



## INTEGRATED SCIENCE LEARNING USING SCIENTIFIC APPROACH IN JUNIOR HIGH SCHOOLS IN SEMARANG REGENCY

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### ABSTRACT

The scientific approach is strongly suggested to be used in implementing “Curriculum of 2013” (K13) by Department of Education. This study aimed to identify whether integrated science learning was implemented in Junior High Schools in the Semarang Regency, Indonesia used a scientific approach, how it was implemented, and what problems that emerged in it. This research was conducted in 13 Junior High Schools in Semarang Regency, Central Java Province that implemented K13 during the odd semester in 2016/2017 school year by interviewing the science teachers in each school to determine how scientific approach was implemented in their schools. Based on the interview results analyzed using qualitative description methods, K13 was implemented, teachers used a scientific approach to teach science subject in their classes, and they integrated science materials in the curriculum. However, not all of the science materials were able to be integrated and taught using scientific approach because the teachers’ educational background is not from science education. Furthermore, the availability of the teachers and students books, the laboratory facilities, and funds were very limited. Many solutions such as using various learning models were done, but they were not be able to maximize the learning even though the students were active and enthusiastic in learning. Therefore, the teachers really need real supports to enhance their learning using scientific approach.

**Keywords:** integrated science learning, scientific approach, curriculum of 2013, junior high school

### INTRODUCTION

Scientific approach is one of the learning approaches that should be used in learning by teachers applying Curriculum of 2013 (K13). According to Department of Education (Permendikbud No. 103/2014), scientific approach involves five learning experiences i.e. observing, questioning, experimenting, associating, and communicating. Learning using scientific approach is a learning process that is designed to make students actively construct the concepts or principles using steps of observing to identify problems, stating the problems, stating the hypothesis, gathering data using various methods,

analyzing data, making conclusion, and communicating the concepts or principles that are found. Those steps are also mentioned by Nezvalova (2007) and Chen et al (2014) in their studies. Scientific approaches are used to give students a comprehensive understanding to know and understand various materials, that information comes from anywhere, anytime, and independent from teachers. Therefore, expected learning state is directed to stimulate students finding out various sources by doing observation, not only being given ones (Wijayanti, 2014).

Learning science is something that students do, not something that is done to them. It is a process that gives meaning and

build understanding through students' interaction with the world. The combination of scientific knowledge with reasoning and thinking skills develop actively students' understanding of science (Nezvalova, 2007)

Learning using scientific approach gives benefit for students. According to the study of Prahastiwi *et al.* (2014), it is able to improve students' achievements and their curiosity to the material. Purnama *et al.* (2014) and Juliyanto (2017) also finds that it is able to improve students' science process skills and problem solving skills. According to those studies, scientific approach is able to improve students' ability on the aspects of cognitive, psychomotor, and curiosity.

Based on the survey results on several schools in Salatiga City and Semarang Regency, it has been found that most teachers still apply teacher-centered approach. As a result, even though teachers implement K13, students' achievements could not improve significantly. Another problem is that teachers have not had references of learning strategies using scientific approach yet. Based on those problems, the further analysis of the implementation of scientific approach in Junior High Schools in Semarang Regency that apply K13 was conducted in order to give solutions for those science teachers.

This study aims to identify whether integrated science learning that have been implemented in Junior High Schools in Semarang Regency using scientific approach, how it is implemented, what problems that emerge in it. This study is useful for having a database of Junior High Schools in Semarang Regency that have been using scientific approach in implementing K13, knowing how they implement it, and making a database of problems that emerge from it. Hopefully, this research will also be useful for the curriculum developer in order to give solution for Junior High Schools science teachers on how to use scientific approach in their learning and to advise the governor about the implementation of Curriculum of

2013 in integrated science learning in Junior High Schools in Semarang Regency.

## RESEARCH METHODS

This research was conducted on Junior High Schools in Semarang Regency, Central Java Province for science subject during the odd semester in 2016/2017 School year. There are 13 schools implementing Curriculum of 2013. 19 science teachers in 13 schools involved in this research had been interviewed. The interview with the science teachers was done to get information of how they implement scientific approach in their science classes during the odd semester in 2016/2017 school year and what problems emerge in it.

In order to gain the data needed in this study, the interview guidelines consisting of seven main questions were used and the interview were recorded using a recorder. The questions were (1) How long has the school applied the K13?, (2) During the experience of applying the K13, has the scientific approach been used in the science learning? If it has, were there any difficulties in applying it? If it has not been applied yet, why?, (3) During the Odd Semester in 2016/2017 school year, how was the Integrated Science learning delivered : they have not been integrated yet (they were still separated in each subject) or some of them have already been integrated? If the subjects have not been integrated yet, why? If the subjects have been integrated, what materials have been integrated and how to integrate them? (4) How did the students react/response when the teacher was teaching using the scientific approach?, (5) How did the students react/response when the teacher was teaching using the Integrated Science?, (6) What were the learning models that were often used in the scientific learning?, (7) Can we have the samples of the Lesson Plans (*RPP*) of the Integrated Science that have been made and implemented during the Odd Semester in 2016/2017 school year?

The data gathered from the interview were analyzed using a qualitative descriptive method to find out if the science approach has been implemented in integrated science learning in the classrooms during odd semester of school year 2016/2017 and identify the problems that emerge in it.

## RESULTS AND ANALYSIS

### **Q1. How long has the school applied the K13?**

This study was done in 13 Junior High Schools in Semarang Regency. From those schools, there were 5 Junior High Schools were the pilot schools for Curriculum of 2013 (K13) since 2013/2014 school year. From those 5 schools, one of them had once returned to use the previous curriculum called *KTSP* for a while, and then it continued to apply the K13. The other 8 schools have been applying K13 for 3-7 semesters. Five of them had once returned to use the previous curriculum called *KTSP* for a while, and then continued to apply the K13 some semesters ago. Three other schools have just applied the K13 since this school year.

Five schools implemented K13 for 1 year and another five schools for 4 years. Two schools implemented it for 1,5 years and one school for 2 years. It means that all the responden have been applying K13 in their respective schools.

### **Q2. During the experience of applying the K13, has the scientific approach been used in the science learning? If it has, were there any difficulties in applying it? If it has not been applied yet, why?**

The implementation of K13 in the science learning requires the implementation of scientific approach in the class. The 13 Junior High Schools applied the scientific approach in their classes, although few of them applied it for some materials only. Those who applied it mostly followed the guidelines in the teacher's books, students' book, and other references. It indicates that there are some obstacles when the scientific approach was applied

for all science materials. The teachers face difficulties in implementing scientific approach to all materials in science subject.

Those obstacles mostly included the following factors: students' condition, teacher's condition, and facilities. Twelve teachers complained that only few students used to be taught using scientific approach, and it was difficult to make the students to be active in the learning process. They said that "*Students are not use to be taught with scientific approach so that they did not response us or asked non-scientific questions.*" According to the teachers, only few students tried to create questions so the teachers must give them more stimuli. In addition, the students were not be able to actively involved in the discussion and be independent. On the other hand, the science teachers' educational background mostly was not bachelors of science education, but bachelors of physics education or bachelors of biology education or bachelors of chemistry education. Less are bachelors of science education. The difference educational background became another problem when they have to integrate Physics, Biology, and Chemistry into one material. It took a longer time to learn the material beyond their educational background. In fact, the material target must be accomplished in a relatively short time. Besides that, there were some teachers who were not comprehended the assignment methods using *K13* yet.

Another teachers' concern was on the large number of the materials with a very limited time that made it difficult to teach students deeply and thoroughly. Furthermore, the teacher's books and the student's books were not adequate as the teachers also need other references, both from other books and from internet. Unfortunately, even though there are many e-books of integrated science literatures but mostly schools had no wi-fi/internet access yet, so the teachers and students could not download it easily. Some schools received a package of teacher's books and student's books, but the number of the books was inadequate to facilitate all students. On the

other hand, there were some schools which did not receive any guidance books yet. The other facilities, the laboratory equipments, were very limited. A large amount of fund was really needed to purchase the laboratory equipments, however the school's budget was also limited. It was stated by five teachers (Teacher B, D, M, O, and S) "*Our school have limited lab equipments, internet access, and references*".

Those problems must surely be overcome. The teachers tried hard to find the solutions for those problems. In order to make the students to be active, the teachers kept trying to apply the learning approach and the scientific learning. In addition, they also assigned the students to do the take home assignments so that the students would be encouraged to find out more knowledge on their own.

**Q3. During the Odd Semester in 2016/2017 school year, how was the Integrated Science learning delivered: they have not been integrated yet (they were still separated in each subject) or some of them have already been integrated? If the subjects have not been integrated yet, why? If the subjects have been integrated, what materials have been integrated and how to integrate them?**

To overcome the problem of integrating the materials because of the teachers' educational background, the teachers from two or three different educational backgrounds collaborated to discuss about it and they observed it from the physical, biological, and chemical specific point of view. To solve the problem of the material depth, the teachers applied other references provided in the library (they usually used books from the previous curriculum called *KTSP*) and they tried to browse the materials from the internet if the school provided internet access.

To overcome the limited number of laboratory equipments, the teachers created their own learning media from simple equipment or they asked the students to

create some media by working in group so that they would not be burdened. Some teachers emphasized that the variety of learning media are really important in stimulating the students' enthusiasm to learn. Therefore, the teachers must be creative in creating and providing various media in the learning process.

Most of the schools present the Integrated Science learning by integrating physics, biology, and chemistry in a material based on the essence of Integrated Science. However, they apply it only for some materials based on the teacher's books or the student's books or based on the other reference books. The examples of integrating the materials were combining the material of vision sense and optical tools, hearing sense, listening process, and sound, nerve system and electricity, transportation system (blood circulation) and hydro-statistical pressure, magnetism and animals migration, living things growth and magnitude measurement, acid test on alkaline salt, pollution and booming algae, energy and photosynthesis, etc.

Nevertheless, there were some teachers presenting the materials separately on each subject like physics or biology. They argued that all of the materials could be integrated as long as they were learnt and the teacher applied the appropriate method. Conversely, there were some other teachers who argued that the more they integrated the material, the more unrelated it was to each other. Besides, the teachers who still felt awkward in integrating the materials would not be able to maximize their teaching. It needs a great concern for the school and related parties to provide trainings or models of integrating the materials and supporting books to facilitate the teachers.

**Q4. How did the students react/response when the teacher was teaching using the scientific approach?**

**Q5. How did the students react/response when the teacher was teaching using the Integrated Science?**

Even though there were many problems and teachers' complaints about applying the scientific approach, the students' response was quite positive. When they were taught using the scientific approach, most of them became active, pleased, enthusiastic, and motivated to learn although at the beginning they complained since they had a pile of assignments. They were happy as they did many activities such as lab works and field observations. They became more active in asking questions, in discussing, and in finding out more knowledge and insight about the lesson. They became more confident during the presentation and they were contented when their output was appreciated. It would surely become a consolation for the teachers. A similar result also took place when they presented the Integrated Science. The students understood the material more than before as it was integrated with daily life facts. This part needs further observation. In fact, the observation of classroom situation during learning was not yet done. The data was get from the interview with the teachers.

**Q6. What were the learning models that were often used in the scientific learning?**

**Q7. Can we have the samples of the Lesson Plans (RPP) of the Integrated Science that have been made and implemented during the Odd Semester in 2016/2017 school year?**

The learning itself cannot be separated from the learning methods and learning models. In order to create a good material package, the teachers applied discovery learning, demonstration, lab works, problem based learning, and project based learning. Besides that, some teachers have ever applied cooperative learning (jigsaw), inquiry, guided inquiry, games, field observation, case study, etc. It caused the students to be under the condition to do the discussion, to deliver the presentation, and to do the experiments. Unfortunately, only some of the teachers prepared their own Lesson Plans (RPP). Some of them only downloaded the Lesson Plan form the internet and they did not prepare their own

Lesson Plan as they waited for the assistant teacher's Lesson Plan. It must be highly noticed since the Lesson Plan (RPP) is supposed to be made by the teachers because they are "the film director" in the class.

## CONCLUSION

The Junior High Schools in Semarang Regency applying the *K13* implemented the scientific approach and integrated the science materials. However, not all of the materials were integrated and not all of teachers applied the scientific approach. It was caused by the teachers' educational background which was only from a certain subject, such as physics, biology or chemistry. Besides that, the limited availability of the teachers' books, students' books and laboratory facilities also caused the problems. A lot of alternative solutions had been done because of the limited budget, but they were not able to support the maximum learning yet. A variety of learning models had been applied, but they could only be succeed using the discovery learning, problem based learning, project based learning, and cooperative learning (jigsaw). Nevertheless, the students were still active and enthusiastic in learning.

Based on the following problems stated above, it is highly expected that the government and the educational practitioners can assist the teachers in maximizing the implementation of the scientific approach and the integration of science materials at schools by providing sufficient trainings of Integrated Science Lesson Plan (RPP IPA) using the scientific approach with various learning methods and models. In addition, the availability of more teacher's books, student's book, and other learning references and recourses is strongly needed to enrich the learning.

## REFERENCES

Chen, L.C., Chen, Y., & Ma, W. (2014). *Effects of Integrated Information Literacy on Science Learning and*

- Problem-solving among Seventh-grade Students*. Malaysian Journal of Library and Information Science, 19(2), 35-51. Retrieved from <https://pdfs.semanticscholar.org/eaba/ce0dece25e40a048d5909a95bc4b9855922e.pdf>
- Juliyanto, E. (2017). Model Pembelajaran IPA dengan Pendekatan Inkuiri Berbasis Proyek untuk Menumbuhkan Kompetensi Menyelesaikan Masalah [*Science Learning Model with a Project Based Inquiry Approach to Cultivate Problem Solving Competencies*]. Indonesian Journal of Science and Education, 1(1), 36-42. Retrieved from <http://jurnal.untidar.ac.id/index.php/ijos/article/view/419>
- Nezvalova, D., (2007) *The Constructivist Perspective and Teaching Integrated Science : Making Science Accessible to All Students*. The International Journal of Learning, 14(6), pp. 133-140. Retrieved from <http://web.b.ebscohost.com/ehost/pdfviewer/pdfviewer?vid=0&sid=60d93aba-5027-4573-817c-e152d00eea90%40pdc-v-sessmgr01>
- Purnama, T., Haris, M., & Arsyad, M. (2014). Pengaruh Pendekatan Ilmiah dalam Pembelajaran Fisika terhadap Keterampilan Proses Sains Peserta Didik Kelas X SMAN 1 Marioriwawo Kabupaten Soppeng [*The Influence of Scientific Approach in Physics Learning toward Students' Science Process Skills of Grade X SMAN 1 Marioriwawo Kabupaten Soppeng*]. Jurnal Sains dan Pendidikan Fisika, 11(2), 150–154. Retrieved from <http://ojs.unm.ac.id/index.php/JSdPF/article/view/1482>
- Prahastiwi, R. B. (2014). Penerapan Pendekatan Saintifik untuk Meningkatkan Karakter Rasa Ingin Tahu dan Prestasi Belajar Siswa Kelas X MIA SMA Negeri 6 Malang [*The Implementation of Scientific Approach to Improve Curiosity Character and Students' Achievement of Grade X MIA SMA Negeri 6 Malang*]. Universitas Negeri Malang. (<http://library.um.ac.id/ptk/index.php?mod=detail&id=67008>).
- Sudjana (2010). Pengantar Evaluasi Pendidikan [*Introduction of Education Evaluation*], Jakarta: Raja Grafindo Persada.
- Sugiyono (2012). Metode Penelitian Kuantitatif, Kualitatif, dan R&D [*The Quantitative, Qualitative, and R&D Methods of Research*], Alfabeta: Bandung.
- Trianto (2010). Mendesain Model Pembelajaran Inovatif-Progresif [*Designing Inovative-Progressive Learning Model*], Jakarta: Kencana Prenada Media Group.
- Wijayanti, A. (2014). Pengembangan Autentic Assesment Berbasis Proyek dengan Pendekatan Saintifik untuk Meningkatkan Keterampilan Berpikir Ilmiah Mahasiswa [*Development of Project Based Authentic Assessment with Scientific Approach for Improving Students' Scientific Thinking Skills*]. Jurnal Pendidikan IPA Indonesia. JPII 3 (2) (2014), 102-108. Retrieved from [https://journal.unnes.ac.id/artikel\\_nju/jpii/3107](https://journal.unnes.ac.id/artikel_nju/jpii/3107)