Profile of student scientific literacy Melinda

by Erman Erman

Submission date: 12-Jan-2022 08:18PM (UTC+0700)
Submission ID: 1740576602
File name: Melinda_2021_J._Phys._3A_Conf._Ser._2110_012031-1.pdf (735.11K)
Word count: 5062
Character count: 26061

Journal of Physics: Conference Series

PAPER • OPEN ACCESS

Profile of Students' Scientific Literacy in Physics Learning during COVID-19 Pandemic

To cite this article: V Melinda *et al* 2021 *J. Phys.: Conf. Ser.* **2110** 012031

View the article online for updates and enhancements.

This content was downloaded from IP address 114.125.77.3 on 26/11/2021 at 02:56

Profile of Students' Scientific Literacy in Physics Learning during COVID-19 Pandemic

V Melinda*, E Hariyono, E Erman, and B K Prahani

Science Education Postgraduate Program, Universitas Negeri Surabaya, Indonesia

*Email: vina.20012@mhs.unesa.ac.id

Abstract. Online learning during the COVID-19 pandemic that is not optimal has an impact on students' Scientific Literacy (SL). Facts in Indonesia, online learning has not been fully run optimally. In this case, teachers and students are still less adaptable to changes in learning methods. This certainly has an impact on aspects of students' SL. The main objective is to analyze the initial level of students' SL during COVID-19 pandemic. Research use 105 senior high school students in Surabaya. Based on the result we can conclude that the profile of students' SL in Physics learning during COVID-19 pandemic is still at low category, that's percentage are 28.38% (level 2). It's means students can perform basic epistemic and procedural knowledge, contain knowledge in daily, basic procedural knowledge to give identification of scientific explanations, interpret scientific data, and draw conclusions from simple experimental data. The implication of this research can be used as empirical evidence stating that the SL of Senior High School students still need to be improved.

1. Introduction

Indonesia is faced with a fairly serious problem, namely the outbreak of the corona virus, which is now known as the pandemic of COVID-19. It has a negative impact on various sectors of many countries, especially in the education sector of Indonesia. The Indonesian government made a policy by changing the face-to-face learning series from being online learning. There are still many teachers and students who complain because of difficulties in the learning process, especially technical problems in teaching, this can hinder the learning process [1]. While flexibility in time and location is an advantage of online learning, it can also present problems. The manner of students who are not serious about the online learning process can cause many problems. Moreover, many students often do not participate in online learning due to internet accessibility constraints [2].

The results according of interviews with several students, some students said that they felt uncomfortable when studying online; this led to increased frustration and confusion [3]. Many students complain because the teacher does not explain the topic in a coherent manner, and the teacher tends to only give independent assignments continuously. This is a challenge to develop learning content that does not only include the curriculum but must involve students [4]. The components of learning content, technology, students' psychology need to be considered, so that the online learning process can be balanced. If the components in the learning process are not balanced, it will have an impact on students' Scientific Literacy (SL). In this case, understanding of science and the implication is very important to learn, so science must be a feature of the education of every young generation [5,6].

Content from this work may be used under the terms of the Creative Commons Attribution 3.0 licence. Any further distribution of this work must maintain attribution to the author(s) and the title of the work, journal citation and DOI.
Published under licence by IOP Publishing Ltd

The results of the last scientific literacy assessment conducted by PISA in 2018 seen by the Organization for Economic Cooperation and Development (OECD) stated that the SL aspects of Indonesian students before pandemic COVID-19 were still low. Indonesia is ranked 70th out of 78 OECD member countries with an average SL score of 396 [7]. This is an illustration that Indonesia's SL are still low, which is at level 1a. It means a student is able to use basic concepts and knowledge that associated lives with everyday life. They can conduct a scientific investigation of no more than two variables, the students also to identify simple correlations and they draw graphical and visual data that require low cognitive comprehension [7].

In addition, many studies in Indonesia conducted prior to COVID-19 stated that students' SL were still relatively low [8-12]. SL are influenced by several factors they are teaching materials, learning models, learning medias, students' worksheets, evaluation instrument based on SL [12]. Three main categories of inventions were identified as consisting of issues related to online learning, teachers, and content development. Learner-related issues are including students' expectations, identities, readiness, and participation in online learning. Meanwhile, content-related issues are including the role of teachers in content development, integration of multimedia in content, strategic roles of teaches in content development, and considerations for content development. The problems that faced by teachers are the transition from face to face to online learning, the role of agencies, the time management, and the teaching methods [4]. The low SL of students is possible because of these factors.

The SL measured by PISA includes the Physics subject matter. Therefore, the measurement of students' SL in the physics topic is very necessary. Meaningful learning can be obtained through students' SL which is useful for problem solving in everyday life. One of the physics topics is the kinetic theory of gases. Based on the questionnaire, students think that the kinetic theory of gases topic is difficult to understand, because of its abstract nature related to microscopic things. Student in explaining an abstract concept is a main to receive knowledge [13]. Therefore, a great reasoning is necessary to understand abstract concept. In this case, teachers must have many ideas to make learning more meaningful, and need to adjust so that students' scientific performance can still be carried out even though learning is carried out online.

Based on the description, this research aims to describe the profile of students' SL on the kinetic theory of gases topic during the COVID-19 pandemic. The results of this research will be used as a reference for efforts to improve students' SL.

2. Method

2.1 General Background

The design of this research was pre-experimental. The main objective of this research was to analyze the initial level of SL of senior high school students during the COVID-19 pandemic on kinetic theory of gases topic.

2.2. Sample of Research

The subjects of this research were Senior High School students in Surabaya (East Java, Indonesia) that consist of 105 eleventh grade students in Surabaya. Purposive sampling is used in this research.

2.3. Procedure

The procedure of this research consists of: (1) researchers conduct a literature about SL; (2) researchers focused on finding indicators and assessments of several SL in the physics learning; (3) researchers develop SL test instrument to determine the initial level of SL of senior high school students during the COVID-19 pandemic; (4) researcher gave instruments to three experts, to validate the SL test Instruments; (5) Researchers revise related on suggestions from three validator experts; (6) Researchers tested 105 students using a question instrument to determine the profile of high school students' SL on the topic of Kinetic Theory of Gases; and (7) researchers conducted analysis and conclusions the results of the instrument on SL.

2.4. Instrument

In this research, the SL question instrument was developed to determine the initial level of SL of high school students during the COVID-19 pandemic on kinetic theory of gases topic. Indicators of SL questions consist of (1) Explaining phenomena scientifically; (2) Evaluating and designing scientific investigations; and (3) Interpreting scientific data and evidence. The results of instrument validation on SL test are shown in Table 1.

Table 1. The results of SL test instruments' validation and reliability

Aspect	Indicators of Validation	Assessment (validator)			Score	Criteria	R (Cronbach's Alpha)
		V1	V2	V3			
Content	The suitability of the item with the topic	4.00	3.00	3.00	3.33	Valid	Reliable
	The suitability of the items with the indicators	4.00	3.00	3.00	3.33	Valid	Reliable
	The items presented are able to reveal the profile of students' SL	4.00	3.00	3.00	3.33	Valid	Reliable
Construct	The clarity of instructions on how to do the questions	4.00	3.00	3.00	3.33	Valid	Reliable
	The clarity of questions and answer boundaries	4.00	3.00	4.00	3.67	Valid	Reliable
Language	The structure of communicatives' sentence	4.00	3.00	4.00	3.67	Valid	Reliable
	The use of question sentences does not cause double interpretation	4.00	3.00	4.00	3.67	Valid	Reliable
	Use of good and correct language	4.00	3.00	3.00	3.33	Valid	Reliable
Average		4.00	3.00	3.38	3.46	Valid	Reliable
Conclusion: The Instrument of SL test is valid and reliable							

The development of SL test instrument of senior high school on the kinetic theory of gases by experts is 3.46 valid. The instrument validation sheet for SL test based on the statistical reliability of Cronbach's alpha, which is 0.956, is categorized as very reliable.

2.5 Data Analysis

The initial level of high school students' SL during the COVID-19 pandemic on kinetic theory of gases topic analyzed using quantitative descriptive. The results of this research show the initial level of SL for Senior High School students on the kinetic theory of gases topic.

Data analysis of students' SL was carried out by:

a. Giving weight or score to each question that has different literacy competencies. SL cognitive competence adapted from PISA
   1. The point 1, maximum scores: 5, questions with low cognitive level
   2. The point 2, maximum score: 10, questions with moderate cognitive level
   3. The point 3, maximum score: 15, questions with high cognitive level
b. Determine the score for each question with the description assessment rubric that has been made.
c. Total score of students:

$$\text{Total Score} = \frac{score\ obtained}{Maximum\ score}\ x\ 100 \quad (1)$$

d. Determine the achievement score for each competency:

$$\text{Total Score} = \frac{score\ obtained}{Maximum\ score\ x\ sample}\ x\ 100 \quad (2)$$

e. The score obtained is converted into a level score based on PISA [7] based on Table 2.

Table 2. Score and level of scientific literacy

Level (Score of PISA)	Conversion Indonesian's Score
6 (708)	86-100
5 (633)	73-85
4 (559)	58-72
3 (484)	43-57
2 (410)	28-42
1a (335)	13-27
1b (261)	0-12

3. Results and Discussion

The SL test instrument that has been valid and reliable was tested on 105 eleventh grade Senior High School students in physics learning. The questions of test were developed by researchers and the categorization of SL levels adapted from PISA 2018. The result of students' SL test based on levels of SL shows in Table 3.

Table 3. The results students' SL in level of PISA 2018

Levels of scientific literacy	Average score of scientific literacy	Percentage (%)	Students who can answered questions on level
1b	-	-	-
1a	31.59	39.05	41
2	23.31	60.95	64
3	-	-	-
4	-	-	-
5	-	-	-
6	-	-	-
Percentage of all students'SL	28. 36 %	Students	105

Based on Table 2, we can see that students' SL in online learning during the COVID-19 pandemic are still low, namely dominant at level 2. This means that students' SL has not changed before and after the pandemic COVID-19, that's in low category [10,11]. Table 3 shows that percentage of all students' SL in aspects of competence and knowledge in 105 students are 28.36%, it can be interpreted into the level 2 [7]. In this case, the students of eleventh grade in physics learning can demonstrate the basic of epistemic knowledge. They can use their contain knowledge in daily, basic procedural knowledge to give identification of scientific explanations, interpret scientific data, and draw conclusions from simple experimental data [7]. This result shows one level higher than the result which states that the average SL of Indonesian students is low, it's show at level 1 a [7]. There are several causes of low SL during the COVID-19 pandemic, including learning media, textbooks, learning models, worksheets, and evaluation instruments based on SL [13]. Improving the SL of Senior High School students can be done by using science textbooks that are developed appropriately. Textbooks, worksheets, learning models, and evaluation instruments who develop based on SL can improve the students' SL [14].

The students are not used to learning more about scientific issues. Students also do not understand the problem, because the reading level is low [12]. There are still many students in Indonesia who

experience misconceptions, especially on kinetic theory of gases topic, so in this case, teachers need to prepare learning well so that the concepts conveyed can be accepted by students clearly. They also increase self-confidence and improves the relationship between teaching and learning process with the environmental context where students live [15]. Teachers should try to choose the right model and method to be applied to the online learning process during pandemic COVID-19. In addition, learning topic on the kinetic theory of gases tends to be abstract and related to microscopic. In this case, the teacher can integrate technology, especially in online learning. The development of high-quality computer-based learning resources on kinetic theory of gases topic effectively improves students' understanding, use and quality, and has received good responses from students [16]. During the pandemic COVID-19 media that can help in the virtual lab, namely interactive PhET. The function of PhET interactive simulation is also effective in increasing students' motivation to experiment, facilitating students to collect experimental data very well [17]. Developing inquiry-based teaching materials effectively improves SL in learning. [18].

Based on several research, it is concluded that several models that can improve SL are problem-based learning [19-21]. STEM approach in learning can also improve students' scientific literacy [22-24]. If viewed from the achievement of students' SL competence, the result of SL test shown in Table 4.

Table 4. The percentage of indicator SL competencies

Indicator of Scientific Literacy	Question number	Percentage results (%)
1. Explanation of scientific phenomena	1 and 6	59.81
2. Evaluation and designation of scientific investigations	2, 4, and 5	20.87
3. Interpretation of scientific evidence and data	3 and 7	29.57

Table 4 shows the percentage of SL competencies on each question. The highest percentage is shown in the first scientific literacy indicator, which is explaining phenomena scientifically, while the lowest is shown in the indicator of evaluating and designing scientific experiments. Based on Table 4 it can be obtained as many as 40.19 % of students are still not able to understand the concept of kinetic theory of gases on indicator 1 clearly. This shows that students have not been able to use and relate the concept of the kinetic theory of gases to issues in the surrounding environment. Several factors can cause this to happen, students assume that the phenomena around them have nothing to do with physics concepts [25], students often think that physics is a difficult lesson, it's just identical to formulas that can make students confused and experiments that can only be done in the laboratory. This means that the level of reading literacy in Indonesia is still low category [26]. Student still use traditional literacy in their learning activities [27]. Based on the analysis, the information was obtained that most Indonesian students still have limited scientific knowledge that can only be applied to a few situations. They are only able to provide clear scientific explanations and follow explicit evidence. Other than that, many students are less sensitive to the phenomena around them, even more, sensitive to the virtual world, especially in online learning. In the modern era that is increasingly advanced, many students prefer to play online games than observing scientific phenomena around them. So, the impact of misused internet use can affect students' academic achievement and social life [28].

It can be obtained on Table 4, as many as 79.13 % of students still do not understand the concept of evaluating and designing scientific experiments, the fact that in the classroom there are still many teachers who only teach using conventional methods so that learning becomes boring and weakens students' thinking patterns to propose ideas, investigate scientific questions, and solve problems around them. When online learning students tend only writes the topics explained by the teacher [29]. The

results of students doing less of laboratory activities when, the solution for that condition is the teacher can integrate STEM in their learning. It's can improve students' understanding of concepts than learning with conventional methods [14,30]. Problem-solving that occurs in everyday life can be overcome if students already have a good understanding of science [31]. Other factor show that the weakness of online learning is the obstacle to internet accessibility, students who do not have an internet network will find it difficult to access the material provided by the teacher [2,29,32,33], this results in students cannot learn optimally.

Based on Table 4, it can be known as many as 70.43% of students still weak in terms of interpreting scientific data. The reasons are the teaching materials provided by the teacher only use full text, it's less interactive. This is because the teaching materials used by the teacher are only in the form of textbooks, containing formulas, concepts, materials that are packaged classically, so that they are easily understood by students. Good teaching materials should be prepared with various attractive representations and can motivate students in learning physics. The development of unique, creative, and innovative teaching materials by teachers needs to be done with the hope of increasing students' understanding of concepts, interactive e-modules can help students learn to understand material independently anywhere [34]. The development of physics instruments can improve students' scientific attitudes [35]. To improve SL teacher can develop SL-based teaching materials [36,37].

To determine whether gender affects the results of students' SL literacy, the data were analyzed using two-way analysis of variance. The assumption of homogeneity variance was tested using Levene test. The results of the Levene test are shown in table 5, the value of the Levene test p 0.764 > 0.050 indicates the homogeneity of the variance between the gender.

Table 5. The results of Levene test for equality of variances

Dependent variable	F	df1	df2	Sig.
Scientific literacy	3.288	1	103	.764

The results of Table 6 show that the mean SL values of male and female students are 27.30 and 29.06, respectively. According to the result, we can conclude that the average SL of female students is higher than male students [7,9]. That supported by the PISA 2018 results, the average of female students (399) than boys (393) [7].

Table 6. Students' mean score and standard deviation of scientific literacy based on gender

Gender	Number of participants	Mean	Standard deviation
Male	42	27.30	4.89
Female	63	29.06	4.84

Table 7 shows the independent t-test, the sig value of 0.073 > 0.050 its mean there is no statistically significant difference of the average scores of females and males' SL. The mean difference value shows the difference between the average scientific literacy score of female and male students, namely -1.753. It can be concluded that gender does not significantly affect the SL scores of senior high school students in learning physics in the COVID-19 pandemic.

Table 7. As a result of independent sample t test with factors of gender

Source	df	Sig.	Mean difference
Gender	103	0.073	-1.753

However, the researchers' findings prove that there is no statistically significant difference between the two. The average score of women and men on SL was statistically proven that there was no

significant difference between them. It can be concluded that the gender of students does not affect the score of their SL [38].

4. Conclusions

In this case of the research, the profile of students' scientific literacy in Physics learning during COVID-19 pandemic is still at low category, that's percentage are 28.38%. The students' SL based on PISA is still at level 2. It's means students can perform basic epistemic and procedural knowledge, contain knowledge in daily, basic procedural knowledge to give identification of scientific explanations, interpret scientific data, and draw conclusions from simple experimental data. The students' SL for each indicator are: (1) 59.81% can give the explanation of scientific phenomena; (2) 20.87% can give evaluation and designation of scientific investigations; and (3) 29.57% can give interpretation of scientific evidence and data. This research will be used as empirical evidence on how to improve the scientific literacy level in physics learning.

References

[1] Favale T, Soro F, Trevisan M, Dargo I, and Mellia M 2020 *Comput. Netw.* **176** 107290
[2] Dwijuliani R, Rijanto T, Munoto, Nurlaela L, Basuki I, and Maspiyah 2021 *J. Phys. Conf. Ser.* **1810** 012072
[3] Dhawan S 2020 *J. Educ. Technol. Syst.* **49** 5
[4] Kebritchi M, Angie L, and Lilia S 2017 *J. Educ. Technol. Syst.* **46** 4
[5] COSCE 2011 *Informe ENCIENDE, Enseñanza de las Ciencias en la Didáctica Escolar paraedades tempranas en España, Confederación de Sociedades Científicas de España, Madrid* Retrieved from: https://www.cosce.org/pdf/Informe_ENCIENDE.pdf
[6] National Research Council 2012 *A Framework for K-12 Science Education: Practices, Crosscutting Concepts, and Core Ideas* (Washington, D.C: The National Academies Press)
[7] OECD 2019 PISA 2018 *Assessment and Analytical Framework* (Paris: OECD Publishing)
[8] Widowati A, Widyastuti L, and Widodo E 2019 *J. Phys. Conf. Ser.* **1321** 032070
[9] Nur'aini D, Rahardjo S B, and Susanti V H E 2018 *J. Phys. Conf. Ser.* **1022** 012016
[10] Suroso J, Indrawati, Sutarto, and Mudakir I 2021 *J. Phys. Conf. Ser.* **1832** 012040
[11] Mukti W R, Yuliskurniawati I D, Noviyanti N I, Mahanal S, and Zubaidah S 2019 *J. Phys. Conf. Ser.* **1241** 012043
[12] Purwani L D, Sudargo F and Surakusumah W 2018 *J. Phys. Conf. Ser.* **1013** 012019
[13] Rusilowati A, Nugroho S E, Susilowati E S M, Mustika T, Harfiyani N, and Prabowo H T 2019 *J. Phys. Conf. Ser.* **1170** 012028
[14] Parlindungan S, Ida K, and Andhy S 2017 *J. Turk. Sci. Educ.* **14** 92
[15] Udompong L and Suwimon Wongwanich 2014 *Procedia Soc. Behav. Sci.* **116** 5091
[16] Pratidhina E 2019 *J. Phys. Conf. Ser.* **1157** 032004
[17] Rustana C E, Andriana W, Serevina V, and Junia D 2020 *J. Phys. Conf. Ser.* **1567** 022011
[18] Aulia E V, Poedjiastoeti S, and Agustini R 2018 *J. Phys. Conf. Ser.* **947** 012049
[19] Wicaksono R S, Susilo H, and Sueb 2019 *J. Phys. Conf. Ser.* **1227** 012005
[20] Husna F R, Sukaesih S, and Setiati N 2017 *J. Biol. Educ.* **6** 357
[21] Nurtanto M, Nurhaji S, Widjanarko D, Burhan M R, Wijaya, and Sofyan H 2018 *J. Phys. Conf. Ser.* **1114** 012038
[22] Afriana J, Permanasari A, and Fitriani A 2016 *J. Pendidik. IPA Indones.* **5** 261
[23] Khaeroningtyas N, Permanasari A, and Hamidah I 2016 *J. Pendidik. IPA Indones.* **5** 94
[24] Amiruddin B, Budi A S, and Sumantri M S 2021 *J. Phys. Conf. Ser.* **1869** 012176
[25] Al Faizah W A, Suparmi, and Aminah N S 2019 *J. Phys. Conf. Ser.* **1155** 012025
[26] Pratama W A, Hartini S, and Misbah 2019 *J. Inov. Pembelajaran Fis.* **6** 9
[27] Brown C 2013 *Literacy Boost Indonesia Endline Report* (Indonesia : Save the Children)
[28] Soegoto E S and Tjokroadiponto S 2018 *IOP Conf. Ser. Mater. Sci. Eng.* **407** 012176
[29] DebarghaBanerjee, Das D, Pal S, Paul S R, Debnath A, and Reza M 2021 *J. Phys. Conf. Ser.* **1797**

012066
[30] Thahir A, Anwar C, Saregar A, Choiriah L, Susanti F, and Pricilia A 2020 *J. Phys. Conf. Ser.* **1467** 012008
[31] Salamah P N and Rusilowati A 2017 *Unnes Phys. Educ. J.* **6** 3
[32] Sulisworo D, Wulandari Y, Effendi M S, and Alias M 2021 *J. Phys. Conf. Ser.* **1783** 012117
[33] Akmam, Hidayat R, Mufit F, Jalinus N, and Amran A 2021 *J. Phys. Conf. Ser.* **1876** 01208
[34] Maison and Wahyuni I 2021 *J. Phys. Conf. Ser.* **1876** 012089
[35] Gunada I W, Sanida, and Sutrisno H 2015 *J. Pendidik. Fis. Teknol.* **1** 38
[36] Hatta, Miterianifa, and Octarya Z 2021 *J. Phys. Conf. Ser.* **1842** 012045
[37] Thaybah, Mastuang, and Mahtari S 2018 *J. Phys. Conf. Ser.* **1097** 012032
[38] Sema Altun-Yalçın, AçıŞlı S, and Turgu U 2011 *Procedia Soc. Behav. Sci.* **15** 783

Suplementary File:

SCIENTIFIC LITERACY TEST INSTRUMENT (SLTI)

Answer the following questions honestly and thoroughly based on your own ability, please!

Indicator 1:

Pay attention to the following phenomena!

Figure 1A. Hot air balloon fly early hours of the morning

Hot air balloon is a technology of the first flight by humans, invented by the Montgolfier brothers in Annonay, France in 17[illegible]. You need to know, the first flight was carried out in Paris November 21, 1983 by Pilâtre de Rozier and the Marquis d'Arlandes. Hot air balloons can be controlled and not only carried by the wind known as thermal airships or airships. The original idea behind the hot air balloon we know today has been around for a long time. Archimedes, an ancient Greek mathematician, described the principle of floating more than 2000 years ago.

Hot air balloons can fly in the air because of their buoyancy. Initially, the air pumped was hydrogen. Due to the risk of explosion, now the noble gas helium is used as the propulsion medium. "Hot air balloons are often flown in the early hours of the morning. In theory, hot air balloons were easier to fly at that time".

1. Explain your opinion, why hot air balloons are theoretically easier to fly in the early hours of the morning? ***(max. score: 5)***

Indicator 2:

2. **Pay attention to the following phenomena!**

Figure 2A. Dented tennis ball

One day your friends, Dini and Bella were playing table tennis, during the game you accidentally step on a table tennis ball and the ball becomes dented. At that time there was no replacement and the game wanted to continue, then what would you do? Design scientifically, how do you restore a dented ball to its original shape and why do you use that method? *Hint: relate your answer to the concept of an ideal gas!* ***(max. score: 15)***

Indicator 3:

A student conducts an experiment using PhET media to investigate the relationship between temperature and pressure. From these experiments the data obtained shows on the table A1.

Table A1. The experimental data.

V (nm^3)	T (K)	P (Atm)
9	400	0.70
	500	0.91
	600	1.08
	700	1.26

3. Based on the data obtained, interpret the magnitude of the pressure (P) at a temperature (T) of 800 K. Please, analyze the data and make a graph that fits the data! ***(max. score: 10)***

Indicator 2:

The heating of an ideal gas looks like the figure A4.

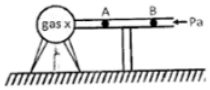

Figure 4A. Heated gas

Due to gas heating:

a. Particle speed increases
b. The momentum of the particle increases
c. The kinetic energy of the particles increases
d. Gas pressure increases

4. If due to rising temperature drops A moves to B, make a design of figure 4A and then evaluate what will happen to gas X! *Hint: choose the option appropriate!* ***(max. score: 15)***

5. A hairspray can fill with isobutane gas at constant volume reads a warning that "Store Only at Temperatures below 49^0 C".
   a. The gas in the can initially has a temperature of 23 °C and 360 kPa with a volume of 340 ml, a can is placed in a motorbike seat storage, the temperature reaches 45 °C on a hot day. Evaluate the new pressure in the can!
   b. If the hairspray can accidentally catch fire, evaluate what will happen to the hairspray can and design what steps should be taken to prevent this from happening! ***(max. score: 15)***

Indicator 1:

Figure A5. Divers are diving in the sea of different depths

Divers wear diving equipment containing compressed air (nitrogen-oxygen) when they dive in the deep ocean. When the diver swims in the deep sea, the bubbles come out of the diver's mouth and these bubbles rise. It is observed that the volume of the bubbles increases gradually. These bubbles rise and become several times larger than they were before. There is no change in the chemical construction when the bubble rises.

6. Explain why did the volume of the bubble at that time change? (Assume that the temperature in seawater remains constant the same at all points in the ocean) ***(max. score: 5).***

Indicator 3:

Figure A6. The human respiration

The lungs are made of spongy and elastic tissue, so that when you breathe, they contract 18 expand. When humans inhale, the intercostal muscles and diaphragm contract, expanding the chest cavity so that the volume of the human lungs is larger. This volume increase causes a decrease in pressure. In this case the air flows into the lungs (from high pressure to low pressure). When humans exhale, the diaphragm and rib muscles relax, as opposed to inhaling. The chest cavity will contract, and the volume of the lungs will decrease, so the pressure increases.

7. From the process of human respiration, make a table of assumptions about the relationship between volume, pressure, at constant temperature and interpret the statement into a graph that allows the situation! Which ideal gas theory fits this situation? ***(max. score: 10)***

Profile of student scientific literacy Melinda

ORIGINALITY REPORT

10%	10%	%	%
SIMILARITY INDEX	INTERNET SOURCES	PUBLICATIONS	STUDENT PAPERS

PRIMARY SOURCES

1	eprints.ulm.ac.id Internet Source	2%
2	repository.tudelft.nl Internet Source	1%
3	daten-quadrat.de Internet Source	1%
4	dokumen.pub Internet Source	1%
5	cyberleninka.org Internet Source	1%
6	s3.amazonaws.com Internet Source	1%
7	eudl.eu Internet Source	1%
8	repository.lppm.unila.ac.id Internet Source	<1%
9	aip.scitation.org Internet Source	<1%

10	www.fotosearchsite.com Internet Source	<1 %
11	repository.usd.ac.id Internet Source	<1 %
12	articles.gourt.com Internet Source	<1 %
13	journal.uin-alauddin.ac.id Internet Source	<1 %
14	www.science.gov Internet Source	<1 %
15	publicatio.bibl.u-szeged.hu Internet Source	<1 %
16	worldwidescience.org Internet Source	<1 %
17	www.journal.uad.ac.id Internet Source	<1 %
18	airwayjedi.com Internet Source	<1 %

Exclude quotes	On	Exclude matches	Off
Exclude bibliography	On		