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Next generation science standards assessment for Java coastal students

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ABSTRACT

In the 21st-century, we need a generation who can read and face the challenges of the times. The research aimed to master patterns of science with the next generation science standards (NGSS) standards of junior high school students in north coastal areas of Java Island. The research method is quantitative expose-facto and subjects were 228 students determined by purposive sampling. The students who come from Tegal, Pekalongan, Pati and Demak Regencies north coastal Java Island, Indonesia. The results showed a significant difference between the achievement of students in Tegal, Pekalongan, Pati, and Demak Regencies ($p=0.012$; $\propto=0.05$). Based on the analysis of variance (ANOVA) test, there was a significant difference between the groups of students' achievements in mastery of science oriented NGSS. It can be concluded that the achievement among students from four different regions is quite significant. Students from families with middle and upper economic levels have low achievement but students with low economic levels have high academic achievement.

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1. INTRODUCTION

The era of disruption is part of the 21st-century, which is marked by rapid changes in all areas of life. The core of the assessment uses the next generation science standards (NGSS) framework to measure students' critical thinking, reasoning, argumentative, and creative thinking skills. Measuring the quality of Indonesian students' needs to be improved through research, especially in the aspect of using international standard test instruments because Indonesian students are still in the middle to lower position in participating in the trends in international mathematics and science study (TIMSS) and programme for international student assessment (PISA) science literacy competitions.

The 2013 curriculum development launched by the government has emphasized four improvements, namely the process, content, graduate competency standards, and an evaluation system for primary and secondary education levels. NGSS is a science learning framework in America as a pedagogical direction and a road map to build coherence of science principles and understanding of the nature of science [1], [2]. The component of content assessment and multi-representation regarding learning achievement in schools still needs improvement to realize authentic assessment [3], [4]. The research findings provide information that the science assessment needs to improve the form of display of scientific problems and content.

The development of assessments that reveal 21st-century skills including NGSS at the junior high school level needs to be improved. The research results concluded that the combined NGSS and education teacher performance assessment (EdTPA) assessment program was effective for preparing prospective teachers and learning designs that actively involve high school-level students [5]. In addition, research on the nature of science in NGSS succeeded in 78% of science content according to NGSS standards. Science learning is programmed to be implemented in an integrated manner between conceptual and practice science [6]. The lowest student achievement in science is seen as an indicator of the low quality of science education in schools. The results of the study show that the understanding of energy literacy depends on gender and energy-saving behavior [7]. Less challenging material causes students to be lazy, so that learning outcomes are less effective. Students' intentions to pursue a science-related study or career and their enjoyment of science were the most central indicators for all three science courses [8].

In 2011, the average score in science level 8 (junior high school age) from the participation of TIMSS, Indonesia's achievement was 406 in the order of 45 from 50 countries [9]. Although, the two analyses were validated across 20 countries show that attribute specifications can differ from expert opinions [10]. Analysis of the test material tested by TIMSS found that science material about creatures and ecosystems and natural phenomena was not well mastered. The results of the competition show that the performance of Indonesian students is still far below the international average.

According to Kyllonen [11] formulated an assessment focused on three main topic groups that support 21st-century literacy for future generation science standards, namely: i) Ways of thinking (creativity and innovation, critical thinking, problem solving, and decision making; metacognition); and ii) How to work (communication, collaboration, and teamwork). NGSS emphasizes the importance of science work practice and is actively involved, which is a vehicle for teaching the science process [12]. Each standard in the NGSS is a combination of three dimensions [13]. The three dimensions are: i) Scientific practice and engineering skills, namely the skills and behaviors used by individuals in carrying out scientific investigations and engineering designs; ii) The concept of crosscutting, namely a science theme that provides an important organizational scheme for connecting domains together, making connections between various scientific concepts to create a coherent and knowledge-based holistic view of the environment; and iii) Disciplinary core ideas (DCIs) are the key ideas in science that have broad importance within or across multiple science or engineering disciplines. These core ideas build on each other as students progress through grade levels and are grouped into the four domains (physical science, life science, earth and space science, and engineering).

According to Drew and Thomas [14] it is emphasized that professional educators carry out science practices that are directed by NGSS guidelines in science learning. Science learning that is carried out by teachers in general has not used varied learning sources and has not used assessment instruments that refer to international standards (PISA and TIMSS). The results of the study stated learning resources were limited to teacher books and student books as well as student worksheets and assessment instruments had not yet developed higher-order cognitive measures of thinking [15]. The results of other studies have revealed the problem of how to activate students and the tensions faced by elementary school teachers in teaching science. These two problems are overcome through research-based operational steps towards quality science learning and teaching practices [16].

Equitable education carried out in various regions of Indonesia has various obstacles in implementing it. The problem is caused by remote rural areas and far from urban areas in accessing services education is still not evenly distributed [17]. Diversity of the place environment stay will grow a different experience, which then form knowledge different beginnings [18]. Initial knowledge (prior knowledge) is a collection of knowledge and experience individuals obtained in daily life and capital to gain learning experience new one [19]. The low quality of education on the coast, namely, there is a problem in science education on the coast is like a gap scientific progress with the world of education, achievement our education is lagging and global issues of education [20]. Science learning has not been taught anywhere should be. The main factor for the occurrence of the condition. This is due to the low quality of teachers teaching science in schools. This teacher factor is not the only problem in science education but such as government policies, the performance of leaders in this case principals and supervisors, community support, student interest in learning in schools in coastal areas.

The results of research on the ability of scientific literacy students in coastal areas of 38.76 with very low criteria [21]. Students' scientific literacy ability based on scientific literacy has an average score percentage of content aspect (55.9%), process aspect (54.70%), and context aspect (57.4%). When viewed as a whole, from the results of the translation of the average percentage value, it shows that students' scientific literacy skills are still in the low category [22]. Based on the results of the average percentage of marine literacy tests of 29%, it can be concluded that the marine literacy ability of junior high school students in the is categorized as low [23]. Research on student learning outcomes in coastal areas measures cognitive learning outcomes, measures high-level thinking skills, and measures scientific literacy, and motivation.

What level is the achievement of the NGSS for Java coastal students. Research measuring sustainable development goals (SDGs)-oriented student learning outcomes has not been conducted. Therefore, the purpose of this study is to determine the level of achievement of SDGs-oriented learning outcomes for students in coastal areas.

2. RESEARCH METHOD

The research was carried out using ex post facto quantitative methods with assessment innovations containing competencies from a combination of national and international NGSS standards. Research is characterized by the disclosure of the variables that become the research problem using reliable instruments, so that quantitative and qualitative data are obtaine [24]. The research subjects consist of Tegal, Pekalongan, Pati and Demak Regencies in Central Java, Indonesia. The research sample was determined by purposive sampling by considering the characteristics of all regencies. The number of respondents was 228 students who come from north coastal Java Island. The data collection technique of this research employed a multiples choice test and essays. The instrument has met the validity as a good measuring tool. The sampling technique of this research is purposive sampling. Purposive sampling is a sampling technique with certain considerations in [25]. These data were analyzed using analysis of variance (ANOVA) test analysis among regional groups, quantitative and qualitative analysis.

3. RESULTS AND DISCUSSION

NGSS-oriented science mastery was collected using test instruments in the form of choice and essays. The results of the study can be reported that as many as 228 students have filled in personal data and carried out online tests that were supervised by the science teacher at the school. Based on the three sub-fields of science subjects, consist of physics, integrated science, and biology are presented in Table 1. Based on the results of data that the extreme differences in the physics, integrated science and biology with lowest scores of 26, 21, and 24 with highest scores of 84, 84, and 87 respectively (scales 0-100) have been obtained. This study compares individual and collaborative approaches to teaching the critical thinking "why how (WH) questions" show that the individual groups used more "what questions," whereas students in the collaborative group used more "why and how questions" [26]. the results of the ANOVA test for differences in learning achievement in the four regions are presented in Table 2.

The information is also interesting for the biology with the highest scores among the three science concept scores that students have achieved of 87 (scales 0-100). The results showed a significant difference between the achievement of students all regencies ($p=0.012$; $\propto=0.05$). The supporting research that pupillometry has been applied in the world laboratories to assess how listening effort of cognitive processing during listening [26]. The research find suggestive evidence in some models that time on science instruction is related to science achievement but little evidence that the number of science skills covered are related to greater science achievement [27]. Research in line with [28], [29] that showed there is some evidence indicating that compared with female students, male students' perceptions of science utility are higher in relation to more inquiry-based instruction in both their science and mathematics classrooms. Moreover, by using ethnoscience learning, students' scientific literacy skills also increased so that they could apply their knowledge [15].

Table 1. Results of the NGSS of students'tests score

Three categories	Min score	Max score	Average score
Physics	26	84	56
Integrated science	21	84	55
Biology	24	87	67

Table 2. Results of ANOVA Analysis

	Sum of squares	Df	Mean square	F	Sig.
Between groups	1559.354	4	311.871	3.34	.012
Within groups	3853.832	224	20.720		
Total	5413.186	228			

Based on the ANOVA test, there was a significant difference between the four groups of students' achievements in mastery of science oriented NGSS with $F=3.37$, $p=0.019$, $df=3$ and $\propto=0.05$. The research showed the results indicate that variable selection inspired by social science methodologies how various early

childhood variables predict the long-term outcomes of children [30]. It can be concluded that the achievements among students who came from four different regencies were quite significant. Those the subjects with middle and high economic backgrounds tend to have low achievement but students with low economic levels have high academic achievement. The difference in scores obtained by students from four regions is caused by several factors, namely regional characteristics (agriculture, religion, trade, and industry), education and socioeconomic level of parents, and student association groups.

Quality of education in coastal areas is not optimal. The education of fishermen's children in the coastal areas of Indonesia is still relatively low. It is worrying, only about 1-1.3% of fishermen's children have graduated from education bachelor's degree, the remaining around 3% are high school graduates, 6% are junior high school graduates, and the remaining 85% only elementary school education. On the other hand, the issue of the education of fishermen's children is not despite the poverty that complements their lives, coastal communities Indonesians who live below the poverty line are 32.14% [31], [32] state that young people in coastal areas in general prefer to help parents go to sea than go to school. Furthermore, the strength of the mind and parents' views on children so that they can can help the economy of parents become triggers cannot be separated from the way of thinking traditional and conservative. Learning outcomes are influenced by factors within the individual and external. The factors that exist within students of physical and psychological. While the factors outside the students include factors family, school and community. Quality of education in coastal areas not optimal [33]. Economic conditions also have a positive and significant influence on the level of education of their children. Economic conditions related to ability to cover basic living expenses in advance such as everyday life [34]. This is of course related to the amount of income and amount of expenditure for daily needs. The level of income that is low if it is balanced with high expenditure needs, so it will lower the level of economic conditions.

The results of this study concluded that students who come from high economic families end to get low scores and parents with low economics get high scores. Revealing that there is an influence significant/positive from socio-economic on learning achievement stated that the financial capability differently will have influence on student learning achievement [35]. This matter means that the socio-economic parents have important role in height low student achievement. The higher the level of the economy socio-economic parents of students, then greater expectations for achievement. The influence of parents' socioeconomic status not only determinant in direct child learning achievement but also indirectly can affect it. Parents with high income possible can meet children's learning facilities [36].

The high-test scores for students who come from a low economy are thought to have high motivation from themselves. Students in coastal areas divide their time to work and studies are accustomed to dividing their time, facing problems and taking responsibility for assignments at home and at school. The situation is different if high economic students are equipped with learning facilities, more time and do not find many problems so that their motivation tends to be less developed. Learning outcomes can be influenced by factors of parents' economic ability, learning facilities, and learning motivation [37]. The family environmental factors with high or low. The socioeconomic status of parents plays an important role because it is related to the fulfillment of needs which includes primary, secondary, and tertiary needs in which there is fulfillment of the need for education for their children [33]. The results of this study, motivation is a major factor in achieving student achievement in coastal areas. Students with high family economy who fulfill learning facilities, high parental attention and support are suspected of having low learning motivation so that the learning outcomes obtained are low.he essence of motivation is encouragement internal and external to students who is learning to hold changes in behavior, in general with several indicators or supporting elements [23]. With respect to This motivation that learning motivation gives contribution to learning achievement. The tendency of students who have high learning motivation will have high interest and enthusiasm will learn happily and voluntarily [38]. On the other hand, motivated students low learning will have low interest and enthusiasm in study, lazy to join the process learning. According to Descals-Tomás *et al*. [39] that there is a partial effect between learning motivation and learning achievement.

4. CONCLUSION

The results showed a significant difference between the achievement of students in Tegal, Pekalongan, Pati, and Demak Regencies ($p=0.012$; $\propto=0.05$). Based on ANOVA test, there was a significant difference between the groups of students' achievements in mastery of science oriented NGSS. Based on the ANOVA test, there was a significant difference between the four groups of students' achievements. Students from families with middle and upper economic levels have low achievement but students with low economic levels have high academic achievement. Based on research results, motivation is very important for students in achieving learning achievement.

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