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To cite this article: A H Odja and Mursalin 2019 *J. Phys.: Conf. Ser.* **1171** 012020

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The effectiveness of implementation cooperative learning model oriented life skills for the 21st century to improve writing science skills in physics concepts

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Abstract. This study aimed to describe the improvement of writing science skill after the implementation of the Life Skills oriented learning model in the 21st Century. This research was conducted at several State Junior High Schools in Bone Bolango District, Gorontalo Province in the even semester of 2017/2018. This research was experimental research with One Group pre-test-post-test design. The assessment instruments used writing science test and observation sheet. The results showed that students' writing science skill improved with the N-gain value in the medium category. The improvement of writing science skill occurred in all writing science indicators which were science vocabulary comprehension, identifying investigated problems, providing evidence for solving problems/ questions and providing evidence-based explanations.

1. Introduction

The Fourth Industrial Revolution has developed since the beginning of the 21st century in accordance with the revolution characterized by ubiquitous internet; automation/robotics, internet of things, artificial intelligence, mobile internet; sensors are cheaper, smaller, and stronger; and artificial and machine learning [1] [2], [3]. Thus, in the Fourth Industrial Revolution, we will face the principle of new technologies and products, education must be reformed to improve sensitivity, creativity and communication [1].

Communication in today's era is associated with the term hoax. The term hoax is associated with information obtained from various online media such as Facebook, WhatsApp, line, google, yahoo, and others. A hoax is a falsehood deliberately fabricated to masquerade as the truth. [4]. Most people define hoax as a deliberate lie, writing is a large percentage of hoax used in social media [5].

Educational institutions including teachers must develop mechanisms to investigate teaching and learning objectives of programs designed in schools and highlight technological changes and their effects on industrial and life applications [1]. One of the solutions to this problem with the implementation of cooperative learning by integrating skills in the 21st century, especially in the industrial time 4.0. Cooperative teaching has three main objectives: academic achievement, tolerance and acceptance of diversity and the development of social skills [6][7]. Cooperative teaching is also taught to compete to achieve the best in learning. The teaching goals in cooperative learning are compatible with life skills in the 21st century.

Life skills encompass five types, namely: (1) self-knowing skill, (2) thinking skill, (3) social skill, (4) academic skill, and (5) vocational skill. Four life skills can be applied as entirely in learning, but the



vocational skill is just to be applied to vocational schools. The social skills encompassed communication skill and collaboration skill [8]. Some of the skills and abilities that must be possessed in the industrial era 4.0 include: cognitive abilities, social skills, problem solving skills, process skills [3]. ATCS (Assessment and Teaching for 21st Century Skill) states that there are four main things related to the 21st century, namely ways of thinking, how to work, work tools, and life skills. The way of thinking includes creativity, critical thinking, problem solving, decision making, and learning. How to work includes communication and collaboration. Tools for work include information communication. Life skills include citizenship, life and career, and personal and social responsibilities [9].

Through the application of cooperative learning students are trained in 21st century for they life skills, especially inter-group collaboration and communication about science. Communicating with others can make learners use and test the thinking skill [10]. When studying science, we will have numerous opportunities to communicate, either verbally or written. Scientific communication may occur orally. Scientists often share ideas directly and through a phone. We can also have the opportunity to talk about science topics when working in small groups or doing presentations in front of the classroom. Most scientific communication takes place through writing or printed. New research is most frequently reported in a printed form, and it generally goes in scientific journals. Likewise, you may write down the procedures and results of your experiment in a lab report. Lab reports usually contain the following sections: problems or questions, hypothesis, lists of tools and materials, procedures, observations (organized in data tables), analysis (including any calculations and graphs) and conclusions [11].

Writing is one of the communication forms used from elementary school to college level [12], [13]. It is also associated with thinking activity, writing is an activity of the entire brain using the right hemisphere (emotional) and left hemisphere (logic)[14]. It is also an important aspect of science literacy [15], [16]. Writing skill is one of the language skills taught in an integrated with three other language skills, namely listening, speaking, and reading [17]. Listening and reading skills are receptive, while speaking and writing are productive. Writing skill is productive because a person produces, manifests, and expresses his/her thoughts and feelings through written language symbols to be read by others. Writing skill is one of the productive and expressive language skills that is used to communicate indirectly and not face-to-face with others [18].

2. Methodology of Research

The is an experimental research with a one-group pretest-posttest design as in Table 1

Table 1. The One-Group Pretest-Posttest Design [19]

Group	Pre-Test	Treatment	Post-Test
A	O ₁	X	O ₂

O₁ = Pre-Test Writing Science Skills

O₂ = Post-Test Writing Science Skills

X = Implementation Cooperative Learning Model oriented Life Skills

This research was conducted at one of Junior High Schools in Gorontalo District, Gorontalo Province. The instruments apply writing science test adapted from written expression [20] and written lab reports [11]. The components of writing science comprise an understanding of the vocabulary of science, the ability to identify problems to be investigated, the ability to respond questions with solutions, and the ability to provide evidence-based explanations. The improvement analysis is performed with a normalized N-gain analysis which aims to categorize the amount of improvement of students' writing science skills after implementation of life skills-oriented cooperative learning in the 21st century. The n-gain value is determined by the equation: $N\text{-gain} = (\text{score post-test} - \text{score pre-test}) / (\text{maximum score} - \text{pre-test score})$ [21]. According to the following criteria, as shown in Table 2.

Table 2. N-gain Criteria

N-Gain Score	Criteria
Score $\leq 0,3$	“Low-g”
$0,3 < \text{score} \leq 0,7$	“Medium-g”
Score $\geq 0,7$	“High-g”

3. Result and Discussions of Research

The result of this research is pre-test and post-test data regarding writing science ability based on the entire indicator and mean as shown in Table 3.

Table 3. Average Score of Post Test and Pre Test

No	Indicator	Average Post-Test	Average Pre-Test
1	Indicator 1	78.10	15.69
2	Indicator 2	64.37	39.08
3	Indicator 3	78.45	29.31
4	Indicator 4	82.33	0.00
<i>Average</i>		75.81	21.02

Indicator 1 = Understanding of science vocabulary.

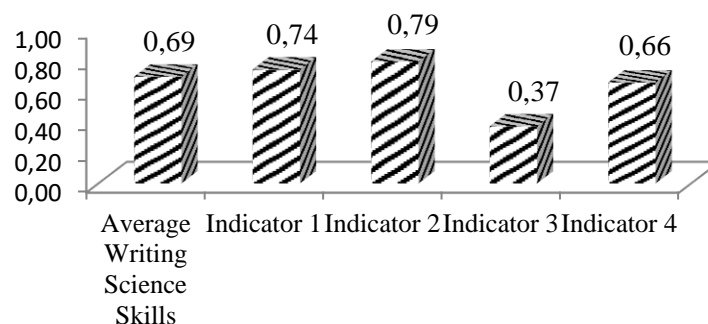
Indicator 2 = Ability to identify issues to investigate,

Indicator 3 = Ability to respond to inquiries with solutions,

Indicator 4 = Ability to provide evidence-based explanations.

Table 3 shows an improvement in average score of writing science skills either reviewed from four indicators or overall. The sequence of the percentage of indicators from the highest average to the lowest averages are the indicator of explanatory ability, ability to respond to question with a solution, an understanding on the vocabulary of science and is the ability to identify the problem or question to be investigated.

Meanwhile, improvements in overall writing science skills improve with Medium categories. The improvement of each indicator is varied as shown in Figure 1.

**Figure 1.** Improvement of Writing Science Skills as Entire and Indicators

The Figure 1 shows that the overall average students' writing science skill obtains a score of 0.69 or includes in the medium category. The highest improvement was in the second indicator obtains a score of 0.79 or includes in the high category while the lowest indicator was on the 3rd indicator obtains a

score of 0.37 or includes in the medium category. Meanwhile, the indicator 1 obtains a score of 0.74 or includes in high category and indicator 4 obtains a score of 0.66 or includes in the medium category.

The improvement of writing science skill is likely due to in life skill oriented cooperative learning, students are trained to cooperate in scientific activities through simple experiment which is started from asking problem, formulating a hypothesis, designing experiment, analyzing experiment result until communicating the result of activity both orally and written. Observation or experiment activities with the level of cognitive development of junior high school students aged between 11-14 years. According to Piaget's theory of cognitive development the age of junior high school students is included in the concrete operational category (7-11 years) or formal operations (11 years and over) [10]. Problem-solving activities and communicate the results both oral and written facilitated by the teacher through some help (scaffolding). Thus students can develop self-regulated learning or metacognitive. These findings are based on previous research which expresses that self-regulated learning-oriented Natural Science learning can improve writing science skills [22]. Additionally, the cooperative learning is an alternative to learning done in a heterogeneous class to solve complex cognitive problems such as writing science. This result, in accordance with previous studies that show cooperative learning with metacognitive training is an alternative to heterogeneous classroom learning in solving complex problems in reasoning, and mathematical communication suggested to be tried on other concepts [23]. Other research reports about the application of cooperative learning both conducted face to face and online also showed an improve in writing skills and the growth of positive traits in teaching [24].

Scientific activities which apply continuous cooperative learning makes students easy to recommunicate things that have been done either orally or written. Through oral discussion activities, students communicate experimental results in front of their friends orally. Then, it is followed by writing activities for each of the students. Writing activities based on events that have been done either in the form of narration or experimental reports with the format specified by previous teachers. The writing on the concept of science either in the form of presentation or experimental reports is displayed at the end of every subject. Students are also asked to post in the social media group, and they are expected to get a response from their classmates or different classes.

It is hoped that through this kind of activity, students' post in the social media is avoided from the hoax's element. The results of the 2017 survey in Indonesian that states hoax has become national problem, and comprises several forms including writing for 62%; picture for 37.50%, and video for 0.40% [5]. The survey results show that writing is the most widely used form to spread hoax information. Hoax writings are easily shared without correction of the information being spread. Through life skill oriented cooperative learning activities in the 21st century, students are expected to communicate through social media based on facts and able to provide a rational explanation.

Life skill oriented cooperative learning activities in the 21st-century trains students with various literacy that is integrated with one another, such as science, math, reading (writing) and technology literacy. This is accordance to a statement that the core of teaching STEM in the 21st century is technological and technical literacy that is not just making and using technology artifacts but embodies the knowledge and skills needed to create a global environment [25]. Students in 21st century an era of industrial revolution 4.0 should be able to use and understand the use of technology in developing the skills of thinking and communicating for example by publishing scientific activities in the form of writing about science performed through social media to get response from classmates or other classes to create scientific discussion without being limited by space and time.

4. Conclusions

Based on research and data analysis, some things can be concluded which are: (1) The implementation of life skill oriented cooperative learning in the 21st century can improve students' writing science skills which are in a medium category; (2) Improvement of writing science skills is different for every indicator, from the highest to the lowest indicators is as follows: the indicator of ability to identify a problem, understanding on science category, providing an explanation and the last indicator is providing a solution to the question proposed.

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