

## PROFILE OF STUDENT ABILITY OF SCIENCE LITERACY IN BIOLOGY AT THE SECOND GRADE OF JUNIOR HIGH SCHOOL STATE IN MATARAM DISTRICT INDONESIA

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**Abstract:** This research aims to describe the student ability of science literacy in Biology at the second grade of Junior High School State in Mataram district Lombok Island Indonesia. This research used a qualitative descriptive method. The subject of this research was second-grade students. The data collection technique used the instrument ability of science literacy test regarding indicators competence of science literacy. The technique of data analysis was done descriptively. These results show that the student ability of science literacy at 53.7. At the same time, students' achievement is dominated by the aspect of competence in evaluating and designing investigation scientifically at 65.5%. The average in the element of competence explains the phenomenon scientifically at 49.2%, and the lowest competence in interpreting data and evidencing scientifically at 45.8%. Therefore, the student ability of science literacy of Junior High School state in Mataram sub-district including the low category.

**Keywords:** *Competence of science literacy, PISA 2015*

### PENDAHULUAN

Science literacy is defined as the ability to understand knowledge about science and its application in people's lives. According to the Programme for International Student Assessment (PISA) defines science literacy as, "...the ability to engage with science-related issues, and with the ideas of science, as a reflective citizen" (p.13). The purpose of the educational assessment conducted by the Organisation for Economic Co-operation and Development (OECD) through PISA 2015 to review the quality of education of participating countries focusing on reading literacy, mathematical literacy, and science literacy [1]. Science literacy plays an important role in providing students with understanding of the environment, health, economy, and various other issues needed in addressing the development of science and technology [2] and has been recognized internationally as a benchmark of the high-low quality of education of a country [3]. Kincal and Ileriturk [4] stated also that the results of the PISA 2015 test can be a determinant of the level of development of a country to some extent.

Indonesia is one of the participating countries in the assessment conducted by the OECD through PISA from 2000 to 2018 shows that the science literacy skills of Indonesian students are still very low compared to other participating countries. According to Rohana et al. [5] that in 2015 Indonesia's average score began to increase but not so significant and still ranked below that of 62 out of 70 participating countries. The latest data shows indonesia's average score on the science literacy aspect of 396 points and ranks Indonesia 74th out of 79 participating countries [6]. The result is still below the OECD average score of 489 points [7]. That is, the achievement is limited to the

ability to remember the simple facts of science and has not led to the improvement of science literacy skills. Therefore, efforts are needed in improving, training, and improving the science literacy skills of students through science education in schools.

The profile of students' science literacy skills in Indonesia is still very low. As the average science literacy profile of junior high school students in Purwokerto is still low on 3 aspects, namely the content aspect (53.80%), the process aspect (44.04%), and the context aspect (35.08%). The low ability of science literacy of learners is due to the emphasis of science learning on abstract concepts without being balanced by experimental activities and low reading and writing culture of learners [8]. Research by Setiadi [9] and Fidiantara et al (2020) that the science literacy skills of SMPN/MTsN students in Mataram City are still very low. Because it is known because the teaching material is abstract and does not contain issues related to natural phenomena that occur in the environment around learners (contextual). Similar results were also presented Suryani et al [11] that the achievement of learners only two of the four categories of science literacy, namely nominal (95.8%) and functional (4.1%). Low science literacy skills among students give rise to a less responsive attitude to problems that arise in the surrounding environment, especially related to natural phenomena and local excellence [8]. Therefore, there needs to be integration of science literacy in science learning tools to encourage active involvement of learners [12].

Science learning in schools has an important role in creating a young generation who are scientifically literate and through science students are expected to be able to face the advancement of science and technology in the 21st

century [13; 14]. Efforts that can be made by integrating aspects of science literacy competencies in learning tools and science learning processes in schools, implementing pbl model based socioscientific issues [15]. Utilization of e-books [16] develop student worksheets based on science literacy by integrating scientific approaches in science literacy-based learning [17], and apply scientific approaches during the science learning process [18]. Through these efforts, students are expected to show improvement in science literacy skills and foster learning interest. Thus, it is necessary to measure the achievement of science literacy skills in the subjects of Science Biology class VIII SMPN in Mataram Subdistrict through analysis of students' science literacy skills based on the category of science literacy competencies by PISA 2015 consisting of the competence to explain phenomena scientifically, evaluate and design scientific investigations and interpret data and evidence scientifically [19]. So that an overview of the profile of students' science literacy skills in the subjects of Science Biology class VIII SMPN in Mataram Subdistrict.

### RESEARCH METHOD

This type of research is descriptive with qualitative approach. According to Sukmadinata [20] qualitative descriptive research is a type of research that describes events or phenomena in the field to produce descriptive data in the form of written words that can be observed. This study aims to describe the achievements of students' science literacy skills in the subjects of Science Biology grade VIII SMPN in Mataram Subdistrict. The population in this study was all students of grade VIII SMPN in Mataram Subdistrict. Sampling techniques use purposive sampling techniques based on the researcher's objectives.

Science literacy ability data collection techniques using multiple choice tests based on a number of indicators of science literacy competency according to PISA 2015 as many as 20 questions. The validity test is first used to test Pearson Correlation and reliability test using Cronbach's Alpha test. Validity test results show that  $p > 0.05$  (Valid), meaning that the question instrument is eligible to be used to measure students' science literacy skills. While reliability tests show the value of Cronbach's Alpha is between 0.61 to 0.80, it means that the problem is reliable and can be used repeatedly. The answers to each question are then analyzed using descriptive analysis techniques.

$$\text{Science Literacy Achievement} = \frac{\text{Number of Score Earned}}{\text{Maximum Score Count}} \times 100\%$$

Results of achievement analysis on every aspect of science literacy competency in the form of percentage value (%) to be further categorized following Purwanto rules in Table 1.

Tabel 1. Kualifikasi Hasil Persentase Kemampuan Literasi Sains Peserta Didik

Percentage	Category
86%-100%	Very High
76%-86%	High
60%-75%	Medium
55%-59%	Low
≤ 54%	Very Low

### RESULTS AND DISCUSSION

The results showed the average science literacy ability of students in the subjects of Science Biology grade VIII SMPN in Mataram Subdistrict belongs to the low category (57.7). There are differences in the results of each school tested. The average results of science literacy tests of grade VIII smpn students in Mataram Subdistrict can be seen in Table 2.

Table 2. Average Value of Science Literacy Achievement of Grade VIII SMPN Students in Mataram Subdistrict

SMPN Code	Achievement of Student Science Literacy Skills (%)
SMPN A	59,3
SMPN B	57,2
SMPN C	37,7
SMPN D	60,5
Average	53,7

Based on Table 2 SMPN with the largest average achievement of science literacy, SMPN D with a score of 60.5 belongs to the moderate category, while the school with the smallest average science literacy achievement is SMPN C with a score of 37.7 including a very low category. According to Jufri [21] that science-literate learners will be able to apply knowledge about science concepts and processes to assess and filter issues and problems in the surrounding environment and be able to make science decisions to overcome problems in daily life. The competency aspect of science literacy consists of a number of indicators. These indicators are a number of abilities that describe the competence of science literacy. The average achievement of each indicator of science literacy competency of smpn grade VIII students in Mataram Subdistrict is presented in Figure 1.

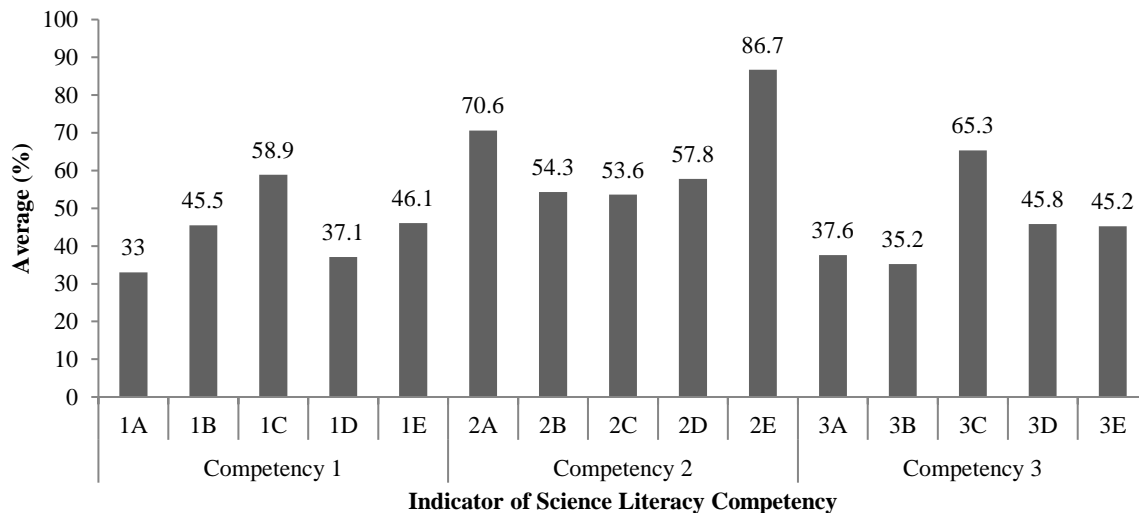


Figure 1. Average Achievement of Science Literacy Competency of SMPN Students in Mataram Subdistrict (1A: Recalling and applying scientific knowledge, A2: Identifying, using and producing an explanation of a model and a representation, A3: Making and giving reasons for an appropriate prediction, A4: Offering an explanation of a hypothesis, A5: Explaining the potential implications of knowledge about science on society; 2A : Identifying questions explored in a given scientific study, A2: Distinguishing questions that can be investigated scientifically, 3A: Exploring how to propose questions scientifically, 4A: Exploring ways to evaluate questions scientifically, 5A: Describing and evaluating how scientists ensure the reliability of a data, the objectivity of a data, and the generalization of an explanation; 3A: Transforming data from one representation to another, 3B: Analyzing and interpreting data, 3B: Analyzing and interpreting data and making conclusions, 3C: Identifying assumptions, evidence, and reasoning in science-related texts, 3D: Distinguishing between arguments based on evidence and theory and those based on other considerations, 3E: Evaluating arguments and evidence from different sources of information).

The achievements of students for each indicator of science literacy competency show different percentage values. In LS 1 competency that explains the phenomenon scientifically, the highest achievement is at indicator 1C of 58.9% and lowest achievement in indicator 1A of 33.0%. While the achievements in LS 2 competency are evaluating and designing scientific research, the highest achievement is at indicator 2E of 86.7% and lowest achievement on 2C indicator of 53.6%. For LS 3 competency that is interpreting data and proving data scientifically, the highest achievement is at indicator 3C of 65.3% and lowest achievement on indicator 3B of 35.2%. Overall of these indicators, students dominated the competence of evaluating and designing scientific investigations over other competencies. While the description of the achievement of science literacy skills of each competency is presented in Figure 2 below.

Students' science literacy skills are dominated by the competence to evaluate and design scientific inquiry by 65.5%, meaning that most students can answer questions on this aspect of competence. Then, the average achievement by the competency to explain phenomena scientifically is 49.2%, meaning that some students can answer questions on this aspect of competence. The achievement of science literacy competency interprets data and proves data scientifically

(interpret data and scientifically evidence) get the lowest percentage average of 45.8%, meaning that a small percentage of learners are able to interpret data from scientific evidence obtained and evaluate a conclusion obtained correctly by conducting scientific analysis through reasons with various representations [22].

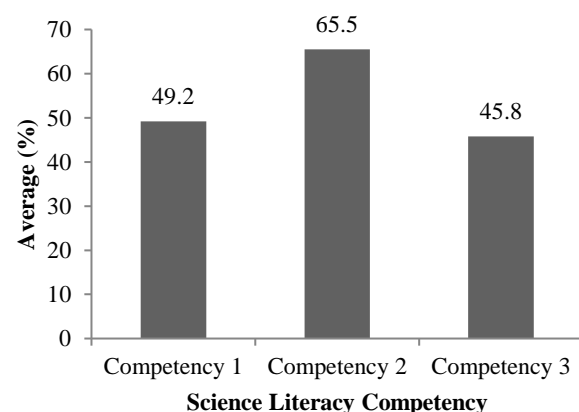


Figure 2. The average achievement of science literacy skills of SMPN students in Mataram Subdistrict (LS 1: Explaining phenomena scientifically, LS 2: Evaluating and designing scientific investigations, LS 3: Interpreting data and proving data scientifically).

The results of the analysis showed that most of the students mastered aspects of competence in evaluating and designing scientific investigations, meaning that most students have the ability to describe and evaluate various scientific ways to ensure the reliability of a data, the objectivity of a data, and the generalization of an explanation. When the student is able to evaluate a data of the results of the investigation, then the learner has the ability to explore various questions through scientific studies provided. Mastery of this competency by learners shows that learners are able to use the concept of knowledge about science to solve a problem through scientific investigation [19].

The results of the analysis showed that students mastered aspects of competence to explain phenomena scientifically, meaning that some of these learners have the ability to recognize and remember simple concepts of science, explain and describe a model, propose and predict hypotheses, and apply scientific knowledge in daily life [19]. If the learner is able to explain the phenomenon scientifically then it can be said that the learner has been able to apply his knowledge about science, able to draw conclusions and use theories, ideas, information, and facts that occur in daily life. According to Fakhriyah et al. [23] in explaining a scientific phenomenon it takes sufficient theoretical ability and is able to identify or determine problems.

The results of the analysis showed that the science literacy skills of students at least in the competence of interpreting data and proving data scientifically (interpret data and evidence scientifically). This shows that the ability of a small percentage of learners is still lacking in processing data obtained in the form of tables, diagrams, or graphs. In addition, the lack of ability of learners in analyzing data and drawing conclusions appropriately, understanding texts or discourses related to science from a variety of different sources of information (such as articles, journals, the internet, newspapers), and distinguishing between arguments based on scientific and non-scientific evidence [19].

Factors that affect the low ability of science literacy smpn students in Mataram Subdistrict is that students very rarely even never face science questions in the form of discourse that requires them to understand the meaning of each sentence contained in the discourse. Students only find problems with long discourses only in Indonesian subjects. This is known from the direct statement of some students of grade VIII SMPN who complained about the amount of discourse for each item of the question and the difficulty of the problem to be worked on. This is because they are used to working on questions in the form of memorization and short questions and do not

require discourse on every item of the question. Putri et al. [24] stated that the low literacy ability of biological sciences of jss students is due to their infrequent encounters in the form of discourses and graphs that require expertise in looking at them. This is in line with the results of research by Angraini [25] that there are several factors that cause low ability of science literacy learners including the learning process that is less supportive in the development of student literacy skills, subjects or subject matter that have not been taught, and there is no habituation for learners to work on questions in the form of discourse.

The skills of teachers of science subjects in designing and developing questions are still lacking, thus limiting students to train analytical skills in understanding the purpose and purpose of the problem. Problems designed and developed by teachers of science subjects are limited in terms of practicing the ability to remember learners to adjust various scientific terms. The same was also expressed by Hadinugraha [26] that the emphasis during the biological learning process is based only on memory and very rarely builds the analytical ability of learners based on the existence of scientific data.

The low reading culture among students is due to the willingness to take time to read is still lacking. Whereas student science literacy will not grow if the willingness and awareness to read is not owned by every student. This fact is reinforced through one of the results of research by Nofiana and Julianto [8] that students from several junior high schools in Purwokerto have a low level of reading and writing culture. During the learning process IPA emphasises only on material content that is abstract and less supported by experimental activities to prove the truth of the concept. So often there is a misconception or just memorized which in the end the concept is easy to forget. The results of the study are in line with the results by Dewi and Rochintaniawati [27] that science literacy must be supported by good reading competence because the text in the science literacy question contains a science phenomenon that must be studied by each student in answering a problem addressed in the phenomenon. Hernandez et al. [28] added that 97.0% of educators think that reading, writing, speaking, and understanding skills are important for learners to become proficient in science. If students are unable to do so, it can be said that they can hardly develop science literacy skills. The results of the study by Fitriani et al. [22] showed that most of the students lacked scientific characteristics and had low scientific literacy skills in Biology subjects. Most of these learners cannot connect concepts with events that occur in daily life.

Efforts that can be made to train and improve the literacy skills of learners according to Akbar [29] is to prioritize the role of schools in the

application of literacy culture, instill the importance of literacy culture for students, add reading book resources, and be supported by an environment with a high literacy culture. Through contextual learning learners are given the ability to connect material with the context of daily life. In addition, Dewi and Sunarti [30] added that using guided inquiry learning is able to improve students' science literacy skills in associating the material taught with the surrounding life and encourage students to relate the relationship between understanding and its application in daily life. According to Jamaluddin et al. [31] in order for students' science literacy skills to develop, it is necessary for science educators who are able to master science learning materials and methods well. The development of students' science literacy skills is considered very important so that they have high competitiveness towards the development of information technology and global competition in the future.

## CONCLUSIONS

The achievement of science literacy skills of students in the subjects of Science Biology Grade VIII SMPN in Mataram Subdistrict has an average value of science literacy achievement of 53.7 and falls into the category with low achievements. The achievement of science literacy of learners is dominated by the competence of evaluating and designing scientific investigations by 65.5%, followed by the competence to explain phenomena scientifically by 49.2% and the competence to interpret data and prove data scientifically by 45.8%.

Suggestions and recommendations for further research are to conduct further research to analyze the ability of science literacy in other aspects of science literacy, such as aspects of knowledge. However, to get maximum results can also be done measuring the science literacy ability of learners in the aspects of knowledge and aspects of competence.

## REFERENCES

- [1] Odja, A. H., Payu, C. S. (2014). Analisis Kemampuan Awal Literasi Sains Pada Konsep IPA. *Prosiding Seminar Nasional Kimia*, 40-47.
- [2] Situmorang, R. P. (2018). Analisis potensi lokal untuk mengembangkan bahan ajar Biologi di SMA negeri 2 wonosari. *Jurnal Pendidikan Sains (JPS)*, 4(1), 51-57.
- [3] Ardianto, D., & Rubini, B. (2016). Literasi Sains dan Aktivitas Peserta didik Pada Pembelajaran IPA Terpadu Tipe Shared. *Unnes Science Education Journal*, 5(1), 1167-1174.
- [4] Ileriturk, D., & Kincal, R. Y. (2018). Analysis of Pisa 2012 Participant Countries' Success Rankings in Terms of Their Patent Productivities. *International Journal of Instruction*, 11(4), 191-206.
- [5] Rohana, I. N., A.Rusilowati., & Khumaedi. (2018). Pengembangan Tes untuk Mengukur Kemampuan Literasi Sains Peserta didik SMP pada Materi Getaran dan Gelombang. *Unnes Physics Education Journal*, 7(3), 1-10.
- [6] OECD. (2019). *Indonesia-Country Note PISA 2018 Results Volumes I-III*. PISA: OECD Publishing.
- [7] Cordon, J. M., & Polong, J. D. B. (2020). Behind the Science literacy of Filipino students at PISA 2018: A Case study in the Philippines' Educational System. *Integrated Science Education Journal*, 1(2), 72-78.
- [8] Nofiana, M., & Julianto, T. (2017). Profil Kemampuan Literasi Sains Peserta didik SMP di Kota Purwokerto Ditinjau Dari Aspek Konten, Proses, dan Konteks Sains. *Jurnal Sains Sosial dan Humaniora*, 1(2), 77-84.
- [9] Setiadi, D. (2013). Model Pembelajaran Berbasis Peningkatan Literasi Sains dan Implementasinya Dalam Kurikulum Sains SMP 2013. *Jurnal Pijar MIPA*, 9(1), 1-8.
- [10] Fidiantara, F., Kusmiyati, K., & Merta, I. W. (2020). Pengaruh Penggunaan Bahan Ajar IPA Materi Sistem Ekskresi Berbasis Inkuiri Terhadap Peningkatan Literasi Sains. *Jurnal Pijar Mipa*, 15(1), 88-93.
- [11] Suryani, A. I., Jufri, A. W., & Setiadi, D. (2017). Pengaruh Model Pembelajaran 5E Terintegrasi Pendekatan Saintifik Terhadap Kemampuan Literasi Sains Siswa Smpn 1 Kuripan Tahun Ajaran 2016/2017. *Jurnal Pijar Mipa*, 12(1).
- [12] Asrizal, A., Festiyed, F., & Sumarmin, R. (2017). Analisis kebutuhan pengembangan bahan ajar ipa terpadu bermuatan literasi era digital untuk pembelajaran siswa SMP kelas VIII. *Jurnal Eksakta Pendidikan (JEP)*, 1(1), 1-8.
- [13] Freshman, P. J. (2018). Science Education Policy Making: Eleven Emerging Issues. Paris: UNESCO, Section for Science, Technical and Vocational Education.
- [14] Kristyowati, R., & Purwanto, A. (2019). Pembelajaran Literasi Sains Melalui Pemanfaatan Lingkungan. *Scholaria. Jurnal Pendidikan Dan Kebudayaan*, 9(2), 183-191.
- [15] Sariningrum, A., Rubini, B., & Ardianto, D. (2018). Pembelajaran Berbasis Masalah (Pbl) Dengan Konteks Socioscientific Issues Pada Materi Pemanasan Global Untuk Meningkatkan Literasi Sains Siswa. *Journal of Science Education and Practice*, 2(2), 35-46.
- [16] Yulianti, R. N. E., Permanasari, A., & Heliawati, L. (2019). Pemanfaatan E-Book Konsep Asam Basa Dalam Pembelajaran Kimia Untuk Meningkatkan Literasi Kimia

- Siswa SMA Kelas XI. *Journal of Science Education and Practice*, 3(1), 33-41.
- [17] Indana, S., & Indah, N. K. Validitas Dan Efektivitas LKS Berbasis Literasi Sains Pada Materi Tumbuhan Untuk Siswa Kelas X The Validity And Effectiveness of Worksheets Based On Scientific Literacy In Plant Topic For Senior High School To Students Of Grade X Susiani.
- [18] Novili, W. I., Utari, S., Saepuzaman, D., Karim, S. (2017). Penerapan Scientific Approach Dalam Upaya Melatihkan Literasi Sainifik Dalam Domain Kompetensi dan Domain Pengetahuan Siswa SMP Pada Topik Kalor. *Jurnal Penelitian Pembelajaran Fisika*. 8(1), 57-63.
- [19] OECD. (2016). *Assessing Scientific, Reading, and Mathematical Literacy A Framework for PISA 2015*. Paris: OECD Publishing.
- [20] Sukmadinata, N. S. (2010). *Metode Penelitian Pendidikan*. Bandung: Remaja Rosdakarya.
- [21] Jufri, A. W. 2017. *Belajar dan Pembelajaran Sains Modal Dasar Menjadi Guru Profesional*. Bandung: Pustaka Reka Cipta.
- [22] Fitriani, N. H., Sari, I. M., & Liliawati, W. (2016). Literasi Sains Siswa SMP Kota Bandung pada Tema Pencemaran Lingkungan. *Prosiding Seminar Nasional*.
- [23] Fakhriyah, F., Masfuah, S., Roysa, M., Rusilowati, A., Rahayu, E. S. (2017). Student Science Literacy in The Aspect of Content Science?. *Jurnal Pendidikan IPA Indonesia*, 6(1), 81-87. *Pendidikan IPA Pascasarjana UM*, 381-386.
- [24] Putri, A. N. (2013). *Analisis Penguasaan Hakikat Sains Guru Biologi SMA dan Penerapannya Dalam Pengembangan LKPD* (Thesis). Bandung, Universitas Pendidikan Indonesia.
- [25] Angraini, G. (2014). Analisis Kemampuan Literasi Sains Siswa SMA Kelas X di Kota Solok. *Prosiding Mathematics and Sciences Forum 2014*, 169.
- [26] Hadinugraha, S. (2012). *Literasi Sains Siswa SMA Berdasarkan Kerangka PISA (The Programme for Student Assessment) Pada Konten Pengetahuan Biologi*. Skripsi UPI.
- [27] Dewi, P, S., & Rochintaniawati, D. (2016). Kemampuan Proses Sains Siswa Melalui Pendekatan Saintifik Dalam Pembelajaran IPA Terpadu Pada Tema Global Warming. *Jurnal Edusains*, 8(1), 18-26.
- [28] Hernandez, K. M., Ikpeze, C., Kimaru, I. (2015). Perspectives on Science Literacy: A comparative study of United States and Kenya. *Educational Research International*, 4(2), 23-34.
- [29] Akbar, A. (2017). Membudayakan Literasi Dengan Program 6M Di Sekolah Dasar. *Jurnal Pendidikan Sekolah Dasar*, 3(1), 42-52.
- [30] Dewi, N. A. R., & Sunarti, T. (2018). Upaya Meningkatkan Kemampuan Literasi Sains Dengan Model Pembelajaran Guided Inquiry Pada SMA Untuk Materi Alat Optik. *Jurnal Inovasi Pendidikan Fisika*, 7(3), 381-38.
- [31] Jamaluddin., Jufri, A. W., Ramdhani, A., Azizah, A. (2019). Profil Literasi Sains dan Keterampilan Berpikir Kritis Pendidik IPA SMP. *Jurnal Penelitian Pendidikan IPA (JPPIPA)*, 5(1), 120-130.