JURNAL PENDIDIKAN DAN PENGAJARAN
Volume 56 Nomor 2 2023, 241-250
E-ISSN: 2549-2608; P-ISSN: 2301-7821
DOI: https://doi.org/10.23887/jpp.v56i2.58032

The Positive Impact of Digital Literacy on Science Process Skills

Darmaji[1*], Astalini[2], Dwi Agus Kurniawan[3], Minarsih[4], Rahmat Perdana[5]

[1,2,3,4,5] Physics Education, Universitas Jambi, Jambi, Indonesia
*Corresponding author: darmaji@unja.ac.id

Abstrak

Keterampilan proses sains peserta didik penting untuk ditingkatkan salah satunya dengan cara menggunakan teknologi sehingga diperlukan juga kemampuan literasi digital peserta didik dalam menggunakan teknologi. Tujuan penelitian ini adalah untuk menganalisis pengaruh literasi digital terhadap keterampilan proses sains. Jenis penelitian yang digunakan adalah mix methode dengan model sequeential explanatory. Populasi dalam penelitian ini adalah peserta didik kelas X MIPA di SMA. Teknik pengambilan sampel yang digunakan yaitu simpel random sampling dan didapatkan sampel sebanyak 50 siswa dan dengan instrumen berupa lembar angket, observasi dan wawancara dari guru. Data kauantitatif didapatkan dari lembar angket dan observasi sedangkan data kualitatif didaptkan dari hasil wawancara. Setelah penelitian dilakukan maka data akan dianalisis. Analisis data kauntitatif menggunakan uji statistik yaitu statistik deskriptif dan statistik inferensial parametrik. Analisis statistk deskriptif disajikan dalam bentuk tabel berupa frekuensi, mean, median, nilai max dan nialai min sedangkan analisis inferensial parametrik berupa uji t dengan uji prasyarat: uji normalitas dan uji linearitas. Sedangkan data kualitatif menggunakan miles & Huberman. Hasil penelitian yang didapatkan adalah literasi digital berpengaruh terhadap keterampilan proses sains dengan presentase sebesar 93,5%.

***Kata Kunci*:** *Literasi digital, keterampilan proses sains, pembelajaran fisika.*

Abstract

Students' science process skills are important to improve, one of which is by using technology so that students' digital literacy skills are also needed in using technology. The purpose of this study was to analyze the effect of digital literacy on science process skills. The type of research used is a mix method with a sequential explanatory model. The population in sthis study were students in class X MIPA at senior high school. The sampling technique used was simple random sampling and a sample of 50 students was obtained and the instruments included questionnaires, observations and teacher interviews. Quantitative data were obtained from questionnaires and observations while qualitative data were obtained from interviews. After the research is done, the data will be analyzed. Quantitative data analysis used statistical tests, namely descriptive statistics and parametric inferential statistics. Descriptive statistical analysis is presented in tabular form in the form of frequency, mean, median, max value and min value while inferential parametric analysis is in the form of a t test with prerequisite tests: normality test and linearity test. While the qualitative data uses Miles & Huberman. The research results obtained were that digital literacy had an effect on science process skills with a percentage of 93.5%.

Keywords: Digital literacy, science process skills, physics learning.

History:
Received : January 30, 2023
Revised : February 04, 2023
Accepted : July 06, 2023
Published : July 25, 2023

Publisher: Undiksha Press

1. INTRODUCTION

Education in Indonesia has undergone changes, namely the turn of the revolutionary era 4.0 into the era of society 5.0. Education in the era of society 5.0, this era offers a society that is centered on balance where the Internet is not only for information but for living life (Handayani & Ni, 2020; Suryadi et al., 2021; Sukitman & Ridwan, 2021). Society 5.0 Education In the field of education in the era of society 5.0, students in the learning process are directly confronted with digital tools specifically designed to replace educators or controlled by educators remotely. The use of learning media and online-based learning is one of the visible characteristics of education in the 5.0 era of society and is able to maintain the function of education today (Kurniawan & Purnamawirayuda, 2020; Nastiti et al., 2022). So that in the world of education in the era of society 5.0, students' digital literacy skills are a challenge that must be developed by teachers and schools. Digital literacy is a person's

competency in using digital media in finding, utilizing, processing, packaging, evaluating and disseminating information correctly, wisely and responsibly (Hestiyani et al., 2022; Lee et al., 2014; Safitri et al., 2020). Digital literacy is the cohesion, views and expertise of individuals who implicitly use digital technology and communication systems to search, organize, connect, analyze and assess information, create something current, create and relate to other people so they can play a dynamic role in society (de Aldecoa et al., 2015; Oktaviani et al., 2018). In education, technology and digital play a supporting role in school learning so that in utilizing technology and digital digital literacy is needed which helps students to be wise in using technology. Digital literacy also needs to be supported as a learning procedure, which is included in the curriculum system, or at least connected to the teaching and learning system (Cicha et al., 2021; Mujab & Kamal, 2016; Zimmer & Matthews, 2022). By including digital literacy in the curriculum or learning system at school, the teacher will have the responsibility to increase students' digital literacy skills.

This digital literacy aims to increase student motivation in learning to develop students' creative thinking and foster student integrity (Alexander et al., 2017; Blau et al., 2020; Faiqoh et al., 2018). Students with good digital literacy skills will try to find/select important information and understand, communicate, and convey ideas in the digital space (Saenab et al., 2022; Yerkinay & Dzhussubaliyeva, 2022). However, without sufficient digital literacy, individuals who are actively looking for information have the potential to get lost (Tsaniyah & Juliana, 2019; Matli & Ngoepe, 2020; Kozanoglu & Abedin, 2021). Because technology is getting faster and not accompanied by good digital literacy, it will make students misuse existing technology, as nowadays there are lots of negative things that grow from the development of technology if someone doesn't have an understanding of digital literacy itself. Digital literacy education can also improve other abilities in learning such as science process skills because with digital literacy it will be easier for students to do learning such as remote practicum using the supporting applications that have been provided.

KPS is a fundamental skill needed to master science experienced in everyday life (Syazali et al, 2021; Pujawan et al., 2022; Tahya et al., 2022). According to previous study science process skills are grouped into two parts, namely basic process skills and integrated process skills (Beaumont-Walters & Soyibo, 2001; Pratiwi & Pritanova, 2017). Basic science process skills namely observing, classifying, measuring and predicting which are useful as an intellectual foundation in scientific investigations and as a prerequisite for integrated science process skills. While integrated science process skills include identifying and defining variables, collecting and processing data, creating data tables and graphs, describing relationships between variables, interpreting data, manipulating materials, formulating hypotheses, designing investigations, drawing conclusions and generalizing information that is useful for solving problems or do science experiments.

Science process skills are important to be integrated and trained in the learning process because these skills are the basis for developing students' cognitive abilities (Asy'ari & Herdiyana, 2017; Maranan, 2017; Seda & Bulut, 2021). But at this time the problem that occurs is that there are still many schools that do not have adequate facilities and learning methods carried out by teachers who have not improved students' science process skills. Science process skills are important to students' cognitive skills in mastery and can make it easier to understand abstract concepts in self-directed learning through concrete objects (Astalini, Dwi Agus Kurniawan, 2019; Rahman et al., 2019). Science process skills are important to develop so that students become active learners. So that students' science process skills in learning become a focus that needs to be studied and see if there is an effect of digital literacy on science process skills. In this study studied how digital literacy can affect students' science process skills at school. Because the process of science skills is important for students because it can improve students' abilities both in the cognitive and

psychomotor domains. Using digital literacy helps students to take advantage of technology in improving science process skills so that in this study they learn how much influence digital literacy has on science skills. This research is important to do because the role of technology is increasing rapidly along with the development of the times, the information obtained is increasingly widespread. So that an understanding of science process skills is easier to obtain and increases knowledge and strengthens students' process skills. Based on the results of this presentation, this study aims to analyze digital literacy influences students' process skills. So that later it can be seen how much influence digital literacy has on science process skills.

2. METHODS

The type of research used in this research is mixed methods with a sequential explanatory research design. Mixed method is a type of research that uses quantitative and qualitative methods, while the sequential explanatory model is a type of combination research where quantitative research is carried out first and then followed by qualitative research (Creswell, 2013; Sugiyono, 2017). Research using the mixed method aims to obtain data in the form of statistics and follow up in order to obtain a more in-depth explanation of the statistical results obtained previously. The population in this study were students of class X MIPA SMAN 8 Muaro Jambi. The sampling technique used is simple random sampling. The simple random sampling technique is the simplest sampling procedure that is carried out fairly, meaning that each unit has the same opportunity to be selected. So that a sample of 25 students was obtained from X MIPA 1 class and 25 students from X MIPA 2 class.

The instruments used were digital literacy questionnaires, KPS observation sheets and teacher interview sheets. The digital literacy questionnaire has 25 ports with a Likert scale of four (4 for strongly agree, 3 for agree, 2 for disagree and 1 for strongly disagree). While the observation sheet consists of 25 terminals which will later be filled in by the observer in straight motion practicum material using a 4-point Likert scale, namely (4 for very good, 3 for good, 2 for not good and 1 for very bad). The results obtained from these numbers and observations will later be strengthened by the results of interviews with teachers regarding students' digital literacy and science process skills. The grid of indicators and items in the digital literacy questionnaire and observation sheet of science process skills is show in Table 1.

Table 1. Grids of Digital Literacy Questionnaire Sheets and Science Process Skills Observation Sheets

Variabel	Indikator
Digital Literacy	Internet Seraching
	Hypertextual Naviagition
	Content Evaluation
	Knowladge Assembly
Science Proces Skill	Observe
	Classify
	Communication
	Measurement
	Predict
	Planning Research
	Experiment
	Presenting Data/Graphics
	Conclude

Furthermore, Table 1 is an interval scale used to classify students' abilities in digital literacy and science process skills in 4 categories. Digital literacy likert scale categories and science process skills is show in Table 2.

Table 2. Digital Literacy Likert Scale Categories and Science Process Skills

Kategori	Interval
Very Not Good	25-43,75
Not Good	43,75-62,5
Good	62,5-81,25
Very Good	81,25-100

After the research was carried out, the results of the data were obtained in the form of qualitative and quantitative data. Quantitative data were obtained from observation sheets for straight motion practicum materials filled in by validators and digital literacy in the form of questionnaires filled out by students. Meanwhile, qualitative data was obtained from teacher interviews and student interviews on digital literacy and students' science process skills. Quantitative data analysis used statistical tests, namely descriptive statistics and parametric inferential statistics. Descriptive statistical analysis is presented in tabular form in the form of frequency, mean, median, max value and min value while parametric inferential analysis is in the form of a t test. Before the t-test is carried out, a prerequisite test is first carried out. Other prerequisite tests are the normality test and linearity test. Meanwhile, for qualitative data analysis are data reduction, data presentation, conclusions (Miles et al., 2014).

3. RESULTS AND DISCUSSION

Result

The digital literacy abilities of students can be seen from the Table 3.

Table 3. Digital Literacy Results

Class	Category	Interval	F	%	Mean	Median	Min	Max
X MIPA 1	Very Not Good	25-43.75	0	0	86.12	85	80	94
	Not Good	43.75-62.5	0	0				
	Good	62.5-81.25	4	16				
	Very Good	81.25-100	21	84				
X MIPA 2	Very Not Good	25-43.75	0	0	84.04	83	79	90
	Not Good	43.75-62.5	0	0				
	Good	62.5-81.25	6	24				
	Very Good	81.25-100	19	76				

From Table 3 it can be seen that the average digital literacy ability of students in class X MIPA 1 is greater than the digital literacy ability of students in class X MIPA 2. The results of descriptive statistics of students' science process skills is show in Table 4.

Table 4. Results of Science Process Skills

Class	Category	Interval	F	%	Mean	Median	Min	Max
X MIPA 1	Very Not Good	25-43.75	0	0	84.80	85	78	92
	Not Good	43,75-62.5	0	0				
	Good	62,5-81.25	6	24				

Class	Category	Interval	F	%	Mean	Median	Min	Max
X MIPA 2	Very Good	81.25-100	19	76	84.92	85	78	90
	Very Not Good	25-43.75	0	0				
	Not Good	43.75-62.5	0	0				
	Good	62.5-81.25	7	28				
	Very Good	81.25-100	18	72				

From Table 4 it can be seen that the science process skills of students in class X MIPA 2 are higher than those in class X MIPA 1. Then the data that has been obtained is carried out a t test to determine the effect of digital literacy skills on students' science process skills. But before that, a normality test will be carried out first. The following is a normality test for digital literacy skills and science process skills. Normality test for digital literacy and science process skills is show in Table 5.

Table 5. Normality Test for Digital Literacy and Science Process Skills

Variable	Class	Sig	Distribution
Digital Literacy	X MIPA 1	0.078	Normal
	X MIPA 2	0.137	Normal
Science Process Skill	X MIPA 1	0.200	Normal
	X MIPA 2	0.200	Normal

From Table 5. It can be seen that digital literacy data and science process skills are normally distributed with a significance value of >0.05, both in class X MIPA 1 and class X MIPA 2. Furthermore, the data is tested whether the data is linear or not. Linearity test is show in Table 6.

Table 6. Linearity Test of Digital Literacy Ability and Science Process Skills

Variable	Class	Sig	Distribution
Digital Literacy	X MIPA 1	0.020	Linear
	X MIPA 2	0.027	Linear
Science Process Skill	X MIPA 1	0.036	Linear
	X MIPA 2	0.039	Linear

From Table 6 data on digital literacy and science process skills are normally distributed because the sig value of those that have been tested is sig <0.05. So that the data obtained can then be carried out a t test to find the effect of digital literacy on students' science process skills. Result t-test is show in Table 7.

Table 7. Result t-Test Results with Digital Literacy ANOVA and Science Process Skills

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	714.153	1	714.153	692.135	0.000
	Residual	49.527	48	1.032		
	Total	763.680	49			

Table 7 shows that the t test results obtained are sig 0.00 so that it can be said that digital literacy affects science process skills because the value obtained is <0.05. Then how much influence digital literacy has on science process skills can be seen from the R Square

value obtained. The result of the regression test seen from the R Square value is show in Table 8.

Table 8. Result t-Test R Square Digital Literacy and Science Process Skills

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	0.967	0.935	0.934	1.016

Based on Table 8 it can be seen that the R Square value obtained is 0.935, so it can be said that digital literacy affects science process skills by 93.5%. Next, the following is a regression table seen from the 2-failed value as show in Table 9.

Table 9. Result Sig t-Test (2-failed) Digital Literacy and Science Process Skills

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	8.808	2.903		3.034	0.004
	Kps	0.899	0.034	0.967	26.308	0.000

Base on Table 9 was found that there was an effect of digital literacy skills on science process skills because the sig value obtained was 0.004 with the condition (2-failed) < 0.05. Teacher interviews were also conducted as a reinforcement of quantitative data. The results of interviews with physics teachers stated that students' science process skills in easy material were still good and students were still able to follow class lessons well. However, if the physics material is relatively difficult, then the process of students' skills decreases. Obstacles in improving students' process skills lie in terms of inadequate facilities and infrastructure. Because there are some practicum tools that cannot be used on certain materials. So that the practicum on the material sometimes cannot be carried out. The way teachers improve science process skills with digital literacy is by using technology, usually I use digital media such as cellphones, laptops with simulations or online practicum

The results of teacher interviews regarding students' digital literacy are that learning usually uses digital media to help students learn. For example, by using the help of mobile phones and the internet to find material that is not in the book. The literacy skills of digital students in studying physics using a cellphone or laptop in finding material that is not in the book and looking for material from various sources. So that in learning students make good use of digital media. Because digital literacy can make good use of technology and the internet. Digital literacy also provides understanding in processing practicums with the help of applications in digital media such as phet simulations.

Discussions

The average student digital literacy is in the very good category. From the research that has been done, the minimum score in class X MIPA 1 is 84 and in class X MIPA 2 is 79. This indicates that students have an interest in utilizing technology so it is necessary to instill an understanding of digital literacy. Teachers also stated that in learning physics they often use digital media to assist the teaching and learning process. Because according toprevious study in this digital era, technology can help the teaching and learning process (Ramadhan & Bulqini, 2018). Mobile phones, laptops and the internet network is one of the technologies used in learning. Digital media is used to search for material that is not in the book. The ability of students to operate digital media is also often used in conducting online practicums using the phetsimulation application which makes it easier for students to carry out

experimental simulations of physics material. This also follows research conducted that state practicum using technology can utilize phetsimulation as a practicum simulation (Roosyanti, 2022). The average students' science process skills are in the very good category. The minimum score in class X MIPA 1 is 76 and in MIPA 2 is 72, so there are no students with bad disabilities. The teacher also stated that in learning physics which was relatively difficult, students had difficulty developing KPS but vice versa. teacher training as well as in developing science process skills due to inadequate infrastructure to carry out practicums. Science process skills can enhance other abilities. Science process skills train children to actively experiment, think about what is happening and conduct experiments. This is in line with previous study that state with science process skills students will actively experiment and be able to develop their science process skills (Astalini et al., 2022). This is also influenced by each KPS indicator which is able to develop and improve students' cognitive, psychomotor, and affective aspects (Astalini et al., 2022).

From the data obtained, it can be seen that digital literacy has an effect on science process skills. Research shows that digital literacy has an effect of 93.5% on science process skills. This was also reinforced by the teacher's statement during the interview that students' digital literacy skills helped improve science process skills. Digital literacy by teachers is developed through learning that utilizes digital media (Astalini et al., 2022; Chan et al., 2017). In learning physics, especially practicum, applications such as phetsimulation help students to do practicum online. This is in line with other study that phet simulations help students learn physics optimally (Arifin et al., 2022). This makes it easier for students to repeat the practicum at home if they don't understand and can re-sharpen the concept of the material at that time with practicum simulations. In addition, it also makes it easier for teachers to practice remotely if conditions do not allow face-to-face learning. Understanding the good use of the internet can help students learn by looking for material from various sources that are not in books. Previous study also stated that with the internet students can read information and material more easily (Adzkiya & Suryaman, 2021). This makes it easier for students to dig deeper into information and material that they do not understand and to find the truth or facts about physical events or phenomena related to the material taught at school. From this research it was found that in a study it was said that learning science process skills was best done using multimedia-based learning media (Nofikasari et al., 2019; Wati & Fatimah, 2016).

In addition, digital literacy reduces the negative impact of the rapid development of information and communication technology. Due to current technological developments, access to information obtained on the internet is increasingly widespread and easy to obtain. Even though not all of the information or features that exist have a positive impact on someone, especially for students. With digital literacy, guide students to make good use of technological developments and put them to good use. So that technological developments can improve students' abilities, especially in this research, namely science process skills. In previous research they implemented the application of digital literacy in schools by examining the negative and positive impacts of students bringing cell phones to school (Fernanda et al., 2020). In this study, digital literacy was implemented for students by applying science process skills in practicum learning. Previous study looks at how digital literacy affects student learning outcomes in entrepreneurship and examines how digital literacy and independent learning affect science learning achievement, while in this study looks at how digital literacy influences students' science process skills (Altun, 2019). In line with some of these studies, that digital literacy can help students in their learning process at school. This can be seen from the output or learning outcomes of students at school by utilizing the development of information and communication technology. With the help of technology students will find it easier to learn so that technological abilities need to be

improved and direct students to make the best use of technology for positive things. From these several studies, there has been no research that examines the effect of digital literacy on science process skills. So this research will analyze the effect of digital literacy on science process skills in students through practicum learning. The advantage of this study is that there has not been a similar study using the mixed method in two different classes. This research can be a reference for further researchers in the same discussion. In addition, this study provides information to teachers about the importance of digital literacy so that teachers can consider teaching using digital media.

4. CONCLUSION

The conclusion from this study is that digital literacy affects students' processing skills. Digital literacy can help access information and material that is not available in books and access various kinds of practice questions and discussions. So students can easily get learning resources from various sources. Digital literacy also influences students' sample processing skills in practical learning. Digital literacy with one indicator of the operation of technological devices can assist students in carrying out experimental simulations using an application, one of which is Phet simulation. So that in this study digital literacy affects the process of students' science skills. The impact of this research is that it can provide knowledge of how digital literacy influences the improvement of students' science process skills so that future researchers can make this research one of the references in creating new works.

5. REFERENCES

Adzkiya, D. S., & Suryaman, M. (2021). Penggunaan Media Pembelajaran Google Site dalam Pembelajaran Bahasa Inggris Kelas V SD. *Educate : Jurnal Teknologi Pendidikan*, *6*(2). https://doi.org/10.32832/educate.v6i2.4891.

Alexander, B., Adams Becker, S., Cummins, M., & Hall Giesinger, C. (2017). Digital Literacy in Higher Education, part II. *NMC Horizon Project Strategic Brief*, *3.4*, 37. https://www.learntechlib.org/p/182086/.

Altun, D. (2019). Preschoolers' Emergent Motivations to Learn Reading: A Grounded Theory Study. *Early Childhood Education Journal*, *47*(4), 427–443. https://doi.org/10.1007/s10643-019-00939-3.

Arifin, M. M., Prastowo, S. B., & Harijanto, A. (2022). Efektivitas Penggunaan Simulasi Phet Dalam Pembelajaran Online Terhadap Hasil Belajar Siswa. *Jurnal Pembelajaran Fisika*, *11*(1), 16. https://doi.org/10.19184/jpf.v11i1.30612.

Astalini, Dwi Agus Kurniawan, R. P. (2019). Identifikasi Sikap Peserta Didik terhadap Mata Pelajaran Fisika di Sekolah Menengah Atas Negeri 5 Kota Jambi. *UPEJ Unnes Physics Education Journal*, *8*(1), 34–43. https://doi.org/10.15294/upej.v8i1.29510.

Astalini, Darmaji, Kurniawan, D. A., & Minarsih. (2022). Identification of HOTS Creative Thinking, Science Process Skills and Digital Literacy in Physics Subject. *Jurnal Penelitian Fisika Dan Aplikasinya (JPFA)*, *12*(1), 47–61. https://doi.org/10.26740/jpfa.v12n1.p47.

Beaumont-Walters, Y., & Soyibo, K. (2001). An analysis of high school students' performance on five integrated science process skills. *Research in Science and Technological Education*, *19*(2), 133–145. https://doi.org/10.1080/02635140120087687.

Blau, I., Shamir-Inbal, T., & Avdiel, O. (2020). How does the pedagogical design of a technology-enhanced collaborative academic course promote digital literacies, self-

regulation, and perceived learning of students? *Internet and Higher Education*, *45*(May 2019), 100722. https://doi.org/10.1016/j.iheduc.2019.100722.

Chan, B. S. K., Churchill, D., & Chiu, T. K. F. (2017). Digital Literacy Learning In Higher Education Through Digital Storytelling Approach. *Journal of International Education Research (JIER)*, *13*(1), 1–16. https://doi.org/10.19030/jier.v13i1.9907.

Cicha, K., Rutecka, P., Rizun, M., & Strzelecki, A. (2021). Digital and media literacies in the polish education system—pre-and post-covid-19 perspective. *Education Sciences*, *11*(9). https://doi.org/10.3390/educsci11090532.

Creswell, J. W. (2013). *Research Design: Qualitative, Quantitative, and Mixed Methods Approaches, 4th Edition*. Sage Publications, Incorporated.

de Aldecoa, C. Y., Okada, A., & Palau, R. (2015). Nuevos escenarios de aprendizaje para el siglo xxi relacionados con la educación, la cultura y la tecnología. *RUSC Universities and Knowledge Society Journal*, *12*(2), 87–102. https://dialnet.unirioja.es/servlet/articulo?codigo=5584496.

Faiqoh, N., Khasanah, N., Astuti, L. P., Prayitno, R., & Prayitno, B. A. (2018). Profil Keterampilan Argumentasi Siswa Kelas X dan XI MIPA di SMA Batik 1 Surakarta pada Materi Keanekaragaman Hayati. *Jurnal Pendidikan Biologi*, *7*(3), 174. https://doi.org/10.24114/jpb.v7i3.10122.

Fernanda, F. F. H., Rahmawati, L. E., Putri, I. O., & Nur'aini, R. (2020). Penerapan Literasi Digital Di Smp Negeri 20 Surakarta. *Buletin Literasi Budaya Sekolah*, *2*(2), 141–148. https://doi.org/10.23917/blbs.v2i2.12842.

Hestiyani, R. R., Dewi, C., & Lestari, S. (2022). Analisis kemampuan literasi digital siswa kelas IV SDN 1 Kunti Kabupaten Ponorogo. *Konferensi Ilmiah Dasar*, *3*, 559–564. http://prosiding.unipma.ac.id/index.php/KID/article/view/2680.

Kurniawan, D. A., & Purnamawirayuda, R. (2020). *Gender diff erences : Students ' science process skills based on gender homogeneous class*. *6*(2), 239–250. https://doi.org/10.21831/jk.v6i2.42654.INTRODUCTION.

Lee, S. S., Hung, D., & Teh, L. W. (2014). Toward 21st Century Learning: An Analysis of Top Performing Asian Education Systems' Reforms. *Asia-Pacific Education Researcher*, *23*(4), 779–781. https://doi.org/10.1007/s40299-014-0218-x.

Miles, M. B., Huberman, A. M., & Saldana, J. (2014). *Qualitative Data Analysis: a Method Sourcebook*. Sage Publications.

Mujab, S., & Kamal, M. (2016). Stimulus Guru Dan Respon Siswa Dalam Pembelajaran Bahasa Arab Kelas Vii Smp Daru Ulil Albab Tegal 2020/2021. *Jurnal Bashrah*, *01*(2), 131–145. https://www.journal.stitpemalang.ac.id/index.php/bashrah/article/view/321.

Nastiti, F. E., Ni'mal 'abdu, A. R., & Kajian, J. (2022). Kesiapan Pendidikan Indonesia Menghadapi era society 5.0. *Edcomtech*, *5*(1), 61–66. http://download.garuda.kemdikbud.go.id/article.php?article=1615488&val=10060&title=Kesiapan Pendidikan Indonesia Menghadapi Era Society 50.

Nofikasari, I., Suryani, F., & Yuliana, M. E. (2019). Induction of Interactive Multimedia-Based Learning Media Technology at PAUD Aisiyah Al-Hasanah Sukoharjo. *Undiksha Journal of Early Childhood Education*, *1*(1), 3–5. http://ejurnal.unisri.ac.id/index.php/sndms/article/view/3264.

Oktaviani, B. A. Y., Mawardi, & Astuti, S. (2018). Perbedaan Model Problem Based Learning dan Discovery Learning Ditinjau Dari Hasil Belajar Matematika Siswa Kelas 4 SD The Difference of Problem-Based Learning and Discovery Learning Viewed From Mathematic Learning Outcomes of 4 th Grade Students. *Scholaria Jurnal Pendidikan Dan Kebudayaan*, *8*, 131–132. https://ejournal.uksw.edu/scholaria/article/view/1589.

Pratiwi, N., & Pritanova, N. (2017). Pengaruh Literasi Digital Terhadap Psikologis Anak Dan Remaja. *Semantik*, *6*(1), 11. https://doi.org/10.22460/semantik.v6i1p11.250.

Pujawan, I. G. N., Rediani, N. N., Antara, I. G. W. S., Putri, N. N. C. A., & Bayu, G. W. (2022). Revised Bloom Taxonomy-Oriented Learning Activities To Develop Scientific Literacy and Creative Thinking Skills. *Jurnal Pendidikan IPA Indonesia*, *11*(1), 47–60. https://doi.org/10.15294/jpii.v11i1.34628.

Rahman, R., Sopandi, W., Widya, R. N., & Yugafiati, R. (2019). Literacy in The Context of Communication Skills for The 21st Century Teacher Education in Primary School Students. *International Journal of Science and Applied Science: Conference Series*, *3*(1), 101. https://doi.org/10.20961/ijsascs.v3i1.32462.

Ramadhan, A., & Bulqini, A. (2018). Analisis Receive pada Pertandingan Final Sepak Takraw Pomda Jatim 2017. *JSES : Journal of Sport and Exercise Science*, *1*(1), 13. https://doi.org/10.26740/jses.v1n1.p13-19.

Roosyanti, A. (2022). Interactive Simulations Sebagai Laboratorium Virtual Pada Pembelajaran Sains Sekolah Dasar Selama Pandemi Covid-19. *AULADUNA: Jurnal Pendidikan Dasar Islam*, *9*(2), 121–135. https://journal3.uin-alauddin.ac.id/index.php/auladuna/article/view/26794.

Saenab, S., Saleh, A. R., & Adnan, A. (2022). How Literate are Prospective Science Teachers in this digital era? Profile of Digital Literacy Skills of Preservice Science Teachers in South Sulawesi, Indonesia. *SAR Journal - Science and Research*, *5*(4), 194–199. https://doi.org/10.18421/sar54-04.

Safitri, I., Marsidin, S., & Subandi, A. (2020). Analisis Kebijakan terkait Kebijakan Literasi Digital di Sekolah Dasar. *Edukatif : Jurnal Ilmu Pendidikan*, *2*(2), 176–180. https://doi.org/10.31004/edukatif.v2i2.123.

Seda, A., & Bulut, K. (2021). The effect of the integration of science and mathematics on critical thinking and scientific process skills of the gifted students *. *International Journal of Curriculum and Instruction*, *13*(1), 290–312. https://eric.ed.gov/?id=EJ1285764.

Sugiyono. (2017). *Metode Penelitian Kuntitatatif Kualitatif dan R&D* (Cetakan Ke). Penerbit Alfabeta.

Suryadi, S., Kushardiyanti, D., & Gusmanti, R. (2021). Challenges of Community Empowerment in the Era of Industry Society 5.O. *KOLOKIUM Jurnal Pendidikan Luar Sekolah*, *9*(2), 160–176. https://doi.org/10.24036/kolokium-pls.v9i2.492.

Tahya, D., Dahoklory, F. S., & Dahoklory, S. R. (2022). Development of Local Wisdom-Based Chemistry Modules to Improve Students' Science Process Skills. *Jurnal Penelitian Pendidikan IPA*, *8*(2), 731–739. https://doi.org/10.29303/jppipa.v8i2.1424

Tsaniyah, N., & Juliana, K. A. (2019). Literasi Digital Sebagai Upaya Menangkal Hoaks Di Era Disrupsi. *Al-Balagh : Jurnal Dakwah Dan Komunikasi*, *4*(1), 121–140. https://doi.org/10.22515/balagh.v4i1.1555.

Wati, W., & Fatimah, R. (2016). Effect Size Model Pembelajaran Kooperatif Tipe Numbered Heads Together (Nht) Terhadap Kemampuan Berpikir Kritis Siswa pada Pembelajaran Fisika. *Jurnal Ilmiah Pendidikan Fisika Al-Biruni*, *5*(2), 213–222. https://doi.org/10.24042/jpifalbiruni.v5i2.121.

Yerkinay, Y., & Dzhussubaliyeva, D. (2022). Developing future teachers' digital competence via massive open online courses (MOOCs). *Journal of Social Studies Education Research*, *13*(2), 170–195. http://www.jsser.org/index.php/jsser/article/view/4197.

Zimmer, W. K., & Matthews, S. D. (2022). A virtual coaching model of professional development to increase teachers' digital learning competencies. *Teaching and Teacher Education*, *109*(July), 103544. https://doi.org/10.1016/j.tate.2021.103544.