# Analysis of Science Learning Outcomes of Class VIII Students of Air Satan State Junior High School: Impact of Problem Based Learning Models

Hellen Anggraini[1], Ria Dwi Jayati[1], Harmoko[1*], Nur Hayati[2]

[1] Universitas PGRI Silampari, Lubuklinggau 31628, Indonesia
[2] Universitas Hasyim Asy'ari Tebuireng Jombang, Jombang, Indonesia

**Abstract:** Many students have not yet completed the science learning process, so there is no need for students to take part in the improvement program to meet the Minimum completion criteria. The purpose of this study was to analyze the science learning outcomes of VIII-grade students of Air Setan Middle School through the Problem Based Learning model. The design of this study used a design that was created pretest-posttest Group Design. Samples are taken at random (simple random sampling). Data collection techniques using essay questions, this test is done twice, namely before (pre-test) and followed (post-test) learning process. Data analysis techniques using the t-test, in using this t-test, both the experimental class and the control class data must be normal and have a homogeneous variant that is tested for normality and homogeneity before testing the hypothesis with the t-test. Learning outcomes using problem-based learning are better because this learning involves students solving problems, by means of their creative ideas and ideas, so students do not easily forget the lessons they have learned.

**Keywords:** Analysis; Junior High School; Learning outcomes; Natural science; Problem Based Learning

## Introduction

When we talk about learning, we talk about how to change the behavior of a person or individual through the various experiences they have taken (Suprihatiningrum, 2013). Difficulties in learning IPA are caused by the model of delivery of teachers in managing learning that is less effective and interesting (Lestari, 2011; Surayya et al., 2014). Teachers in learning are still fixated on one model, the traditional model (Setyorini et al., 2011; Syafi'i et al., 2011). In traditional learning the classroom atmosphere tends to be centered on the teacher so as to make students passive (Trianto, 2011; Kusumaningtias, 2013).

Efforts made to improve the quality of students appear to be not optimal. This is evident from the results of observations made by researchers in the learning process carried out in class VIII Air Satan Middle School. Based on the results of interviews with teachers who teach IPA classes VIII in Air Satan Middle School, it is known that the learning process they do is still dominated by lectures (teacher center). Air Satan State Junior High School Minimum Completion Criteria which has been set by the school is 72. Based on the number of grade VIII students, 97 people, 91 students who have not completed or 77.80% and 6 students who have completed or 22.20%, so they do not few students attend remedial programs to meet the Minimum Completion Criteria. This means that these results have

_____
* Corresponding Author: putroharmoko@gmail.com

not yet reached the specified target. The above problems need to look for solutions so that the learning that is carried out can provide optimal results and be able to improve student learning outcomes in IPA learning.

One of them is by applying a learning model that is able to create a better learning process based on constructivism, one of which is the Problem Based Learning learning model (Hasnunidah, 2012; Azizah et al., 2014; Wasonowati et al., 2014; Nurqomariah et al., 2015; Mayasari et al., 2016; Sumartini, 2018). Problem Based Learning is a learning model in which students are confronted from the beginning on a problem then followed by a process of finding information that is (student centered) (Siswanto et al., 2012; Widodo, 2014; Supiandi & Julung, 2016). Problem based learning is a learning that is designed and developed to develop students' ability to solve problems.

The Problem-based Learning Model (PBL) is one of the recommended learning models in the 2013 curriculum as one of the innovative learning models (Rahayu & Laksono, 2015). This model will train students to be able to organize their own knowledge, develop independence and confidence (Wulandari et al., 2011; Fakhriyah, 2014; Sudewi et al., 2014). Some of the advantages of Problem Based Learning are as follows: students are accustomed to dealing with problems and solving them, social solidarity due to frequent discussions, bringing teachers and students closer and experimental methods for problems that need experimentation (Warsono & Hariyanto, 2012; Fitriyani et al., 2015). This study attempts to analyze the science learning outcomes of class VIII SMP Negeri Air Setan using the Problem Based Learning model.

## Method

### Research design

The design of this study uses a design in the form of pretest-posttset Group Design where students are grouped into two groups, namely the experimental group and the control group. The experimental group uses the Problem Based Learning model, while the control group uses the Conventional learning model. Based on the description above, the research design can be seen in Table 1.

**Table 1.** Pretest-postest Control Group Design

| Group | Pre-test | Treatment | Post-test |
|---|---|---|---|
| Eksperiment Class | $O_1$ | X | $O_2$ |
| Control Class | $O_3$ | Y | $O_4$ |

### Population dan Sample

The population in this study were all eighth grade students of Air Satan Public Middle School, which consisted of 4 classes and amounted to 97 students.

Samples are taken at random (simple random sampling). Sampling is done by lottery, which draws all classes VIII of 4 classes, namely classes VIII.1, VIII.2, VIII.3 VIII.4. After the draw, it can be 1 class that will be used as a control class, namely class VIII.2 and class that will be used as an experimental class, namely class VIII 4.

### Data collection techniques

Data collection techniques using essay questions, the test was carried out twice, namely before (pre-test) and after (post-test) learning process.

### Data analysis techniques

Data analysis techniques using t-test, in using this t-test, both the experimental class and the control class data must be normal and have a homogeneous variance so that normality and homogeneity tests are carried out before testing the hypothesis with t-tests.

## Result and Discussion

Based on the results of the pre-test and post-test normality test results are all in the normal data category, as well as homogeneity tests all in the homogeneous data category. Learning outcomes using the problem posing model, can be seen in the following Figure 1.
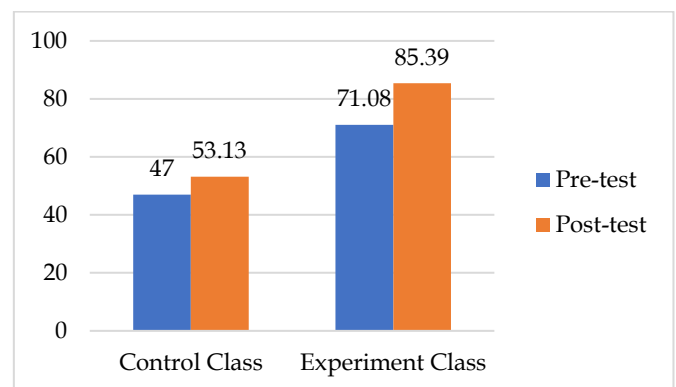


**Figure 1.** Student Pre Test and Post Test Results

The results of the t-test comparison regarding the final ability of students obtained t count = 3.41 with degrees of freedom df = $ne + nk - 2 = 23 + 24 - 2 = 45$ and $\alpha = 0.05$, the value of t table = 1.684 Then t test = 3.41 ≥ t table = 2.000, this means that Ho was rejected and Ha was accepted. Thus the hypothesis proposed in this study can be accepted truthfully, so that it can be concluded that there is a significant influence on the Problem Based Learning model on the learning outcomes of IPA students in class VIII Air Satan Middle School.

Based on the results of research conducted by researchers, at the time of the pre-test the average score of the initial abilities of students in the control and

experimental classes was not much different, this is because the average value of the control class 47 and the experimental class 53.13. After the pre-test, the experimental class is given treatment using the Problem Based Learning model. While the control class uses conventional learning with questions and answers and information methods. In conducting research, the subjects presented in the experimental class and the control class are the same material that is the digestive system in humans.

Based on observations made by researchers, it appears that in the first meeting the learning process in the experimental class was not as expected, because students were less accustomed to working together in groups, and the activity and mastery of student material in the classroom was not optimal. At the beginning of the implementation of learning with the problem based learning model experienced a few obstacles. Learning with this model is new for students, so students need time to adjust. When students are divided into groups there is a bit of noise in the classroom, this is because students are still not accustomed to forming study groups and explaining the material to their friends (Khoiri et al., 2013; Nurqomariah et al., 2015; Tyas, 2017; Abdurrahman, 2017).

The second meeting, in the experimental class the students were conditioned and began to adapt to their respective group members. In addition, students begin to be interested and enthusiastic about conducting experiments. It was proven when students were asked to give opinions about the digestive system organs in humans, students were also quite active and interested in giving their opinions even though they were not very precise and focused on the material. This is also experienced by (Wasonowati et al., 2014; Hartini et al., 2014; Riau & Junaedi, 2016), in his research at this second meeting students no longer feel difficulties, because through the Problem Based Learning model can create interactions between students, as seen from their faiths who exchange ideas and work together in group discussions, so that those who have been passive tend to be lazy in their opinions, with this activity can encourage their activities they become better in learning because students can exchange opinions and of course students' understanding of a material increases.

While in the control class learning the researcher conducted two meetings in the learning process by providing treatment using conventional learning. In the control class the researcher looked at conventional learning as students only listened and recorded the information conveyed by the researcher. This is also supported by (Herman, 2007) which suggests that conventional learning is characterized by: teacher-centered, through the student lecture method, questions from students rarely arise, class activities that are often done are just taking notes and copying. This learning activity does not accommodate the development of students' abilities in problem solving, connection reasoning, and communication. As a result, students' high cognitive abilities are very weak.

After completing the learning process, the next step is a post-test. But before it is carried out post-test students answer the student worksheets that have been given to each group just carried out a 2-hour post-test, Post-test is given to the experimental class and the control class with the aim to find out the average score of students' final ability after the learning process as benchmarks to determine the effect of Problem Based Learning models on students' science learning outcomes. After conducting a post-test and checking the results, the researcher found that the answers of the experimental class students were better than the control class students. This can be seen based on post-test data analysis. In the experimental class and control class the ability to finally increase, but the increase in the control class is not significant, even tends to be small.

Based on the results of the study of the similarity of the two final test average values obtained t test = 2.04 and t table = 2.021. This means that the learning outcomes of science students who use the Problem Based Learning model are better than student learning outcomes by using conventional learning with questions and answers and information methods. Thus, there is a significant influence on the Problem Based Learning model on the learning outcomes of Natural IPA students of VIII grade Air Satan Middle School. Learning outcomes by using problem based learning for the better because this learning emphasizes the direct involvement of students in problem solving, with their creative ways and ideas, so students do not easily forget the lessons they have learned.

The findings in this study are consistent with the results of previous studies. Learning using the problem based learning model, students become more enthusiastic about learning, students are more responsive to receiving messages from other students, students are more active, and students' sense of responsibility towards themselves and other students increases. So that student learning outcomes are increasing and the model of problem based learning is very influential on student learning outcomes (Wahyudi et al., 2015; Listiawati et al., 2017; Khoiriyah & Husamah, 2018; Ramdiah et al., 2018; Lukitasari et al., 2019). Problem-based learning helps students to get information that is already in their minds and construct their own basic knowledge and complex knowledge (Malmia et al., 2019).

Problem Based Learning helps students in developing thinking skills (Mardi et al., 2021) and problem solving skills (Aslan & Duruhan, 2021),

becoming independent students (Arends, 2009) train students to develop and explore problems by increasing their awareness of different ways of thinking for solving a problem (Tan, 2009). Increased ability to solve problems and cognitive learning outcomes of students through learning with the Problem Based Learning model is also suspected because the Problem Based Learning model is based on the principle that students not only gain knowledge but also that they know how to apply this knowledge in real situations (Sockalingam & Schmidt, 2011; McQuade et al., 2018) including learning how to study (Ibrohim & Nur, 2002).

## Conclusion

Based on the results of the study it can be concluded that there is a significant influence on the Problem Based Learning model on the learning outcomes of IPA students of class VIII Air Satan Middle School. With this research, teachers are expected to be able to use the PBL model so that learning is more interesting and makes.

## References

Abdurrahman. (2017). Efektivitas dan Kendala Pembelajaran Sains Berbasis Inkuiri terhadap Capaian Dimensi Kognitif Siswa: Meta Analisis. *Tadris: Jurnal Keguruan Dan Ilmu Tarbiyah*, 2(1), 1–9. https://doi.org/10.24042/tadris.v2i1.1206

Arends, R. (2009). *Learning to Teach. Sixth Edition*. McGrawHill.

Aslan, S. A., & Duruhan, K. (2021). The effect of virtual learning environments designed according to problem-based learning approach to students' success, problem-solving skills, and motivations. *Education and Information Technologies*, 26(3), 2253–2283.

Azizah, N., Fatmaryanti, S. ., & Ngazizah, N. (2014). Penerapan Model Pembelajaran Konstruktivisme Berbasis Problem Based Learning (PBL) Untuk Meningkatkan Kemampuan Berfikir Kritis Pada Siswa SMA Negeri 1 Kutowinangun Kelas X Tahun Pelajaran 2013 / 2014. *Radiasi*, 5(2), 24–28.

Fakhriyah, F. (2014). Penerapan Problem Based Learning dalam Upaya mengembangkan Kemampuan Berpikir Kritis Mahasiswa. *Jurnal Pendidikan IPA Indonesia*, 3(1), 95–101. https://doi.org/10.15294/jpii.v3i1.2906

Fitriyani, R., Corebima, A., & Ibrohim, I. (2015). Pengaruh Strategi Pembelajaran Problem Based Learning dan Inkuiri Terbimbing Terhadap Keterampilan Metakognitif, Berpikir Kritis, dan Hasil Belajar Kognitif Siswa SMA. *JPS (Jurnal Pendidikan Sains)*, 3(4), 186–200. https://doi.org/10.17977/jps.v3i4.8170

Hartini, T. ., Kusdiwelirawan, A., & Fitriana, I. (2014). Pengaruh Berpikir Kreatif Dengan Model Problem Based Learning (PBL) Terhadap Prestasi Belajar Fisika Siswa Dengan Menggunakan Tes Open Ended. *Jurnal Pendidikan IPA Indonesia*, 3(1), 8–11. https://doi.org/10.15294/jpii.v3i1.2902

Hasnunidah, N. (2012). Keterampilan Berpikir Kritis Siswa SMP pada Pembelajaran Ekosistem Berbasis Konstruktivisme Menggunakan Media Maket. *Jurnal Pendidikan MIPA*, 13(1), 64–74. https://www.neliti.com/id/publications/121537/keterampilan-berpikir-kritis-siswa-smp-pada-pembelajaran-ekosistem-berbasis-kons

Herman, T. (2007). Pembelajaran Berbasis Masalah untuk Meningkatkan Kemampuan Berpikir Matematis Tingkat Tinggi Siswa Sekolah Menengah Pertama. *Educationist*, 1(1), 47–56. http://ejournal.sps.upi.edu/index.php/educationist/article/view/28/22

Ibrohim, & Nur. (2002). *Pengajaran Berbasis Masalah*. Universitas Negeri Surabaya.

Khoiri, W., Rochmad, & Cahyono, A. . (2013). Problem Based Learning Berbantuan Multimedia Dalam Pembelajaran Matematika Untuk Meningkatkan Kemampuan Berpikir Kreatif. *Unnes Journal of Mathematics Education.*, 2(1), 114–121. https://doi.org/10.15294/ujme.v2i1.3328

Khoiriyah, A. ., & Husamah. (2018). Problem-based learning: Creative thinking skills, problem-solving skills, and learning outcome of seventh grade students. *Jurnal Pendidikan Biologi Indonesia*, 4(2), 151–160. https://doi.org/10.22219/jpbi.v4i2.5804

Kusumaningtias, A., Zubaidah, S., & Indriwati, S. . (2013). Pengaruh Problem Based Learning dipadu Strategi Numbered Heads Together terhadap Kemampuan Metakognitif, Berpikir Kritis, dan Kognitif Biologi. *Jurnal Penelitian Kependidikan*, 23(1), 33–47. http://jpk.lemlit.um.ac.id/wp-content/uploads/2014/08/02-Anyta-Kusumaningtyas-OK.pdf

Lestari, N. Y. . (2011). Pengaruh Model Pembelajaran Berbasis Masalah (Problem- Based Learning) Dan Motivasi Belajar Terhadap Prestasi Belajar Fisika Bagi Siswa Kelas VII SMP. *Jurnal Teknologi Pembelajaran Indonesia*, 1(2), 1–21.

Listiawati, W., Gunawan, & Sutrio. (2017). Pengaruh Penerapan Model Pembelajaran Berbasis Masalah Berbantuan Simulasi Interaktif Terhadap Hasil Belajar Fisika Siswa Kelas VIII SMPN 1 Pujut Tahun Pelajaran 2013/2014. *Jurnal Pendidikan Fisika Dan Teknologi*, 1(1), 82–86. https://doi.org/10.29303/jpft.v1i1.239

Lukitasari, M., Purnamasari, I., Utami, S., & Sukri, A. (2019). Blended-Problem-Based Learning: How its impact on students' critical thinking skills? *JPBI*

*(Jurnal Pendidikan Biologi Indonesia)*, *5*(3), 425–434. https://doi.org/10.22219/jpbi.v5i3.10048

Malmia, W., Makatita, S. H., Lisaholit, S., Azwan, A., Magfirah, I., Tinggapi, H., & Umanailo, M. C. B. (2019). Problem-based learning as an effort to improve student learning outcomes. *International Journal of Scientific and Technology Research*, *8*(9), 1140–1143.

Mardi, Fauzi, A., & Respati, D. K. (2021). Development of students' critical thinking skills through guided discovery learning (Gdl) and problem-based learning models (pbl) in accountancy education*. *Eurasian Journal of Educational Research*, *95*(3), 210–226. https://doi.org/10.14689/EJER.2021.95.12

Mayasari, T., Kadarohman, A., Rusdiana, D., & Kaniawati, I. (2016). Apakah Model Pembelajaran Problem Based Learning Dan Project Based Learning Mampu Melatihkan Keterampilan Abad 21? *Jurnal Pendidikan Fisika Dan Keilmuan (JPFK)*, *2*(1), 48–55. https://doi.org/10.25273/jpfk.v2i1.24

McQuade, R., Wiggins, S., Ventura-Medina, E., & Anderson, T. (2018). Knowledge disagreement formulations in problem-based learning tutorials: balancing pedagogical demands with 'saving face.' *Classroom Discourse*, *9*(3), 227–243.

Nurqomariah, Gunawan, & Sutrio. (2015). Pengaruh Model Problem Based Learning Dengan Metode Eksperimen Terhadap Hasil Belajar Ipa Fisika Siswa Kelas VII SMP Negeri 19 Mataram Tahun Pelajaran 2014/2015. *Jurnal Pendidikan Fisika Dan Teknologi*, *I*(3), 173–178.

Rahayu, R., & Laksono, E. . (2015). Pengembangan Perangkat Pembelajaran IPA Berbasis Problem Based Learning Di SMP. *Jurnal Kependidikan*, *45*(1), 29–43. https://doi.org/10.21831/jk.v45i1.7184

Ramdiah, S., Abidinsyah, H., & Mayasari, R. (2018). Problem-based learning: Generates Higher-Order Thinking Skills of Tenth Graders in Ecosystem Concept. *Jurnal Pendidikan Biologi Indonesia*, *4*(1), 29–34. https://doi.org/10.22219/jpbi.v4i1.5490

Riau, B. E. ., & Junaedi, I. (2016). Analisis Kemampuan Pemecahan Masalah Matematik Siswa Kelas VII Berdasarkan Gaya Belajar Pada Pembelajaran PBL. *Unnes Journal of Mathematics Education Research*, *5*(2), 166–177.

Setyorini, U., Sukiswo, S. ., & Subali, B. (2011). Penerapan Model Problem Based Learning Untuk Meningkatkan Kemampuan Berpikir Kritis Siswa Kelas. *Jurnal Pendidikan Fisika Indonesia*, *7*(1), 52–56. https://doi.org/10.24246/j.sw.2019.v35.i1.p33-41

Siswanto, Maridi, & Marjono. (2012). Pengaruh Model Problem Based Learning ( PBL) Terhadap Kemampuan Memecahkan Masalah Dan Hasil Belajar Kognitif Biologi Siswa Kelas VII SMP Negeri 14 Surakarta Tahun Pelajaran 2011 / 2012. *Jurnal*

*Pendidikan Biologi*, *4*(2), 53–59.

Sockalingam, N., & Schmidt, H. . (2011). Characteristics of Problems for Problem-Based Learning: The Students' Perspective. *Interdisciplinary Journal of Problem-Based Learning*, *5*(1), 3–16. https://doi.org/10.7771/1541-5015.1135

Sudewi, N. ., Subagia, I. ., & Tika, I. . (2014). Studi Komparasi Penggunaan Model Pembelajaran Problem Based Learning (Pbl) Dan Kooperatif Tipe Group Investigation (Gi) Terhadap Hasil Belajar Berdasarkan Taksonomi Bloom. *Jurnal Pendidikan Dan Pembelajaran IPA Indonesia*, *4*(1), 12–21.

Sumartini, T. (2018). Peningkatan Kemampuan Pemecahan Masalah Matematis Siswa melalui Pembelajaran Berbasis Masalah. *Mosharafa: Jurnal Pendidikan Matematika*, *5*(2), 148–158. https://doi.org/10.31980/mosharafa.v5i2.270

Supiandi, M, I., & Julung, H. (2016). Pengaruh Model Problem Based Learning (PBL) terhadap Kemampuan Memecahkan Masalah dan Hasil Belajar Kognitif Siswa Biologi SMA. *JPS (Jurnal Pendidikan Sains)*, *4*(2), 60–64. https://doi.org/10.17977/jps.v4i2.8183

Suprihatiningrum, J. (2013). *Strategi Pembelajaran*. Ar-Ruzz Media.

Surayya, L., Subagia, I. ., & Tika, I. . (2014). Pengaruh Model Pembelajaran Think Pair Share Terhadap Hasil Belajar IPA Ditinjau Dari Keterampilan Berpikir Kritis Siswa. *Jurnal Pendidikan Dan Pembelajaran IPA Indonesia*, *4*(1), 1–11.

Syafi'i, W., Suryawati, E., & Saputra, A. . (2011). Kemampuan Berpikir Kreatif dan Penguasaan Konsep Siswa Melalui Model Problem Based Learning (PBL) dalam Pembelajaran Biologi Kelas XI IPA SMAN 2 Pekanbaru Tahun Ajaran 2010/2011. *Jurnal Biogenesis*, *8*(1), 1–7. https://doi.org/10.16194/j.cnki.31-1059/g4.2011.07.016

Tan, O. . (2009). *Problem Based Learning Inovation, Using Problem to Power Learning in the 21st Century*. Cengage Learning Asia Pte. Ltd.

Trianto. (2011). *Model Pembelajaran Terpadu*. Bumi Aksara.

Tyas, R. (2017). Kesulitan Penerapan Problem Based Learning Dalam Pembelajaran Matematika. *Tecnoscienza*, *2*(1), 43–52. http://ejournal.kahuripan.ac.id/index.php/TECNOSCIENZA/article/view/26

Wahyudi, A., Marjono, & Harlita. (2015). Pengaruh Problem Based Learning Terhadap Keterampilan Proses Sains Dan Hasil Belajar Biologi Siswa Kelas X Sma the Influence of Problem Based Learning Towards Science Process Skills and Biology Learning Achievement of the X Graders Sma Negeri Jumapolo in. *Bio-Pedagogi*, *4*(1), 5–11.

Warsono, & Hariyanto. (2012). *Pembelajaran Teori Aktif dan Asesmen*. Remaja Rosdakarya.

Wasonowati, R. R. ., Redjeki, T., & Ariani, S. R. . (2014). Penerapan Model Problem Based Learning (PBL) Pada Pembelajaran Hukum-hukum Dasar Kimia Ditinjau Dari Aktivitas Dan Hasil Belajar Siswa Kelas X Ipa Sma Negeri 2 Surakarta Tahun Pelajaran 2013/2014. *Jurnal Pendidikan Kimia (JPK)*, *3*(3), 66–75.

Widodo, L. . (2014). Peningkatan Aktivitas Belajar dan Hasil Belajar Siswa dengan Metode Problem Based Learning pada Siswa Kelas VIIA MTs Negeri Donomulyo Kulon Progo Tahun Pelajaran 2012/2013. *Jurnal Fisika Indonesia*, *17*(49), 32–35. https://doi.org/10.22146/jfi.24410

Wulandari, N., Sjarkawi, & M, D. (2011). Pengaruh Problem Based Learning dan Kemampuan Berpikir Kritis terhadap Hasil Belajar Mahasiswa. *Tekno-Pedagogi*, *1*(1), 14–24.