to learning [18]. The materials in human digestive system is very contextual with the development of learners that exist in the phase of adolescence. In this early adolescence, junior high school students are in the phase of seeking self-identity that is also associated with food selection. In learning about the food digestive system, teachers can integrate about healthy foods. Integration of health education on food digestion system as proposed by Citrawathi and Adnyana [19]. Contextual lesson material will elicit a positive response because students need that knowledge. This positive response is a good start so that students are interested to follow the learning process in earnest to achieve optimal performance. In science learning especially on the digestive
system material, the positive response from students plays an important role to increase the curiosity of the students.

Science learning using question-based inquiry module is given a very positive response by students. This means that, in science, teachers with question-based inquiry module make learning science more enjoyable. Fun atmosphere is one of the most important things in learning.

4. Conclusion
Based on the results of data analysis and discussion, it can be concluded.

a. Application of Question-Based Inquiry Module can improve science process skills by 79.7%
b. Application of Question-Based Inquiry Module can improve student learning activities
c. Application of Question-Based Inquiry Module responded very well by students.

Recommendation
To improve the science process skills, teachers can create instructional media as question-based inquiry module. Question-based inquiry modules that completed with question-based student work sheet, teachers can train students in observation, predict, conclude and communicate skills.

References
[1] Gormally C, Brickman P, Hallar B and Armstrong N 2009 International Journal for the Scholarship of Teaching and Learning 3 1
[2] Minner D D, Levy A J and Century J 2009 Journal of Research in Science Teaching 47 276
[3] Adnyana B P and Citrawathi D M International Journal of Environmental & Science Education 12 1871
[4] Callahan J F, Clark L H and Kellough R D 1992 Teaching in the Middle and Secondary Schools (United State of America: Macmillan)
[5] Cotton K 2012 Classroom Question (http:// -69.20.125.200-workshop, accessed Mart 17, 2012)
[6] Citrawathi D M, Adnyana B P and Santiasa P A 2016 Jurnal Pendidikan Indonesia 5 764 (In Indonesia)
[7] Fraenkel J R and Wellen N E 1996 How to design and evaluate research in education 3rd ed (New York: McGraw-Hill)
[8] Hake R R 1999 Analyzing Change/Gain Score (USA: Indiana University)
[9] Adnyana B P and Citrawathi D M 2008 Jurnal Penelitian dan Pengembangan Pendidikan 2 206 (In Indonesia)
[10] Adnyana B P, Citrawathi D M and Maryam S 2011 Jurnal Penelitian dan Pengembangan Pendidikan 5 274 (In Indonesia)
[11] Citrawathi D M, Adnyana P B and Maryam S 2010 Jurnal Penelitian dan Pengembangan Pendidikan 4 77 (In Indonesia)
[12] Bekiroglu F O and Arslan A 2014 Procedia Social and Behavioral Sciences 141 1187
[13] Dwijono, Sunarno W and Sugiyarto 2013 Jurnal Inkuiri 2 124 (In Indonesia)
[14] Simsek P and Kabapinar F 2010 Procedia Social and Behavioral Sciences 2 1190
[15] Wulaningsih S, Prayitno B A and Probosar R M 2012 Jurnal Pendidikan Biologi 4 33 (In Indonesia)
[16] Agustanti T H 2012 Jurnal Pendidikan IPA Indonesia 1(1) 16-20 (In Indonesia)
[17] Marzano R J and Pickering, D J 2011 The Highly Engaged Classroom (Bloomington, IN: Marzano Research Laboratory)
[18] Citrawathi D M 2016 Bali Medical Journal 5 119
[19] Citrawathi D M and Adnyana B P 2017 Makalah Disajikan pada Seminar nasional Memperkuat Jati Diri Bangsa Melalui Riset Inovatif, Unggul, dan Berkarakter di Denpasar (In Indonesia)