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THE RELATIONSHIP BETWEEN STUDENTS' INTERNAL AND EXTERNAL FACTORS AND THEIR ACADEMIC ACHIEVEMENT

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ABSTRACT

This research aims to determine the relationship between students' internal and external factors, such as student background, school characteristics, teacher factors, and internet use and the academic achievement of high school students majoring in science and social studies in Indonesia. Employing a quantitative approach, the research utilizes panel data from all 34 provinces in Indonesia over a span of 3 years, from 2017 to 2019. The data sources used are from the Ministry of Education, Culture, Research, and Technology and the Central Bureau of Statistics. The data is analyzed using random effect model through linear regression analysis of panel data. The results show that student background factors, such as student participation and scholarship have a positive and significant relationship with academic achievement. Additionally, school characteristic factors, specifically, being a private school and the use of the Internet have been shown to have a positive and significant relationship with academic achievement. However, the variables related to teacher factors, specifically qualifications and certification do not have any significant relationship with students' academic achievement.

***Keywords**: academic achievement; internet use; school characteristics; student background; teacher factors*

INTRODUCTION

Students' academic achievement is one of the indicators that reflects the effectiveness of the education system. Therefore, every actor involved in the education system needs to evaluate the educational process so that student achievement can be improved. One measure that aims to evaluate the education system in a country is the Program for International Student Assessment (PISA). PISA is a program issued by The Organization for Economic Co-operation and Development (OECD) which aims to measure student performance in secondary education, particularly in the fields of mathematics, science, and literacy.

The results of the last PISA average score issued in 2018 showed Indonesia's position as one of the lowest, ranking 71 out of 77 countries with an average score of 382. This result is considered unsatisfactory, considering that this average score is below the overall average - an average of 77 countries rated at 487 (Figure 1). In addition, since 2000, Indonesian students' reading, numeracy, and science skills on the PISA assessment have also tended to stagnate. Figure 2 shows that Indonesia's PISA score has fluctuated since the first enrollment in 2000, but in general, there had been no increase between 2000 and 2018 (Schleicher, 2018).

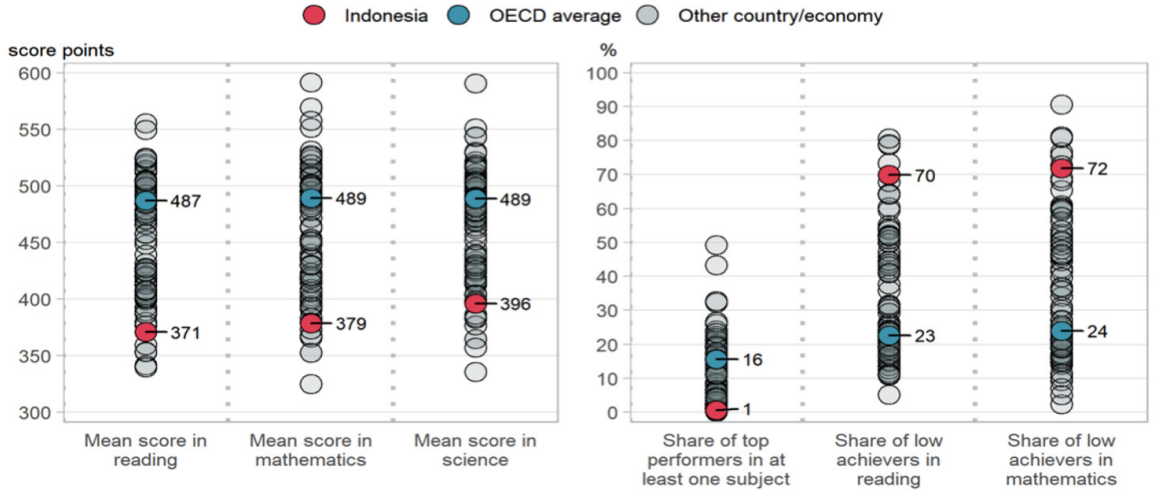


Figure 1 Snapshot of Performance in Reading, Mathematics, and Science (Indonesia).
Source: OECD, PISA 2018 Database

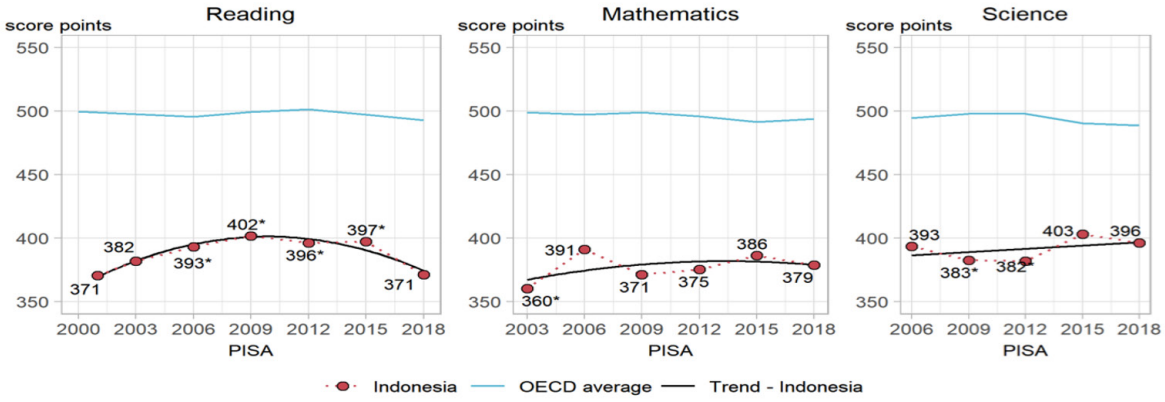
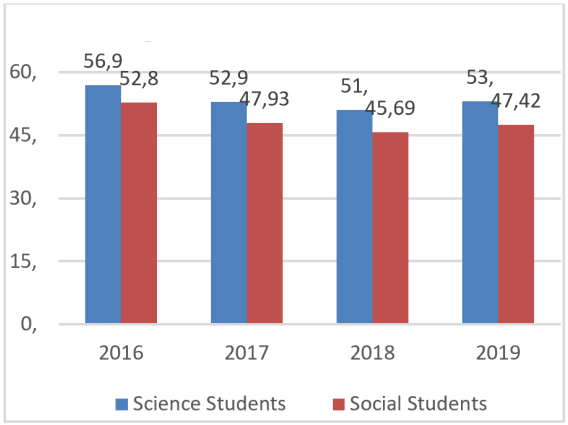


Figure 2 Trends in Performance in Reading, Mathematics, and Science (Indonesia)
Source: OECD, PISA 2018 Database

In Indonesia, one of learning evaluations to measure students' academic abilities is National Public Examination (UN) (Sartina et al., 2020). However, the trend of UN scores, before it was abolished in 2020, also tended to fluctuate (Graph 1). This means that the quality of the education system in Indonesia still leaves much to be desired, which has an impact on learning achievement. One of the benchmarks or standardization of the quality of education is expressed by obtaining a pure evaluation score (NEM). This value is taken through the national exam (UN). A school's educational standard is deemed high when its average NEM score is elevated. The acquisition of students' NEM scores at the end of each education level also serves as an indicator of quality education. (Ismail, 2015).



Graph 1 Average (UN) Scores in 2016-2019
Source: Ministry of Education and Culture, 2019

However, this understanding of the quality of education is not comprehensive. The quality of education tends to be seen only in one cognitive (intellectual) domain or in other words, it is seen in the aspect of mere academic value. Therefore, the factors that influence student achievement need to be identified so that in the future, the evaluation process can be carried out as a whole (Hadi, 2018).

Based on previous theories and researches, there are many factors that affect students' academic achievement. One theory that is commonly used to detect factors that influence students' academic achievement is Self-Regulated Learning (SLR). The theory explains that self-regulated learning is considered to play an important role in developing students' learning competencies that affect learning outcomes (Zimmerman, 2013).

According to SLR theory, two main factors, internal and external, influence the development of a student's SLR. Internal factors are factors that come from within the individual which are the self-characteristics of students including knowledge, motivation, gender, ability, and background. On the other hand, external factors are factors that come from the outside of students' individual self, including the family environment, class or school conditions, teacher quality and qualifications, learning methods, technology, and relationships with other students.

Several studies have identified student participation as one of the internal factors that can affect learning achievement (Ali et al., 2018; Erdogdu & Erdogdu, 2015; Hanushek & Woessmann, 2017; Masci et al., 2018). Most of these studies found that students with high attendance rates were proved to achieve higher achievements at the level of education they attended.

Apart from internal factors, various researches have also examined external factors that can affect learning achievements, such as teacher factors (Adnot et al., 2017; Dodeen et al., 2012; Gerritsen et al., 2017; Gershenson, 2016; Kosgei et al., 2013; Metzler & Woessmann, 2012; Sirait, 2016); class or school conditions (Ali et al., 2018; Bosworth, 2014; Erdogdu & Erdogdu, 2015; Hanushek & Woessmann, 2017; Koc & Celik, 2015; Lucas & Mbiti, 2014; Martorell et al., 2016; Masci et al., 2018), as well as the use of technology or the internet (Adegoke & Osokoya, 2015; Duley, 2020; Erdogdu & Erdogdu, 2015; Muralidharan et al., 2018; Yuniarsih, 2020; Zhou et al., 2020).

Moreover, Hattie (2008) has summarized a comprehensive perspective of quantitative findings from a meta-analysis comprising of 800 sources which includes more than 50,000 studies on factors that influence

students' learning outcomes. For the past 15 years, his research has been centered around visible learning, with a primary emphasis on both teachers and students. Numerous factors associated with visible learning influence students' academic performance. These factors include teachers collaborating to enhance their effectiveness, teachers self-assessing their impact on students' learning, teachers regularly offering feedback to students, teachers designing learning plans based on students' existing knowledge, and teachers fostering class discussions among students.

A teacher is quite a decisive factor in influencing a student's learning achievement (Adnot et al., 2017; Banerjee et al., 2017). Previous studies suggest that teachers with extensive teaching experience and appropriate qualifications are believed to have the capacity to enhance student performance (Adnot et al., 2017; Dodeen et al., 2012; Gerritsen et al., 2017; Metzler & Woessmann, 2012; Sirait, 2016), However, conflicting studies have indicated that there is no significant relationship between teacher qualifications and student achievement (Gershenson, 2016; Kosgei et al., 2013).

Other research also indicates that schools equipped with good facilities and infrastructure are closely associated with improved student achievement (Masci et al., 2018). However, Lucas & Mbiti (2014) and Martorell et al. (2016) suggest that the quality of schools, despite having excellent reputations and ample resources, does not significantly impact student academic performance. In addition, it has been observed that schools with a low student-to-teacher ratio demonstrate effectiveness in enhancing student achievement (Bosworth, 2014; Erdogdu & Erdogdu, 2015; Koc & Celik, 2015), although, studies by Ali et al. (2018) and Hanushek & Woessmann (2017) propose that class size alone may not guarantee academic success for students.

Technological developments have a great influence on students' academic achievement. Several studies have found that technological developments significantly impact students' academic performance. The use of technology, especially the internet, can be advantageous for students, enhancing their learning outcomes when utilized for school-related tasks (Adegoke & Osokoya, 2015; Duley, 2020; Erdogdu & Erdogdu, 2015; Yuniarsih, 2020). However, contrasting research indicates that internet usage may not always lead to positive effects on students' academic achievement (Muralidharan et al., 2018; Zhou et al., 2020).

Drawing on the context of these issues, this research aims to examine the relationship between Indonesian students' internal and external factors and their academic achievement. These factors include student characteristics, teacher factors, school conditions, and the use of technology. While previous research has predominantly explored individual factors in isolation, this research incorporates a broader range of factors for a comprehensive analysis.

RESEARCH METHODS

This research employed a quantitative descriptive method, as it involves working with numerical data, which is analyzed through quantification techniques and statistical procedures to arrive at a conclusion. This research is focused on high school students in science and social studies across 34 provinces in Indonesia, spanning a period of three years from 2017 to 2019. The research analyzed 102-panel data--utilizing raw data obtained from the Ministry of Education and Culture (2019) and the Central Bureau of Statistics (2019). Data were collected by documentation, involving the download of data from official sources and tabulating it based on specified variable measurements.

This research takes science and social studies students' academic achievement as the dependent variable, and 10 independent variables encompassing four aspects, which are student characteristics (students' participation and students' scholarship);

school characteristics (school accreditation, school type, and school size); teacher factors (teacher qualification and teacher certification); and internet usage (general internet use; internet use at school, and Internet use for school tasks). All variables are specifically explained in Table 1.

Table 1 Variable Operational Definitions

Variable	Description	Type of Data
Dependent Variable		
Academic achievement		
-Science students	Average UN score for science students	Ratio
-Social studies students	Average UN score for social studies students	Ratio
Independent Variables		
Student background		
-Student participation	Net enrollment rate for senior high school (%)	Ratio
-Student scholarship	High school students who received the Program Indonesia Pintar (%)	Ratio
School characteristic		
-School accreditation	High schools with minimal good accreditation (%)	Ratio
-School type	High schools with public school type (%)	Ratio
-School size	Number of students per teacher	Ratio
Teacher factors		
-Teacher qualification	High school teachers with a minimum diploma or bachelor (D4/S1) (%)	Ratio
- Teacher certification	High school teachers who are certified (%)	Ratio
Internet use		
-Internet use	High school students using the internet in the last three months (%)	Ratio
-Internet use at school	High school students using the internet at school (%)	Ratio
-Internet use for school tasks	High school students using the internet for school tasks (%)	Ratio

The method of data analysis employed is panel data regression analysis. The specific model used for this analysis is the panel data linear regression equation model, referred to as the two-way model, which is presented as follows in the work by Schmidheiny and Basel (2011):

$$y_{i,t} = \alpha + \alpha_i + \delta_t + X'_{it}\beta + \varepsilon_{it} \quad (1)$$

Where is the dependent variable, α is a constant, is an individual effect that varies for each i-individual, represents a fixed or random time effect between years, is an observation to it of P independent variables, β is a vector of size P x 1 is the estimation result parameter, is the regression error, ί describes the individual unit and t is the period. The panel data regression model must go through several stages of testing to determine the right estimation model. These stages are the determination of an estimation model consisting of a common effect model (CEM), a fixed effect model (FEM), and a random effect model (REM); determining the estimation method in the form of Chow test, Hausman test, and Lagrange multiplier; classic assumption test in the form of normality test, heteroscedasticity test, and multicollinearity test; as well as the interpretation of the selected regression model.

RESULTS AND DISCUSSION

The results presented in Table 2 indicate that from 2017 to 2019, high school students majoring in science in Indonesia achieved higher average national exam scores (0.5068) compared to students majoring in social studies (0.4584). In general, provinces in the western region, particularly in Java, tend to have higher average UN scores than those in the eastern region. However, across provinces, the average UN score tends to fluctuate, with a decline in 2018 followed by a subsequent increase in 2019. Jakarta boasts the highest average UN score among provinces, while Aceh has the lowest average UN score for both students majoring in science and social studies. However, when considering the standard error, the disparity in values is not substantial (t value of 0.99, which is less than the critical t-table value of 4.303, with standard errors of 13.93 for science students and 13.24 for social studies students). Additionally, the standard deviation of the academic achievement variable is lower than the mean score for both science and social studies. This indicates that the data distribution lacks diversity, and there are no significant differences among the individual data points.

Table 2 Description Data Result

Variable	Mean	Std. Dev.	Maximum	Minimum
Academic achievement				
-Science students	0.5068	0.618	0.6799 (Jakarta 2019)	0.4012 (Aceh 2018)
-Social studies students	0.4584	0.564	0.6375 (Jakarta 2019)	0.3727 (Aceh 2018)
Student background				
-Student participation	0.6391	0.0791	0.8305 (Yogyakarta 2019)	0.332 (Papua 2017)
-Student scholarship	0.3345	0.2054	0.7380 (East Kaliman-tan, 2017)	0.042 (Jakarta 2018)

Variable	Mean	Std. Dev.	Maximum	Minimum
School characteristic				
-School Accreditation	0.6997	0.1479	0.934 (Jakarta 2018)	0.314 (East Nusa Tenggara 2017) 0.0984 (Gorontalo 2018)
-School type	0.4003	0.1684	0.7562 (Jakarta 2017)	0.047 (West Java 2018)
-School size	0.0682	0.1127	0.11 (Aceh 2017 & 2019)	
Teacher factors				
-Teacher qualification	0.9717	0.011	0.989 (South Sulawesi 2019)	0.949 (Maluku 2017)
- Teacher certification	0.4778	0.1022	0.682 (Yogyakarta 2018)	0.24 (East Nusa Tenggara 2017)
Internet use				
-Internet use	0.7989	0.1336	0.9803 (Yogyakarta 2019)	0.3983 (North Maluku 2017)
-Internet use at school	0.1957	0.086	0.907 (Riau Islands 2019)	0.1022 (Bangka Belitung 2019)
-Internet use for school tasks	0.2994	0.0637	0.465 (West Sumatera 2017	0.1546 (East Kalimantan 2019)

Source: Secondary data processed, 2023

On student characteristics, the student participation variable as measured by the pure enrollment rate for high school students shows an average of 0.6391. That means, between 2017 and 2019, approximately 63.91% of the population in the high school age group attended higher secondary education level on a national average. In 2019, Yogyakarta province achieved the highest high school participation rate at 83.05%. Conversely, in 2017, Papua had the lowest participation rate at 33.2%. The standard deviation indicates a smaller value compared to the average, indicating a relatively uniform distribution of data with minimal variations between the units of analysis. Meanwhile, for the student scholarship variable, from 2017 to 2019, approximately 33.45% of high school students were beneficiaries of the Smart Indonesia Program—Program Indonesia Pintar (PIP). Generally, the percentage of high school students receiving PIP was higher in 2017 than in the subsequent two years. East Kalimantan stood out with the highest percentage of PIP recipients among high school students in Indonesia in 2017, reaching 73.8%. Conversely, Jakarta recorded the lowest percentage in 2018, with

only 4.2% of high school students receiving PIP. The standard deviation is smaller than the average value (0.2054 < 0.3345) which indicates the data is spread uniformly.

Next is the factor of school characteristics. For the school accreditation variable, the average percentage of high schools that have been accredited very well (A) and good (B) is 69.97%. High schools in the western region, particularly in Java, boast significantly higher accreditation rates, surpassing those in eastern Indonesia by a substantial margin. In 2018, Jakarta boasted the highest percentage of high schools accredited with an A or B rating, reaching an impressive 93.4%. Conversely, in 2017, the province of East Nusa Tenggara recorded the lowest percentage of high school accreditation in the good and very good categories, standing at just 31.4%. The recorded standard deviation value is lower than the average, indicating that the data is spread homogeneously. For the school type variable, there is a lower number of private schools compared to public schools in Indonesia. The average percentage of private high schools in Indonesia in 2017-2019 was 40.03%. Only provinces in Java Island, parts of Sumatra, Bali, and West Nusa Tenggara have more than 50% private high schools, while other provinces are dominated by public schools. Jakarta is the province with the highest percentage of private high schools, which is more than 70%, while Gorontalo is the lowest, which is just under 10%. The distribution of private high schools in Indonesia tends to be uniform, shown by a lower standard deviation value compared to the average. On the school size variable, 15 high school students are being taught by a single teacher on average. The smaller the value, the more the number of students taught by the teacher. West Java is the province with the highest proportion of students to teachers with more than 20 high school students for one teacher, while Aceh is the smallest where one teacher only teaches less than 10 students. The standard deviation value is smaller than the average which indicates that the distribution of data on the proportion of students to teachers tends to be homogeneous.

In terms of teacher factors, while around 97.17% of high school teachers meet the minimum qualification of having a bachelor's degree, only about 47.78% of high school teachers have obtained teacher certification. In general, a high percentage of teachers meet the qualifications, but the percentage of certified teachers remains quite low, especially in eastern Indonesia. In 2019, South Sulawesi boasted the highest percentage of high school teachers with a minimum qualification equivalent to a bachelor's degree (98.9%), while in 2017, Maluku recorded the lowest figure (94.9%). Meanwhile, in 2018, Yogyakarta is the province with the highest percentage of certified teachers at 68.2%, while East Nusa Tenggara in 2017 is the province with the lowest percentage of certified teachers (24%). The two variables in the teacher factors have a standard deviation value that is lower than the average so the data tends not to vary.

The results of the latest data descriptions related to technological or internet factors exhibit distinct characteristics. The average number of high school students who use the internet is quite high (reaching almost 80%), but the average number of students who use the internet at school is not more than 20%, and only fewer than 30% who use the internet to do school work.

High school students in the western region typically experience greater internet accessibility compared to high school students in the eastern region. Yogyakarta is the province with the highest percentage of high school students using the internet in Indonesia, while North Maluku province is the lowest. However, in terms of internet usage in schools, Riau Islands is the province with the highest percentage, while Bangka Belitung is the lowest. Meanwhile, for the variable of internet use for school work, West Sumatra is the province with the highest percentage (46.5%), while East Kalimantan is the lowest (15.46%). The standard deviation

value for all variables on the internet use is lower than the average value, which means the data is spread homogeneously.

The first step in estimating the regression equation with panel data is to determine the regression model using the Chow test, Hausman test, and Lagrange multiplier test methods. The Chow test aims to choose the right model between the common effect model (CEM) or the fixed effect model (FEM).

The results of the Chow test chose FEM rather than CEM for models of students majoring in science and social studies because the probability values in Cross-section F and Cross-section Chi-Square show 0 < 5%. The next procedure is the Hausman test which aims to choose the right model between FEM or random effect model (REM). The results of the Hausman test show that the probability value in the random cross-section of the science and social studies students' model is greater than 5% so the model chosen from the Hausman test is REM rather than FEM.

Table 3 Results of the Regression Estimation Model Test

Method (1)	**Probability** (2)	**Decision** (3)
-Chow test result		
Model 1 (Science students)		
Cross-section F	0.0000	Choose FEM over CEM
Cross-section Chi-square	0.0000	(Prob < 5%)
Model 2 (Social studies students)		
Cross-section F	0.0000	Choose FEM over CEM
Cross-section Chi-square	0.0000	(Prob < 5%)
-Hausman test result		
Model 1 (Science students)		
Cross-section random	0.0505	Choose REM over FEM
Model 2 (Social studies students)		(Prob > 5%)
Cross-section random	0.2044	Choose REM over FEM
		(Prob > 5%)
-Lagrange multiplier test result		
Model 1 (Science students)		
Breusch-Pagan	0.0000	Choose REM over CEM
Model 2 (Social studies students)		(Prob < 5%)
Breusch-Pagan	0.0000	Choose REM over CEM
		(Prob < 5%)

Source: Secondary data processed, 2023

To choose the right model between REM and CEM, the next step is to do a Lagrange multiplier test. Using the Breusch-Pagan method, the probability cross-section values for students majoring in science and social studies models both show lower than 5%. This means that the model chosen is REM rather than CEM so in this research, panel data regression analysis is estimated using the random effect model.

Table 4 Panel Data Regression Estimation Results

Independent Variable	REM (Science Students) (Prob/Coef.)	REM (Social Studies Students) (Prob/Coef.)
Constant	0.6999	0.4318
	(0.188142)	(0.383453)
Student participation	0.0017***	0.0203**
	(0.297954)	(0.227257)
Student scholarship	0.0664*	0.0368**
	(0.047205)	(0.052875)
School accreditation	0.9291	0.7699
	(-0.004672)	(-0.015738)
School type	0.0128**	0.0133**
	(0.105565)	(0.112588)
School size	0.4196	0.5613
	(-0.465576)	(-0.346606)
Teacher qualification	0.9187	0.6669
	(-0.053779)	(-0.226563)
Teacher certification	0.1984	0.2986
	(0.099057)	(0.083385)
Internet use	0.0873*	0.0965*
	(0.103782)	(0.076242)
Internet use at school	0.5735	0.4997
	(-0.024626)	(-0.028701)
Internet use for school tasks	0.2530	0.3317
	(0.116926)	(0.097209)
R-Square	0.420986	0.336293
Adjusted R-Square	0.357358	0.263358
F-Statistic	6.616375	4.610870
Prob. (F-Statistic)	0.0000***	0.000027***
Number of observations	102	102

Note: ***) significant at 1%, **) significant at 5%, *) significant at 10%

Dependent variable: academic achievement of science and social studies students.

Source: Secondary data processed, 2023

The first interpretation is a partial test for each independent variable. The estimation results of the panel data regression with the random effect model show that the student participation variable as measured by the school enrollment rate has a positive and significant relationship with learning achievement for both science and social studies majors. This is proven by 0.0017 < 1% significance level for science students and 0.0203 < 5% significance level for social studies students, while the respective regression coefficients show a positive number of 0.297954 (science students) and 0.227257 (social studies students). The school enrollment rate shows the number of the population attending school by age group. The higher the level of school enrollment, the more evenly distributed the education system's absorption capacity for the school-age population. This is used as a basic indicator to see access to education, especially for the school-age population. This research shows that provinces with high enrollment rates tend to have students with good academic achievements because access to education has been evenly distributed, and in effect, it encourages more students to improve their learning achievement. The results of this research are in line with researches by Erdogdu & Erdogdu (2015) and Ali et al. (2018).

Other research findings show that receiving the Program Indonesia Pintar (PIP) fund assistance have a positive and significant relationship with the learning achievement of high school students majoring in science and social studies. According to the Ministry of Education, Culture, Research, and Technology (MoECRT), PIP is designed to ensure school-aged children from underprivileged, vulnerable, or priority group families to receive education services until they graduate from secondary education. Through PIP, the government offers a fund assistance to expand access and learning opportunities to students who come from underprivileged or vulnerable families. The Minister of Education and Culture Regulation Number 10 of 2020 (Permendikbud 10/2020) concerning the Program Indonesia Pintar states that PIP fund can be used by students to meet all educational needs including competency tests, so that access to education remains equitable and student achievement can improve.

In terms of school characteristics, there is no correlation between the school accreditation variable and student achievement in science and social studies. This is supported by the significance level of these variables, which is greater than 1%, 5%, or 10%. According to Samad & Mangindara (2019), schools with A or B accreditation cannot ensure improved student achievement as the accreditation evaluation is not conducted consistently and often becomes a procedural formality. In this case, schools that are accredited A or B lack the incentive or appropriate resources to improve student learning outcomes. This aligns with the research by Lucas & Mbiti (2014) who found little evidence of a positive impact on learning outcomes for students attending high quality schools. This suggests that their reputation for excellence is more a result of the quality of students they admit, rather than their ability to produce improved test scores.

The learning achievement of high school students doesn't correlate with the school/ class size variable either. This is shown by the probability of the two models on these variables which show a number greater than the agreed research confidence level. Hanushek & Woessmann (2017) argues that the size of the class size does not necessarily have an impact on student learning outcomes. In other words, having a lower student-to-teacher ratio may not necessarily lead to improved student learning outcomes, and vice versa. This is due to the fact that the effectiveness of learning models that have an impact on learning outcomes greatly relies on the experience of each teacher. Teachers with extensive teaching experience can effectively manage classroom dynamics, ensuring effective learning activities even in the presence of larger class sizes, and vice versa.

However, in contrast, this research finds that private schools have a positive and significant relationship with high school student achievement (both science and social studies). The results indicate that provinces with a large percentage of private high schools have higher average national exam scores than public schools. According to Eshetu (2015), private schools generally have better quality facilities than public schools. This allows private schools to have higher funding levels compared to public schools, reflecting their ability to provide better facilities and infrastructure, experienced teachers, and flexible curriculum implementation, which in turn has an impact on student learning outcomes. In addition, students in private schools also take more academic courses to improve their academic achievement than students in public schools (Newhouse & Beegle, 2006).

Next factor to discuss is teachers. In this research, the two variables that represent teacher factors, which are teacher qualifications and teacher certification have no significant relationship with high school student achievement. While over 90% of high schools in Indonesia have teachers with qualifications equivalent to S1/D4 levels, this does not guarantee a significant impact on the improvement of student achievement. The teacher's experience factor becomes more significant in improving student achievement, rather than simply meeting qualifications (Kosgei et al., 2013). Furthermore, teachers with more teaching experience have greater opportunities to improve student achievement (Siswandoko & Suryadi, 2013). In addition, the data in Table 2 shows that 47.78% of teachers in Indonesia have yet to get their certification. This could be a factor in causing no correlation between teacher certification and student achievement.

The results show that general internet use among high school students had a positive and significant relationship with the academic achievement of students majoring in science and social studies. This is supported by empirical data which proves that almost 80% of high school students have used the internet, which means that access to the internet among high school students is more evenly distributed and experiencing rapid growth. A more evenly distributed and improved internet accessibility makes it easier for students to access education, eliminating space and time constraints (Yuniarsih, 2020). Through the internet, students can easily find information about the subjects they are studying, enabling them to improve their academic achievement (Duley, 2020).

Interestingly, while internet access has grown among high school students, its usage at school and for academic purposes has shown a declining trend. The average student who uses the internet at school is only 20%, while the average student who uses the internet for school work is only about 30%. This is much lower than internet use at home and internet use for social media which has reached more than 80% (Central Bureau of Statistics, 2019). This statistic indicates that there is no correlation between students' academic achievement and their varying levels of internet use at home or their utilization of the internet for educational purposes.

The Adjusted-R2 value means that only 35.7358% of all independent variables used in Model 1 were able to explain the variable of academic achievement of science students and 26.3358% of all independent variables in Model 2 were able to explain the variable of academic achievement of social studies students, while the rest were explained by other explanatory variables not examined in this research. Prob. F(Statistics) showed that all independent variables in both Model 1 and Model 2 have a significant impact on student academic achievement when tested simultaneously. This is evidenced by the probability values in both models which show less than the 1% research confidence level.

CONCLUSION AND POLICY RECOMMENDATIONS

In conclusion, this research finds several variables that have a significant relationship

with high school students' academic achievement (both for science and social studies). Those variables include student participation and student scholarships (student characteristics), type of school (school characteristics), and internet use by students (internet usage factors). Internal factors in the form of student characteristics represented by student participation and student scholarships tend to be more significant in increasing academic achievement than external factors. This is because internal factors are the basic factors that must be fulfilled by each student in the learning process, while external factors are factors that are considered to support the learning process to achieve student academic achievement.

Teacher factors (teacher qualifications and teacher certification) show a weak correlation with student achievement. Most teachers have met the required qualifications, and some have taken part in the teacher certification program. However, a significant number of teachers lack substantial teaching experience, resulting in less effective learning activities, and ultimately failing to contribute to improvements in student academic performance. Furthermore, school characteristics (school size and school accreditation) are proven not to have significant impact to student achievement. This could be due to the fact that school accreditation evaluations often prioritize formalities, whereas student success is more significantly shaped by the quality of classroom learning experiences.

Conclusively, this research offers insights and policy recommendations for relevant stakeholders, particularly the government, schools, teachers, and companies involved in information technology advancement. First, considering the significance of student participation, the government (in this case, the MoECRT) should continue to increase student enrollment rates, especially in eastern Indonesia. Furthermore, it is necessary to ensure the precise and effective targeting of the PIP program, guaranteeing its reach to students in remote areas. There should be an affirmative action to ensure an increased allocation of PIP program beneficiaries for students in eastern Indonesia. Second, the establishment of schools should not only prioritize aspects of quantity but also quality. In this case, the person in charge of the school must pay attention to aspects of school quality. Third, apart from schools, the quality of teachers must also be continuously improved. Until 2019, the percentage of teachers who were certified was still low, indicating that the overall quality of teachers in Indonesia, particularly in the eastern region, remained subpar. In addition to this, the qualification policy is also taken into account for teachers who have successfully completed at least a bachelor's degree in the field of education. Lastly, it is time for developers from IT companies to expand and level their internet access in Eastern Indonesia. Presently, the internet has become almost as essential as basic necessities, although it tends to be prominent mainly in the western region of Indonesia. Additionally, there's potential for extending internet accessibility to schools, where tech companies could engage in partnerships with schools to facilitate this expansion.

This research has certain constraints that could be addressed in future research to enhance its overall quality, such as: 1) It is interesting to examine the impact of teacher competence, extensive experience, and a favorable school environment on student academic performance in comparison to teacher education or certification. 2) The correlation between school-based internet usage and student academic performance appears to be weak. This could be attributed to factors such as a weak internet connection, lack of internet use in schools, or insufficient teachers' proficiency in utilizing technology. However, further research is necessary to thoroughly explore this topic and potentially uncover more evidences.

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