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Factors Affect Students' Science Learning Outcomes (Case Study in 8th Grade Junior High School Students in Masohi City, Central Maluku Regency)

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Abstract

Identification of the dominant factors that influence student learning outcomes, aimed to find out (diagnose) the problems faced in learning so that improvements can be made to improve student learning outcomes. The selection of the most influential factors can be done using the analysis of the main components. The purpose of this study was to find out the main factors that influence junior high school students' science learning outcomes in the Masohi city, Central Maluku Regency. The population in this study were 180 8th grade students at four junior high schools in Masohi city. The research instrument was in the form of a questionnaire to measure 8 variables compiled based on a Likert scale. Determination of the main factors that affect student learning outcomes was carried out using principal component analysis, with the assistance of SPSS software version 18.0. The results showed that in Public Islamic Junior High School 2 Masohi, the main factors influencing students' science learning outcomes were interest, motivation, infrastructure, and parents, while the second factor was teachers and peers, while in public junior high school 1, 2 and 3 Masohi, it appeared that the main factors influencing students' science learning outcomes were teachers, infrastructure, peers and parents, while the second factor was interest and motivation. Thus, it can be concluded that the main factors affecting learning outcomes in junior high schools in Masohi City are different.

Keywords: principal components, student learning outcomes

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INTRODUCTION

In junior high school, physics, biology, and chemistry are included in natural science subjects. According to Faisal and Sonya. (2019) the purpose of learning science is to prepare students to become good citizens based on the Pancasila (basic ideology of the Indonesian state) and the 1945 Constitution by focusing on developing individuals who can understand the problems in the environment, both those in the social environment that discuss human interaction and natural environment.

As part of Natural Sciences, Physics, Chemistry and Biology are considered important as a basis in relation to the mastery of science and technology (Barnabas et al., 2019), as well as influencing and directly related to various fields of life and jobs that are information and technology based (Das et al, 2014). According to Mekonnen (2014), without the existence of natural science, humans will have difficulty exploring the universe. Rull (2014) states that understanding natural science helps in understanding the contents of the universe while for students, it helps develop observation skills, accuracy, analytical skills, and creative thinking, so natural science mastery is needed and cannot be avoided by students (Wenno, 2014; Wenno et al., 2016; Prachagool and Nuangchalerm, 2019).

Not only Physics, Biology is also a subject that is considered boring for students, especially junior high school students. According to Gottlieb et al. (2007), Biology is a science that is very useful in solving life's problems and in efforts to understand other sciences. Although it is often regarded as one of the relatively "easy" science lessons, in reality for some students, learning biology is always not easy, because there are materials that require knowledge of basic concepts and overall level of mastery of science in Biology. In addition, there are assumptions that Biology as a subject that is boring, contains a lot of memorization, and is monotonous, causing lower students' learning outcomes.

The low student learning outcomes towards science are caused by many factors, such as internal and external factors (Tatar et al., 2016). Internal factors can be in the form of attitudes, motivation, interests, knowledge, skills, expectations, assumptions, and goals (Nyoni et al., 2017), while external factors are the conditions of student learning environment (Byers et al., 2018), such as the use of teaching methods by teachers (Bal Tastan et al., 2018), family environment, and the availability of learning facilities and infrastructure (Ramli and Zain, 2019; Sutriayu et al., 2020). The low student learning outcomes in learning are also caused because, science especially physics has been considered as a difficult subject by students, especially if the material is related to mathematical calculations (Baran, 2016).

Likewise with junior high school students in Masohi City, Central Maluku Regency. In these schools, generally students' perceptions and understanding of Natural Sciences subjects are also still influenced by various aspects such as student interest and motivation, learning support facilities in the form of laboratories, teacher teaching styles or methods, as well as parental support and environmental influences such as their peers.

Based on the results of preliminary observations and open interviews with natural science subject teachers, it is known that student learning outcomes in junior high schools in Masohi city are still low. This is because students still do not have great interest in science. Students also do not understand the true benefits of their learning. Students learn for a while and get grades for advancement and / or graduation. On the other hand, the teaching methods and methods of teachers, as well as very minimal supporting facilities, lead to lower student interest and motivation, so that it determines and affects their learning outcomes.

According to Leinhard and Leinhard (2013) learning difficulties are very complex because they relate to the emotional aspects of students, have the opportunity to be a threat, a barrier or a disruption in learning, thus substantially affecting student learning abilities, and also student academic achievement.

Ma'rifah (2017) states that children who experience learning difficulties exhibit traits such as difficulty in doing school academic tasks, to learning achievement that decreases far from the actual potential expected.

Ullah et al. (2013) reported that student motivation in learning was influenced by the school environment and also the family environment. Identification of the dominant factors that influence learning outcomes by students, aims to find out ot to diagnose problems encountered in learning both from within (internal) students, or from outside (external) of students, so that the preventive and corrective actions can be taken right so it is expected that the learning process can go according to plan with maximum results.

Previously it has been explained that the factors that influence student learning outcomes consists of many factors which are grouped into two major groups namely the inside and outside factors. From both two factors, we will look for which factors that most influence student learning outcomes in science lessons. The selection of the most influential factors can be done using principal component analysis. This is a part of factor analysis that carried out to reduce the large number of variables to a number of new selected variables (Howard, 2016), so that the new variables can be used as the most influential variables, in this case, the learning outcomes of science students in junior high schools in Masohi City the Central Maluku Regency. So, the objective of this research was to find out what are the main dominant factors that are greatly affect the science learning outcomes of 8th grade students at junior high school in Masohi City, the Central Maluku Regency.

METHOD

Research Population and Sample

The population in this study were all junior high schools in Masohi City, Central Maluku Regency. Meanwhile, the school sample included 4 junior high schools. School samples were determined randomly. All school names were written on paper, rolled up, and then randomized and selected as many as 4 schools. This selected school became the location for the research implementation.

Then, at each location, the classes that will be the samples were determined. In each school, 2 8th grade classes were taken. The intended class was selected with the same way as the school sample determination, The name of all 8th grades in the school were written on papers and randomized. Then, the 2 classes were obtained after the papers were raffled. Therefore, students in the two selected classes became the samples for research, namely 8th grade students in the odd semester of the 2019/2020 academic year. The name of the school and the number of students in each school are as follows:

School names	Number of sample students
State Junior High School 1 Masohi	44
State Junior High School 2 Masohi	48
State Junior High School 3 Masohi	44
Islamic Junior High School 2 Masohi	42
Total number of samples	180

Research Instruments

The instrument used in this study was a non-test instrument in the form of

questionnaires arranged on a Likert scale. The statements in the questionnaire were favorable and unfavorable with 4 alternative answers, namely SA (strongly agree), A (agree), DA (disagree), and SDA (strongly disagree). The scoring for each statement item in the instrument is as follows:

Alternative answers	***Favourable* (+)**	***Unfavourable* (-)**
Strongly Agree	3	1
Agree	3	2
Disagree	2	3
Strongly Disagree	1	4

Research Procedure

Prior to the true implementation, and before preparing a questionnaire, the observations at the schools sample was done. After that, the questionnaire compiled was tested on 80 samples of students from 2 schools. Instrument testing aimed to test the validity and reliability of the instrument. The validity test was based on the value of the Pearson Product-Moment correlation coefficient (r) by comparing the r_{count} and r_{table} values. If the r_{count} value is more than r_{table}, the statement item was valid. If the r_{count} value is less than r_{table}, the statement item was invalid and discarded so that it was not used as a research instrument. The reliability test was based on the Alpha-Cronbach coefficient (r_i). The variables is reliable if the r_i value is more than 0.6 and is not reliable if the r_i value is less then 0.7 (Streiner, 2003). As same as with the validity test results, unreliable statement items were discarded and not used as an instrument for true research. The following is the number of items before and after the validity and reliability test.

Table 1. Number of items before and after Validity Test and the result of reliability test

Variable	**Validity test results**			**Reliability test results**	
	The number of items before the test	The number of items after the test	Note	Alpha Cronbach Value	Note
Interest	30	27	3 items discarded	.634	Reliable
Motivation	50	45	5 items discarded	.843	Reliable
Teacher	35	31	4 items discarded	.912	Reliable
Infrastructure	30	26	4 items discarded	.741	Reliable
Peers	25	21	4 items discarded	.873	Reliable
Parents	30	22	8 items discarded	.891	Reliable

Based on the data in Table 1, it can be seen that the number of statement items for research are interest (27 items), motivation (45 items), teachers (31 items), infrastructure (26 items), peers (21 items), and parents (22 points), while for reliability, all variables were reliable so they could be used for data collection in real research.

Data analysis

The research data was in form of the results of filling out questionnaires by students on six variables to determine which variable was the most dominant in influencing student learning outcomes. Determination of the main factors or dominant factors that affect student learning outcomes was carried out using Principal Component Analysis (PCA), with the assistance of SPSS software version 18.0.

The main component analysis stages are as follows:

a. The test of analysis requirements

The requirements test for principal component analysis was the *Kaiser Meyer Olkin* (KMO) test, which is used to determine sample adequacy or measure sample feasibility. Factor analysis was considered feasible if the KMO value was > 0.5. In addition to the KMO value, the analysis requirements test can also be done by looking for the *Barlett Test of Sphercity* significance value, which tests that the sample variables are correlated. The *Barlett Test of Sphercity* significance value must be less than 0.05.

b. Factor rotation

A factor rotation was done to determine the number of main components that are formed. This was done by looking at the *Eigen* value of each major component. The components selected were those whose *Eigen* values are more than 1 (Zu´ska, et al. 2019).

c. Determining the constituent variables of the principal components

The variables that make up the principal component were seen based on the value of the partial correlation between a variable and a major component. If the value was > 0.7 then the variable was included in the principal component (Zu´ska, et al. 2019).

d. Identifying the main factors

Identification of the main factors that affect student learning outcomes was carried out based on the variable's position in a major component. If a particular variable was in the first principal component, that variable was the main factor. Conversely, if a certain variable was included in the second principal component, that variable was the second factor.

RESULTS

Factor analysis is an interdependency technique, which means that there is no dependent variable or independent variable. The process of factor analysis tries to find a relationship between a number of independent variables so that one or several sets of variables that are less than the initial number of variables can be made (Loehlin and Beaujean, 2017). Odunlami (2013) states that the main objective of factor analysis is to summarize the information contained in the initial variable into a new factor.

The principal component analysis (PCA) requirements test which was done by looking to the value of the Kaiser-Meyer-Oikin (KMO) and the significance value of the Bartlets Test of Sphericity which is a requirement or condition to determine or testing the feasibility of a variable to be analyzed with PCA. The KMO value requirement for the feasibility test data in the analysis of the PCA must be

more than 0.5 with the significance of the Bartlets Test of Sphericity must be less than 0.05 (Table 2).

Table 2. KMO-Bartlett's Test of Sphericity values for principal component analysis (PCA)

No.	School names	KMO Value	Significance Value of Bartlett's Test of Sphericity
1.	Public Islamic Junior High School 2 Masohi	0.682	0.000
2.	Public Junior High School 1 Masohi	0.735	0.000
3.	Public Junior High School 2 Masohi	0,762	0.000
4.	Public Junior High School 3 Masohi	0,752	0.000

Table 2 shows that at all sampling locations, the data collected was eligible to be tested by PCA because all KMO values were more than 0.5 (KMO> 0.5), and the Bartlets Test of Sphericity significance value was all less than 0.05 (sig. <0.05). The next stage in PCA is determining the number of new components to be formed. That is why this analysis is called principal component analysis or factor analysis because the aim is to find a number of new components or new factors that can define the variable which was want to know. The purpose of this principal component analysis is also to reduce the large number of variables into a number of new variables that can be categorized into new components or factors. At this step, the analysis is based on the size (less or more) of the Eigenvalue. According to Brunelli (2015) Eigenvalue is a value that shows how much a variable will affect the formation of new components. The greatest Eigenvalue is what gives the strongest characteristics for a major component. Eigenvalue criteria that can be used are more than one (Brunelli, 2015) (Table 3).

Table 3. Number of principal components (PC) with Eigen values for each component

School names	The number of new principal components formed	Eigenvalues that form the Principal Component	Contribution of variables to the formation of Principal Components (%)	Cumulative Contribution (%)
Public Islamic Junior High School 2 Masohi	1	2.377	39.618	39.618
	2	1.167	19.454	59.072
Public Junior High School 1 Masohi	1	2,825	48,751	48,751
	2	1,143	19,044	67,796
	1	3,206	53,430	53,430

Public Junior High School 2 Masohi	2	1,083	18,055	71,485
Public Junior High School 3 Masohi	1	3,122	52,035	52,035
	2	1,034	17,230	60,265

Table 3 shows that in general in all scholls, there was two principal components (PC) were formed with an Eigenvalue more than 1. With these result, the next analysis was done to determine which one of these variables affected student learning outcomes, which were included in the first or second Principal component. This analysis was done through the correlation test between variables and the components which were formed, with the required value of the correlation test results is more than 0.5 (Table 4 - Table 6).

Table 4. The correlation values between variables and principal components in Public Islamic Junior High School 2 Masohi

School names	**Variables**	**The number of principal components formed by the value of the relationship between the variable and its main component**	
		PC1	PC2
Public Islamic Junior High School 2 Masohi	Interest	**.763**	.118
	Motivation	**.571**	.485
	Teacher	.054	**.819**
	Infrastructure	**.706**	.284
	Peers	.085	**.760**
	Parents	**.728**	-.135

Table 5. Correlation values between variables and principal components in Public Junior High School 1 Masohi

School names	**variables**	**The number of principal components formed by the value of the relationship between the variable and its main component**	
		PC1	PC2
Public Junior High School 1 Masohi	Interest	.004	**.880**
	Motivation	.326	**.782**
	Teacher	**.782**	.283
	Infrastructure	**.817**	.021
	Peers	**.801**	.228
	Parents	**.719**	.071

Table 6. The correlation value between variables and principal components in Public Junior High School 2 Masohi

School names	**variables**	**The number of principal components formed by the value of the relationship between the variable and its main component**	
		PC1	PC2
Public Junior High School 2 Masohi	Interest	-.028	**.919**
	Motivation	.553	**.625**
	Teacher	**.692**	.517
	Infrastructure	**.784**	.156
	Peers	**.887**	-.052

	Parents	**.736**	.180

Table 7. The correlations between variables and main components in Public Junior High School 3 Masohi

School names	**variables**	**The number of main components formed by the value of the relationship between the variable and its main component**	
		PC1	PC2
Public Junior High School 3 Masohi	Interest	-.028	**.919**
	Motivation	.553	**.625**
	Teacher	**.692**	.517
	Infrastructure	**.784**	.156
	Peers	**.887**	-.052
	Parents	**.736**	.180

Data in Table 4 untill Table 7, shows that there are two main components were formed based on their correlation values between variables and one of the principle component, namely the First Principal Component (PC1), and the second Principal component (PC2). After this analysis, the final step of principal component analysis was done to determine the main variables or factors and the second one which is be the most influence tfactors which affect he science learning outcomes of students in each school were identified (Table 8).

Table 8. The results of Variable Identification that affect the Science Learning Outcomes of Junior High School in Masohi City

Name of school	**Factors affecting student learning outcomes**	
	Principal Factors	Second Factors
Public Islamic Junior High School 2 Masohi	interest, motivation, facilities, and parent	Teacher, and peers
Public Junior High School 1 Masohi	Teacher, facilities, peers, and parent	Interest and Motivation
Public Junior High School 2 Masohi	Teacher, facilities, peers, and parent,	Interest and Motivation
Public Junior High School 3 Masohi	Teacher, facilities, peers, and parent,	Interest and Motivation

Based on the table above, it can be explained that the main factors that influence students learning outcomes in science in Public Islamic Junior High School 2 Masohi are interest, motivation, infrastructure, and parents, while the second factor is the teacher and peers. In the public junior high school 1, 2 and 3 Masohi, it appears that the main factors that influence students' science learning outcomes are teachers, infrastructure, peers and parents, while the second factor is interest and motivation.

DISCUSSION AND CONCLUSSION

These results indicate that in the three public schools, namely Public Senior High Schools 1, 2, and 3, the main factors that influence student learning outcomes were the same, namely facilities, teachers, parents, and friends, as well as the second factor, namely interest, and motivation. This means that students' interest and motivation in these three schools can be said to be good. However, other supporting

factors such as facilities, teachers, parents, and peers that affected student learning outcomes were not good. Because the facilities, teachers, parents, and peers were not supportive, students' interests and motivation were affected, and this overall affects their learning outcomes.

The role of motivation and interest in influencing student learning outcomes is not something new and has been the subject of discussion among education experts, teachers, and all those who are involved in the field of education, and have been reported by many researchers at various levels of education from elementary school (Wijaya dan Bukhori, 2017; Phuntsho, 2018) to tertiary level (Sulistiyarini and Sukardi, 2016) as well as in the higher education (Taurina, 2015; Schumacher and Ifenthaler, 2018). It is undeniable that interest and motivation are the biggest movers that greatly affect student learning outcomes. With a high level of interest and motivation, students will have the encouragement and drive to enable them to learn and carry out learning activities. However, according to Chue & Nie (2016) motivation as an internal factor is not only activated by students themselves, but also stimulated by external stimuli that usually come from the environment (parents) and the school environment including teachers and learning facilities in the schools. Therefore, teachers, staff, parents and the community need to encourage and foster student motivation in learning both through attitude, performance, creating a good learning environment, and good teaching methods and strategies, so that students can be motivated to learn more which in turn can love what they learn, and obtain maximum learning outcomes.

In these three schools, the main components that influenced student learning outcomes were facilities, teachers, parents, and friends. This means that these four components or the four factors must be fixed. Nepal and Maharjan (2018) state that if schools want to improve student learning outcomes, learning support facilities must be maximized. It is not only quantity and availability but also quality. Hofstein (2017) states that Natural Science is learning that emphasizes process and requires many experiments. According to Kwok (2015), the essential components in learning science in schools is a laboratory's presence. This is because science learning is not just memorizing theories. However, it is necessary to implement the theory obtained through real work in form of experiments nor observations and correlate between concepts and facts. By conducting experiments and or observations, it allows students to learn to construct their knowledge, link theory and practice, have the ability to solve problems, practice skills in using tools and materials, and improve scientific thinking and working skills. All of this can be achieved if the infrastructure is available and can be used by students (Harman et al., 2016; Cullin et al., 2017).

Apart from infrastructure, the quality of teacher teaching also affected student learning outcomes. In fact, at Public Junior High Schools 1, 2, and 3 in Masohi. The factors of infrastructure and teachers are the main factors affecting student learning outcomes. On the one hand, the infrastructure was not adequately available. If the teacher is not qualified or the teacher's teaching method is not suitable, this will worsen student learning outcomes. According to Duban et al. (2019), Science teachers must realize that their presence in the classroom is not only for reading supporting books, explaining material, asking questions and assessing student learning outcomes but also creating a learning environment that is supportive for

student learning. Teachers' teaching methods must be innovative and creative, especially in science learning. The teacher must simplify the subject matter so that students can easily understand it by using interesting learning methods and models. Teachers also have to balance theory and practice. The teacher must master the equipment and be skilled at using it. Teachers must be good at designing experimental and or practicum activities so that students learn many theories and are guided to do the practicum. With a combination of good theory delivery by the teacher and direct experiments by students, it allows students to learn well, achieve learning completeness, and improve learning outcomes.

When discussing infrastructure and teachers, these are the elements that exist in the school. However, it is not just these two components because students do not stay at school all day. After studying at school, students will return home. Home is a component that also has a significant influence on student learning habits. Wijaya and Bukhori (2017) reported a significant influence between family factors and student learning outcomes majoring in administration at Public Vocational High School 2 Blitar. According to Ngussa and Mundula (2019), a comfortable home condition with parents who support the student learning process will have an excellent influence. Parents are also required to provide supporting equipment for students to study, such as a special study room at home with the appropriate equipment, providing facilities such as books and the internet.

In addition, the students' peers is a factor that also determines the success of student learning. Peers who always do positive learning activities will undoubtedly influence and encourage students to study together, such as doing assignments together, or looking for and discussing lessons that have not been understood. However, the habits of study partners who do not support student learning will worsen student learning outcomes. In Masohi 1, 2, and 3 public junior high schools, if these four factors are corrected, it is likely that student interest and motivation will be better so that their learning outcomes will also be good.

In contrast to the results at Senior High School 1, 2, and 3, student learning outcomes at Islamic Junior High School 2 Masohi School were influenced by the main factor, which was a combination of internal factors (interest and motivation), as well as external factors (facilities and parents). If in public schools 1, 2, and 3 the factors of interest and motivation were not the main factors, at public Islamic junior high school 2 Masohi, interest, and motivation were the main factors besides facilities and parents, while the second factor was teachers and peers.

For the facilities and parents factors, the situation is almost the same as described in public schools 1, 2, and 3, while teachers and peers might be better than in public schools 1, 2, and 3. Students' special findings at Public Islamic Junior high School 2 were interest and motivation as the main factors. This shows that the school and parents have to work extra hard to revive students' interest and motivation. Conditions in which interest and motivation significantly affect students' learning outcomes are very important to be considered by all parties, because this factor comes from within students. That means students have no interest and liking for the subject, which is very dangerous and should be a warning. There can be low student interest and motivation due to other factors that cumulatively give students a bad impression. Thus it worsens the students' impression towards the object that must be studied.

If we look at the main factors in all schools, it is generally found that the facilities and parents. It cannot be denied that students in these four schools come from similar family backgrounds, in terms of education level, occupation, and also parents' income. Some students come from families with low educational backgrounds of parents. Their parents do not have permanent jobs, and also have uncertain income. Some work as farmers, fishers, market sellers, bricklayers, car drivers, pedicab drivers, and only a small proportion of them are office workers. This, of course, affects student learning outcomes. Parents with irregular and uncertain income may not provide learning facilities that meet standards and support student learning situations. Sometimes, after completing learning activities at school, students help their parents working at home, such as gardening, fishing in the sea, selling, or collecting wood in the forest. This condition is exacerbated by the fact that students' peers have almost the same conditions. They often spend their time playing football, bathing in the river or on the beach, or just relaxing in certain places after helping their parents. There are no learning activities carried out by students outside of the main study hours at school with such circumstances. When students have spent much time working or playing at home, they no longer have their attention to study.

When they returned to school the next day, students did not have sufficient provisions about the lessons they learned. They hope to be taught by the teacher. If the quality of teachers and learning facilities in schools is inadequate, students will suffer further. This situation was ongoing and repeated. Cumulatively, student learning outcomes will decrease.

The principal's leadership also supports teachers who teach well. As an inseparable part of a school organization, the principal has the duty and responsibility to lead the management of the organization in the school including providing space to support the improvement of the quality and creativity of teachers so that it eventually has an impact on improving student learning outcomes (Kempa et al., 2017).

The school, including the principal, teachers, and parents, must improve this condition, because student learning outcomes are the main thing that must be considered to improve the quality of education, especially in the four schools studied in this study.

Based on the results of research and discussion, it is concluded that the science learning outcomes of junior high school students in Masohi City, Central Maluku Regency are different. In Public Islamic Junior High School 2 Masohi the main factors that influence students science learning outcomes are interest, motivation, infrastructure, and parents, while the second factor is the teacher and peers. In the public junior high school 1, 2 and 3 Masohi, it appears that the main factors that influence students' science learning outcomes are teachers, infrastructure, peers and parents, while the second factor is interest and motivation.

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