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Analysis of Learning Implementation, Self-Efficacy, and Students Attitude Towards Science in Relation with Science Literacy

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Abstract

Student science literacy is influenced by external and internal factors. One external factor is learning implementation, while internal factors are self-efficacy and attitude towards science. This research aims to analyze the science literacy of students, the linkages of learning implementation, self-efficacy, and attitudes toward science in a linear and simultaneous ways. This study uses explanatory research design at SMAN 1 Cepiring and SMAN 1 Kaliwungu. The subjects of this research are 125 students. Data collection techniques through observation, questionnaire, psychological scale, and tests. Data analysis used descriptive statistics, proportion test, one sample T test, correlation and regression. The results showed science literacy of students in the medium category, achieving a minimum average completeness and classical completeness of 75%. The linkages of the learning implementation with science literacy were 10.7%, self-efficacy was 11,7% and attitudes toward science was 9.5%. The linkages of learning implementation, self-efficacy, and attitudes toward science with science literacy simultaneous ways shows that there is a positive and significant relationship in the low category with a coefficient of determination of 18,7%. Result shows that collaboration between external and internal factors have shown a higher relationship in influencing students' science literacy.

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INTRODUCTION

Global competence related to the growth of the globalization process requires that a person have basic skills that can be utilized in a social environment. Competitive generation in supporting global competence according to PISA is based on the ability of science literacy (Setiawan et al., 2017). Science literacy is one of the challenges 21st century and a key competency in the main objectives of science education (Dragos & Mih, 2015; OECD, 2017). The ability of science literacy can support students' lives in society.

Scientific knowledge in the learning process is an important component in science literacy, but interests, attitudes and self efficacy are also components that support students to achieve learning goals (Fortus, 2014; Sheldrake et al., 2017). If students have high interests, positive attitudes and strong self efficacy but low scientific literacy abilities then teaching and learning methods might be influential (Said et al., 2018). Based on this, the ability of science literacy can be influenced by external and internal factors. One external factor is the learning process while the internal factors that influence are self efficacy and students' attitudes towards science. According to Permendikbud No.103 of 2014, learning is a process of interaction between students, between students and teachers and learning resources to develop the potential of students. Self efficacy is a person's judgment that helps someone in making choices, efforts to progress and perseverance in the face of difficulties (Sunaryo, 2017). Student attitudes toward science is positive and negative feelings in learning science (Lovelace & Brickman, 2013).

The results of observations at the school show that the learning and evaluation process carried out is in accordance with the demands in the 2013 curriculum. Evaluation of students's science literacy skills has not been done in biology subjects. Evaluation of science literacy is indeed not the demands of the 2013 curriculum but can be used as a parameter of student competence in the dimensions of knowledge, procedural, and epistemic. Observations related to the implementation of learning show some students still have doubts and are not confident when asked to ask questions or work on problems / practice. Some students showed an attitude of not being interested in following the learning process shown by speaking alone and did not want to ask questions during the learning process. The results of this observation indicate that students' self-efficacy and attitudes toward science in the learning process need to be further investigated.

Research studies on science literacy show that some of the focus of research are more oriented to aspects of the learning process (Sari et al., 2017 & Basam et al., 2018), learning resources and evaluation instruments (Fu`adah et al., 2017 & Paramita et al., 2017) and describe the factors that influence scientific literacy (Wulandari & Hayat, 2016). These studies have not yet been explained regarding the achievements of students' scientific literacy and their relation to external and internal influencing factors. The material scope of biology is one of the material that is contextual and related in everyday life so that it can be used to measure science literacy.

The aims of this research are analyze the achievement of science literacy skills and the relationship of factors that influence the ability of student science literacy. Factors to be observed include the implementation of learning, self-efficacy, and attitudes towards science in learning the scope of biology. The hope in this research is by evaluating the factors that influence scientific literacy can develop students' scientific literacy better.

METHODS

This research uses explanatory research design. The study population was all students of class X SMAN 1 Cepiring and SMAN 1 kaliwungu Academic Year 2019/2020. Sampling through simple random sampling consists of 2 classes in each school with a sample of 125 students. Research variables include the ability of students`s science literacy (Y), learning implementation (X_1), self efficacy (X_2), and students' attitudes toward science (X_3). Data collection techniques include: 1) data on the implementation of learning through questionnaire sheets and observations based on the stages of learning Chemie im Kontext (ChiK), 2) self efficacy data through psychological scale sheets based on dimensions of magnitude, generality,

and strength, 3) data on students' attitudes towards science obtained through a psychological scale sheet based on Test of Science-Related Attitudes (TOSRA), and 4) data on the ability of science literacy through essay questions on the scope of biology.

All research instruments were validated by experts and then tested to determine the validity and reliability of the empirical. The items on the questionnaire, psychological scale, and questions that have been declared valid and reliable are then used to retrieve data. Data then performed prerequisite test analysis including tests of normality, linearity, multicollinearity, and heterokedasticity. Prerequisite test analysis is used to fulfill parametric statistical use. Data were analyzed by proportion test, one sample T test and inferential statistics (correlation and regression) using SPSS 16.0.

RESULTS AND DISCUSSION

Data collection in this study was carried out related to science literacy skills and external and internal factors that affect students' science literacy abilities. The external factors analyzed were the learning implementation while the internal factors were self efficacy and students' attitudes toward science.

The implementation learning in this study is the appearance of science literacy content in learning adapted from the learning stage of Chemie im Kontext (ChiK), namely the contact stage, the curiosity stage, the elaboration stage, the decision making stage, the nexus stage, and the assessment stage. Data on learning implementation were obtained during the learning process by observation. The implementation of learning is also obtained through a questionnaire to determine student responses related to learning by the teacher. Self efficacy referred to in this study is the belief and ability of students to take action in certain situations and conditions based on the dimensions of magnitude, generality, strength. Students 'attitudes towards science in this study are measures of students' attitudes toward science dimenssions developed based on the Test of Science-Related Attitudes (TOSRA). Self efficacy and students' attitudes towards science are obtained through the psychological scale given at the end of the learning process. The achievement of students' science literacy skills in the learning process is done by providing essay test questions. Science literacy indicators include science as the body of knowledge, ways of thinking, ways of investigating and interacting parts of the environment, technology, and society. Tests carried out after the biological scope of material is taught. Average recapitulation of the results of research on each variable in SMAN 1 Cepiring and SMAN 1 Kaliwungu can be seen in Figure 1.

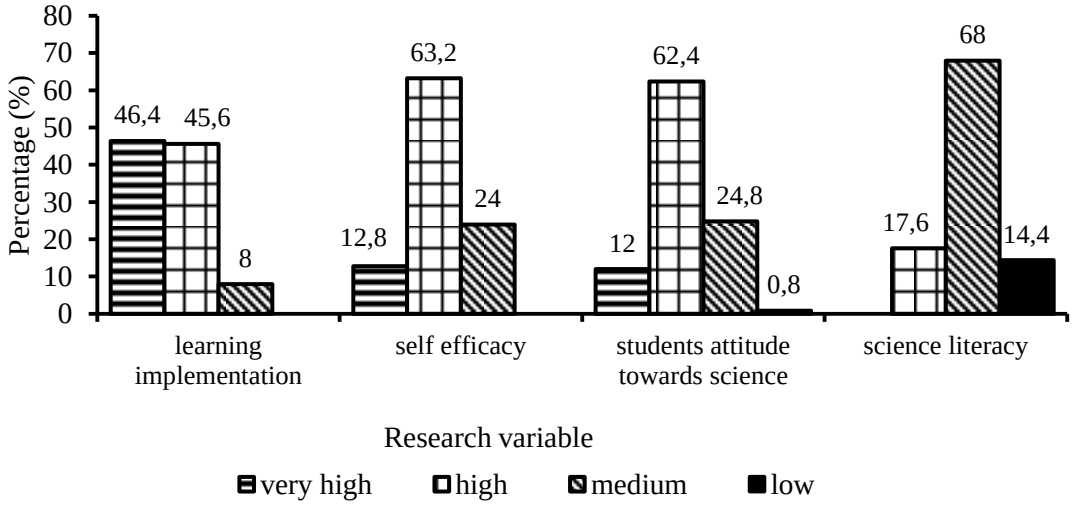

Figure 1. Recapitulation of mean results on each variable

Based on Figure 1, in general student responses related to the implementation of learning showed a very high category. This shows that teacher learning has been implemented well based on the stages of learning Chemie im Kontext (ChiK) including the stages of contact,

curiosity, elaboration, decision making, nexus and assessment.

At the contact stage the teacher gives a contextual problem through learning individually or in groups so that students can develop their science literacy through their thinking skills. In this aspect it can lead students to be actively involved and generate interest in following the next learning phase. In the elaboration stage, the teacher raises the problem in the form of questions based on the problem issues presented so as to arouse students' curiosity based on the active involvement of students in asking and answering questions based on observations.

The elaboration phase is carried out by providing opportunities and guidance to students to reason, but this stage is not maximally carried out by the teacher because sometimes the discussion activities are not carried out so that it does not give students the opportunity to reason. According to Asikin & Yulita (2019) at this stage students are expected to be creative in conducting experimental innovations. Therefore, in order for concepts to be well embedded into science competencies, learning activities that should be carried out are conducting discussions and practicum so that students' knowledge is not only memorized concepts and can develop students' reasoning abilities.

The decision making stage is carried out by directing students to find basic concepts based on the issues presented at the contact stage. The results of observation show students are still experiencing difficulties in finding concepts. Difficulties faced by students can be caused by the lack of guidance related to not carrying out continuous discussion activities at the elaboration stage.

In the Nexus stage the teacher has directed students to show or carry out ideas applicatively based on the concepts they have acquired. Observation results show students still find difficulties in applying concepts in other contexts so that students' knowledge is not maximized to be applied outside the context of learning (decontextualization). This can be seen if in solving problems encountered, students still do not involve scientific methods in solving these problems. Difficulties faced by these students can be related to the lack of knowledge of concepts and scientific phenomena in the environment. According to Sabila et al. (2019) the nexus stage helps students in comprehending the concepts of science as a whole by linking understanding of concepts at the elaboration and decision making stages. Therefore, if students have good knowledge concepts and understand scientific phenomena around them, students can maximize concepts in the context of learning well.

The assessment phase is carried out by teacher with evaluating the aspects of content through discussion and student assignments. The psychomotor and affective aspects have not been maximized by teachers even though the implementation of learning in general is already loaded with science literacy. According to Ernawati and Hidayat (2017) assessments on aspects of knowledge, attitudes and skills have a role in knowing students' real abilities so that they are not only the masters of theory or concepts. According to Pamungkas et al. (2018) in developing students' science literacy skills need to be supported by assessments in evaluating and monitoring students' science literacy. Therefore, if the assessment on cognitive, affective and psychomotor aspects is carried out in an integrative manner, it can develop students' scientific literacy skills better.

Based on the discussion above, the implementation of learning has been going well, but teachers needs to be accustomed so that learning can foster and develop science literacy. Thus learning by carrying out phases of science literacy is expected to be carried out intact in the learning process so that the ability of science literacy can be fully developed.

Data related to students' self-efficacy based on Figure 1 shows that most students have high self-efficacy. This means students have the confidence and ability to respond to diverse situations and conditions in a positive way based on information knowledge and previous experience. As the study of Ait et al. (2015) showed that students' high self efficacy could monitor and evaluate their actions and thoughts which correlated with the ability to achieve goals based on problem solving. Self-efficacy can increase self-motivation in facing challenges. According to Sunaryo (2017) self efficacy can determine someone in making choices, persistence

and perseverance in facing difficulties. Therefore, high self-efficacy ability of students can be used as capital in improving academic achievement, one of which is the ability of science literacy.

Data related to students' attitudes toward science generally shows that students have a high category. Students believe facts as a basis for belief in explaining the material and using scientific approaches appropriately in solving problems. Problems related to the environment and sustainable life and interest in a career in the field of science are of concern to students in following the learning process. The results of this study are supported by the research of Azizah et al. (2017) a person's attitude towards science is related to the interest, attention, and response to technology related to the problems they face. Thus, the development of students' attitudes towards science can help in understanding nature and its symptoms.

Students' science literacy skills generally indicate their abilities are in the medium category. The results by using one sample T test indicate the average scientific literacy ability has reached the Maximum Mastery Criteria (KKM value = 70) determined by the achievement of an average value of 75,55. Calculation data based on proportion test obtained z count = -1,631, so because z count = -1,631 > z table = - 1.64, the proportion of students had reached KKM and fulfilled classical completeness by 75%. The results showed that although science literacy ability in general has reached completeness based on average and classical completeness, it still needs to be improved so that scientific literacy ability can reach high categories. The results of previous studies by Fu'adah (2014) and Natalina & Suryawati (2019) also showed students' science literacy skills still needed to be improved.

Improving students' science literacy skills can be done by taking into account the conditions and problems encountered in the field. The research of Natalina & Suryawati (2019) shows that internal factors of students do not contribute to the ability of scientific literacy, but according to the research of Pakpahan (2016) internal factors and external factors support each other and influence students' scientific literacy. This shows that the development of students' science literacy ability can be done by paying attention to internal and external factors that influence it.

The interrelationship of the influencing factors in this study was done by correlation and regression analysis. The X variable in this study is the implementation of learning (external factors), self efficacy, and students' attitudes toward science (internal factors), while the Y variable is the science literacy ability of students. Correlation and regression test analysis is presented in Table 1.

Table 1. Recapitulation of correlation and determination coefficient

Variable	R	R square
Learning implementation	0.327	0.107
Self efficacy	0.342	0.117
Students` attitute towards science	0.308	0.095

Based on Table 1, the results of the correlation coefficient (R) variable of the learning implementation have a positive and significant relationship in the low category. A positive and significant relationship means that if the learning process is good, the ability of science literacy also shows good results. The low relationship between the two variables is indicated by the large coefficient of determination shows 0,107 or 10,7% of students' science literacy skills are influenced by the implementation of learning. The low relationship and influence between the two variables is supported by research data which shows that 19,13% of students who provide very high and high responses have high science literacy abilities, while 80,87% of other students demonstrate medium science literacy abilities. The low linkage between performance and student's science literacy can be caused by the learning methods used by the teacher, the ability of the teacher to manage and develop the science literacy content in the learning process, and other factors from within the student. The results of this study are supported by research by Rohman et al. (2017) shows the quality of teaching in generating science literacy is very much needed in improving students' science literacy.

The relationship or linkages of self efficacy with the ability of science literacy based on the correlation coefficient shows a positive and significant relationship in the low category. This means that if students' self efficacy is high, the

ability of science literacy also shows a high category even though the category of relationships is low. The low relationship between the two variables is supported by research data which shows only 23,15% of students who have a very high self efficacy category and high science literacy skills show a high category. The results of the coefficient of determination show that 0,117 or 11,7% self efficacy can affect students' science literacy skills. The results of this study are supported by the research of Said et al. (2018) and Tiyuri et al. (2018) shows that there is a positive and significant relationship between self efficacy and student academic performance, one of which is the result of students' science literacy.

The correlation coefficient of students' attitudes towards science shows a positive and significant relationship in the low category. The results of this study are supported by research by Fakhriyah et al. (2017) and Purwani et al. (2019) shows the ability of scientific literacy is positively correlated with students' attitudes toward science. This is supported by the magnitude of the coefficient of determination of 0,095 or 9,5% of students 'attitudes towards science that can affect students' scientific literacy abilities. Research data shows that only 20,43% of students' attitudes toward science in the very high and high categories have high scientific literacy categories, while 0,67% indicate the medium category, and 11,82% in the low category. The low relationship and influence between students' attitudes towards science and scientific literacy can be influenced by other factors. According to Rusilowati et al. (2018) there are several factors that influence students 'scientific literacy attitudes, namely 1) the concern of school citizens, 2) teaching science, and 3) students' interest in science. According to Sandika & Fitrihidajati (2018), activeness in the learning process which is characterized by high motivation can also improve student attitudes. Thus students 'attitudes toward science depend on many factors from within the student or from the student environment which gives an influence on student achievement, in this case is the ability of students' science literacy.

The linkages between the learning implementation, self-efficacy, and students' attitudes towards science with the ability of students' science literacy together were carried out by multivariate analysis through correlation analysis and multiple regression. The analysis shows the correlation coefficient is 0,432 which means there is a positive and significant relationship between various factors that affect student scientific literacy. The magnitude of the coefficient of determination shows 0,187 or 18,7% of students' science literacy ability is influenced by the implementation of learning, self-efficacy, and students'attitudes towards science. The results of these calculations provide an interpretation that the effect of the implementation of learning, self-efficacy, and student attitudes together have a greater influence than the effect on each variable. There are aspects of the implementation of learning that are met, self-efficacy that encourages students to excel and is supported by students 'attitudes towards science, so students' science literacy abilities can be optimized. Student involvement in the learning process can shape students' attitudes towards science and increase student self-efficacy. The results of this study are similar to those of Said et al. (2018) shows if the provisions of teaching and learning can affect scientific literacy, where other factors are the attitudes and interests and self-efficacy of students. The results of the study of Jamaluddin et al. (2019) also shows students' science literacy can develop well if educators master the material and learning methods well.

The implications of this study results indicate that the development of students' science literacy skills is a form of collaboration between external and internal factors. The ability of students' science literacy can be improved by paying attention to the implementation of learning that integrates the contents of science literacy and focuses on empowering students' internal factors such as self-efficacy, and students' attitudes towards science. Based on the results of the study, this study still has limitations related to the scope of the material, the number of samples, and the allocation of time. Therefore, further research is needed on students' science literacy abilities and their relation to the implementation of learning, self-efficacy, and students' attitudes toward science. The greater number of research samples, the full coverage of biological material, and the longer time it is also possible to have different results implications from the findings of this study.

CONCLUSION

Achievement of students' science literacy skills at SMAN 1 Cepiring and SMAN 1 Kaliwungu generally indicate the medium category. The average scientific literacy ability has reached Maximum Mastery Criteria (KKM value = 70) with an average value of 75,55 and fulfills the classical completeness proportion of 75%. Analysis of external factors shows that implementation of learning has very high category and it has a relationship with the ability of students` science literacy in the low category. Internal factor analysis shows self-efficacy and students' attitudes towards science show a high category and it have low relationship with science literacy of students. Analysis of the implementation of learning, self-efficacy, and attitudes towards science with student's science literacy simultaneously shows that there is a positive and significant relationship in the low category with a coefficient of determination of 18.7%. This shows that if the implementation of learning, self-efficacy, and attitudes toward science shows a high category, the ability of scientific literacy is also high even though the effect is only 18.7% while 81.3% is influenced by factors other than variables in this study.

REFERENCES

Ait, K., Rannikmae, M., Soobard, R., Reiska, P., & Holbrook, J. (2015). Students' Self-Efficacy and Values Based on A 21st Century Vision of Scientific Literacy – A Pilot Study. *Procedia - Social and Behavioral Sciences*, 177 (2015), 491–495.

Asikin, N. & Yulita, I. (2019). Scientific Literacy-Based Chemical teaching Materials Design of Chemical Solution Materials on Sea Pollution Context. *Jurnal Penelitian Pendidikan IPA (JPPIPA)*, 5(2), 204-211.

Azizah, A.L., Zulfani., & Muslim, B. (2017). The Influence of Inquiry Based Learning (IBL) Toward Science Literation Skill of Students. *Edusains*, 9(2), 182-192.

Basam, F., Rusilowati A., & Ridlo, S. (2018). Profil Kompetensi Sains Siswa Dalam Pembelajaran Literasi Sains Berpendekatan Inkuiri Saintifik. *Pancasakti Science Education Journal*, 3(1), 1-8.

Dragos, V. & Mih, V. (2015). Scientific Literacy in School. *Procedia - Social and Behavioral Sciences*, 209 (2015), 167 – 172.

Ermawati, S. & Hidayat, T. (2017). Penilaian Autentik dan Relevansinya dengan Kualitas Hasil Pembelajaran (Persepsi Dosen dan Mahasiswa IKIP PGRI Bojonegoro). *Jurnal Pendidikan Ilmu Sosial*, 27(1), 92- 103.

Fakhriyah, F., Masfuah, S., Roysa, M., Rusilowati, A., & Rahayu, E.S. (2017). Students Science Literacy in The Aspect Of Content Science. *Jurnal Pendidikan IPA Indonesia JPII*, 6(1), 81-87.

Fortus, D. (2014). Attending to Affect. *Journal of Research in Science Teaching*, 51(7), 821-835.

Fu`Adah, H., Rusilowati, A., & Hartono. (2017). Pengembangan Alat Evaluasi Literasi Sains Untuk Mengukur Kemampuan Literasi Sains Siswa Bertema Perpindahan Kalor Dalam Kehidupan. *Lembaran Ilmu Kependidikan*, 46(1), 51-59.

Jamaluddin, J., Jufri, A.W., Ramdani, A., & Azizah, A. (2019). Profil Literasi Sains dan Keterampilan Berpikir Kritis Pendidik IPA SMP. *Jurnal Penelitian Pendidikan IPA (JPPIPA)*, 5(1), 120- 130.

Lovelace, M. & Brickman, P. (2013). Best Practices for Measuring Students` attitude toward learning science. *CBE life science education*, 12(4), 601-617.

Natalina, M. & Suryawati, E. (2019). Profil Kemampuan Literasi Sains Siswa SMA Kelas X di Pekanbaru Tahun Ajaran 2017/2018. *Talenta Conference Series: Science and technology*,2(2). Retrieved from https://talentaconfseries.usu.ac.id/st/article/view/537.

OECD. (2017). *PISA For Development Assessment And Analytical Framework: Reading, Mathematics And Science, Preliminary Version*. Paris: OECD Publishing.

Pakpahan, R. (2016). Faktor-Faktor Yang Mempengaruhi Capaian Literasi Matematika Siswa Indonesia Dalam PISA 2012. *Jurnal Pendidikan Dan Kebudayaan*, 1(3), 334-347.

Pamungkas, Z.S., Aminah, N.S., & Nurosyid, F. (2018). Analisis Kemampuan Berpikir Kritis Siswa dalam Menyelesaikan Soal Literasi Sains Berdasarkan Tingkat Kemampuan Metakognisi. *Edusains*, 10(2), 254-264.

Paramita, A.D., Rusilowati, A., & Sugianto. (2017). Pengembangan Bahan Ajar Berbasisi Literasi Sains Materi Suhu Dan Kalor. *Phenomenon Jurnal Pendidikan MIPA*, 7(1), 58-67.

Permendikbud RI Nomor 103 Tahun 2014 tentang Pembelajaran Pada Pendidikan Dasar dan

Pendidikan Menengah. (2014). Jakarta: Kementerian Pendidikan Dan Kebudayaan

Purwani, L.D., Sudargo, F., & Surakusumah, W. (2019). Analysis of Student's Scientific Literacy Skills Through Socioscientific Issue's Test on Biodiversity Topics. Dalam: *Prosiding 4th International Seminar of Mathematics, Science And Computer Science Education.* Volume 1013. Bandung, 14 Oktober 1017. Bandung: IOP Publishing Conf. Hlm 1-5.

Rohman, S., Rusilowati, A., & Sulhadi. (2017). Analisis Pembelajaran Fisika Kelas X SMA Negeri di Kota Cirebon Berdasarkan Literasi Sains. *Physics Communication*, 1(2), 12-18.

Rusilowati, A., Linuwih, S., & Nugroho, S.A. (2018). The Profile of Science Literacy Attitudes of Junior High School Students in Purbalingga. Dalam: *Prosiding ICMSE*. 4(1). Semarang, 18-19 September 2017. Semarang: MIPA Unnes. Hlm 183-189.

Sabila, H., Dewahrani, Y.R., & Miarsyah, M. (2019). The Effect of Biology in Context Learning on Student Cognitive Learning Outcome. *Lensa (Lentera Sains): Jurnal Pendidikan IPA*, 9(1), 13-21.

Said, Z., Al- Emadi, A.A., Heather L.F., & Elina, A. (2018). Assessing the Science Interest, Attitude, and Self-Efficacy of Qatari Students at the Preparatory, Secondary, and University Levels. *EURASIA Journal of Mathematics, Science and Technology Education*, 14(12), 1-12.

Sandika, B. & Fitrihidajati, H. (2018). Improving Creative Thinking Skills and Scientific Attitude Through Inquiry-Based Learning in Basic Biology Lecture Toward Students of Biology Education. *JPBI (Jurnal Pendidikan Biologi Indonesia)*, 4(1), 23-28.

Sari, D.N.A., Rusilowati, A., & Nuswowati, M. (2017). Pengaruh Pembelajaran Berbasis Proyek Terhadap Kemampuan Literasi Sains Siswa. *Pancasakti Science Education Journal*, 2(2), 114-124.

Setiawan, B., Innatesari, D.K., Sabtiawan, W.B., & Sudarmin. (2017). The development of local wisdom-based natural science module to improve science literation of students. *Jurnal Pendidikan IPA Indonesia*, 6(1), 49-54.

Sheldrake, R., Mujtaba, T., & Reiss, M.J. (2017). Science teaching and students`attitudes and aspirations: The importance of conveying the applications and relevance of science. *International Journal of Educational Research*, 85(2017), 167-183.

Sunaryo, Y. (2017). Pengukuran Self- Efficacy Siswa dalam Pembelajaran Matematika di MTs N 2 Ciamis. *Jurnal teori dan Riset Matematika (TEOREMA)*, 1(2), 39- 44.

Tiyuri A., Saberi, B., Miri, M., Shahrestanaki, E., Bayat, B.B., & Salehiniya, H. (2018). Research self-efficacy and its relationship with academic performance in postgraduate students of Tehran University of Medical Sciences in 2016. *International Journal of Education and Health Promotion*, 7(11), 1- 5.

Wulandari, N. & Hayat S. (2016). Analisis Kemampuan Literasi Sains Pada Aspek Pengetahuan Dan Kompetensi Sains Siswa SMP Pada Materi Kalor. *Edusains*, 8(1), 66-73.