

MEASURE THE ACHIEVEMENT OF INDONESIAN STUDENTS IN MATHEMATICS AND SCIENCE THROUGH THE 2016-2019 NATIONAL OLYMPIADS ON MATHEMATICS AND SCIENCE

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ABSTRACT

The National Olympiad of Mathematics and Science, which is known in Indonesian (Bahasa) The National Olympiad of Mathematics and Science (ONMIPA) is held annually to support student achievement Mathematics and Science. The sample in this study was 1024 ONMIPA participants from fourteen regions (LLDIKTI) (2016 to 2019). Four ONMIPA judges were selected by purposive sampling method for in-depth interviews. The data obtained from the documentary study are presented in tabular form, and graphs are followed by the results of in-depth interviews, which are then collected and analyzed. This study concludes that the learning achievement of Indonesian students in mathematics, physics, chemistry, and biology is still low. However, from year to year, it has increased significantly from 2016 to 2018 and then shows a downward trend in 2019. It was found that there was an achievement gap between ONMIPA participants. Between tertiary institutions, between state and private universities and between tertiary institutions in Java and outside Java. So it can be said that the implementation of ONMIPA every year is not sufficient to support student achievement in the fields of Mathematics and Science.

Keywords: basic science mastery, competition, national Olympiad

Introduction

There are at least two main parameters that we can use to measure Indonesia's progress when this nation commemorates. First, the achievement of the noble ideals of this nation. Independent, united, sovereign, justice, and prosperous have been declared since Indonesia became independent state. Second, in the era of globalization, the level of a nation's progress can also be measured by the competitiveness of this nation when compared to other countries. Several problems currently faced by this nation show that the entire government still needs to strive to achieve our goal of living as a nation and state.

The Organization for Economic Co-operation and Development describes that the capability to innovate and bring innovation successfully to the market will be a crucial determinant of the global competitiveness of nations (OECD 2007). Then in The US Commission on National Aid to Vocational Education warned that "the battles of the future between nations will be fought in the

markets of the world(West 2015). The government of a country and higher education institutions will have a significant role in the mastery of science, technology, and innovation, not from competitive These problems include poverty, inequality of welfare between individuals and regions, ignorance and backwardness, corruption, collusion, and nepotism, the persistence of intolerance, radicalism, terrorism, and even demands that lead to the disintegration of this nation. Meanwhile, the competitiveness of the Indonesian nation has not shown a significant increase. Even the World economic forum (2019) has published that Indonesia's competitiveness in 2019 has decreased. If in 2018 it is ranked 45, then in 2019 it will decrease to rank 50 (Schwab 2019). The fact that the government of the Republic of Indonesia is taking sides in the development of science, technology, and innovation of regulations on the establishment of higher education institutions which require the establishment of a university of at least 5 (five) Indonesian higher education in various forms and qualities, currently the number has reached 4,644 universities (Indonesia 2020).

International accreditation is essential in national university competition in this globalization era. Higher education, with its Three mission of higher education (Tri Dharma Perguruan Tinggi), puts learning as the main activity. In the current independent campus policy, extra-curricular activities have an excellent position because many activities that were initially extra-curricular activities can be recognized (converted) into activities that are weighted semester credit units (SKS). The universities give great appreciation for extra-curricular activities because it is well aware that they should graduate alumni who not only have academic abilities according to their chosen field (hard skills), but also have some competencies that are relevant to the world of work, business world, and alumni life in their community, including the ability to master the human side of a human being (soft skills).

One of the extra-curricular activities closely related to curricular and co-curricular activities is the administration of the National Olympiad in Mathematics and Sciences (ONMIPA). The National Olympiad for Students in Mathematics and Natural Sciences (ONMIPA) has been held by the Directorate of Learning and Student Affairs of the Ministry of Education and Culture since 2009. The ONMIPA activities aims to increase learning motivation, academic ability, broaden the horizons of students in mathematics and Science, improve the quality of Mathematics and Science learning in universities, and promote the attractiveness of the Mathematics and Science field in society (Indonesia 2020). (ONMIPA Guidelines 2016, 2017, 2018, 2019).

Regarding the implementation of this Connected to the importance of competition in education, Abernathy & Vineyard (2001) also suggested that the Science Olympiad involved students in developing and using science skills and scientific reasoning to build new content knowledge and increase student interest in Science (Abernathy and Vineyard 2001). Furthermore. One of the reasons for the administration of ONMIPA is to foster student's interest in Science, technology, and mathematic (Kuech and Sanford 2014; Wahidin and Romli 2020). An issue of fostering

interest in students' interests in STEM also proposes in other research. That research suggested that competition is an effective way to foster career interest in a specific STEM career, impact on the participants and followers of learning in science and mathematics, strengthens learning motivation and It could be intrinsic or extrinsic motivation (Costică 2014; Miller, Sonnert, and Sadler 2018).

Innovation is key to meet many development challenges and the primary force for innovation Without it, there would be no science to apply (Aymar 2006). For the university, basic research generates new knowledge and contributes to the quality of university education (van Rij 2015). As stated above, universities have a strategic position to be the key for winning competition between nations in the future. Students are prospective researchers, technocrats, innovators, and national leaders who will determine competition among countries in the future. Thus, this research would identify how the achievements of Indonesian students in Mathematics and Sciences are, how the progress of Indonesian students' achievements in Mathematics and Sciences is, and whether the achievements of Indonesian students evenly distributed throughout the country.

Literature Review

A. The History of ONMIPA

Universities with superior accreditation (A) have only reached 96 universities, while others have only achieved excellent (B) or good (C) predicate, even there are still many universities that are not yet accredited (Indonesia 2020). Today, the industrial world and the business world in recruiting or designing employee career development systems pay much attention to non-academic or soft skills. The Directorate General of Higher Education often mentions that university alumni must master 21st century competencies which are also known as 6C's (Critical thinking, Creativity, Collaboration, Communication skills, Computational skills, and Compassion) (Indonesia 2020).

In 2020, the use of the word "Olympics" was prohibited by Indonesian Olympic Committee (KOI) and International Olympic Committee (IOC). The ONMIPA, which has been going on since 2009, was renamed the Indonesian Student National Competition in Mathematics and Science (KN-MIPA), organized by the National Achievement Center of the Ministry of Education and Culture, with an activity format which is more or less the same as ONMIPA. ONMIPA participants are students in the field of Mathematics and Natural Sciences or relevant fields from universities throughout Indonesia who are selected through 3 stages, namely selection at the university level, regional level (carried out by 14 regions/LLDIKTI), and national level (conducted by the Directorate of Student Affairs).

Each year, this activity is attended by 256 participants at the national level consisting of 64 students for each field (Mathematics, Physics, Chemistry, and Biology). A total of 64 participants from each area taken from the first winner of the regional level selection, participants with the highest (best) score from private universities (PTS) in each region, and students with the highest score of regional selection (others) as a whole to meet the maximum quota.

B. The Medal Level of ONMIPA

At the national level of ONMIPA, each field competed for three gold medals, five silver medals, seven bronze medals, and several students who received honourable mention. (ONMIPA Guidelines 2016, 2017, 2018, 2019). Specifically for mathematics, the medal winner is also projected to participate in the international mathematics competition (IMC) in Bulgaria. This competition in mathematics and Science has a very strategic position considering that competition among nations in the future will occur in science, technology, and innovation. Therefore mastery of basic sciences will be the key to win the competition in this era of industrial revolution 4.0 and the future. Because by mastering the basic sciences, a country will not run out of materials to make innovations, giving birth to new technologies as a capital. Science in research and development (R&D) are now more open,

collaborative, and geographically dispersed. R&D efforts are simultaneously more globalized and more localized while an increasing variety of actors in emerging countries contributes to enrich the innovation landscape (Dutta, Lanvin, and Vincent 2016)

C. The Advantage of Mastery in Basic Sciences

Mastery of basic sciences will be the key to winning the competition in this era of industrial revolution 4.0 and the future because by mastering the basic sciences, a country will not run out of materials to make innovations which will then give birth to new technologies as capital to win the competition. The danger is that in the race to improve competitiveness, countries may lose sight of the adage that "without basic science, there would be no science to apply" (Soeta 2015)

Faraday's experiments on electricity, for example, we're driven by curiosity but eventually brought us electric light. Electric light came from innovation driven by fundamental Science (Aymar 2006). Fundamental Science or basic Science has a vital role to play in today's world competitive. It is a whole science that lays the long-term foundations for innovation and prosperity. Abdus Salam, the Nobel prize-winning physicist from Pakistan, said, "In the final analysis, creation, mastery, and utilization of modern Science and technology are basically what distinguishes the South from North. On Science and technology depend the standards of living of a nation. "This is the challenge for fundamental Science in today's world of competition. Fundamental Science has a vital role to play in the process of innovation. In today's competitive world, it is as essential as it has ever been (Aymar 2006). History teaches us that big jumps in human innovation come about mainly due to pure curiosity. Innovation is key to meeting many of today's development challenges, and the primary force for innovation is fundamental research. Without it, there would be no science to apply for the university. Basic research does not only generate new knowledge but also contributes to university education (Soeta 2015).

Methods

This research implemented a descriptive-analytical method. The uniqueness of descriptive analysis partly lies in its ability to explore both quantitative and qualitative research methods. Therefore, when conducting descriptive research, researchers can use a wide variety of techniques that aids the research process. When conducting research, it is advantageous to identify characteristics, frequencies, trends, correlations, and categories. Descriptive studies aim to find out "what is," so observational and survey methods are frequently used to collect descriptive data(Gall, Borg, and Gall 2003).

The sample of this study was 1024 participants of ONMIPA from all 14 regions (LLDIKTI)

participants who have gone through regional selection and colleges (universities) for four years of ONMIPA administration from 2016 to 2019. And 4 (four) judges of ONMIPA are chosen by the purposive sampling method, for in-depth interviews. The data were obtained from the 2016 to 2019 prepared by the Directorate of Student Affairs at the Ministry of Research, Technology and Higher Education. The data from the documentary study was displayed in the form of a table and graphic followed by the result of an in-depth interview then collected and analyzed. To answer the first question related to the achievement of Indonesian students in Mathematics and Natural Sciences, the average score of ONMIPA participants calculated each year which is referred to the following category :

Table 1. Score classification in percent (scale 100)

No.	Score (%)	Category
1	81-100	Very high
2	61-80	High
3	41-60	Moderate
4	21-40	Low
5	0 – 20	Very low

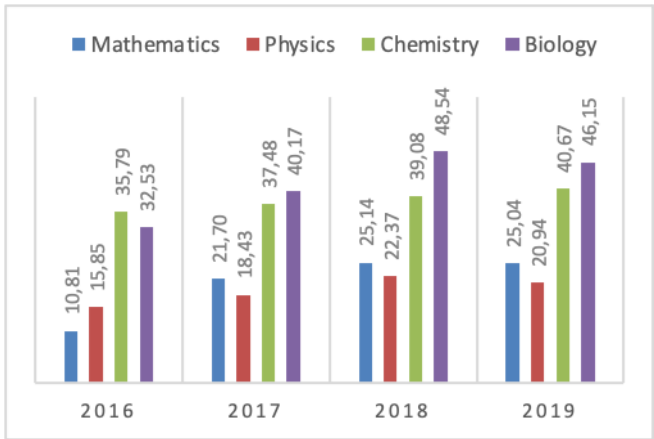


Figure 1. The Average score of ONMIPA 2016-2019

Meanwhile, the tendency for student achievement progress to be shown in increasing or decreasing student scores from 2016 to 2019. It is determined by comparing the average student scores each year. The significance of the difference will be analyzed with the Analysis of Variance (ANOVA)

Discussions

A. Achievements of Indonesian higher education students in Mathematics and Science from 2016-2019

Based on data from National Olympiad in Mathematics and Sciences studies documentation in the (ONMIPA) at the national level, the achievements of Indonesian students in Mathematics and Sciences (MIPA) are as shown in Figure 1

The achievements of Indonesian students in Mathematics and Sciences can be briefly described as follows: Based on Figure 1, the acquisition student scores in the Mathematics 2016 was 10.81. When referred to in table 1, this score is classified as very low. In 2017, 2018, and 2019 it is in the range of 21-40, so it is classified as low category. Meanwhile, in Physics, the average score of participants in 2016 was 15.85. In 2017, this score was 18.43 and it is classified as very low. In 2018 and 2019, it was in the range of 21- 40, so it was classified as low. Student scores for the Chemistry Sector in 2016 were 35.97, and for 2017, 2018, and 2019 it was in the range of 21-40, so it is relatively low. For Biology, the

average score of participants in 2016 was 15.85, when referred to in table 1, classified as very low, while in 2017, 2018, and 2019 it was in the range of 41-60 was classified as moderate. Let's check at the score acquisition data as presented in Figure 1. Suppose the score 100 is considered a perfect score. In that case, the level of mastery of learning mathematics and Natural Sciences subject is still below 50%, even for physics and Mathematics are still very low.

We further interpret the achievement data from ONMIPA participants. In that case, it can hypothetically say that the level of mastery of Mathematics and Sciences field material for all Indonesian higher education students is shallow. We have always received information about the low learning achievement of Indonesian high school level students. It was measured through the PISA (Program for International Student Assessment) test in Mathematics and Sciences, carried out by the OECD (The Organization for Economic Co-operation and Development). As an illustration, Indonesian students' mathematics and sciences achievements in 2018 were below the average achievement of other OECD member countries. In 2018 the PISA score of OECD member countries was 379 and science was 489, while Indonesia for mathematics only reached 379 and science reached 396. In Mathematics, Indonesia was ranked 73 and science was ranked 71 out of 79 countries. In the PISA test, 71 per cent of Indonesian children have their mathematical abilities below the minimum competency. As for science, 40 per cent of Indonesians who have not reached the expected minimum competence (Harususilo 2019).

It is not an easy thing to determine what factors are the causes for the low achievement of Indonesian students in the Mathematics and Natural Sciences field. The low indication of Indonesian human resources quality comes from education quality. It can interpret that low student achievement could be an indicator of the low quality of learning in the classes in higher education. The level of mastery of the material by students is related to aptitude (Joyce, Weil, and Emily 2015). Aptitude is the amount of time taken

by someone to learn any given material, rather than his or her capacity to master it.

Concerning student achievement, Suryabrata (2004) suggests that the factors that influence learning outcomes consist of: (1) factors originating from outside the student, consisting of social and non-social factors; and (2) factors that come from within students; consists of psychological factors, and physiological factors. These two factors are meant to determine student learning outcomes (Suryadarma et al. 2004). Many recent studies in mathematics and science education had studied the effect of non-cognitive factors in students' achievements, such as emotions, attitudes, values, beliefs, motivation, anxiety, and grit. It showed that determination is positively and significantly correlated to academic achievement in math only, while attitudes towards math and science were positively and significantly correlated to academic achievement in both subjects (Al-Mutawah and Fateel 2018).

Research by Suryadarma *et al.* (2004) found that student performance is strongly influenced by individual variables, teacher variables, and school variables. Among the significant variables are:

- The education level of parents.
- Student-teacher ratio.
- Quality of school facilities and teacher absence rate (Suryadarma et al. 2004).

Other research shows that motivation factors, family factors, campus environment, a peer, teacher, class size, school, socio economic family, student himself, teacher, home, schools, principal, peer effect and organizational activity positively and significantly affect student academic achievement (Betts, Zau, and Rice 2003; Hattie 2003; Olufemi, Adediran, and Oyediran 2018).

It is very complex and varied to know various ways factors that may affect the low learning achievement of students in mathematics and natural sciences (IPA) at the National Olympiad of Mathematics and Sciences (ONMIPA). Some classify come from school factors and some classify come from cognitive and non-cognitive factors. Some classify it into internal and external

student factors. Of course, it requires in-depth and specific research to determine which factors are the most significant. In addition to the many factors that affect student achievement, there are also meaningful interactions between these various factors. It will be very situational and conditional. Whatever the factors, the quality of learning is the primary determinant of student achievement. Meanwhile, the most dominant aspect of quality of education is mainly determined by the quality of students themselves and the quality of lecturers.

B. The Progress of Student Achievement in Mathematics and Natural Sciences

Data on student achievement progress in ONMIPA activities can be seen in Figure 2.

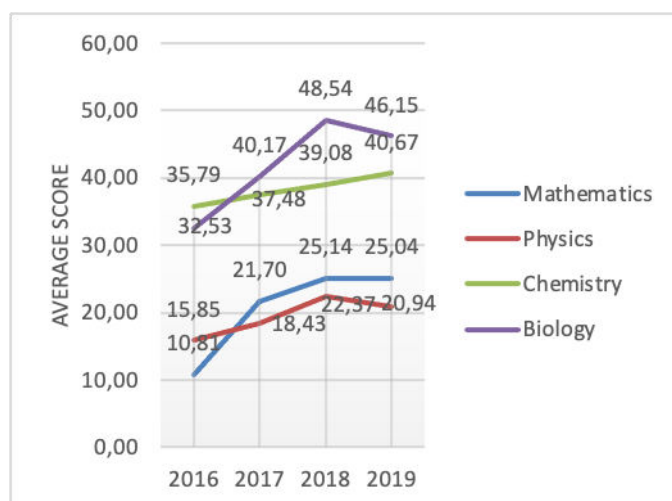


Figure 2. The Progress of the average score of ONMIPA (2016-2019)

Based on the average student achievement, it can conclude that from 2016 to 2018, student achievement in all fields of competition (Mathematics, Physics, Chemistry, Biology) showed a significant increase. Meanwhile, if you look at the following data, the tendency of a decline occurs from 2018 to 2019. Mathematics, Physics, and Biology show a significant reduction. Only, ONMIPA judges said that the test in all subjects had no significant changes, the difficulty level of the questions remains consistent with the previous year, the competition is also the same, and the participants selection system who take

part in the national level ONMIPA is still consistent as stated in the ONMIPA guidelines(Wahidin and Romli 2020).

The Indonesian Constitution, which outlines an education budget of 20% of the State Budget and the use that is not yet on target. For comparison, the world average in 2015 based on 105 countries is 4.70 per cent. As an example for reflection, China excels in international tests as the first rank in the PISA test or other international competitions (UNESCO 2020). It is simply because it has increased its budgets more than others. Western countries aim to secure or improve their relative positions shortly and they need to increase their efforts in budgetary terms. In the first instance, the key is money, more than structures or organizations. From the White House, Obama warned that "we cannot cut education. We can't cut the things that will make America more competitive (West 2015)".

C. Equitable Student Achievement

Indonesian students who took mathematics competition at the International Mathematics Competition (IMC) in Bulgaria performed very well and increased compared to the previous year. In 2019 Indonesian students won 3 gold medals, two silver medals, and one bronze. (KOMPAS 3/12/2019). Unfortunately for Chemistry, Physics, and Biology, there are no international competitions that are consistently held regularly not to take international quality references. This fact shows that there is a reasonably large achievement gap that exists among Indonesian students, especially in the field of mathematics. The average mathematics achievement is still low.

The PISA tests in mathematics and natural sciences for secondary schools also show that there are still quite large quality gaps between areas. Based on the 2018 PISA results, it was found that there was still a high disparity (distance) in the quality and outcomes of education for each region in Indonesia. The 2018 PISA results show that students' achievement in Jakarta and Yogyakarta is close to the OECD average score. In other areas, it is still far below

the average PISA score of other OECD member countries. The average national-level ONMIPA score data as contained in table 2 below. In that case, it can be seen that the average score data shows the low student achievement in mathematics and sciences, as well as the standard deviation of each year for all competition. The standard deviation shows the dispersion of a dataset relative to its mean, the more spread out the data, the higher the standard deviation.

Table 2. Average Score of ONMIPA Results 2016 – 2019

Fields	Year			
	2016	2017	2018	2019
Matematika	10,81	21,70	25,14	25,04
Sd	12,26	18,42	18,31	18,90
Fisika	15,85	18,43	22,37	20,94
Sd	10,26	14,45	17,25	14,35

Fields	Year			
	2016	2017	2018	2019
Kimia	35,97	37,48	39,08	40,67
Sd	15,74	16,78	17,02	18,27
Biologi	32,53	40,17	48,54	46,15
Sd	11,93	14,13	10,47	12,85

It can state that the score range in mathematics shows an extensive range, as seen in table 3 below. In Physics, the score ranges for the participants also show a huge range. Participants who got a 0 (zero) score in 2016 were one person; in 2017, there are two people; in 2018, there were three people, and in 2019, there were four people. In Chemistry, the score ranges for the participants showed a fairly large range.

Table 3. Range of Score ONMIPA 2016-2019

No.	Year	Range of Score (highest score – lowest score)			
		Mathematics	Physics	Chemistry	Biology
1	2016	47 (0 – 47)	46.25 (0 - 46.25)	58.50 (4.25 – 62.75)	53.75 (5.38 – 59.13)
2	2017	68 (0 – 68)	53.38 (0 - 53.38)	73.80 (0.00 – 73.80)	54.60 (8.80 – 63.40)
3	2018	87 (0 – 87)	60.00 (0 - 60.00)	65.25 (3.00 – 68.25)	45.70 (18.40 – 64.10)
4	2019	67 (0 – 67)	52.94 (0 - 52.94)	64.00 (2.38 – 66.38)	53.00 (15.13 – 68.13)

An Analysis of the national level ONMIPA score range from 2016-2019 shows a vast score range, and even for the fields of mathematics and physics, there are still many participants who get a score of 0 (zero). The content is a measure of spread in statistics: it's the difference between the highest value and the lowest value in a data set. Based on standard deviation data and student

score ranges in ONMIPA 2016-2019, which are contained in table III.1. above, it can be interpreted that the achievement among ONMIPA participants is not evenly distributed. There is still a fairly significant achievement gap between participants. Even worse, some participants score quite a lot of zero (0), even though they are the participants with the best achievements from their university or college or their respective regions.

Table 4. The ONMIPA Gold medal-winner college in 2016-2019

Num.	University / College	2016				2017				2018				2019				Sum
		M	P	C	B	M	P	C	B	M	P	C	B	M	P	C	B	
1	ITB	1	1	1	-	1	3	3	1	1	3	1	1	3	2	1	1	24
2	UI	1	1	1	-	-	-	-	-	-	-	-	1	-	1	1	1	7
3	UGM	-	-	1	1	1	-	-	1	1	-	1	-	-	-	-	1	7
6	Un. Surabaya	-	-	-	1	-	-	-	-	-	-	1	-	-	-	1	-	3
5	ITS	-	-	-	-	-	-	-	1	1	-	-	-	-	-	-	-	2
7	UPH	-	-	-	1	1	-	-	-	-	-	-	-	-	-	-	-	2

Num.	University / College	2016				2017				2018				2019				Sum
		M	P	C	B	M	P	C	B	M	P	C	B	M	P	C	B	
4	IPB	-	-	-	-	-	-	-	-	-	-	-	1	-	-	-	-	1
8	Univ. Sanata Dharma	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1
9	UNNES	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1
	Sum	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	48

Table 4 shows that there is still a gap in achievement between tertiary institutions. More than 4700 universities in Indonesia (from 2016-2019) and only 9 (nine) universities that have won gold medals, with one university is very dominant. And of the 9 (nine) universities, there are 6 (six) large state universities and 3 (three) private universities, which are also large universities with excellent accreditation. The nine universities are established universities from the island of Java, and there is none university from outside Java.

The reader can see a more detailed analysis from the data in the following tabl. Table 5 showed more about the acquisition of medals (gold, silver, bronze), from 2016 to 2019, of the 240 medals (12 gold medals, 20 silver medals, and 28 bronze medals), there were only three medal. Students

from universities outside Java Island won one bronze medal for mathematics, while students from universities located in Java won the remaining 237 awards. Meanwhile, it also examines the data on medal winners based on the status of public and private universities. And if we investigate further, the private universities that have won awards are domiciled in Java.

The acquisition of scores or medals at the 2016-2019 national level ONMIPA activities in mathematics, physics, chemistry, and biology reveals a quality gap in universities. Both state universities and other public universities show that there is a quality gap between regions, between tertiary institutions on the island of Java and universities located outside Java.

Table 5. ONMIPA gold, silver, and bronze medalist *)

Num.	Year	Statues	Medals												Sum	Note
			Gold				Silver				Bronz					
			M	P	C	B	M	P	C	B	M	P	C	B		
1	2016	Java	3	3	3	3	5	4	5	5	7	7	7	7	59	M = math P = Physic C = Chemistry B = Biology
		Outside Jv	0	0	0	0	0	1	0	0	0	0	0	0	1	
		Public	2	3	3	1	4	4	4	5	7	7	7	6	53	
		Private	1	0	0	2	1	1	1	0	0	0	0	1	7	
2	2017	Java	3	3	3	3	5	4	5	5	7	7	7	7	59	
		Outside Jv	0	0	0	0	0	1	0	0	0	0	0	0	1	
		Public	2	3	3	3	5	5	5	4	7	7	7	7	58	
		Private	1	0	0	0	0	0	0	1	0	0	0	0	2	
3	2018	Java	3	3	3	3	5	5	5	5	7	7	7	7	60	
		outside Jv	0	0	0	0	0	0	0	0	0	0	0	0	0	
		Public	3	3	2	3	5	5	5	4	7	7	5	6	55	
		Private	0	0	1	0	0	0	0	1	0	0	2	1	5	
4	2019	Java	3	3	3	3	5	5	5	5	7	6	7	7	59	
		Outside Jv	0	0	0	0	0	0	0	0	0	1	0	0	1	
		Public	3	3	2	3	5	5	5	5	7	6	7	7	58	
		Private	0	0	1	0	0	0	0	0	0	1	0	0	2	

*) Every year there are 15 medals up for grabs, gold medals (3 pieces), silver medals (5 pieces), and bronze medals (7 pieces) in the ONMIPA competition

Strategic Plan of the Ministry of Research, Technology and Higher Education 2015-2019 (Permenristek No.13 of 2015) was made with the vision of increasing access, relevance between

higher education. It also and enhanced the ability of science, technology, and innovation to improve innovative products in various programs throughout the country. However, it seems that it still takes hard work to make it happen. These programs do not differentiate between state universities in Java and outside Java, do not differentiate between state and private universities. Of course, the ministry does not make programs to equalize the treatment of universities with different levels of progress. In addition, to compete with fellow universities in the country, there must also be universities that are continuously encouraged to compete with other universities from other countries.

Many programs made by the Directorate General of Learning and Student Affairs for increasing the acquisition of international certification, assistance for pre-facilities, assistance for infrastructure in private universities, quality of competence and qualifications of lecturers, research grants and community service, student exchanges between universities both at home and abroad, developing the distance learning, setting higher education standards, increasing the accreditation of study programs to superior accreditation, organizing competency examinations, providing various scholarships for outstanding students in the fields of curricular and extra-curricular activities, and developing multiple student activities, reasoning and creativity competition, interest and talent competition, career centre development and tracer study (Tinggi 2018). Various higher education development programs, including justice in the distribution of the state budget (APBN), BOPTN, and various other assistance, as well as the inclusion of multiple sources of funding from non-APBN funds should be fair. Ignoring and unfair treatment of private universities will mean neglect of the quality in education for the nation's children who will become leaders.

Private tertiary institutions have worked together with the government to make various efforts in educating the nation's life. The government should appreciate other national goals. Appreciation is also appropriate for private universities students

who are educated in private universities and their friends from state universities will become leaders and citizens of the nation. They have the same rights and obligations as students from public universities. This appreciation will contribute to the achievement of the nation's goals, more or less. Only superior tertiary institutions will produce qualified and exemplary citizens.

Of course, it must be taken seriously by all education stakeholders, especially the government, so that this trend of decline in achievement does not continue. A comprehensive evaluation seems to be carried out in a programmed, planned and thorough manner. That programs include improving the institution and governance of higher education, accrediting higher education institutions both nationally and internationally, improving the quality and qualifications of lecturers, and also improving the quality of learning.

Conclusion

It is essential to mastery of science, technology, and innovation in this era of global competition. The low achievement of Indonesian students in mathematics and natural sciences should be a severe warning to all education stakeholders. They should be used as feedback for various government policies in the education sector to improve the quality of education in the future. Intensive multi-directional communication is needed to improve student achievement in Mathematics and Natural Sciences between universities and the government. The accomplishments of Indonesian students at ONMIPA are parallel to the successes of Indonesian students on the PISA test. There is a need to strengthen training programs for improving it. Competition Mathematics and Natural Sciences need to be reproduced and improved to have international quality references for higher education. Further research is required to determine the causes of low student achievement, decreased performance development, and unequal Mathematics and Natural Sciences in this country.

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