

# Scientific Attitude Profile of Student Through Guided Inquiry by Experiment Method

Gita Dynamika Putra, Burhanudin Milama, Nanda Saridewi

Syarif Hidayatullah State Islamic University Jakarta, Jl. Ir. H. Djuanda 95, Ciputat, Indonesia

Corresponding e-mail: [aden.putra92@gmail.com](mailto:aden.putra92@gmail.com)

## Abstract

Scientific attitude is extremely needed in science teaching especially chemistry. This research was done to analyze scientific attitude of student through guided inquiry by experiment method. Used instruments were observation sheet and interview. The research had undertaken in three senior high schools. There are five dimension of scientific attitude that measured in this research. They are curious attitude, respect to data, flexible thinking, critical thinking and considerate attitude to environment. Analyzing data in this research was done with descriptive method. It was found that the five dimension of analyzed scientific attitude is in the good until very good category. The highest scientific attitude obtained is critical thinking dimension with percentage 87.48% (very good category). In addition, the lowest scientific attitude obtained is flexible thinking with percentage 72.50% (good category).

Keywords: Student Scientific Attitude, Experiment, Guided Inquiry

## 1 INTRODUCTION

In reality, learning process is not only transferring knowledge from a teacher to their students, but raising values from the learning process itself in a subject to students with the help of teacher a facilitator. The values do not only focus on the cognitive dimension, but also focus on the affective dimension and psychomotor dimension in students. These three dimensions are important that should be presented in every learning process, so that a learning process has a good quality and produces students who are smart by their cognitive dimension, skilful by their psychomotor dimension and has good character by their affective dimension. Achievement from affective dimension is one of the realization from the effort of the educational purpose in students' attitude profile. (Permendiknas No. 41 Tahun 2007)

In the learning process in the class, we need to apply a learning strategy to help students understanding the learning material, the application and the connection in real life such as material in science subject. This thing is the same with an

opinion from Zulfiani *et al.* (2009) stated that the essence implementation of science is actualized in learning of natural science that compiled through a curriculum emphasized in giving the direct experience to develop competency to explore and comprehend nature with science.

Chemistry is one of the departments of natural science. Natural science is a subject that is guided to find out and execute so that it can help students to gain in-depth comprehension about nature. Depdiknas in Zulfiani *et al.* (2009) stated that there are three competencies in natural science: (1) competency of determining what is observed, (2) competency of predicting what has not happened yet, and (3) competency of examining the result of experiment.

All of this time, there is tendency of teacher considered natural science learning only as a collection of product and neglected other profiles, one the profiles is scientific attitude profile. However development of concept cannot be separated with development of scientific attitude in the learning process of natural science. "In reality, natural science is constructed in fundamental of

scientific product, scientific process and scientific attitude". (Trianto, 2013) Consequently learning process of natural science should be suitable with the function and its purpose, that is developing scientific attitude (Istikomah *et al.*, 2010).

Students continually are opposed the natural phenomenon and to face that problem. They not only depend on theoretic knowledge, but also should be accompanied with scientific attitude that become reject progression of students' understanding level (Wahyudiati, 2010). Scientific attitude is individual tendency to act and behave in solving an opposed problem systematically through scientific actions (Toharudin *et al.*, 2011).

Harlen (2000) stated that scientific attitude has five dimensions; they are curious attitude, respect to data, flexible thinking, critical thinking and considerate attitude to environment.

Severe follow up is needed from teacher to achieve five dimensions of scientific attitude so that the outcome of students' learning in chemistry can be achieved optimally, and students' scientific attitude can be increased. As like a research conducted by Lestari *et al.*, (2012) that considerable scientific attitude has positive influence to the outcome of students' learning. One of the effort to have a considerable scientific attitude is using experiment method with guided inquiry that escalate the work, the process skills and the attitude profile of students (Rustaman, 2005).

Experiment method allows an opportunity for students to experience by themselves, to follow a process, to observe an object, to analyze, to prove, to conclude by themselves about an object. Experiment method also can develop the way of rational and scientific thinking (Pranolo, 2013).

Inquiry learning process model can form and develop self concept in students so that students comprehend about basic concept and better ideas, helping students to use memories and transferring them in the recent learning process, and stimulating students to think and work by their initiative, being objective, reliable, and opened (Roestiyah, 2008).

According to Ali (2004) guided inquiry is inquiry that the operation is done by students based on teacher's instructions. Generally the instruction is given in questions form that can guide students. This leaning process model makes students opposing relevant assignments to be done individually or together to solve the problem and conclude independently. The steps of learning process with guided inquiry are offering a problem, formulating the problem and collecting data, producing hypothesis and analyze data experiment, evaluating hypothesis and concluding (Lasley, 2002)

According to Hermawati (2012), learning process that emphasizes the involvement of students

in developing their knowledge can be implemented by following inquiry learning process model. Nevertheless inquiry learning process is not easily conducted in school, so that the implementing of inquiry is done by providing guidance or instructions to students that is known as guided inquiry (Nurhidayah *et al.*, 2015). Santiasih *et al.*, stated that guided inquiry model can develop and expand students' scientific attitude through the application of natural science that is done by planning, doing a trial, experimenting, observing, analyzing, and concluding experiment result. That learning process will involve all of students' potency maximally to find out and investigate systematically, critically, logically and analytically, so that students are able to formulate the discovering through experiment to attain better and more considerate understanding.

Guided inquiry by experiment method is a learning process method that makes students as learning centre and teachers as tutor who offers guidance, for the rest. Student is the one who find out themselves a concept from a learning process by resolving an opposed problem by experiment method. In line with research conducted by Mawasari *et al.*, (2013) stated that guided inquiry by experiment method is able to increase comprehension of concept and scientific attitude of students. Based on the analyzed background, researcher undertook an experiment to analyze scientific attitude of student through guided inquiry by experiment method.

## 2 METHODS

This research was held in February – March 2016, in three different schools; MAN 2 Kota Bekasi, MA Khazanah Kebajikan Ciputat, and SMA Muhammadiyah 8 Ciputat at colloid matter. Research method used was quantitative descriptive that was a research aimed to describe phenomena by using measurement, quantity, or frequency (Sukmadinata, 2012). Population of the research was all of students in MAN 2 Kota Bekasi, MA Khazanah Kebajikan and SMA Muhammadiyah 8 Ciputat, and reached population was all of XI students in those schools. The taken sample was class XI Natural Science in those schools. Sampling technique was by using purposive sampling technique.

Collecting data method used was observation method. Scientific attitude profiles observed in learning process included five dimensions; they are curious attitude, respect to data, flexible thinking, critical thinking and considerate attitude to environment. Instrument used in this research was

scientific attitude constructed observation sheet. Collected data through the observation sheet analyzed by summing up the number of checklist (✓) in every column in observation sheet from each scientific attitude indicator that had been made and counting presentation of scientific attitude by converting raw data into percentage and determining student scientific attitude category for each sub of indicator based on ability scale as in Table 1 showed (Riduwan, 2013).

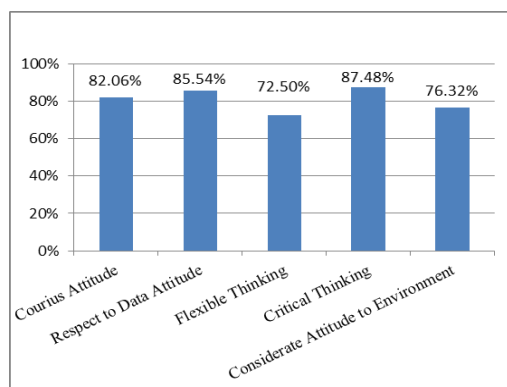
Table 1 Score Interval Scientific Attitude

| No. | Score Interval | Category          |
|-----|----------------|-------------------|
| 1.  | 81 - 100%      | Very Good         |
| 2.  | 61 - 80%       | Good              |
| 3.  | 41 - 60%       | Adequate          |
| 4.  | 21 - 40%       | Insufficient      |
| 5.  | 0 - 20%        | Very Insufficient |

### 3 RESULTS AND DISCUSSION

Scientific attitude of students in curious attitude obtained outcome 82.06% (very good category). In the learning process, students were offered problem in Student's Worksheet (LKS). According to Natalina *et al.* (2013), increasing of curious indicator is caused by rapprochement of guided inquiry that has specialty on offering problem in LKS text. With the help of offering problem, it will invite students' curiousness so that students will be motivated to keep learning and finding the answer of the questions or the answer of their curiousness. Skilled students with guided inquiry as learning strategy will have higher accuracy level to understand concepts as an attempt to satisfy their curiousness.

Figure 1. Result of Students Scientific Attitude



Therefore in stage of formulating and collecting data, students started to find the problems in LKS from various resources, such as book, internet, and teacher. The stage of formulating and collecting data was done by tempting the curiousness of students. It was when teacher and students did question and answer about the offered problem so that good interaction happened in learning process. Through question and answer, teacher dug into students' knowledge about given problem.

Dimension of respect to data attitude obtained outcome 85.54% (very good category). Respect to data attitude using guided inquiry possessed proportion with very good category because it can accustom students to solve problem and designing experiment with their own thinking so that objective and reliable attitude on expressing the output of experiment will be high.

In the stage of formulating problem and collecting data, teacher guided the students to find the solution of the discussed problem and students were given deliverance to construct knowledge related to the material by digging information from various learning resources around. Apart from the outcome experiment, students got the truth of data from other resources like book, internet, and teacher. Sanjaya (2006) stated that in this stage, teacher continuously motivated students to learning from various questions so that they were stimulated to think.

From several respect to data attitude, it can be concluded that students should have curiousness to show the truth of the temporary answer (offering hypothesis) that was available in LS. This thing is in line with Candrasekaran (2014), that scientific attitude of student in giving respond should be supported its correctness with relevant prove. In guided inquiry, teachers observed the process that had been done by the students, not only observed the outcome, so that students reported the outcome they got without manipulating them.

Flexible thinking dimension obtained outcome 72.50% (good category). In this dimension, students are demanded to be more considered about the temporary answer outcome before they decide. Therefore, students should think rationally, opened, always trying to find the alternative, accepting others' opinion, and being careful in concluding the truth answer before reporting it in front of different group of friend (Philips in Suryawati *et al.* 2010). To overcome that thing, students can do that by doing experiment of colloid system concept and finding the answer from relevant resources, so that

flexible thinking attitude in this stage is going to be looked better.

Meanwhile in analyzing data stage and evaluating and concluding hypothesis stage, students analyzed and evaluated from their investigating through solving problem in LKS with explanation that was given by the teacher as a reflection of students' reported answer. Apart from that, students were given an opportunity to explain their opinion and ask to the teacher about the material that had not been understood yet. Susanti *et al.* (2012) stated that in asking stage, flexible thinking attitude of students can be trained. Students can give various interpreting against a picture, story or a problem.

Scientific attitude in critical thinking skill obtained outcome 87.48% (very good category). During learning process, teacher gave an opportunity for students to find out the solution from the served problem in LKS. Sari (2015) revealed that learning with guided inquiry strategy made students being more active and students involved directly in gaining knowledge, so that critical thinking ability of student is higher with guided inquiry strategy than learning with speech strategy. Thing mentioned was also supported by Puspita *et al.* (2013) that stated implementation of guided inquiry learning model emphasized in student activity maximally to train critical thinking skill.

Guided inquiry learning process in creating hypothesis and experiment stage, teacher asked students to discuss anything that should be prepared to find the answer or to prove the hypothesis, accurate in creating and deciding an alternative procedural in order to avoid any mistake, so that students did not hesitate to answer the questions in LKS. Thing mentioned could make students being more active in learning process that had been conditioned to get initiative in attempt to solve the problem, take a decision, and train critical thinking of students.

In the dimension of considerate attitude to environment obtained outcome 76.32% (good category). Considerate attitude to environment could be observed in the stage of creating hypothesis and experiment. In this stage, students investigated problem by doing experiment to get appropriate data/prove with the obtained information resources.

Students should absolutely pay close attention to environment around them by observing safety, used material and equipment that are suitable with the procedure in LKS, and the place where the experiment taken (Harlen, 2000). Those things should be done so that considerate attitude to

environment observed and there is responsibility owned by the students.

Scientific attitude generally can be observed if it's done by guided inquiry model with experiment method. It was demonstrated with the average of scientific attitude from three schools which is 80.81% with good category. In learning process, student scientific attitude is important to be observed, because, with scientific attitude, the desired learning purpose and learning outcome will make students become active and creative (Lelly *et al.* 2013).

Scientific attitude is important in social interaction, science, and technology. In addition, scientific attitude formed in students is going to actualize a good example for students in investigating and interacting with people (Sardinah *et al.*, 2012). This attitude can be developed well if teacher continuously grows that attitude in every learning process through group discussion and solved problem questions. Based on the scientific attitude indicator, majority of students were active to ask, having desire to respond into statements of friend and teacher, cooperative well in group, and confident, so that scientific attitude of students that observed was good.

## 4 CONCLUSIONS

Application of guided inquiry model with experiment method accomplishes student scientific attitude with percentage of value average 80.81% that included in good category.

## 5 REFERENCES

- Ali, M. (2004). *Ilmu dan Aplikasi Pendidikan*. Bandung : PT Imperial bhakti Utama.
- Candrasekaran. (2014). Developing scientific attitude, critical thinking and creative intelligence of higher secondary school biology students by applying synectics techniques. *International Journal of Humanities and Social Science Invention*, 31(6), 1-8..
- Hermawati. (2012). Pengaruh Model Pembelajaran Inkuiri Terhadap Penugasan Konsep Biologi dan Sikap Ilmiah Siswa SMA Ditinjau dari Minat Belajar Siswa, 6-7. *Skripsi*. Universitas Indonesia.
- Lasley, T. J., Matczynski, T. J., Rowley, J. B. (2002). *Instructional Models Strategies for Teaching in a Diverse Society*. USA: Wadsworth
- Lelly, P., Zulhelmi, Nasir, M. (2013). Sikap ilmiah siswa dalam pembelajaran IPA fisika melalui penggunaan media asli pada siswa kelas VIII SMP Negeri 32 Pekanbaru, 4. *Skripsi*. Universitas Riau.

- Lestari, W., Susilowati, E., Mahardiani, L., & Nugroho, A. (2012). Pembelajaran kimia melalui pendekatan Contextual Teaching and Learning (CTL) dengan metode praktikum yang telah dilengkapi dengan lembar kerja siswa dan diagram vee ditinjau dari sikap ilmiah. *Jurnal Pendidikan Kimia*, 1(1), 115.
- Natalina, M., Yusuf, Y. Ermadiani. (2013). Penerapan strategi pembelajaran inkuiri terbimbing untuk meningkatkan sikap ilmiah dan hasil belajar biologi siswa kelas VIII 7 SMP Negeri 14 Pekanbaru tahun ajaran 2012/2013. *Jurnal Biogenesis*, 9(2), 32.
- Nurhidayah, R., Irwandi, D., Saridewi, N. (2015). Pengembangan modul inkuiri terbimbing pada materi larutan elektrolit dan non elektrolit. *Edusains*, 7(1), 36 – 47. doi: 10.15408/es.v7i1.1397
- Pranolo, H. H. (2013). Pengaruh Penggunaan Metode Eksperimen Terhadap Hasil Belajar Siswa Kelas V Pada Mata Pelajaran IPA SDN Sukomulyo Ngaglik Sleman. *Skripsi*. Universitas Negeri Yogyakarta, Indonesia.
- Puspita, A. T., & Jatmiko, B. (2013). Implementasi model pembelajaran inkuiri terbimbing (guided inkuiri) terhadap keterampilan berpikir kritis siswa pada pembelajaran fisika materi fluida statis kelas XI di SMA Negeri 2 Sidoarjo. *Jurnal Inovasi Pendidikan Fisika*. 2(3), 122
- Riduwan. (2013). *Belajar mudah penelitian untuk guru-karyawan dan peneliti pemula*. Bandung: Alfabeta
- Rustaman. (2005). *Strategi belajar mengajar biologi*. Malang: IKIP Malang UM Press.
- Sanjaya, W. (2006). *Strategi pembelajaran berorientasi standar proses pendidikan*. Jakarta : Kencana Prenada Media
- Santiasih, N. L., Marhaeni, A. A. I. N., Tika, I. N. (2013). Pengaruh model pembelajaran inkuiri terbimbing terhadap sikap ilmiah dan hasil belajar IPA siswa kelas V SD NO 1 Kerobokan Kecamatan Kuta Utara Kabupaten Badung tahun pelajaran 2013/2014. *e-Journal Program Pascasarjana Universitas Pendidikan Genesha Program Studi Pendidikan Dasar*. 3, 4.
- Sardinah, Tursinawati, Noviyanti, A. (2012). Relevansi sikap ilmiah siswa dengan konsep hakikat sains dalam pelaksanaan percobaan pada pembelajaran IPA di SDN Kota Banda Aceh. *Jurnal Pendidikan Serambi Ilmu*. 13(2), 73.
- Sukmadinata, N.S.. (2012). *Metode penelitian Pendidikan*. Bandung : PT Remaja Rosdakarya.
- Suryawati, E., Osman, K., Meerah, T. S. M. (2010). The effectiveness of rangka contextual teaching and learning on students' problem solving skills and scientific attitude. *Journal of Science direct: Procedia Social and Behavioral Sciences*, 9, 1720
- Susanti, N., Fadiawati, N., Tania, L., Kadaritna, N. (2012). Peningkatan keterampilan berpikir fleksibel dengan menggunakan model pembelajaran inkuiri terbimbing. *Jurnal Pendidikan dan Pembelajaran Kimia*, 2(3), 1-11
- Toharudin, U., Hendrawati, S., Rustaman, A. (2011). *Membangun literasi sains peserta didik*. Bandung : Humaniora.
- Trianto. (2009). *Mendesain model pembelajaran inovatif-progresif*. Jakarta: Kencana Prenada Media Group.
- Wahyudiati, D. (2010). Pengembangan perangkat pembelajaran berorientasi model pembelajaran diskusi pada pokok bahasan energi dan perubahannya untuk menumbuhkan sikap ilmiah siswa. *Jurnal Inovasi dan Perkayasa Pendidikan*, 3 (1), 361-378.
- Zulfiani., Feronika, T., Suartini, K. (2009). *Strategi pembelajaran sains*. Jakarta: Lembaga Penelitian UIN Jakarta.