Research Article

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The relationship between student's perceptions of the learning environment with learning outcomes of the immune system in distance learning

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Article Information	ABSTRACT
	Students' perception of the learning environment is the process of students interpreting the learning experiences they receive. The learning environment is an external factor that has an important role in the learning process, to facilitate students and teachers in achieving learning goals. This study aims to determine the relationship between student's perceptions of the learning environment with learning outcomes of the immune system in distance learning. This research was conducted at State Senior High School 21 Jakarta in June of 2020/2021. The method used was quantitative with a correlational study. The sample in this study was 105 students of second grade class by simple random sampling. The research instrument using the Dundee Ready Education Environment Measure (DREEM) questionnaire with a measurement scale, namely the Likert scale. The learning outcome instrument using test based on basic competence and competency achievement indicators (GPA). The test is in the form of multiple-choice with five answer choices. The prerequisite Test shows the data is normally distributed and homogeneous. Based on the statistical hypothesis testing results, a significant regression model and the correlation coefficient have a strong relationship. Furthermore, the students' perceptions of the learning environment were related to the learning outcomes of the immune system in distance learning. **Keywords**: Distance learning; learning environment; learning outcome
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INTRODUCTION

The change of the educational system to distance learning lead to a debate about the quality of learning (Henriksen et al., 2020). Distance learning held in their homes by utilizing a variety of existing technologies. The distance learning implementation by integrating an internet connection (e-learning), hope can facilitate interaction between students and teachers even without going through face-to-face directly (Zuriati & Briando, 2020). One alternative for the learning process to be carried out is to study at home, but it still has many shortcomings that have an impact on the spirit and interest in learning and student performance is not optimal (Ibem et al., 2017; Setyorini, 2020).

Distance learning has advantages and disadvantages, the advantages are the time and place of learning to be flexible, students can learn in their own way and ability, save costs to school and stress due to congestion on the highway to be reduced (Dost et al., 2020; Purwanto et al., 2020). While the shortcomings of distance learning is easier for students to feel bored, problems with internet connection, learning activities are limited due to inadequate learning facilities, learning materials that are difficult to understand, lack of creativity and the ability of teachers to utilize various media and existing technology, lack of teacher readiness in teaching, some students who do not have mobile phones, low student motivation, interference from the family or the surrounding environment, causing distance learning to be less effective (Nurhasanah & Sobandi, 2016; Wibowo et al., 2020; Dost et al., 2020).

The immune system is a difficult biological material in second Science high school Class because it has a high contextual level and occurs in everyday life (Utami et al., 2018). Immune system learning material is an important thing, to prevent the occurrence of various diseases that exist, one way is the need for knowledge about the immune system so that it can provide benefits to students and their environment (Puriana et al., 2021). There is still a lot of immune system material that is missed to be delivered and teachers have not mastered the material well, causing the immune system concept has not been fully mastered by students (Sartono et al., 2017). This causes low student learning outcomes and becomes a problem that must be considered in order to find solutions (Thobroni, 2015).

Various factors are related to student learning outcomes, one of which is environmental factors. Environment is an external factor that includes the relationship between students and teachers, families, other students and the community as well as the circumstances that occur in the student environment (Woolfolk, 2012). Elements in the learning process include students, teachers, curriculum and learning atmosphere (Lawrence, 2012). Environment learning is something that needs to be evaluated because it can affect the success and development of student behavior (Tompodung, 2017).

A good learning environment can provide positive energy for the development of student learning outcomes (Mustami, 2019). Students become easier to concentrate, freed from physical stress, increased motivation to learn and encourage to be able to think logically (Ibem et al., 2017). A comfortable, clean and safe learning environment can increase morale and facilitate students in learning (Idola et al., 2016). Before students can succeed academically, they must feel safe, both physically and mentally. The trick is that students should feel accepted, supported and respected (Usman & Madudili, 2019). Creating a good learning environment must be built in order to shape the character and students participate in the learning process (Caliskan, 2015).

Vice versa, a bad learning environment can cause students to show negative feelings such as anxiety, tension, boredom and frustration due to adjustment to their low learning environment (Mustami, 2019). Students will have more obstacles due to poor learning environment conditions, few students have the determination to be able to overcome these difficulties. Actually, students are very sensitive to their learning environment and they will respond by expressing a positive or negative attitude according to the existing environmental conditions (Ibem et al., 2017). This attitude will cause a picture in the formation of students' perceptions.

Students ' perception of the learning environment is the way students view an object or event that is supported by the existence of life experiences during the learning process occurs (Megawanti et al., 2020). Several relevant studies, conducted by Sukmawati et al (2019) with the title "relationship of student perception of the learning environment, participation and academic performance in medical schools", found that there was a positive relationship between participation and academic performance, student perception of the learning environment with student participation and student perception of the learning

environment with academic performance. Furthermore, the research conducted by Ahmed et al (2018) with the title "Students' perception of the learning environment and its relationship to their study year and performance in Sudan", showed that there is a positive relationship between student perceptions of the learning environment and its relationship to the year of study and student performance in Sudan. The perception of high-achieving students towards the learning environment is significantly better compared to low-achieving students.

The difference between this study and the existing research is the use of the Dundee Ready Education Environment Measure (DREEM) instrument in educational environments other than medical or health students. Each student has a different perception of the learning environment. This study aims to determine and evaluate how much students ' perception of the learning environment is related to the learning outcomes of the immune system in distance learning.
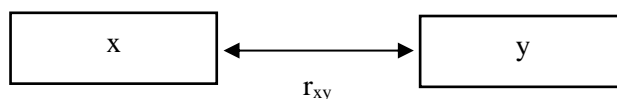
RESEARCH METHODS

Figure 1. Research Design

Note:
x : independent variable (students ' perception of the learning environment)
y : dependent variable (learning outcomes)
rxy : correlation between x and y variable

This study uses quantitative descriptive method with correlational studies. Quantitative descriptive method is the analysis of data by describing a data that has been collected in accordance with the facts in the field. Correlational studies are used to determine whether or not there is a relationship between the two variables tested and to determine how strong the relationship between the two data is, whether the independent variable has a strong relationship with the dependent variable. Research design used, presented in Figure 1 as follows:

The target population in this study are all students of State Senior High School of 21 Jakarta. The affordable population is the second grade students of mathematics and natural sciences which consists of 4 classes and amounted to 143 students. Population sampling using purposive sampling techniques because State Senior High School of 21 Jakarta has the potential in accordance with the purpose of the study, while for sampling using simple random sampling techniques so that each population have the same opportunity to be selected as a sample and to determine the number of samples used taro yamane formula. The resulting sample, as many as 105 students.

Data collection using Google Form link containing questionnaire instrument Dundee Ready Education Environment Measure (DREEM) which consists of 50 items of statement, the measurement scale using likert scale and immune system learning outcomes instrument in distance learning in the form of 40 multiple choice test questions with five answer choices. Scoring for each question if correct it will get a score of 1 and if the answer is wrong it will get a score of 0 which is distributed online to students. Score obtained, then interpreted into value. Both of these instruments, then conducted validity tests using Pearson Product Moment ($\alpha = 0.05$) and Cronbach Alpha reliability test ($\alpha = 0.05$). The data analysis techniques in this study is a prerequisite test of data analysis and hypothesis testing. Prerequisite test of

data analysis includes normality test using Kolmogorov-Smirnov test (α = 0.05) and homogeneity test using Bartlett test (α =0.05). Hypothesis testing includes a simple linear regression test (α = 0.05) and Pearson product Moment correlation test (α =0.05).

FINDING AND DISCUSSION

Based on the research results, from 105 students obtained a score of students' perception of the learning environment of the highest 187 of the maximum score of 200 and the lowest score of 87 of the minimum score of 51, with an average of 137. Students ' perception scores of the learning environment were grouped into 8 interval classes. The highest relative frequency was found in the interval class of 99.5–190.5, which was as many as 27 students (25.71%) and the lowest frequency in the interval class of 86.5-177.5, which was as many as 4 students (3.81%). The frequency distribution of students ' perception scores on the learning environment can be seen in Figure 2 below.
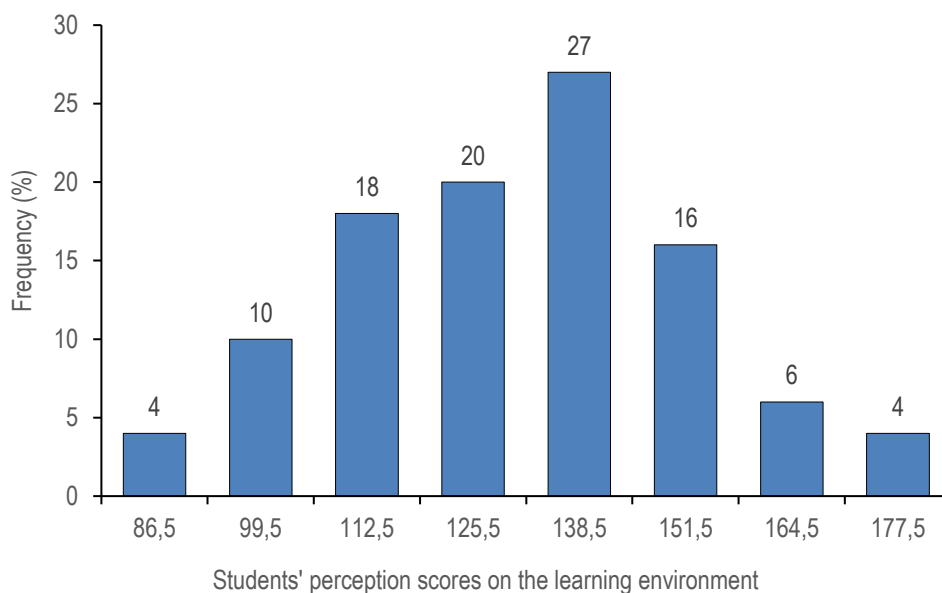

Figure 2. Frequency distribution of students ' perception scores on the learning environment

Based on data analysis on students' perceptions of the learning environment, the highesst percentage obtained as many as 24.76% of students have a very satisfactory perception, 70.48% of students have a satisfactory perception, 4.76% of students have a less satisfactory perception and as many as 0% of students have an unsatisfactory perception of their learning environment. The explanation is based on the criteria of interpretation of the student's perception score of the learning environment. The Data is shown in Figure 3.

The highest student perception sspects of learning environment contained in the perception of students to the atmosphere of learning is equal to 24.33%. Furthermore, 24.10% on the aspect of students 'perception of learning, 20.10% on the aspect of students' perception of teachers, 17.47% on the aspect of students 'academic self-perception and the lowest aspect is contained in the aspect of students' social self-perception of 14.00%. The percentage of students ' perception score achievement towards the learning environment can be seen in Figure 4.
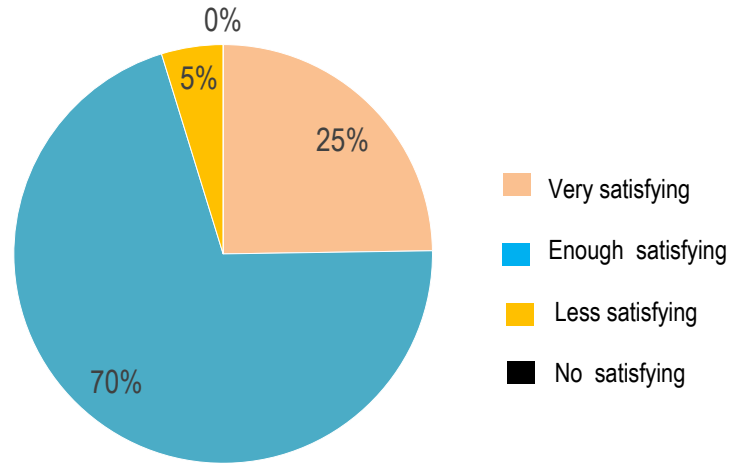
Figure 3. Frequency Score category students ' perception of the learning environment
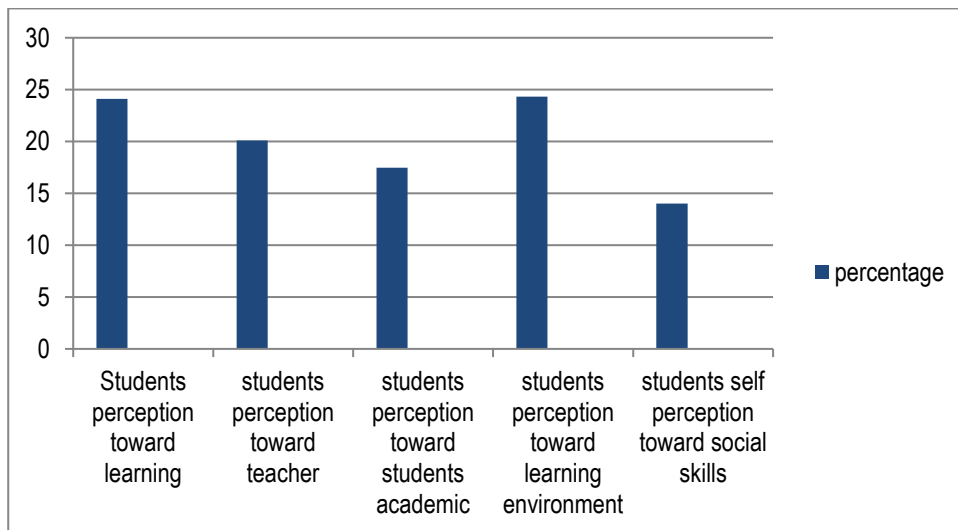

Figure 4. Percentage of students' perception of the learning environment

Based on the results of the study, the highest score of immune system learning outcomes in distance learning was 92 out of a maximum score of 100 and the lowest score was 41 out of a minimum score of 57, with an average of 69. Immune system learning outcomes scores in distance learning were grouped into 8 interval classes. The highest relative frequency was found in the interval class of 47.5 – 96.5, which was as many as 28 students (27%) and the lowest frequency in the interval class of 40.5-89.5, which was as many as 3 students (3%). The frequency distribution of immune system learning outcome scores in distance learning can be seen in Figure 5 below.
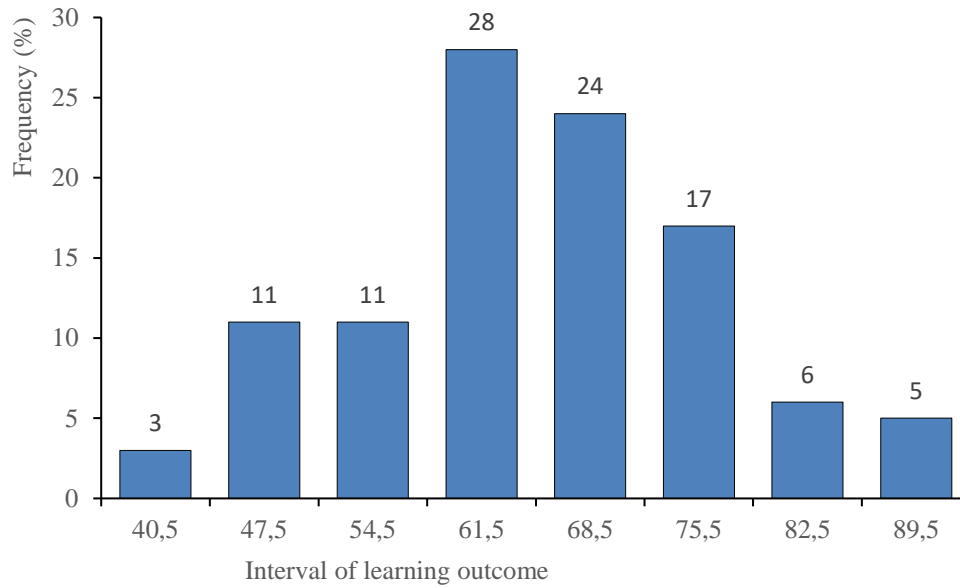
Figure 5. Frequency distribution of immune system learning outcomes in Distance Learning

Based on the calculation of immune system learning outcomes data in distance learning, highest percentage is obtained by 16% of students have immune system learning outcomes with high category, 67% of students have immune system learning outcomes with medium category and 17% of students have immune system learning outcomes in distance learning with low category. The explanation is in accordance with the criteria of interpretation of immune system learning outcomes scores in distance learning. The Data is shown in Figure 6 below.
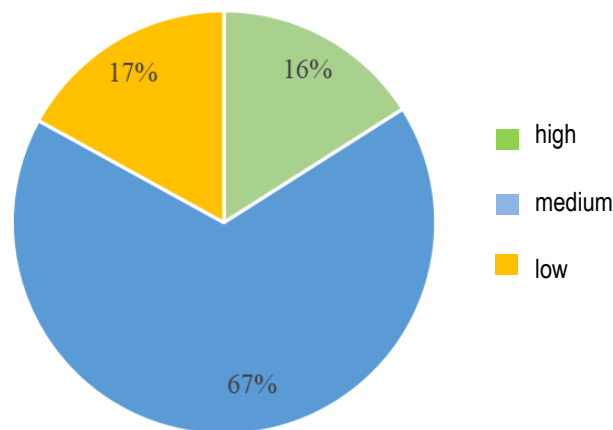
Figure 6. Frequency Score category learning outcomes immune system on learning long distance

The highest indicator of immune system learning outcomes in distance learning is found in the immune system mechanism of 22.19%. Furthermore, the indicators of factors that affect the immune system (18.67%), programs and types of immunization (16.29%), understanding of the immune system (15.93%), immune system function (15.18%) and the lowest score found in indicators of disease or immune system disorders (11.74%). The percentage of achievement of students ' perception score of the learning environment can be seen in Figure 7 below.

Figure 7. Percentage of immune system learning outcomes score achievement in learning long distance

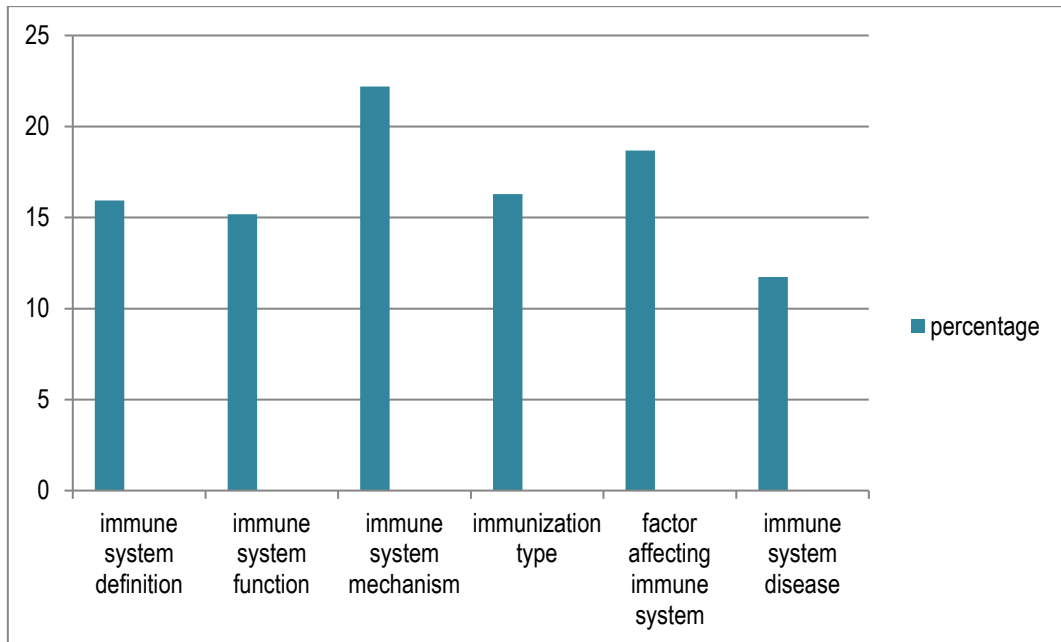The results of the prerequisite test data analysis, namely using the normality test this study was conducted using the Kolmogorov-Smirnov test (K-S) while the homogeneity test using the Bartlett Test at the level of α = 0.05 through SPSS version 25. Based on the results of the KS test obtained a significance value of 0.200 which means the value of significance > α, then accept H0 so that the data is normally distributed. While the Bartlett homogeneity test results obtained a significance value of 0.000 which means the significance value < α, then accept H0 so that the data is distributed homogeneously. Next is the statistical hypothesis test.

Based on the results of testing the significance of the regression model using the SPSS 25 program (α = 0.05), obtained the probability value (p) < α, which is 0.000 < 0.05 which means reject H0 so that it can be concluded that the regression model is significant with equation model Y = 20.097 + 0.355 X for students' perception of the learning environment (X) and immune system learning outcomes in distance learning (Y). The relationship between the two variables can be seen in Figure 8 below.
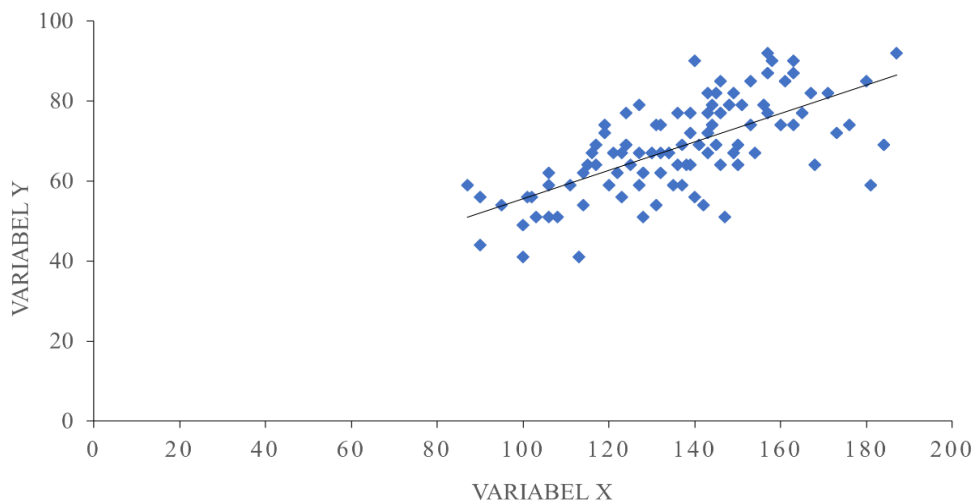

Figure 8. Graph of the relationship of students ' perception of the learning environment with the learning outcome of the immune system in Distance Learning

Figure 8 shows that each increase in students ' perception of the learning environment variable (X) by one value, it will cause an increase in learning outcomes of the immune system in distance learning (Y) of 0.355 at a constant value of 20.097. Linearity test results show that the value of P> α, which is 0.139 > 0.05 so accept H0 and it can be concluded that there is a linear relationship between the two variables.

Based on the correlation coefficient test results (rxy) obtained correlation coefficient value of students' perception of the learning environment (X) with immune system learning outcomes in distance learning (Y) of 0.670 which belongs to the category of strong relationship level. Furthermore, the calculation of the coefficient of determination and obtained the value of R Square (coefficient of determination) of 0.449 indicating that students ' perception of the learning environment associated with learning outcomes of the immune system in distance learning by 44.9%, while 55.1% associated with other factors.

Students' perception of the atmosphere of learning get the highest percentage, which is 24.33%. This can be seen from the results of the respondents ' answers, that the atmosphere of learning in the classroom at a distance learning, learning schedule, the opportunity for students to develop their abilities have been well implemented, self-anxiety about learning is reduced and have a new learning experience. The creation of a pleasant learning atmosphere can be done by means of collaborative learning activities such as online discussions to keep students active, this is certainly adjusted to the learning objectives so that learning outcomes increase (Martin et al., 2019). The atmosphere of learning or can be referred to as classroom climate is any situation that occurs due to interaction between students and teachers or vice versa which is a special feature of a class and affects the learning process. This is because the student's learning environment (physical and social environment) can allow to support or even interfere with students in learning. The existence of a good learning atmosphere, the perception of students will also be positive so as to make students enthusiastic in learning and affect learning outcomes (Sigit et al., 2016).

The condition of students who have a positive perception of the learning atmosphere in the classroom is characterized by active interaction between students and teachers or with other students. That is, teachers motivate, evaluate, inspire, reward students who succeed in their learning activities, such as students being active in the learning process, student discipline being increased, teaching and learning activities that are not boring and the use of appropriate learning media. While the relationship of students with other students includes cooperation and cohesiveness. This condition will also have a positive impact on student learning outcomes (Sigit et al., 2016). However, the condition of students who have a negative perception of the learning atmosphere in the classroom is characterized by the presence of disturbed classroom conditions, such as a rowdy class due to undisciplined student behavior, the occurrence of various conflicts between students or even between students and teachers. This is due to negative student perceptions of the learning atmosphere, such as lack of encouragement from teachers so that students are disciplined in class, help each other, how to teach that does not vary and does not evaluate students fairly and regularly. Such conditions will have a negative impact on student learning outcomes (Sigit et al., 2016).

Apart from the influence of the atmosphere of education on academic achievement, it is a factor that is difficult to measure and its true status in the educational cycle is not fixed. Students 'perception of the academic atmosphere is influenced by various students' cultural backgrounds, learning facilities, academic quality, curriculum and students ' expectations in learning (Askari et al., 2018). Many studies have scientifically proven that for effective learning, the quality of the educational environment plays an

important role and the educational climate can be improved based on the assessment of students ' perceptions (Nadeem et al., 2014).

While the lowest assessment contained in the aspect of social self-perception of students, which amounted to 14.00%. This aspect includes what is felt during distance learning such as stress, boredom, fatigue, loneliness, support systems, relationships between students and their friends and student social life. Based on the results of the respondents ' answers, it was seen that students were bored in distance learning activities. Social self-perception students get the lowest assessment scores due to distance learning conditions that require students to learn from their respective homes online, thus causing limited interaction between students with teachers or other students and with the community as well as research conducted by Sutarto et al (2020) which states that during the learning process at home, there is something that is felt to be lacking, namely togetherness with friends, be it togetherness while studying or in other matters.

Interaction that often occurs is between students and their parents or family, so the attitude of parents is very influential on the development of student learning. Parents who are less or even do not pay attention to their children in their learning activities will cause the child to be less or unsuccessful in the learning process. The situation that occurs in a family will affect the nature, emotions and social activities. Every student should be able to utilize the available time as effectively as possible because it will have an impact on learning outcomes and academic achievement of students (Bangun, 2008).

The interactions that occur between all of them are interrelated and have an influence on the attitudes, habits and development of students. Parents have an important role in the development of student learning, social learning groups of students in the school environment and outside the school environment, the attention of teachers to the development of student learning, student relationships with friends are the determining factors for student success in achieving good academic results (Sumantri & Fitriayani, 2015). A conducive learning environment supports the teaching and learning process so that it can improve achievements, develop the potential of students in a targeted manner and in the end they can carry out learning activities well (Daryanti, 2018).

The learning environment can affect student learning outcomes, this is in accordance with the research results of Eom et al (2016); Al-Samarraie & Saeed (2018) that the learning environment is a significant determinant of student learning processes and outcomes. Husain (2011) explained that the function of the learning environment in general is to help students in interacting with the surrounding environment, one of which is to manage the available educational resources in order to achieve optimal educational goals.

According to Ahmed et al (2018), a good learning environment is an environment that makes students eager to learn, gives satisfaction and a sense of security and can achieve the expected goals. Students with better learning outcomes have a more positive perception of their learning environment. Another study showed a significant relationship between students ' perceptions of the learning environment and learning outcomes. Study results will be significantly better if students ' perceptions of learning activities match their preferred learning environment (Amrullah et al., 2020). Students who have good academic performance, are satisfied with their learning environment, while students who are still not satisfied academically, feel less satisfied with their learning environment (Sukmawati et al., 2019).

Learning outcomes of students' immune system in distance learning are included in the medium or good enough category, it is seen that there are still many students who get scores with low categories. In addition to being influenced by the factors of the learning environment, it is also influenced because the immune system is the last biological material in Class XI MIPA so that the implementation is not

maximized. The number of hours off because of the red date or because there are other activities that make learning the immune system material only a few meetings or even not done at all. This is in accordance with the research of Sartono et al (2017) who explained that the immune system is a difficult material in second grade class in high school and in practice a lot of material is missed to be delivered because it is the last material. In addition, some teachers have not mastered the material properly, causing many concepts that have not been mastered by students and causing low learning outcomes of the immune system.

Immune system material is a material that is abstract and related to everyday life that makes difficult for students to understand. The mechanism of the immune system is complex, not easily observed, has a high contextual level so that it is often an obstacle for students to understand the material so that the immune system material is often complained of as difficult material (Trisnaningsih et al., 2016; Utami et al., 2018). Nevertheless, the immune system material is very useful for life, for protection and defense for the human body (Ernawati et al., 2017). In addition, there are various values from learning immune system materials such as religious, practical, intellectual, socio-political values and character education values that can affect the learning process and self-development of students (Aripin, 2019).

The highest indicator of immune system learning outcomes, namely the immune system mechanism with a percentage of 22.19%. Immune mechanism is an abstract material that makes it difficult for students to imagine the concepts that exist. Another thing that causes the immune system material to be difficult is because the sub-material studied is quite a lot (Raida, 2018). However, it turned out to be overcome quite well because of the cooperation between teachers and students so as to make indicators of the immune system mechanism can be controlled by students. Students understanding of the mechanism of the immune system aims to apply students' understanding in order to provide benefits for life (Jayanti et al., 2017).

As for the lowest indicator of immune system learning outcomes, in analyzing immune system disorders with a percentage of 11.74%. This can be happen because students still difficult to connect between the material concept with everyday life activities. In addition, due to the way students learn who tend to memorize material, not understand. Furthermore, it can also because student lack of learning interest, the learning process has not been maximized such as students are less focused when learning activities take place or because of less varied learning strategies (Raida, 2018).

The immune system material characteristics require problem solving so that it requires students to think critically in solving problems in real situations. Students should be more practice to analyze a problem related to diseases or disorders of the immune system material before students learn the concept of the material related to the problem to be solved so that students have the opportunity to understand and interpret it through their learning activities (Azka et al.,2016).

Preparing the right learning environment will make students enjoy the learning process they do and hopefully the learning results obtained can be maximized, better than before. The results of research conducted by Widyaningtyas et al (2013) explained that students with a conducive learning environment will have high learning readiness and high learning outcomes. In addition, a well-organized learning environment will have a positive influence on student development, and vice versa. This is supported by the results of research conducted by Rustiana & Chalifah (2012) which explains that with a good learning environment in learning will obtain high achievement while the poor learning environment will produce low learning achievement. The student's learning environment must be a concern for parents, teachers, the community, peers and the students themselves so that the expected results can be achieved well (Haesamu et al., 2019).

Other factors related to learning outcomes are due to intrinsic elements, such as learning motivation, study habits and exam performance. Study habits have a significant influence on learning outcomes, there is a close relationship between poor study habits and low learning outcomes. Students who have good learning outcomes, usually have good study habits as well. Students 'perceptions of the learning environment influence the selection of learning approaches that correlate with students' academic performance. The statement is supported by two studies from Oman and Saudi Arabia that show a positive relationship between learning environment, learning style and learning achievement. Students' perception of the learning environment in education varies greatly according to the student's academic level. However, students' perception of a thing does not follow a particular pattern and does not always make students successful in their education as it is influenced by various other factors (Ahmed et al., 2018).

Other internal factors related to success learning process are physiological factors which include student health and psychological factors, such as intelligence, learning interest, perception, attitude, talent, self-confidence, learn readiness and student effort in following the learning process to achieve the expected results (Daryanti, 2016; Gustia & Suhartini, 2021; Husamah & Pantiwati, 2014; Yuranda & Nurhayati, 2016).

The advantages of this research is the use of the instrument Dundee Ready Education Environment Measure (DREEM) which turned out to be applied to measure the perception of students in educational environments other than medicine, midwives, nurses or related to the health environment. Distance learning in State Senior High School 21 21 Jakarta showed a fairly high percentage. Most students have a satisfactory perception of the learning environment, as well as the learning outcomes of the immune system in distance learning, the highest scores obtained by students are included in the medium category this means, with a satisfactory learning environment, the student learning outcomes obtained are also into the category of good enough.

CONCLUSION

The results showed that there is a relationship between students' perception of the learning environment with the learning outcomes of the immune system in distance learning. Based on the results of the correlation coefficient test, the correlation coefficient value of students' perceptions of the learning environment with the learning outcomes of the immune system in distance learning is 0.670 which is included in the category of a strong relationship level.

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REFERENCE

Ahmed, Y., Taha, M. H., Al-Neel, S., & Gaffar, A. M. (2018). Students' perception of the learning environment and its relation to their study year and performance in Sudan. *International Journal of Medical Education*, *9*, 145–150. https://doi.org/10.5116/ijme.5af0.1fee

Al-Samarraie, H., & Saeed, N. (2018). A systematic review of cloud computing tools for collaborative learning: opportunities and challenges to the blended- learning environment. *Compuers & Education*. *124*, 77–91. https://doi.org/10.1016/j.compedu.2018.05.016

Amrullah, A. F., Sulistiawati, S., & Purnamasari, C. B. (2020). The relationship of the students' perception on the campus learning environment and their GPA in School of Medicine of Mulawarman University. *Jurnal Ilmu Kesehatan*, *8*(1), 15–21. https://doi.org/10.30650/jik.v8i1.293

Aripin, I. (2019). Pendidikan nilai pada materi konsep sistem imun. *Jurnal Bio Educatio*, *4*(1), 1–12. https://www.jurnal.unma.ac.id/index.php/BE/article/viewFile/1297/1207

Askari, H., Mansoori, N., Saeed, M. Z., Riaz, K., Mukhtar, A., Rana, M. N., & Mubeen, S. M. (2018). The dundee ready education environment measure (Dreem): perception of educational environment and its impact on academic performance of medical and pharmacy students. *Annals of Jinnah Sindh Medical University*, *4*(2), 59-63. https://www.researchgate.net/publication/340284950

Azka, S. H. M., Indriyanti, D. R., & Widianti, T. (2016). Keefektifan media pembelajaran "SI IMUT" berbasis masalah materi sistem imun terhadap sikap peka dan peduli keselamatan diri dan lingkungan siswa. *Journal of Biology Education*, *5*(3), 237–246. https://journal.unnes.ac.id

Bangun, D. (2008). Hubungan persepsi siswa tentang perhatian orang tua, kelengkapan fasilitas belajar dan penggunaan waktu belajar di rumah dengan prestasi belajar ekonomi. *Jurnal Ekonomi & Pendidikan*, *5*(April), 74–94. https://doi.org/10.21831/jep.v5i1.604

Caliskan, H. (2015). An Investigation into the organization levels of social studies teachers with regard to constructivist learning environments in terms of several variables. *Journal of Social Studies Education Research*, *6*(1), 49–83. https://jsser.org/index.php/jsser/article/view/322/314

Daryanti, M. S. (2018). Hubungan lingkungan belajar dengan prestasi belajar mahasiswa. *Jurnal Kebidanan Dan Keperawatan Aisyiyah*, *12*(1), 84–89. https://doi.org/10.31101/jkk.129

Dost, S., Hossain, A., Shehab, M., Abdelwahed, A., & Lana Al- Nusair, L. (2020). Perceptions of medical students towards online teaching during the COVID-19 pandemic: a national cross- sectional survey of 2721 UK medical students. *BMJ Open*, http://dx.doi.org/10.1136/bmjopen-2020-042378

Eom, S. B., Josephwen, H., & Ashill, N. (2016). The determinants of students' perceived learning outcomes and satisfaction in university online education: An empirical Investigation. *Decision Sciences Journal of Innovative Education*, *4*(2), 215–235. https://doi.org/10.1111/dsji.12097

Ernawati, R., Toharudin, U., & Ibrahim, Y. (2017). Penerapan model pembelajaran aktof-kooperatif tipe LSA terhadap peningkatan hasil belajar siswa SMA pada sub konsep sistem imun manusia. *Biosfer: Jurnal Pendidikan Biologi*, *10*(2), 12–29. https://doi.org/10.21009/biosferjpb.10-2.3

Gustia, L., & Suhartini, S. (2021). Students' interest and cognitive learning outcomes: Biology education in High Schools during COVID-19. *Biosfer: Jurnal Pendidikan Biologi*, *14*(1), 75–85. https://doi.org/10.21009/biosferjpb.18663

Haesamu, Ahiri, J., & Safar, M. (2019). Hubungan antara lingkungan belajar dan kecerdasan emosional dengan hasil belajar kewirausahaan siswa kelas XI SMK Negeri di Kota Kendari. *Wahana Kajian Pendidikan IPS*, *3*(2), 9–19. https://doi.org/10.33772/JWKP-IPS

Henriksen, D., Creely, E., & Henderson, M. (2020). Folk pedagogies for teacher transitions: Approaches to synchronous online learning in the wake of COVID-19. *Journal of Technology and Teacher Education*, *28*(2), 201-209. https://www.learntechlib.org/primary/p/216179/

Husain, S. (2011). Kreativitas Guru dalam merancang lingkungan sebagai sumber belajar pada mata pelajaran produktif di SMK Kota Gorontalo. *Jurnal Penelitian dan Pendidikan*,8(1), 9-50. http://repo.uinsatu.ac.id/11347/6.haspreviewThumbnailVersion/BAB%20III.pdf

Husamah, H., & Pantiwati, Y. (2014). Cooperative learning STAD-PJBL: Motivation, thinking skills, and learning outcomes of biology department students. *International Journal of Education Learning and Development*, *2*(1), 77–94. https://www.eajournals.org/journals/international-journal-of-education-learning-and-development-ijeld/vol-2-issue-1-march-2014/cooperative-learning-stad-pjbl-motivation-thinking-skills-learning-outcomes-biology-department-students/

Ibem, E., Alagbe, O., & Owoseni, O. (2017). A study of student's perception of the learning environment: case study of department of architecture, convenant university, Ota Ogun state. *Proceedings of INTED2017 Conference 6th-8th March 2017, Valencia, Spain*, 6275-6286. https://core.ac.uk/download/pdf/83592984.pdf

Idola, S., Sano, A., & Khairani. (2016). Hubungan antara persepsi siswa tentang keadaan lingkungan fisik sekolah dengan motivasi belajar. *Jurnal Pendidikan Indonesia*, *2*(2), 30–34. http://dx.doi.org/10.29210/12016263

Jayanti, P., Hariani, D., & Kuswanti, N. (2017). Validitas dan efektivitas LKS berbasis pembelajaran aktif dengan metode bermain peran pada materi sistem imun. *BioEdu*, *6*(1), 1–8. https://ejournal.unesa.ac.id/index.php/bioedu/article/view/18838

Lawrence, A. (2012). School environment and academic performance of standard six students. *Journal of Educational and Industrial Studies in the World*, *2*(3), 210-215. https://files.eric.ed.gov/fulltext/ED542331.pdf

Martin, F., Ritzhaupt, A., Kumar, S., & Budhrani, K. (2019). Award-winning faculty online teaching practices: course design, assessment, evaluation and facilitation. *Int. High. Educ*. *42*, 34–43. http://dx.doi.org/10.1016/j.iheduc.2019.04.001

Megawanti, P., Megawati, E., & Nurkhafifah, S. (2020). Persepsi peserta didik terhadap pjj pada masa pandemi covid-19. *Faktor Jurnal Ilmiah Kependidikan*, *7*(2), 75–82. http://dx.doi.org/10.30998/fjik.v7i2.6411

Mustami, M. K. (2019). The relationship between self-adjustment, social support from peers, and self-regulation with learning outcomes among high school students in biology. *Pertanika: Journal Sciences and Humanities*, *27*(2), 925–935. http://www.pertanika.upm.edu.my

Nadeem, A., Iqbal, N., Yousaf, A., Ahmed, M., Daud, B., Younis, A., Military, C., & Attock, H. (2014). Students' perception of educational environment at Army Medical College, Rawalpindi: assesment by DREEM. *Educational Environment*, *64*(2), 298–303. https://pesquisa.bvsalud.org/portal/resource/pt/emr-154713

Nurhasanah, S., & Sobandi, A. (2016). Minat belajar sebagai determinan hasil belajar siswa. *Jurnal Pendidikan Manajemen Perkantoran (JPManper)*, *1*(1), 128–135. https://doi.org/10.17509/jpm.v1i1.3264

Puriana, R. H., Hayati, Hanafi, M., Rizkanto, B. E., Mahardika, R., & Utamayasa, I. G. D. (2021). Penyuluhan penguatan sistem imun sebagai proteksi COVID-19 untuk guru SMP Negeri 1 Perak Jombang. *Kanigara: Jurnal Pengabdian Kepada Masyarakat*, *I*(I), 77–82. https://doi.org/10.36456/kanigara.v1i1.3226

Purwanto, A, Pramono, R, Asbari, M, Hyun, C. C, Wijayanti, L. M., & Putri, R, S. (2020). Studi eksploratif dampak pandemi COVID-19 terhadap proses pembelajaran online di sekolah dasar. *EduPsyCouns: Journal of Education, Psychology and Counseling*, *2*(1), 1–12. https://ummaspul.e-journal.id/Edupsycouns/article/view/397

Raida, S. A. (2018). Identifikasi materi biologi SMA sulit menurut pandangan siswa dan guru SMA se-Kota Salatiga. *Journal of Biology Education*, *1*(2), 209–222. http://journal.stainkudus.ac.id/index.php/jbe%0AIdentifikasi

Rustiana, A., & Chalifah, N. (2012). Pengaruh lingkungan belajar dan kompetensi profesional guru terhadap prestasi belajar siswa SMA N 1 Jekulo Kudus. *Jurnal Pendidikan Ekonomi Dinamika Pendidikan*, *VII*(1), 14 – 28. https://journal.unnes.ac.id/nju/index.php/DP/article/view/4914/4062

Sartono, N., Rusdi., & Handayani, R. (2017). Pengaruh pembelajaran process oriented guided inquiry learning (POGIL) dan discovery learning terhadap kemampuan berpikir analisiss iswa SMAN 21 Jakarta pada materi sistem imun. *Biosfer: Jurnal Pendidikan Biologi (Biosferjpb)*, *10*(1), 58–64. https://doi.org/10.21009/biosferjpb.10-1.8

Setyorini, I. (2020). Pandemi covid-19 dan online learning: apakah berpengaruh terhadap proses pembelajaran pada kurikulum 13?. *Journal of Industrial Engineering & Management Research*, *1*(1), 95-102. https://doi.org/10.7777/jiemar.v1i1.31

Sigit, D. V., Putrawan, I. M., & Sulfitania, C. (2016). Studi komparatif hasil belajar biologi didasarkan pada persepsi siswa terhadap iklim kelas (classroom environment scale/CES): studi ex post facto pada siswa di SMA N 1 Jakarta. *Biosfer: Jurnal Pendidikan Biologi*, *9*(2), 23–38. https://doi.org/10.21009/biosferjpb.9-2.4

Sukmawati, Y. R., Sari, D. P., & Susani, Y. P. (2019). Hubungan persepsi siswa terhadap lingkungan belajar, partisipasi dan kinerja akademik di sekolah kedokteran. *Jurnal Pendidikan Kedokteran*

Indonesia: The Indonesian Journal of Medical Education, *8*(2), 53–60. https://doi.org/10.22146/jpki.46118

Sumantri, M. S., & Fitriayani, E. (2015). Hubungan antara sikap terhadap pendidikan kesehatan dan lingkungan belajar terhadap hasil belajar pendidikan kesehatan siswa kelas v sekolah dasar. *Edutech*, *1*(1), 35–51. https://ejournal.upi.edu

Sutarto, S., Sari, D. P., & Fathurrochman, I. (2020). Teacher strategies in online learning to increase students' interest in learning during COVID-19 pandemic. *Jurnal Konseling Dan Pendidikan*, *8*(3), 129–137. https://doi.org/10.29210/147800

Thobroni, M. (2015). *Belajar dan pembelajaran teori dan praktik*. Ar- Ruzz Media.

Tompodung, L. M. (2017). Persepsi mahasiswa terhadap lingkungan pembelajaran di Universitas Sam Ratulangi Manado. *Jurnal e-Biomedik (eBm)*, *5*(2), 1-6. https://doi.org/10.35790/ebm.v5i2.17072

Trisnaningsih, S., Suyanto, S., & Rahayu, T. (2016). Pengembangan learning management system quipper school pada pembelajaran materi sistem pertahanan tubuh untuk meningkatkan motivasi dan hasil belajar siswa kelas XI di SMA Negeri 3 Yogyakarta. *Jurnal Pendidikan Biologi*, *5*(6), 28–36. http://staffnew.uny.ac.id/upload/131930139

Usman, Y. D., & Madudili, C. G. (2019). Evaluation of the effect of learning environment on student's academic performance in Nigeria. *Online Submission*, 1–9. https://eric.ed.gov/?id=ED602097

Utami, H. D., Yuniastuti, A., & Rudyatmi, E. (2018). Efektivitas model pembelajaran problem based learning dengan asesmen portofolio pada materi sistem imun. *Journal of Biology Education*, *7*(2), 202–208. https://doi.org/10.15294/jbe.v7i2.25518

Wibowo, D. C., Deta, Y., & Dores, O. J. (2020). Efektivitas belajar dari rumah di tengah pandemi COVID-19. *Jurnal Pendidikan Dasar Perkhasa*, *6*(2), 228–241. https://doi.org/10.31932/jpdp.v6i2.893

Widyaningtyas, A., Sukarmin., & Radiyono, Y. (2013). Peran lingkungan belajar dan kesiapan belajar terhadap prestasi belajar fisik siswa kelas Sekolah Menengah Atas Negeri 1 Pati. *Jurnal Pendidikan Fisika*, *1*(1), 136-143. https://jurnal.fkip.uns.ac.id/index.php/pfisika/article/view/1773/1268

Woolfolk, A. (2012). *Educational psychology (12th ed.)*. Pearson Education.

Yuranda, G.S., & Nurhayati. (2016). Hubungan persepsi lingkungan pembelajaran dengan hasil belajar mahasiswa Prodi Pendidikan Dokter FKIK UMY. *Skripsi.* UMY. Yogyakarta.

Zuriati, S., & Briando, B. (2020). Persepsi siswa terhadap pembelajaran online di masa pandemi pada SMAN 4 Tanjungpinang. *Webinar and Call for Papers "Menyongsong Era Merdeka Belajar," June*. https://www.researchgate.net/publication/342330009