artikel 2

by dodi mulyadi

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3	Confused words	
4	Faulty subject-verb agreement	
5	Incorrect noun number	
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characters per word

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Measures average sentence length

15.1

words per sentence

artikel 2

The Use of Augmented Reality Based[1] Learning Media to Develop the Technology Literacy of Chemistry Teachers in the 21st Century

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Abstract

The 21st century[2] chemistry learning process requires teachers to implement creative learning methods that are supported by technology. However, the teachers' ability to use technology in chemistry learning are[3] still low. The

purpose of this study was to develop the teachers' technology literacy using augmented reality based learning media. This research used mix-method with sequential strategies mixed methods. The first stage of this research was conducted by surveying the use of technology in chemistry learning. The instrument used was closed and open questionnaire. The second stage was carried out by collecting qualitative data through interview techniques. The data taken from this stage were to obtain the data of teachers' technology literacy after they received a training treatment using Augmented Reality based learning media. The research subjects consisted of 25 Chemistry teachers spread in Central Java. The results of the study show that teachers' literacy in chemistry learning is still low. The training of augmented reality based learning increases the teachers' technology literacy. In addition, augmented reality based learning media also assist teachers to introduce abstract concepts to students. In addition, this learning media also help teachers who have limited tools and materials in the laboratory to introduce the laboratory work virtually to the students.

Keywords: Technology Literacy, Augmented Reality, in Service teacher, 21st century.

Introduction

To make the world comfortable and liveable, the United Nations as an international non-profit organization issues Sustainable Development goals (SDGs). This program is an advanced program of the MDGs (Millennium Development goals) program. The SDGs consist of 17 goals with 169 measurable performance achievements and deadlines to be reached in 2030. One of the Sectors that are the focus of the SDGs is the quality of education.

Education is the focus of the problem that must be resolved because there are still data that explain the low education of the world community, especially in developing countries. Indonesia as one of the UN member countries, which also implements the SDGs program, has the typical educational problems of developing countries. The problems include the lack of basic literacy skills of students. In addition, the low ability of school-age children and adults in mathematical and scientific abilities is also a problem of education in developing countries such as Indonesia. The problems still exist even though now all countries in the world have entered the century of the industrial revolution 4.0. The industrial revolution 4.0 can be interpreted as an era based on the Cyber Physical System, a combination of the digital, physical, and biological domains [14]. In this era, 75% of the work involves the ability of science, technology, engineering and mathematics, internet of things, and lifelong learning [13]. For this reason, education in the 21st century or the era of the digital revolution demands a number of literacy abilities. Some of the literacy needed in the 21st century can be seen in Figure 1.

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Fig. 1 Literacies in 21st century

Students in the 21st century are also different from the previous century. In this century, there is an increase in the ability of students to use technology to support the teaching and learning activities. Many research indicate that technology enhance students' comprehensive in science learning and impacts in school classroom as being a powerful cognitive tool [8]. This increase requires a change in teachers as well [13]. In science learning, many researchers have been investigated the impact of using various technologies to support students' conceptual understanding, visualization and to promote instructional competency of the 21st century teacher. Teachers in the 21st century are also required to have more capabilities in the field of digital technology to support their careers as educators in the 21st century. The ability of technological literacy is especially needed to overcome the low literacy abilities of mathematics and science in particular and other educational problems in general. However, so far, there has been no clear information about technology literacy that is possessed by teachers in Indonesia.

Chemistry is one of the subjects that has abstract material characteristics. This microscopic chemical material is rarely visualized by the teacher. During this time, students are only asked to memorize the material that has microscopic concepts. The students have also difficulty linking observable phenomena (macroscopic level) to molecular level (microscopic level) interaction [3] Consequently, the practicum activities are needed in chemistry

subject to explain the phenomena of science. These phenomena can be seen through symptoms and signs that can be seen by students to show the existence of chemical reactions. However, the fact shows that practicum activities are rarely or even not carried out by the teachers during chemistry learning. The factors underlying the non-implementation of practicum in schools are the lack of laboratory infrastructure and the high burden of the curriculum in Indonesia. To solve the above problems, it is necessary to have the latest technology-based learning media that can help teachers to transfer the abstract information and simulate the virtual practicum activities. Augmented reality (AR) is a technology that can be used in science learning. AR is capable of displaying an abstract concept or microscopic phenomenon virtually without replacing the real environment [6;14]. For example, [2] were investigated about the impact of the AR on students' achievement, experience meaningful and interesting in chemistry which they found that The AR tool is beneficial in improving middle school students' learning outcome especially in cognitive test.

206 Based on the above problems, there are two main objectives in this article. The first objective is to provide an overview of the information of chemistry teachers' technology literacy. Another one is to describe the use of AR learning media in developing teachers' technology literacy.

Material and Method

This is a mix-method study with sequential mixed methods strategy. Mixed methods are methods that combine qualitative and quantitative approaches, especially on the data collection phase or methodology. In addition, this research also uses mixed model studies incorporating two approaches in all stages of the research process [9]. Descriptive research is a method which conducts the research about a group of people status, an object, a set of

conditions, a system of thought or a class of events in the present [9]. The subjects of this study are 22 chemistry teachers in 12 schools on the island of Java.

The first phase of this research was performed by conducting a survey of the use of technology in learning chemistry. The instrument used was a closed and open questionnaire. The questionnaire instrument consisted of 24 statement items using a Likert scale and 10 items checklist of instruments that assess the Technology Knowledge (TK), Technology Content Knowledge (TCK), Technology Pedagogy Knowledge (TPK) and Technology Pedagogy Content Knowledge (TPCK).

The second stage is carried out by collecting the qualitative data through interview and observation techniques. The data taken from this stage is to obtain the data of teachers' technology literacy after they received the treatment training using the Augmented Reality based learning media. The AR training was held for two days to introduce how to use the AR-based learning media.

Result and Discussion

Result

A. Technology Literacy

Technology literacy related to the use of technology for learning chemistry in this study was measured through 4 indicators. First indicator namely Technology Knowledge (TK). TK of chemistry teacher mean a knowledge about technology in teaching learning. The second indicator was Technology Content Knowledge (TCK). TCK means knowledge of chemistry teacher about technology that related with chemistry. The third indicator was Technology Pedagogy Knowledge (TPK). TPK is knowledge about the use of technology to teaching and understanding student's needs. The last indicator was Technology

Pedagogy Content Knowledge (TPACK). The results of 4 indicators of technology literacy can be seen in Figure 2.

Figure 2. Chemistry teacher's Technology literacy

Based on the figure, the logic can be drawn that the teachers' technology literacy in Indonesia is in the medium category or it is quite good. The figure shows that the teachers' TCK is the lowest indicator of teachers' technology literacy. There are 3 statement items on the TCK Indicator. The lowest score based on the results of the questionnaire given to the teachers is on the item: " I have the technical skills that I need to utilize the technology" . The items of this statement indicate that chemistry teachers feel they do not yet have sufficient technical skills in the field of technology, especially those that support the teaching and learning activities. Another item that is in the low category is " I utilize the technology in managing the students' chemistry assignments (such as using edmodo, moodle, google classroom, or others) ". The information obtained from this statement is that the teachers are not yet familiar with e-learning activities using the Learning Management System (LMS). Another statement that is also in the low category is: " I often use animation to understand what happens on a small scale (microscopic) phenomenon that is found in daily life ". Based on this statement, the

information about the lack of use of animation to visualize the microscopic concept of chemistry can be known. It is important to emphasize that good visualization skills are needed in learning chemical concepts. The benefits of visual animation in learning chemistry can be seen in Figure 3.

Fig.3 Benefits of Using Visual Animation in Chemistry Learning

B. The use of Augmented Reality in Chemistry Learning.

To develop the technology literacy in chemistry learning, in this study, the chemistry teachers were introduced to AR-based learning media. With the use of AR in learning chemistry, teachers are expected to increase their confidence in teaching and learning activities in the 21st century. In this study, the teachers were trained to use AR that is already available on the App Store. The

applications used are RApp Chemistry and AR VR Molecule. This activity introduces the teacher what is needed to be able to use the AR application in learning chemistry. AR basically "only" requires a mobile phone and a marker to be able to run the application. In this training, teachers were given information about marker and how to download it. Markers or patterns are tools that support AR software. Markers can be artificial and similar to QR codes or other things, chemical symbols or real objects. However, the most widely used markers in Indonesia are artificial markers and chemical symbols. In the RApp, the chemistry marker used is in the form of chemical symbols. The information available in the RApp chemistry marker is in the form of symbols of chemical elements, atomic numbers, mass numbers and outermost electron configurations using the theory of quantum mechanics. An example of the RApp Chemistry marker can be seen in Figure 4.

Fig 4. Example of AR marker RApp chemistry.

The results of this training showed that 18 of 22 teachers stated that they felt they were helped to visualize sub-microscopic chemical material using AR. 4

other teachers felt that AR still had limitation. According to them, the limitation of AR is that it only can be used to explain certain topics. In addition, the access to AR on Playstore is also still very limited. Meanwhile, in order to prepare AR which is not available in the play store, the teachers find it difficult with the coding language and the use of AR support software such as Adobe Flash, 3D unity blender and vuforia. The teachers also felt that AR could not be applied in schools because of school regulations that forbade students to bring mobile phones to class.

Discussion

One of the challenges in teaching and learning activities in the technological age of the 21st century includes information, digital, and visual skills to prepare students to continue their education to a higher level and be able to adapt to the demands of this century. In the international level, the quality of education in Indonesia is still in the medium category. Meanwhile, the era of the industrial revolution demand in the field of information technology development has led to very rapid changes in all fields. For this reason, educators or teachers are required to have adequate technology literacy in teaching learning activities, especially in learning science in which the mathematical and scientific skills of students in Indonesia are weak. Weak scientific skills are mainly based on the lack of available teaching aids or learning media that discuss a scientific phenomenon microscopically. In addition, one of the causes of the low science skills of students is the lack of frequency of experimental activities both at home and at school. The lack of experimental activities in learning science is caused by the lack of available time whereas the demand of the curriculum is very tight. There are also no suitable practical tools available.

Technology literacy is the ability to use the technology effectively and
208 efficiently in a variety of academic, career and[157] everyday life contexts. The results of this study indicate that even though the mastery of technology literacy falls into the sufficient category, it is known that most teachers in Indonesia access technology in learning activities only as[158] the users of information from search engines. To implement the technology-based[159] learning such as e-learning or blended learning, teachers in Indonesia are still not ready because they find it difficult and unfamiliar. The statement is contrary to the teachers' own[160] thoughts which[161] state that the technology must be used[162] in learning. A number of[163] studies show that the technology literacy of teachers can be mastered[164] if it is influenced[165] by the factors of teachers' attitudes toward the change. Teachers' readiness to always learn and their openness to new things is an attitude that is needed so that teachers have the same technology literacy as students. In addition[166], the teachers will have good[167] technical literacy if they feel the technology is needed[168,169] for their personal and career lives. Another reason supporting the mastery of technology literacy in teachers is it is easy for them to access the technology.

AR-based learning media, although giving positive feedback to the enthusiasm of students in teaching and learning, apparently, also has various limitations. One limitation is the scope of the availability of AR to be accessed by the users. The number of AR topics available in chemistry-related play stores in Indonesia is still less than 10[170] topics. In fact[171], the topic[172] of chemistry studied at the high school level is 33 topics. In addition[173], the difficulty in applying AR in Indonesia is
209 the policy of some schools to prohibit students from using mobile phones in class.

Although it has several limitations, the uniqueness of AR learning media in chemistry learning can still be used[174] to attract the interests of students. AR has

the ability to help students visualize the sub-level microscopic chemistry such as atoms, molecules, chemical bonds, and other materials that require microscopic explanation. The advantage of AR for learning chemistry is it is easier for the students to perform laboratory practice demonstration activities. AR can help teachers who do not have a chemistry laboratory with complete equipment. The teachers can explain the work steps, types of equipment and chemicals, and show the science phenomena with AR. In addition, because it is easy to use, AR also increases the curiosity of the teachers in learning chemistry further at the microscopic level. This research showed linear result with [13] studies that said AR implied chemistry learning activity . For this reason, it can be concluded that AR can develop the interest of teachers in mastering the technology literacy in education in general and chemistry education in particular. It's like AR technology can be employed in education to help learners approach information and its visual perception [7;12]but, implications to teacher education and teacher professional development are discussed.

Conclusion

The results showed that the mastery of technology literacy in Indonesian teachers is at a fairly good level, especially at the elementary level. However, other studies are needed on high-level technology literacy. This research also provides information related to the application of AR in learning chemistry. AR can be used to develop teachers' technology literacy.

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1.	~~Reality Based~~ → Reality-Based	Misspelled Words	Correctness
2.	~~21st century~~ → 21st-century	Misspelled Words	Correctness
3.	~~are~~ → is	Faulty Subject-Verb Agreement	Correctness
4.	~~reality based~~ → reality-based	Misspelled Words	Correctness
5.	strategies of	Wrong or Missing Prepositions	Correctness
6.	*was conducted*	Passive Voice Misuse	Clarity
7.	a closed	Determiner Use (a/an/the/this, etc.)	Correctness
8.	*was carried*	Passive Voice Misuse	Clarity
9.	~~reality based~~ → reality-based	Misspelled Words	Correctness
10.	~~In addition~~ → Also, Besides	Wordy Sentences	Clarity
11.	~~reality based~~ → reality-based	Misspelled Words	Correctness
12.	~~to introduce~~ → in introducing	Wrong or Missing Prepositions	Correctness
13.	~~In addition~~ → Also, Besides	Wordy Sentences	Clarity
14.	~~introduce~~ → add, enter	Word Choice	Engagement
15.	, as	Punctuation in Compound/Complex Sentences	Correctness
16.	organization,	Punctuation in Compound/Complex Sentences	Correctness
17.	*be resolved*	Passive Voice Misuse	Clarity
18.	~~education~~ → knowledge, culture	Word Choice	Engagement
19.	, as	Punctuation in Compound/Complex Sentences	Correctness

20.	~~problems~~ → issues	Word Choice	Engagement
21.	~~basic~~ → necessary	Word Choice	Engagement
22.	~~In addition~~ → Also, Besides	Wordy Sentences	Clarity
23.	~~abilities~~ → skills	Word Choice	Engagement
24.	~~problems~~ → questions	Word Choice	Engagement
25.	*The problems still exist even though now all countries in the world have entered the century of the industrial revolution 4.0.*	Wordy Sentences	Clarity
26.	*be interpreted*	Passive Voice Misuse	Clarity
27.	~~Cyber Physic~~ → Cyber-Physical	Misspelled Words	Correctness
28.	the internet	Determiner Use (a/an/the/this, etc.)	Correctness
29.	~~a number of~~ → several, some, many	Wordy Sentences	Clarity
30.	*be seen*	Passive Voice Misuse	Clarity
31.	the 21st	Determiner Use (a/an/the/this, etc.)	Correctness
32.	~~indicate~~ → indicates	Faulty Subject-Verb Agreement	Correctness
33.	~~enhance~~ → enhances	Faulty Subject-Verb Agreement	Correctness
34.	~~comprehensive~~ → comprehension	Confused Words	Correctness
35.	the school	Determiner Use (a/an/the/this, etc.)	Correctness
36.	*been investigated*	Passive Voice Misuse	Clarity
37.	, and	Punctuation in Compound/Complex Sentences	Correctness

38.	the instructional	Determiner Use (a/an/the/this, etc.)	Correctness
39.	~~21st century~~ → 21st-century	Misspelled Words	Correctness
40.	~~especially~~ → primarily	Word Choice	Engagement
41.	~~abstract~~ → general	Word Choice	Engagement
42.	The teacher rarely visualizes this microscopic chemical material	Passive Voice Misuse	Clarity
43.	*are only asked*	Passive Voice Misuse	Clarity
44.	~~microscopic~~ → tiny	Word Choice	Engagement
45.	~~have also~~ → also have	Misplaced Words or Phrases	Correctness
46.	. Consequently	Punctuation in Compound/Complex Sentences	Correctness
47.	~~, the~~ → ; the, , and the, . The	Punctuation in Compound/Complex Sentences	Correctness
48.	*are needed*	Passive Voice Misuse	Clarity
49.	~~phenomena~~ → wonders, aspects, events, marvels	Word Choice	Engagement
50.	*be seen*	Passive Voice Misuse	Clarity
51.	~~shows~~ → indicates	Word Choice	Engagement
52.	*To solve the above problems*	Misplaced Words or Phrases	Correctness
53.	~~abstract~~ → general	Word Choice	Engagement
54.	*be used*	Passive Voice Misuse	Clarity
55.	~~about~~	Wrong or Missing Prepositions	Correctness

56.	~~the~~ AR	Determiner Use (a/an/the/this, etc.)	Correctness
57.	~~interesting~~ → exciting	Word Choice	Engagement
58.	, which	Punctuation in Compound/Complex Sentences	Correctness
59.	~~outcome~~ → outcomes	Incorrect Noun Number	Correctness
60.	, especially	Punctuation in Compound/Complex Sentences	Correctness
61.	a cognitive	Determiner Use (a/an/the/this, etc.)	Correctness
62.	~~test~~ → tests	Incorrect Noun Number	Correctness
63.	~~of~~ → on, about	Wrong or Missing Prepositions	Correctness
64.	*This*	Intricate Text	Clarity
65.	a sequential	Determiner Use (a/an/the/this, etc.)	Correctness
66.	~~In addition~~ → Also, Besides	Wordy Sentences	Clarity
67.	~~approaches~~ → strategies	Word Choice	Engagement
68.	~~research~~ → analysis	Word Choice	Engagement
69.	~~which conducts~~ → that conducts	Pronoun Use	Correctness
70.	researches	Wordy Sentences	Clarity
71.	, or	Punctuation in Compound/Complex Sentences	Correctness
72.	*was performed*	Passive Voice Misuse	Clarity
73.	surveying	Wordy Sentences	Clarity

74.	~~10~~ → ten	Improper Formatting	Correctness
75.	~~instruments~~ → tools	Word Choice	Engagement
76.	, and	Punctuation in Compound/Complex Sentences	Correctness
77.	*is carried*	Passive Voice Misuse	Clarity
78.	~~the~~ qualitative	Determiner Use (a/an/the/this, etc.)	Correctness
79.	~~interview~~ → interviews	Incorrect Noun Number	Correctness
80.	~~the~~ AR-based	Determiner Use (a/an/the/this, etc.)	Correctness
81.	*was measured*	Passive Voice Misuse	Clarity
82.	~~. First~~ → —first	Incomplete Sentences	Correctness
83.	, namely	Punctuation in Compound/Complex Sentences	Correctness
84.	~~mean~~ → means	Faulty Subject-Verb Agreement	Correctness
85.	~~a knowledge~~ → knowledge, a piece of knowledge	Determiner Use (a/an/the/this, etc.)	Correctness
86.	teaching-learning	Misspelled Words	Correctness
87.	~~teacher~~ → teachers	Incorrect Noun Number	Correctness
88.	~~with~~ → to	Wrong or Missing Prepositions	Correctness
89.	~~teaching~~ → teach	Confused Words	Correctness
90.	~~indicator~~ → sign, symbol, index	Word Choice	Engagement
91.	*The second indicator was Technology Content Knowledge (TCK). TCK means knowledge of chemistry teacher about technology that related with*	Monotonous Sentences	Engagement

	chemistry. The third indicator was Technology Pedagogy Knowledge (TPK). TPK is knowledge about the use of technology to teaching and understanding student's needs...		
92.	the 4	Determiner Use (a/an/the/this, etc.)	Correctness
93.	~~indicators~~ → signs, symbols	Word Choice	Engagement
94.	*be seen*	Passive Voice Misuse	Clarity
95.	~~figure~~ → number, value, picture, character	Word Choice	Engagement
96.	*be drawn*	Passive Voice Misuse	Clarity
97.	~~that the~~ → that the	Improper Formatting	Correctness
98.	, or	Punctuation in Compound/Complex Sentences	Correctness
99.	~~figure~~ → picture, chart	Word Choice	Engagement
100.	~~item~~ → question, topic, subject, theme	Word Choice	Engagement
101.	~~",~~ → ."	Misuse of Semicolons, Quotation Marks, etc.	Correctness
102.	" .	Improper Formatting	Correctness
103.	~~items~~ → details, elements, issues, pieces	Word Choice	Engagement
104.	~~edmodo~~ → Edmodo	Misspelled Words	Correctness
105.	~~",~~ → . "	Misuse of Semicolons, Quotation Marks, etc.	Correctness
106.	~~statement~~ → report, account	Word Choice	Engagement

107.	*is found*	Passive Voice Misuse	Clarity
108.	~~",~~ → . "	Misuse of Semicolons, Quotation Marks, etc.	Correctness
109.	~~microscopic~~ → tiny	Word Choice	Engagement
110.	~~good~~ → excellent	Word Choice	Engagement
111.	*are needed*	Passive Voice Misuse	Clarity
112.	*be seen*	Passive Voice Misuse	Clarity
113.	~~the~~ technology	Determiner Use (a/an/the/this, etc.)	Correctness
114.	*To develop the technology literacy in chemistry learning, in this study*	Misplaced Words or Phrases	Correctness
115.	*were introduced*	Passive Voice Misuse	Clarity
116.	*are expected*	Passive Voice Misuse	Clarity
117.	*were trained*	Passive Voice Misuse	Clarity
118.	~~RApp~~ → Rapp	Misspelled Words	Correctness
119.	*were given*	Passive Voice Misuse	Clarity
120.	~~marker~~ → stamp, tag	Word Choice	Engagement
121.	the marker, or a marker	Determiner Use (a/an/the/this, etc.)	Correctness
122.	~~Markers~~ → Tags	Word Choice	Engagement
123.	~~Markers~~ → Tags	Word Choice	Engagement
124.	, or	Punctuation in Compound/Complex Sentences	Correctness
125.	~~markers~~ → tags, stamps	Word Choice	Engagement

126.	~~artificial~~ → plastic	Word Choice	Engagement
127.	~~chemical~~ → alchemical	Word Choice	Engagement
128.	~~RApp~~ → app, Rapp	Misspelled Words	Correctness
129.	~~RApp~~ → Rapp	Misspelled Words	Correctness
130.	~~form~~ → way	Word Choice	Engagement
131.	, and	Punctuation in Compound/Complex Sentences	Correctness
132.	~~RApp~~ → Rapp	Misspelled Words	Correctness
133.	*be seen*	Passive Voice Misuse	Clarity
134.	~~RApp~~ → Rapp	Misspelled Words	Correctness
135.	*were helped*	Passive Voice Misuse	Clarity
136.	a limitation, or the limitation	Determiner Use (a/an/the/this, etc.)	Correctness
137.	~~certain~~ → specific	Word Choice	Engagement
138.	~~In addition~~ → Also, Besides	Wordy Sentences	Clarity
139.	~~the~~ access	Determiner Use (a/an/the/this, etc.)	Correctness
140.	~~very limited~~ → minimal	Word Choice	Engagement
141.	~~in order to~~ → to	Wordy Sentences	Clarity
142.	, which	Punctuation in Compound/Complex Sentences	Correctness
143.	, and	Punctuation in Compound/Complex Sentences	Correctness
144.	*vuforia*	Unknown Words	Correctness

145.	*be applied*	Passive Voice Misuse	Clarity
146.	~~In~~ → On	Wrong or Missing Prepositions	Correctness
147.	~~fields~~ → areas	Word Choice	Engagement
148.	*are required*	Passive Voice Misuse	Clarity
149.	teaching-learning	Misspelled Words	Correctness
150.	, in	Punctuation in Compound/Complex Sentences	Correctness
151.	*are mainly based*	Passive Voice Misuse	Clarity
152.	~~In addition~~ → Also, Besides	Wordy Sentences	Clarity
153.	~~experimental~~ → innovative, preliminary	Word Choice	Engagement
154.	The lack of available time causes the lack of experimental activities in learning science	Passive Voice Misuse	Clarity
155.	, whereas	Punctuation in Compound/Complex Sentences	Correctness
156.	~~of~~ → for	Wrong or Missing Prepositions	Correctness
157.	, and	Punctuation in Compound/Complex Sentences	Correctness
158.	as of	Wrong or Missing Prepositions	Correctness
159.	~~the~~ technology-based	Determiner Use (a/an/the/this, etc.)	Correctness
160.	~~own~~	Wordy Sentences	Clarity
161.	, which	Punctuation in Compound/Complex Sentences	Correctness

162.	*be used*	Passive Voice Misuse	Clarity
163.	~~A number of~~ → Several, Some, Many	Wordy Sentences	Clarity
164.	*be mastered*	Passive Voice Misuse	Clarity
165.	*is influenced*	Passive Voice Misuse	Clarity
166.	~~In addition~~ → Also, Besides	Wordy Sentences	Clarity
167.	~~good~~ → excellent, functional	Word Choice	Engagement
168.	*is needed*	Passive Voice Misuse	Clarity
169.	~~needed~~ → necessary, required	Word Choice	Engagement
170.	~~10~~ → ten	Improper Formatting	Correctness
171.	~~In fact,~~ the	Wordy Sentences	Clarity
172.	~~topic~~ → question, issue, subject, problem	Word Choice	Engagement
173.	~~In addition~~ → Also, Besides	Wordy Sentences	Clarity
174.	*be used*	Passive Voice Misuse	Clarity
175.	~~has the ability to~~ → can	Wordy Sentences	Clarity
176.	~~microscopic~~ → tiny	Word Choice	Engagement
177.	~~microscopic~~ → little	Word Choice	Engagement
178.	~~In addition~~ → Also, Besides	Wordy Sentences	Clarity
179.	~~linear~~ → direct	Word Choice	Engagement
180.	~~result~~ → results	Incorrect Noun Number	Correctness
181.	activity .	Improper Formatting	Correctness

182.	*be concluded*	Passive Voice Misuse	Clarity
183.	~~education~~ → school	Word Choice	Engagement
184.	*are discussed*	Passive Voice Misuse	Clarity
185.	~~fairly~~ → reasonably	Word Choice	Engagement
186.	*are needed*	Passive Voice Misuse	Clarity
187.	*was produced*	Passive Voice Misuse	Clarity
188.	~~Indonesia~~ → Indonesian	Confused Words	Correctness
189.	~~..~~ → ., ...	Closing Punctuation	Correctness
190.	Ma .	Improper Formatting	Correctness
191.	~~..~~ → ., ...	Closing Punctuation	Correctness
192.	the Digital	Determiner Use (a/an/the/this, etc.)	Correctness
193.	, and	Comma Misuse within Clauses	Correctness
194.	~~Uzer~~ → User	Misspelled Words	Correctness
195.	~~Usman..~~ → Usman., Usman...	Closing Punctuation	Correctness
196.	Bandung :	Improper Formatting	Correctness
197.	~~Muh~~ → Much	Misspelled Words	Correctness
198.	Adrian ,	Improper Formatting	Correctness
199.	~~Uuntuk~~ → Untuk	Misspelled Words	Correctness
200.	Science :	Improper Formatting	Correctness

201.	~~Acid- Bas~~ → Acid-Base	Misspelled Words	Correctness
202.	Kuwait .	Improper Formatting	Correctness
203.	Exchange,	Punctuation in Compound/Complex Sentences	Correctness
204.	~~,.~~ → ,, .	Comma Misuse within Clauses	Correctness
205.	*Chemistry is one of the subjects that has*	Get Karnataka Board 2nd PUC Chemistry Textbooks In English ... https://byjus.com/kseeb/karnataka-board-2nd-puc-chemistry-text-books/	Originality
206.	*The first objective is to provide an overview of the*	CH04.docx - 1 What are the 2 major objectives of this ... https://www.coursehero.com/file/45662777/CH04docx/	Originality
207.	*The first phase of this research was performed*	Laboratory Modeling of Energy Dissipation in Broken-back ... https://trid.trb.org/view.aspx?id=1262835	Originality
208.	*The results of this study indicate that even*	Assessing the Impact of Sponsor Asset Selection, Intangible Rights, and Activation on Sponsorship Effectiveness	Originality
209.	*prohibit students from using mobile phones in class.*	Should schools ban mobile phones? – VietNam Breaking News https://www.vietnambreakingnews.com/2010/08/should-schools-ban-mobile-phones/	Originality
210.	*For this reason, it can be concluded that*	Functional hemispheric asymmetries during the planning and manual control of virtual avatar movements	Originality
211.	*This publication was produced*	Understanding!Teachers'!Perspec	Originality

	wholly, or in part, with funds from the	tives!on!Teaching!and!Learning! http://www.sedl.org/pubs/teaching07/UnderstandTeachersPerspectives.pdf	
212.	*The content herein does not necessarily reflect the views of*	Understanding!Teachers'!Perspectives!on!Teaching!and!Learning! http://www.sedl.org/pubs/teaching07/UnderstandTeachersPerspectives.pdf	Originality
213.	*A case study of Augmented Reality simulation system application in a chemistry course.*	Pilot Study Using the Augmented Reality Sandbox to Teach Topographic Maps and Surficial Processes in Introductory Geology Labs	Originality
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215.	*Augmented reality in science laboratories: The effects of augmented reality on university students' laboratory skills and attitudes toward science laboratories. Computers in Human Behavior, 57, 334-342*	The Effect of Augmented Reality Use on Achievement ... https://files.eric.ed.gov/fulltext/EJ1185132.pdf	Originality
216.	*e-Proceeding of Applied Science : Vol.3, No.3*	Open Library - E-Proceedings https://openlibrary.telkomuniversity.ac.id/home/epublication/id/39.html	Originality
217.	*Proceedings of the 23rd International Conference on Computers in Education.*	Using YouTube Analytics to Investigate Instructional Video Viewing Patterns	Originality
218.	*EURASIA Journal of Mathematics Science and Technology Education.*	Assessing Computer Application Technology Teachers' e-Skills and Procedural Knowledge With Regard to Teaching With ICT Infrastructure	Originality