The Analysis of Science Literacy Ability and Teachers' Capability in Implementation of Learning by Science Literacy Oriented in Islamic Kindergarten at Bangko City

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Abstract: This study aims to determine the analysis of scientific literacy skills and the ability of teachers in developing science literacy-oriented learning in Islamic Kindergartens in Bangko City. This study uses a quantitative approach with survey techniques. Data analysis was carried out by means of quantification on each measured aspect and continued with descriptive analysis. Based on the data and discussion as described above, at the end of this study it can be concluded that in general the ability of Islamic Kindergarten teachers in Bangko City is evenly distributed in each category. The scientific literacy ability of teachers with category "A" is 8 people or about 22.22%. There are 9 teachers with literacy ability categories "B" and "C" each or about 25%, while the rest, as many as 10 people or around 27.78% are categorized as "D". In the aspect of teacher ability in developing science literacy-based learning, it is dominated by teachers with the ability category "D", as many as 12 people or about 33.33%, then followed by teachers with category "B" abilities as many as 10 people or about 27.27%. In the third place are teachers with the ability category "C" as many as 9 people or about 25%, and the rest are teachers group with category "A", which is as many as 5 people or about 13.89%. Therefore, the improvement and development of teachers' scientific literacy skills still needs to be improved.

Keywords: Scientific literacy, science literacy-based learning, Islamic Kindergarten in Bangko City.

Introduction

Science plays an important role in all aspects of life, because it needs to be studied so that all Indonesian people achieve scientific literacy, so as to form a science literate society but still have national character (Liliasari, 2011). Science learning is a lifelong learning process like learning to count. Children of all ages will benefit by analyzing the surrounding conditions that contain elements of science (Prasetyo, 2017). Therefore, it can be

understood that science learning is one of the important aspects in improving the ability of citizens from an early age, not only in order to prepare students who are experts/understanders in the field of science, but also have a proud national character. This has also been emphasized by Permanasari (2016) that Science/IPA education as part of education plays an important role in preparing students who have scientific literacy, namely those who are able to think critically, creatively, logically, and take the initiative in responding to issues

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in society caused by by the impact of science and technology developments.

The main goal in science education or learning is to prepare students/students to have good scientific literacy skills, namely the ability to understand and use scientific knowledge properly and correctly. This is as stated by Angraini (2014) that scientific literacy is defined as the capacity to use scientific knowledge, identify questions and draw conclusions based on facts to understand the universe and make decisions from changes that occur due to human activities. Similarly, the explanation from Arohman et al., (2016) that scientific literacy ability is the capacity to use scientific knowledge, identify questions and draw conclusions based on facts and data to understand the universe and make decisions from changes that occur due to human activities. In line with this opinion, Noor (2020), also states that scientific literacy is the ability to apply scientific knowledge, identify questions, and draw conclusions based on existing evidence in order to understand and make decisions related to events in the natural environment. Scientific literacy can also be defined as the ability to use scientific knowledge, identify questions, and draw conclusions based on evidence, in order to understand and make decisions regarding nature and changes made to nature through human activities (Yuliati, 2017).

Referring to the definition of scientific literacy as explained above, it can be understood that scientific literacy skills are very important and fundamental to prepare students who are reliable, have good scientific competence and are able to adapt in various situations. This is in line with Yulyanti's opinion (2017) that literacy skills are fundamental things that must be possessed by students in facing the global era to be able to meet the needs of life in various situations. In line with that, Angraini (2014), states that by mastering scientific literacy, students can understand the environment, health, economy and other problems faced by modern society which is very dependent on technology and the progress and development of science. Therefore, it can be said that scientific literacy prepares students to have the ability to make decisions that are beneficial to themselves and the environment based on the scientific insights they have. Ayuningtyas (2016), writes that scientific literacy is needed by students to train themselves to solve problems that they will later face in everyday life and adapt to society. Likewise, Noor, (2020), also mentions that scientific literacy can help the community in shaping the mindset, behavior, and character to be able to care and be responsible for themselves, society, and the environment, as well as the problems faced by society today. It is very important to prepare the skills that must be possessed by the 21st

century for students from elementary school to college level.

The urgency of scientific literacy skills as described above, has not been fully developed by educational institutions in Indonesia. The results obtained from the PISA survey from 2000 to 2018 placed Indonesia as one of the countries with a low scientific literacy rating (Narut & Supradi, 2019). This situation must be the basis of thought and awareness for all education policy holders, including educational institutions and teachers to jointly make serious efforts to improve students' scientific literacy skills. Efforts to develop students' scientific literacy skills must be carried out carefully, integrated and systematically, starting from the preparation of educational policies (curriculum) to implementing the curriculum (learning in schools). Thus, it is clear that one of the important efforts in developing students' scientific literacy skills is through science literacy-based learning.

The success of scientific literacy learning is shown if students understand what they are learning and can apply it in completing various daily lives (Pertiwi et al., 2018). Therefore, it can be understood that the main focus of learning in order to improve scientific literacy skills is the ability of students to understand and apply their scientific abilities in everyday life. The application of scientific literacy skills must be directed to solving the various problems they face. In short, it can be said that through scientific literacy skills, students are directed to have problem solving skills by finding solutions to any existing problems. Therefore, in carrying out science learning the teacher must have the right strategy so that the learning objectives can be achieved.

The achievement of goals in science learning (scientific literacy) can be achieved if the teacher knows, understands the various aspects involved in the process. According to Noor (2020), in carrying out science literacy-based learning, teachers must pay attention to the main elements in scientific literacy, namely: (a) scientific literacy indicators are formulated into basic competencies, (b) scientific literacy aspects are included in teaching materials, (c) scientific literacy is packaged in learning tools such as syllabus and lesson plans. As for conducting scientific literacy-based assessments, teachers should pay attention to: (1) questions must be general in nature, (2) questions are presented in the form of data or information tables, (3) there is a relationship between questions and concepts (4) problems are analyzed by providing statements in the form of descriptions when answering questions, (5) the presentation of questions is carried out in various ways, (6) learning is carried out based on applications that discuss issues of science, technology, environment, society. Therefore, the implementation of a successful science literacy-based learning, teachers must have good

and systematic planning by involving various elements of scientific literacy.

Good and systematic lesson planning is intended so that science learning can run more dynamically and productively. The dynamics and productivity of the learning process are intended so that the implementation of science learning can ensure the achievement of its main goal, namely scientific literacy. The success of students in studying scientific literacy can be seen from the good or bad scores that students get on the tests given by the teacher. The results of the assessment can later be used as evaluation material for further learning (Pratiwi et al., 2019). Thus, it can be understood that one of the important elements in the implementation of learning is the ability of teachers to assess learning outcomes based on scientific literacy.

As mentioned above, scientific literacy skills are very important and fundamental in order to prepare reliable students who have good adaptability. Therefore, the introduction and learning of science literacy based on early childhood, namely Kindergarten children, is very important. This is as conveyed by Purwasi & Yuliariatiningsih (2018), that in their daily life early childhood does not escape scientific knowledge, therefore science is very closely related to children's lives and allows children to learn to find objects in their environment related to science like, the things they use every day. In addition to children learning from their social experiences, those who can develop scientific literacy for early childhood are children who are sensitive or aware of the surrounding environment. So that children can observe and solve problems in their environment. This opinion is also reinforced by Widayati et al., (2020) that scientific literacy activities can be given as early as possible to children through various methods. The development of scientific literacy skills at home can be done by using the discussion method between parents and children regarding reading content that contains scientific material. Science material reading content, parents can invite children to discuss by encouraging them to ask questions, answer and express the reasons for the questions and answers as well as the science content of the material. The whole process is intended so that early childhood is expected to be able to be flexible and adaptive, able to interact socially, be productive, take initiative and be independent and able to think scientifically (Zahro et al., 2019).

The implementation of learning in order to develop scientific literacy skills in early childhood must be carried out appropriately in accordance with the character of the students. In early childhood, the implementation of learning is mostly done through games. Therefore, in early childhood including kindergarten, scientific literacy skills in children can be stimulated with educational game tools, because educational game tools can help develop aspects of child development (Widayati et al., 2020). These various forms of games prove that the teacher's role in developing students' scientific literacy skills is very important. This was also conveyed by Octaviani et al., (2014) that the role of teachers in developing children's scientific literacy skills is very important. This is also reinforced by the results of Fazila's research (2020) that teachers have an important role in developing early childhood literacy skills. Noor (2020), also said that teachers have an important role in introducing scientific literacy to early childhood.

Based on the description above, it can be understood that teachers have an important role in introducing and developing scientific literacy skills in early childhood. Therefore, to find out how the students' scientific literacy ability in general can be known the teacher's ability. This is because the ability of teachers to plan, implement and assess learning based on scientific literacy skills is very important. These abilities will have an impact on students' abilities in general. In the city of Bangko, in general, the ability of teachers to carry out science literacy-based learning is not yet known. There is no accurate data, either in the form of research results or written reports that provide accurate information on the level of teacher ability in developing science literacy-based learning at the level of early childhood education. Learning in early childhood in Bangko City generally focuses more on character values and Islamic education. The science education or scientific literacy-based education has not been seen and tends to be ignored. Therefore, the main focus of this study is to answer the question how is the ability of kindergarten teachers in Bangko City in developing the scientific literacy skills of kindergarten children?

Method

This study uses a quantitative approach using survey techniques. The sample in this study was kindergarten education teachers in the city of Bangko. Based on data from the Merangin District Education Office in 2021, there are 39 kindergartens and playgroups with 12 of them being Islamic kindergartens. This study involved all Islamic kindergartens, totaling 12 schools and 36 teachers who were randomly selected (three people per school). The instruments used in this study were in the form of a teacher's scientific literacy ability test and an assessment rubric for learning planning documentation developed by the teacher. This is in line with the opinion of Rusilowati (2018) that scientific literacy can be measured by objective tests (multiple choice), description tests, attitudes and skills tests. The teacher's scientific literacy ability test on the

aspect of scientific knowledge using an instrument that has been developed before and validated by an expert. The indicators on the instrument include: (a) explaining facts, concepts, principles and laws, (b) presenting hypotheses, theories and models. (c) answer questions related to scientific knowledge or information. The assessment rubric is used to assess the availability/involvement of elements of scientific literacy in the lesson plans that have been prepared by the teacher. These elements include: (a) scientific literacy indicators are formulated into basic competencies, (b) scientific literacy aspects are included in teaching materials, (c) scientific literacy is packaged in learning tools such as syllabus and lesson plans. The scores obtained by each teacher on the two aspects of the assessment are between 0-100. Based on the scores that have been obtained, the teacher's scientific literacy skills are classified into four categories, namely, A (Very Good) with a score of 76-100, B (good) with a score of 51-75, C (Enough) with a score of 26-50 and D (less) with a score of 0-25. Furthermore, the existing data is described in a narrative manner to make it easier to understand

Result and Discussion

As previously mentioned, this research uses a quantitative approach with a survey approach by giving/sending research instruments to the respondents. After the instrument is returned by the respondent, then a score is given according to the respondent's answer and analyzed according to the previously mentioned technique. Based on this, the data obtained on the ability of scientific literacy and the ability of Islamic Kindergarten teachers in Bangko City are as follows:

Table 1. Science Literacy Ability and Development of Science Literacy-Based Learning for Kindergarten Teachers in Bangko City

Aspects	Score	Number	Percentage (%)	Category
Science	76-100	8	22,22	A
Literacy	51-75	9	25,00	B
Ability	26-50	9	25,00	C
	0-25	10	27,78	D
	Total	36	100	
Science	76-100	5	13,89	A
Literacy	51-75	10	27,78	B
Learning	26-50	9	25,00	C
Oriented	0-25	12	33,33	D
	Total	36	100	

Based on Table 1 above, it can be understood that in general the ability of Islamic Kindergarten teachers in Bangko City is evenly distributed in each category. The scientific literacy ability of teachers with category "A" is

8 people or about 22.22%. There are 9 teachers with literacy ability categories "B" and "C" each or about 25%, while the rest, as many as 10 people or around 27.78% are categorized as "D". In the aspect of teacher ability in developing science literacy-based learning, it is dominated by teachers with the ability category "D", as many as 12 people or about 33.33%, then followed by teachers with category "B" abilities as many as 10 people or around 27.27 %. In the third place are teachers with the ability category "C" as many as 9 people or about 25%, and the rest are teachers group with category "A", which is as many as 5 people or about 13.89%. Based on these data, it can be understood that both the general ability of scientific literacy and the ability of teachers to develop science literacy-based learning are still dominated by the group with the ability category "D", although the difference in percentage between groups is small.

Table 2. Science literacy ability on the aspects measured

Aspects	Score	Number	Percentage (%)	Category
Explain facts,	76-100	11	30,56	A
concepts,	51-75	9	25,00	B
principles and	26-50	8	22,22	C
laws	0-25	8	22,22	D
	Total	36	100	
Presenting	76-100	9	25,00	A
hypotheses,	51-75	8	22,22	B
theories and	26-50	8	22,22	C
models	0-25	11	30,56	D
	Total	36	100	
Answering	76-100	10	27,78	A
questions related	51-75	9	25,00	B
to scientific	26-50	8	22,22	C
knowledge or	0-25	9	25,00	D
information	Total	36	100	

Based on Table 2, namely the scientific literacy ability of Islamic Kindergarten teachers in Bangko City in the measured aspect, it can be explained that the aspect of explaining facts, concepts, principles and laws is dominated by the ability of teachers with the ability category " A" that is as many as 11 people or about 30.56%. Then followed by a group of teachers with the ability category "B" as many as 25, while for categories "C" and "D" the same amounted to 8 people or about 22.22%. As for the ability in the aspect of presenting hypotheses, theories and models, dominated by the group with the ability category "D" as many as 11 people or about 30.56%, then followed by the group with the ability category "A" as many as 9 people or about 25%, while the group of teachers with the same ability categories "B" and "C" as many as 8 people or about 22.22%. Furthermore, in the aspect of the ability to answer questions related to science knowledge or

information, it is dominated by a group of teachers with the ability category "A" as many as 10 people or around 27.78%, followed by a group of teachers with the ability category "B" and "D", with the same number of 9 people or about 25%, while the group of teachers with the ability "C" is 8 people or about 22.22%

Table 3. Ability to Plan Learning Based on scientific literacy in the aspects measured

Aspects	Score	Number	Percentage (%)	Category
Preparation of	29-40	4	11,11	A
scientific	14-28	11	30,56	B
literacy	0-13	9	25,00	C
indicators into	29-40	12	33,33	D
basic	Total	36	100	
competencies				
Integration of	29-40	4	11,11	A
scientific	14-28	10	27,78	B
literacy into	0-13	9	25,00	C
teaching	29-40	13	36,11	D
materials	Total	36	100	
Integration of	29-40	4	11,11	A
scientific	14-28	9	25,00	B
literacy in	0-13	10	27,78	C
learning	29-40	13	36,11	D
devices	Total	36	100	

Based on Table 3, namely the ability of teachers to develop science literacy-based learning, in the aspect of compiling scientific literacy indicators into basic competencies, it can be seen that in general it is dominated by a group of teachers with category "D" abilities, which are 12 people or around 33.33 %, then followed by a group of teachers with the ability category "B" as many as 11 people or about 30.56%. The group of teachers with the ability category "C" as many as 9 people or about 25%, and the least is the group of teachers with the ability category "A", as many as 4 people or about 11.11%. Furthermore, in the aspect of integrating scientific literacy into teaching materials, it is also dominated by a group of teachers with the ability category "D" as many as 13 people or 36.11%, then followed by a group of teachers with category "B" abilities, as many as 10 people or around 27.78%, and the group of teachers with the ability category "C" as many as 9 people or about 25%, while the group of teachers with the ability category "A" as many as 4 people or about 11.11%.

As with the previous two aspects, the aspect of the ability to integrate scientific literacy into learning tools is also dominated by the group of teachers with the ability category "D" as many as 13 people or around 36.11%, then the group of teachers with the ability category "C" as many as 10 people or around 27.78%. In this aspect, the groups of teachers with abilities "B" and "A" are 9 and

4 people, respectively, or about 25% and 11.11%. Thus, it can be understood that in general the aspects of the ability to integrate scientific literacy in learning devices are still not optimal.

As mentioned above (Table 1, Table 2 and Table 3) above, it can be understood that in general the ability of Islamic Kindergarten teachers in Bangko city is still relatively not optimal, both in scientific literacy skills and in the ability to develop science literacy-based learning. Referring to these data, it is known that the ability of Islamic Kindergarten teachers in Bangko city still needs to be improved. This is based on existing data (Table 1) that the scientific literacy ability of teachers with category "A" is 8 people or about 22.22%, and the ability of teachers with ability category "B" is 25%. If these two groups are classified as "appropriate" and the rest are classified as "inappropriate", then around 52.78% of teachers still need assistance in increasing scientific literacy skills and their development in learning.

Referring to the purpose of Early Childhood Education activities as mentioned by Noor, (2020) namely developing various potentials of children from an early age as preparation for survival and being able to adapt to their environment, as well as the goals of Early Childhood education mentioned by Zahro et al (2019), that early childhood education is focused on laying the foundation for the growth and development of all intelligences, and when compared with research results, there is still a bias. The goal of kindergarten education is potentially difficult to achieve, considering that one of the main factors, namely the scientific literacy skills of teachers themselves still needs to be developed. This is as previously mentioned that in the realm of PAUD (Early Childhood Education), this literacy activity is the initial step to develop all aspects of development, so that literacy activities are integrated with other learning activities.

In addition, referring to the urgency of scientific literacy skills for students, as mentioned by Yuliati (2017) that the importance of scientific literacy is due to problems related to knowledge and technology. Liliasari (2011), also mentions that scientific literacy has the potential to improve the nation's character and mastery of future technology. In addition, Ayuningtyas (2016) also mentions that scientific literacy is needed by students to train themselves to solve problems that they will later face in everyday life and adapt to society. Thus, mastery of scientific literacy by every citizen, including early childhood is a necessity. Therefore, teachers must consciously understand the urgency of scientific literacy for each student and be able to develop it systematically.

Considering the strategic role of teachers in improving and developing students' scientific literacy skills through the learning process. This is as stated by Syofyan et al., (2019) that the teacher has a central role in

learning in the classroom. Because what is instructed by the teacher will usually be carried out by the students. Teachers as role models and architects as well as directors in their respective classes. To be able to become an architect of learning, teachers must learn to design learning that is fun and enjoyable. The teacher is happy, and the students are happy and listening to every lesson designed by the teacher. Teachers who do not design their lessons well, the learning will definitely not be directed. And of course, this kind of learning is definitely not interesting, let alone fun for the students. Therefore, efforts to improve teachers' scientific literacy skills and the implementation of science literacy-based learning are very important. In other words, the results of the study have implications for the importance of developing plans for improving teacher abilities, especially in terms of scientific literacy skills and their implementation in learning in Islamic Kindergarten in Bangko City.

Some efforts to improve teacher scientific literacy skills, for example through the development of scientific literacy-based Student Worksheets (for prospective teachers) or teacher training. This is as the results of research by Rosdiana et al., (2018) that the development of worksheets with this model shows positive results, namely an increase in scientific literacy skills. Especially for kindergarten teachers who have carried out learning (in service), the development of these worksheets can be adjusted to the needs and character of students. In addition, the development of teachers' scientific literacy skills is also carried out by training teachers to recognize and implement certain learning models, such as problem-based models. According to the research results of Astuti et al., (2017) that problem-based learning can improve students' scientific literacy skills. Therefore, teacher training in implementing problem-based learning is also believed to be able to improve teachers' scientific literacy skills and their implementation in learning.

According to Rahayu (2016) one of the efforts to improve scientific literacy skills and its implementation in learning is through training in mastering science concepts. This is considering that in general kindergarten teachers are alumni teachers of Kindergarten Teacher Education (PGTK) who in general have not obtained in-depth knowledge of natural sciences (IPA). Therefore, the science concept mastery training can be used as an alternative in improving the science literacy skills of kindergarten teachers in Bangko City. Furthermore, in order to improve scientific literacy in kindergarten, teachers deliver learning materials through a variety of interesting media. The power of print media in the form of color images, electronic media, and digital media is able to attract children's interest and attention to be more ready to accept learning

(Zahro et al., 2019). This is also in line with the opinion of Widayati et al., (2020) that children's scientific literacy skills can be developed through direct experience while learning science. The experience gained when observing, exploring and experimenting, children will better interpret the knowledge they have acquired during the learning process. For this reason, teacher training in creating and developing scientific literacy-based learning media is also needed

Conclusion

Based on the data and discussion as described above, at the end of this study it can be concluded that in general the ability of Islamic Kindergarten teachers in Bangko City is evenly distributed in each category. The scientific literacy ability of teachers with category "A" is 8 people or about 22.22%. There are 9 teachers with literacy ability categories "B" and "C" each or about 25%, while the rest, as many as 10 people or around 27.78% are categorized as "D". In the aspect of teacher ability in developing science literacy-based learning, it is dominated by teachers with the ability category "D", as many as 12 people or about 33.33%, then followed by teachers with category "B" abilities as many as 10 people or about 27.27%. In the third place are teachers with the ability category "C" as many as 9 people or about 25%, and the rest are teachers group with category "A", which is as many as 5 people or about 13.89%. Based on these data, it can be understood that both the general ability of scientific literacy and the ability of teachers to develop science literacy-based learning are still dominated by the group with the ability category "D", although the difference in percentage between groups is small. Therefore, the improvement and development of teachers' scientific literacy skills still needs to be improved.

References

Angraini, G. (2014). Analisis Kemampuan Literasi Sains Siswa SMA Kelas X di Kota Solok. *Prosiding : Mathematics and Sciences Forum*. Retrieved from: http://prosiding.upgris.ac.id/index.php/masif2014/masif2014/paper/view/427

Arohman, M., Saefudin, & Priyandoko, D. (2016). Kemampuan Literasi Sains Siswa pada Pembelajaran Ekosistem. *Proceeding Biology Education Conference*. Retrieved from: https://jurnal.uns.ac.id/prosbi/article/view/5662

Astuti, R., Sujana, A., & Hanifah, N. (2017). Pembelajaran Berbasis Masalah Untuk Meningkatkan Literasi Sains Pada Materi

Hubungan Makanan Dengan Kesehatan. *Jurnal Pena Ilmiah*, *2*(1), 261–270. https://doi.org/10.17509/jpi.v2i1.10661

Ayuningtyas, R. S. (2016). Profil Kompetensi Literasi Sains Siswa Berdasarkan The Programme for International Student Assesment (PISA) pada Konten Biologi. *Published Undergraduate Thesis of Universitas Lampung*. Retrieved from: https://onesearch.id/Record/IOS4198.23079

Octaviani, D. Usman, U., & Yuniani, D. (2014). Peran Guru Dalam Pengenalan Sains Pada Anak Kelompok B2 di TK Bina Sari. *Jurnal Pendidikan Pembelajaran.* 7(9). Retrieved from: https://jurnal.untan.ac.id/index.php/jpdpb/article/view/28706/0

Fazila, N. (2020). *Peran Guru Dalam Menumbuhkan Kemampuan Literasi Siswa Kelas V MIN 7 Pidie Jaya*. Retrieved from https://repository.ar-raniry.ac.id/id/eprint/13900/

Liliasari. (2011). Membangun Masyarakat Melek Sains Berkarakter Bangsa Melalui Pembelajaran. *Prosiding Seminar Nasional FMIPA UNNES*.

Narut, Y. F., & Supradi, K. (2019). Literasi sains peserta didik dalam pembelajaran ipa di indonesia. *Jurnal Inovasi Pendidikan Dasar*.

Noor, F. M. (2020). Memperkenalkan Literasi Sains Kepada Peserta Didik: Perspektif Calon Guru PIAUD. *ThufuLA: Jurnal Inovasi Pendidikan Guru Raudhatul Athfal*, *8*(1), 056. https://doi.org/10.21043/thufula.v8i1.7066

Permanasari, A. (2016). STEM Education: Inovasi dalam Pembelajaran Sains. *Prosiding Seminar Nasional Pendidikan Sains*, 2016–2023. Retrieved from https://media.neliti.com/media/publications/173124-ID-...pembelajara.pdf

Pertiwi, U. D., Atanti, R. D., & Ismawati, R. (2018). Pentingnya Literasi Sains Pada Pembelajaran IPA SMP Abad 21. *Indonesian Journal of Natural Science Education (IJNSE)*. https://doi.org/10.31002/nse.v1i1.173

Prasetyo, S. (2017). Implementasi Pembelajaran Sains Untuk Anak Usia Dini Dalam Menghadapi Masyarakat Ekonomi Asean (Mea). *LITERASI (Jurnal Ilmu Pendidikan)*. https://doi.org/10.21927/literasi.2016.7(1).48-57

Pratiwi, S. N., Cari, C., & Aminah, N. S. (2019). Pembelajaran IPA Abad 21 dengan Literasi Sains Siswa. *Jurnal Materi Dan Pembelajaran Fisika (JMPF)*, *9*(1), 34–42. Retrieved from https://jurnal.uns.ac.id/jmpf/article/view/31612

Purwasi, N., & Yuliariatiningsih, M. S. (2018). Pengembangan Literasi Sains Anak Usia Dini Melalui Metode Bercerita Menggunakan Media Gambar Seri. *Cakrawala Dini: Jurnal Pendidikan Anak Usia Dini*, *7*(2). https://doi.org/10.17509/cd.v7i2.10531

Rahayu, S. (2016). Menyiapkan Calon Guru Dalam Berliterasi Sains Melalui Pembelajaran Berkonteks Explisit Nature of Science (NOS). *Konvensi Nasional Pendidikan Indonesia (KONASPI) VII*, (October).

Rosdiana, L., Nurita, T., & Sabtiawan, W. B. (2018). Pengembangan Lkm Untuk Meningkatkan Literasi Sains Calon Guru Ipa. *Jurnal Penelitian Pendidikan IPA*, *3*(1), 27. https://doi.org/10.26740/jppipa.v3n1.p27-32

Rusilowati, A. (2018). Asesmen Literasi Sains: Analisis Karakteristik Instrumen dan Kemampuan Siswa Menggunakan Teori Tes Modern Rasch Model. *Prosiding Seminar Nasional Fisika Universitas Riau Ke-3*, (September), 2–15. Retrieved from https://snf.fmipa.unri.ac.id/wp-content/uploads/2019/03/0.-300B-2-15NI.pdf

Syofyan, H., Susanto, R., Wijaya, Y. D., Vebryanti, V., & Tesaniloka P, M. (2019). Pemberdayaan Guru Dalam Literasi Untuk Meningkatkan Kemampuan Berpikir Kritis Siswa. *International Journal of Community Service Learning*, *3*(3), 127–132. https://doi.org/10.23887/ijcsl.v3i3.20816

Widayati, J. R., Safrina, R., & Supriyati, Y. (2020). Analisis Pengembangan Literasi Sains Anak Usia Dini melalui Alat Permainan Edukatif. *Jurnal Obsesi : Jurnal Pendidikan Anak Usia Dini*, *5*(1), 654. https://doi.org/10.31004/obsesi.v5i1.692

Yuliati, Y. (2017). Literasi Sains Dalam Pembelajaran Ipa. *Jurnal Cakrawala Pendas*. https://doi.org/10.31949/jcp.v3i2.592

Yulyanti, Y. (2017). Literasi Sains dalam Pembelajaran IPA. *Jurnal Cakrawala Pendas*.

Zahro, I. F., Atika, A. R., & Westhisi, S. M. (2019). Strategi Pembelajaran Literasi Sains Untuk Anak Usia Dini. *Jurnal Ilmiah Potensia*, *4*(2), 121–130. https://doi.org/10.33369/jip.4.2.121-130