



## The Effectiveness of School Environment-Based Inquiry Model in the Ecosystem Material Towards Critical Thinking Ability and Environmental Caring Attitudes of High School Students

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### Abstract

The aim of this study is to analyze the effectiveness of the school environment-based inquiry model in the ecosystem material towards critical thinking ability and environmental caring attitude of high school students. This study uses *Pre-Experiment Design* with research design of *One Group Pretest-Posttest Design*. The sample of this study was grade X IPA 5 and X IPA 6 SMA Negeri 1 Slawi. The results of this study indicate that the result of the *N-gain* test of critical thinking ability and the attitude of caring for the environment is in the medium category. The result of classical learning completeness reach 100% of students complete. Students' critical thinking ability shows 100% of students meet critical and very critical criteria. The environmental caring attitude of the students shows that 100% of students fulfill the criteria of care and absolutely care. Students' responses to learning show good criteria in each statement. Conclusion in this study is that the school environment-based inquiry model in the ecosystem material is effective towards critical thinking ability and environmental caring attitude of grade X students of SMA Negeri 1 Slawi.

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## INTRODUCTION

In order to realize superior human resources, the development of 21st century education requires students to be able to compete in the era of globalization. 21st century education develops various skills and demands an education system that allows students to reach maximum potential (Liu, 2015). According to Greenstein (2012) that one of the important thinking abilities is critical thinking. The results of the Trends in the International Mathematics and Science Study (TIMSS) research show that Indonesian scientific abilities from the cognitive domain have the students' highest average in knowing, while the abilities in the aspect of reasoning and applying are relatively low.

The results of interview with biology teachers at SMA Negeri 1 Slawi can be seen that biology learning has only used the lecture method. The students have not been trained to do problem solving in learning material that can improve critical thinking ability. It is proved in the learning process and the evaluation questions given have not been oriented towards the developing critical thinking ability.

Based on the observations in SMA Negeri 1 Slawi, obtained the information that 84% of students stated the lack of use of learning resources that are close to the surrounding environment in the learning process. The difficulty of SMA Negeri 1 Slawi students in understanding ecosystem material is because of the lack of visualization of material as a learning resource so that the material is considered abstract. Biology learning in SMA Negeri 1 Slawi has not yet applied a learning that links material to everyday environmental problems, causing students to be less sensitive to their surrounding environment.

Utilizing the school environment as a learning resource can train students in discovering their own ecosystem material and observing real phenomena in the environment regarding the constituent components of the ecosystem, interactions between components and the energy flow that occurs. Learning from real experience will provide meaningful long-term understanding.

Learning that achieves 21st century skills must meet the criteria, namely focusing on inquiry and investigation conducted by students. One of the learning models required by the 2013 curriculum is model of inquiry. Inquiry model is a learning model that involves all students' abilities to search and investigate. Yamin (2013) said that the inquiry learning process is done naturally, students work and experience, not in the form of transferring knowledge from teacher to student. Learning is no longer a teacher, but is student-centered in order to produce quality graduates.

Regarding human behavior towards environmental conditions that tend to be ignorant, the education pathway is number one priority in overcoming the environmental crisis. Biology is a subject that emphasizes the learning experience of students directly to develop a number of skills to be able to understand themselves and the environment. One of the goals of biology learning is to increase awareness about the environment.

Ecosystem material has a role in instilling cognitive aspects and attitudes related to the environment. This is because ecosystems coexist with the environment. Awareness of the role of the environment for the community through learning activities needs to be more improved to develop the ability to think critically about the environment and its problems which will increase the attitude of love and care for the environment (Kurniawan, 2015). Based on the description above, this study aims to analyze the effectiveness of the school environment-based inquiry model in the ecosystem material towards critical thinking ability and environmental caring attitude of high school students.

## RESEARCH METHOD

The research was conducted at SMA Negeri 1 Slawi in the even semester of the 2018/2019 academic year. The design used in this study is Pre-Experiment Design using the research design of One Group Pretest-Posttest Design. The samples were taken using purposive sampling with the class of X IPA 5 and X IPA 6 as the samples.

The data and the methods of retrieving data used in this study are presented in Table 1.

**Table 1.** The Data and The Methods of Retrieving Data

No	Data	Methods of Retrieving Data	Instrument
1.	Critical thinking ability	a. Pretest at the beginning of the learning process b. Posttest at the end of the learning process c. LDS (student discussion sheet) during the learning process d. LKS (student worksheet) during the learning process	a. Test sheets b. LDS sheets (student discussion sheet) c. LKS sheets (student worksheet)
2.	Environmental care attitude	a. Questionnaire at the beginning and end of learning process b. Observing the environment	a. Questionnaire sheets about environmental care attitude b. Observation sheets about environmental care attitude
3.	Student's responses	Questionnaire after the learning time	Questionnaire sheets of student's responses

Research Procedure of this research consists of three stages, namely the preparation, the implementation, and the data retrieval. At the preparation stage, material experts will make a learning tool and question validation tool. The implementation stage consists of three learning meetings. The first meeting is observing the ecosystem in the school environment. The second and third meetings held group discussions.

The data collection was done by using sheets of pretest-posttest, LDS (student discussion sheet), LKS (student worksheet), questionnaire sheets and observation sheets of students' environmental care attitude, as well as student responses questionnaire.

## RESULTS AND DISCUSSION

### Critical Thinking Ability

The results of the analysis of the critical thinking ability of these two classes are in the form of pretest-posttest scores, LDS scores, LKS scores, and product values. The improvement of students' critical thinking abilities was proven based on the difference in posttest and pretest scores through the N-gain test. The results of the N-gain test can be seen in Table 2.

**Table 2.** The Results of N-gain Test in Critical Thinking Ability

Information	X IPA 5	X IPA 6
Total students	36	36
Total gain scores	24,98	24,45
Average gain scores	0,69	0,68
Criterion	Moderate	Moderate

Based on Table 2, the average gain scores of the two classes are included in the criteria of moderate. The results of the critical thinking ability of grade X IPA 5 and X IPA 6 showed an enhancement after the learning process using the school-based inquiry model is applied.

Classical learning completeness is achieved when the percentage of passing students reaches at least 75% with the requirement to pass the minimum passing criteria limit of 70. The results of classical learning completeness recapitulation in X IPA 5 and X IPA 6 can be seen in Table 3.

**Table 3.** The Recapitulation of Classical Learning Completeness in X IPA 5 and X IPA 6

Grade	Total	Average	Passing	Completeness (%)	Criterion
X IPA 5	36	80,94	36	100	Excellent
X IPA 6	36	82,61	36	100	Excellent

Classical learning completeness obtained by each class after the application of the school environment-based inquiry model, namely 100% of students has passed with excellent criteria. The results of this study can also be supported by Rusli (2014) that the application of inquiry learning strategies can improve students' Curriculum-Based Competence.

The percentage of students' critical thinking ability achievement before and after learning uses the school environment-based inquiry model based on the score of the pretest and posttest can be seen in Table 4.

**Table 4.** Percentage of Students' Critical Thinking Ability Achievement

Criterion	X IPA 5		X IPA 6	
	Pretest (%)	Posttest (%)	Pretest (%)	Posttest (%)
Very Critical	0	94,44%	0	91,67%
Critical	22,22%	5,56%	30,56%	8,33%
Quite Critical	77,78%	0	69,44%	0
Less Kritis	0	0	0	0

The results of the posttest in the two classes have reached  $\geq 75\%$  with the criteria of high critical thinking ability than the results of the pretest so that it can be concluded that inquiry learning based on school environment is declared effective towards the ability to think critically on ecosystem material.

According to Rizal's research results (2014) learning with inquiry provides opportunities for students to have real and active learning experiences so that students are trained in solving problems. Problem-based learning models make students able to form the meaning of learning material through the process of learning and store it in their memory. The problem given is a real problem and close to the living environment of the students so that it makes it easier for students to solve problems because the students have already understood the environment they face. According to Ristiasari (2012) that the problems given will make students become more active in learning, understand the content of learning, challenge students' thinking skills to overcome the problems they confront and find the right solutions to these problems.

This can be seen from the syntax in the inquiry model that requires students to think critically in solving problems. The first stage is an orientation. In this activity, the teacher directs the topic of learning by raising problems based on the students' experience in real life. Rusmono (2012) argues that problems taken from real life will make it easier for students to find information related to learning material. The second stage is to state a problem. The teacher gives problems in the form of material-related questions that encourage students to think and look for answers independently. The third stage is to formulate a hypothesis. The teacher guides students to find temporary answers to the problems given. The answer is used as a temporary guess that must be proven through data searching activities. The fourth stage is collecting data. Through this activity, students can prove the truth of the answers that have been written.

At the first meeting, students were directed by the teacher to collect data in the form of school environment observation. In accordance with Hastutiningsih's research (2016) states that outdoor learning provides the opportunity for students to construct their own knowledge acquired from nature. After the observation in the environment, students made a product that describes the ecosystem of the school environment. The results of the questionnaire responses of students obtained data of grade X IPA 5 amounted to 91.67% and grade X IPA 6 of 94.44% state that the aquarium/terrarium product can help students understand the material since it describes the actual ecosystem that has been observed. Furthermore, for the second and third meetings, students were asked to discover facts on the ground by

presenting problems through student discussion sheet (LDS) and student worksheet (LKS) in the form of group assignments.

Testing the obtained data is the fourth stage, namely testing the hypothesis. Students test the results of observations by linking facts and theories that have been obtained. Students discuss with other students to exchange information that has been obtained. The last stage is drawing a conclusion. At the end of learning, the teacher and students draw the learning conclusion, so that the concept and knowledge gained are the same. Santoso (2010) states that drawing conclusion makes students afford to improve their critical thinking skills.

In addition to the learning model, the learning process also requires learning resources that support the learning process. Learning resources used are in the form of a school environment and discussion sheets containing facts about the ecosystem related to the material being studied. According to Duran & Sendag (2012) that learning content originating from nature is an important factor in improving critical thinking skills.

### Environmental Care Attitude

The results of the students' environmental care attitude were obtained from the scores of the pretest and posttest questionnaire and the observer's assessment. Before and after the learning time, the students were given a questionnaire to find out about their caring attitude. At the time of environmental observations, the observer assessed the students' environmental care attitude. The results of the *pretest* and *posttest* and the observer's assessment of the caring attitude of Grade X IPA 5 and Grade X IPA 6 can be seen in Table 5.

**Table 5.** The Result of Pretest-Posttest and Observer Assessment of Environmental Care Attitude of Grade X IPA 5 and Grade X IPA 6

Information	Grade X IPA 5			Grade X IPA 6		
	Pretest	Posttest	Observer	Pretest	Posttest	Observer
The Number of Students	36	36	36	36	36	36
Average	81,14	93,72	94,31	82,83	94,06	94,83
Criterion	Very Care	Very Care	Very Care	Very Care	Very Care	Very Care

It can be seen that the average value of the posttest questionnaire of the two classes increases compared to the average value of the pretest questionnaire. Observer assessment shows that the results are not much different from the results of student posttest. This reinforces the results of the posttest questionnaire that the results of self-assessment obtained data on increasing environmental care attitudes as well as the results of the observer's assessment.

The results of the posttest questionnaire and the observer's assessment of students' environmental care attitude are better than the results of the pretest questionnaire. This can be explained that learning ecosystem material by using the inquiry model based on school environment is considered as a way of learning that incorporates environmental education which includes motivation and examples of environmental problems. Reinforced by the results of responses of Grade X IPA 5 students amounting to 86.11% and Grade X IPA 6 of 94.44%, agreeing that the inquiry model based on the school environment motivates students to study environmental problems.

The percentage of each criterion of students' environmental care attitude on school-based inquiry model learning can be seen in Table 6.

**Table 6.** Percentage of Environmental Care Attitudes for Students in Each Criterion for Environmental Care Attitudes

Criterion	X IPA 5				X IPA 6			
	Pretest		Posttest		Pretest		Posttest	
	Amount	%	Amount	%	Amount	%	Amount	%
<b>Very Caring</b>	21	58,33	36	100	25	69,44	36	100
<b>Care</b>	15	41,67	0	0	11	30,56	0	0

The results of the analysis show that the posttest value of environmental care attitudes has reached  $\geq 60\%$ . The percentage of environmental caring attitudes in the posttest has changed compared to the percentage of environmental care attitude at the pretest

Increasing students' environmental care attitude was proven based on the difference in posttest and pretest scores through the N-gain test. N-gain test can be seen in Table 7.

**Table 7.** N-gain Test Results for Students' Environmental Care Attitude

Information	X IPA 5	X IPA 6
<b>Number of students</b>	36	36
<b>Number of gain scores</b>	24,04	23,56
<b>Average gain score</b>	0,67	0,65
<b>Criterion</b>	Moderate	Moderate

Based on the N-gain test it is known that the gain scores of grade X IPA 5 and grade X IPA 6 are in the moderate criterion. This is in accordance with the Pratama study (2016) which states that learning that utilizes school environmental media inquiry models can improve students' environmental care attitude. The students' cognitive results and the students' environmental caring attitude after learning, the results obtained were increase. This is in accordance with Taufiq's (2014) learning that students' cognitive understanding of the environment influences the attitude of caring for the environment. The development of attitudes in a person can be deliberately designed through school education. Concern for the environment is not entirely talent or innate instinct, but it is also the result of an educational process in a broad sense (Hamzah, 2015).

Learning with the inquiry model based on the school environment is not only inviting students to think about ecosystem material but can connect it to environmental problems so as to create an environmentally caring attitude. Students are also invited to reflect on behavior that has been done so far to damage or protect the environment. This is in accordance with the results of the responses of grade X IPA 5 students at 97.22% and grade X IPA 6 at 91.67% stating that the learning model is expected to be able to make students more sensitive to their environmental conditions. Environmental care can be developed by raising someone to take responsibility for their environment (Ngabekti, 2014).

Learning ecosystems that instill a caring attitude towards the environment is in line with Khusniati's (2012) opinion that science subjects must implement character values in it, one of which is environmental care attitude. This is intended so that the attitudinal value that enters the learning can be embedded well in students who will eventually form a good character.

### Student Response

The results of student responses obtained that students gave a very good response to the entire learning process carried out, as evidenced by the statements asked in the questionnaire sheets obtained very good response criteria. In accordance with the results of the questionnaire, students felt interested and excited about participating in the learning of ecosystem materials used an environment-based inquiry model, so that students were motivated to play an active role in learning activities

Based on the results of responses of students of grade X IPA 5, that is 83.33% and grade X IPA 6, 88.89%, the model of inquiry based on the school environment can improve the ability to think critically in solving problems. This is the same as the research conducted by Wulandari (2013) that students respond

positively to the implementation of inquiry-based practicum learning that has been carried out. Students' active participation in learning adds to students' interest and motivation in finding their own concepts, so that students better understand concepts and create critical thinking skills.

The application of learning by utilizing the school environment makes students effective in studying the ecosystem material indicated by students who agree with the percentage reaching 91.67%. The results of the research conducted by Sugiyo (2008) show a similar thing that the concept of learning that is associated with the surrounding environment can facilitate students in learning it.

The application of the inquiry model based on the school environment can help in finding problems regarding the environment and finding solutions, making students feel more concerned with the environment. Reinforced from the results of the questionnaire the responses of students of grade X IPA 5 were 97.22% and grade X IPA 6 that is 91.67% stated that after the learning was implemented it could make students more sensitive to their environmental conditions. This is in accordance with the results of Shakil's (2011) study which shows that most students think that providing experience by conducting observations independently can improve students' knowledge.

## CONCLUSION

Based on the results and discussion it can be concluded that the school environment-based inquiry model in the ecosystem material is effective towards critical thinking skills and environmental care attitudes of grade X IPA students of SMA N 1 Slawi

## REFERENCES

- Duran, M. & Sendag. (2012). A Preliminary Investigation Into Critical Thinking Skills of Urban High School Students: Role of An IT/STEM Program. *Scientific Research Creative Education*, 3(2), 241-250.
- Greenstein, L. (2012). *Assessing 21<sup>st</sup> Century Skills*. California: A SAGE Company.
- Hamzah, S. (2015). *Pendidikan Lingkungan: Sekelumit Wawasan Pengantar*. Bandung: Refika Aditama.
- Hastutiningsih, T., A. P. B. Prasetyo, & P. Widiyaningrum. (2016). Pengembangan Panduan Pembelajaran Outdoor Bermuatan Karakter Peduli Lingkungan pada Materi Ekologi. *Journal of Innovative Science Education*, 5(1), 28-35.
- Khusniati, M. (2012). Pendidikan Karakter Melalui Pembelajaran IPA. *Jurnal Pendidikan IPA Indonesia*, 1(2), 204-210.
- Kurniawan, D., M. H. Irawati, & F. Rohman. (2015). Pengembangan Perangkat Pembelajaran Ekosistem dan Pencemaran Lingkungan Berbasis Inkuiri serta Pengaruhnya terhadap Kemampuan Berpikir Kritis, Pemahaman Konsep, dan Sikap Siswa Kelas X SMA. *Jurnal Pendidikan Sains*, 3(3), 137-148.
- Liu, W. C. & E. L. Low. (2015). Editorial: Teacher Education for The 21st Century. *Education Research for Policy and Practice*, 14(3), 189-191.
- Ngabekti, S. (2014). Kawasan Wisata Pendidikan Lingkungan Hidup (KWPLH) Balikpapan sebagai Sumber Belajar Konservasi. *Jurnal Pendidikan IPA Indonesia*, 3(2), 116-122.
- Pratama, D. F. (2016). Pemanfaatan Media Lingkungan Sekolah Dengan Pembelajaran Model Inkuiri dalam Meningkatkan Kemampuan Penguasaan Konsep dan Sikap Peduli Lingkungan Siswa. *Jurnal Pendidikan Kes-SD-an*, 11(1), 21-29.
- Ristasari, T., B. Priyono, & S. Sukaesih. (2012). Model Pembelajaran *Problem Solving* dengan *Mind Mapping* terhadap Kemampuan Berpikir Kritis Siswa. *Unnes Journal of Biology Education*, 1(3), 35-41.
- Rizal, M. (2014). Pengaruh Pembelajaran Inkuiri Terbimbing dengan Multi Representasi terhadap Keterampilan Proses Sains dan Penguasaan Konsep IPA Siswa SMP. *Jurnal Pendidikan Sains*, 2(3), 159-165.
- Rusli. (2014). Penerapan Strategi Pembelajaran Inkuiri untuk Meningkatkan KBK Siswa pada Materi Struktur dan Fungsi Tubuh Tumbuhan. *Journal Education Biology*, 2(1), 174-177.
- Rusmono. (2012). *Strategi Pembelajaran dengan Problem Based Learning itu Perlu: untuk meningkatkan Profesionalitas Guru*. Bogor: Ghalia Indonesia.
- Santoso, H. (2010). Memberdayakan Kemampuan Berpikir Kritis Siswa melalui Pembelajaran Konstruktivik. *Jurnal Bioedukasi*, 1(1), 50-56.
- Shakil, A. F., W. N. Faizi, & S. Hafeez. (2011). The Need and Importance of Field Trips at Higher Level in Karachi Pakistan. *International Journal of Academic Research in Business and Social Sciences*, 2(1), 1-16.
- Sugiyo, W., Latifah, & Z. Abidin. (2008). Peningkatan Hasil Belajar Siswa dengan Model Pembelajaran Team Game Tournament melalui Pendekatan Jelajah Alam Sekitar dan Penilaian Portofolio. *Jurnal Inovasi Pendidikan Kimia*, 2(1), 236-243.

- Taufiq, M., N. R. Dewi, & A. Widiyatmoko. (2014). Pengembangan Media Pembelajaran IPA Terpadu Berkarakter Peduli Lingkungan Tema “Konservasi” Berpendekatan *Science Edutainment*. *Jurnal Pendidikan IPA Indonesia*, 3(2), 140-145.
- Wulandari, A. D., Kurnia, & Y. Sunarya. (2013). Pembelajaran Praktikum Berbasis Inkuiri Terbimbing untuk Meningkatkan Keterampilan Berpikir Kritis Siswa SMA pada Materi Laju Reaksi. *Jurnal Riset dan Praktik Pendidikan Kimia*, 1(1), 18-26
- Yamin, M. (2013). *Strategi & Metode dalam Model Pembelajaran*. Jakarta: GP Press Group.