



## Analysis of Student Behavior Based on the History of Learning Activities in the Learning Management System Using the Pearson Correlation Method

Imam Akbar<sup>1</sup>, Hazriani<sup>2</sup>, Abdul Latief Arda<sup>3</sup>, Ita Sarmita Samad<sup>4</sup>

<sup>1&4</sup>Universitas Muhammadiyah Palopo

<sup>2&3</sup>Universitas Handayani Makassar

Email: imamakbar071093@gmail.com

Receive: 12/01/2024

Accepted: 02/02/2024

Published: 01/03/2024

### Abstract

The purpose of this study is to identify student learning behavior in online learning and to determine the relationship between student learning behavior and learning achievement based on learning history data (Learning logs) on the Learning Management System (LMS), including the performance of assignments and quizzes, utilization interaction features (forums and chat), as well as active access to learning resources (files and URLs). Pearson Correlation method is used to analyze the level of relationship between learning behavior and students' achievement. The research object is 105 students at Muhammadiyah University of Enrekang who programmed introductory information technology (PTI) courses from 5 different classes but taught by the same lecturer. The total number of processed activity histories (after data preprocessing) is 6500 records, while the total number of logs before data preprocessing is 19386 records. Correlation analysis linking student behavior to student learning achievement is quite strong and unidirectional, as evidenced by the correlation value between learning behavior and student final grades which show an average number of 0.80 and all are positive, with confidence interval values reaching 95%. This shows that the higher the learning activities that students participate in in online learning (the more active), the stronger the effect on student learning achievement. It also shows that student activity in completing assignments is the variable that most influences learning achievement with a correlation value of 0.88 (very strong).

**Keyword:** Learning Behavior, Learning Management System, Pearson Correlation

### Abstrak

Tujuan dari penelitian ini adalah untuk mengidentifikasi perilaku belajar mahasiswa dalam pembelajaran online dan mengetahui hubungan antara perilaku belajar mahasiswa dengan prestasi belajar berdasarkan data riwayat belajar (Learning log) pada Learning Management System (LMS), meliputi pengerjaan tugas dan kuis, pemanfaatan fitur interaksi (forum dan chatting), serta keaktifan mengakses sumber belajar (file dan URL). Metode Pearson Correlation digunakan untuk menganalisis tingkat hubungan antara perilaku belajar dan prestasi mahasiswa. Objek penelitian adalah 105 mahasiswa Universitas Muhammadiyah Enrekang yang memprogram mata kuliah pengantar teknologi informasi (PTI) dari 5 kelas yang berbeda namun diajar oleh dosen yang sama. Jumlah total riwayat aktivitas yang diproses (setelah prapemrosesan data) adalah 6500 catatan, sedangkan jumlah total catatan sebelum prapemrosesan data adalah 19386 catatan. Analisis korelasi yang menghubungkan antara perilaku mahasiswa dengan prestasi belajar mahasiswa cukup kuat dan searah, terbukti dengan nilai korelasi antara perilaku belajar dengan nilai akhir mahasiswa yang menunjukkan angka rata-rata 0.80 dan semuanya bernilai positif, dengan nilai confidence interval mencapai 95%. Hal ini menunjukkan bahwa semakin tinggi aktivitas belajar yang diikuti mahasiswa dalam pembelajaran online (semakin aktif), maka semakin kuat pengaruhnya terhadap prestasi belajar mahasiswa. Hal ini juga menunjukkan bahwa keaktifan mahasiswa dalam menyelesaikan tugas merupakan variabel yang paling berpengaruh terhadap prestasi belajar dengan nilai korelasi sebesar 0,88 (sangat kuat).

Kata Kunci : Perilaku Belajar, Learning Management System, Pearson Correlation

## Introduction

Learning Management System (LMS) is an online integrated learning management system through a platform. At the national level, several LMS-based learning systems have been developed including the Indonesian Online Learning System (SPADA) which was pioneered by the Ministry of Research and Higher Education (Pannen, 2021), Learning Houses developed by the Communication Information Center of the Ministry of Education and Culture; Student-Centered e-Learning Environment (SCeLE), which was pioneered by the Faculty of Computer Science, University of Indonesia (Hasibuan & Santoso, 2005). Furthermore, the use of LMS has continued to increase, especially since the Covid-19 pandemic. Various tertiary institutions have designed an online LMS-based learning system as a solution for the learning process can continue even in the midst of a pandemic. One of the universities that implements this kind of learning system is Muhammadiyah University of Enrekang which is based on the Moodle application. Some experts have researched regarding the use of this LMS such as: Cenka et al. (2022) who analyzed student behavior in implementing the LMS learning system using a process mining approach; Kadoic and Oreski (2018) who analyzed student behavior based on log data on Moodle; Hung et al. (2020) who examined the application of educational data mining to examine student learning patterns using the Flipped Learning approach. Moodle-based LMS can store log data based on activities carried out by the user. It makes possible to carry out a learning analysis (LA) or a type of analysis of the learning process including analyzing student learning behavior. Unfortunately, there has been no research conducted in Muhammadiyah Enrekang University regarding student behavior and its relationship with their learning achievement based on log data on LMS usage. Meanwhile, identification of each student's behavior is

important to uncover learning phenomena that will have an impact on improving the quality of education (Romero et al., 2014). This can also be used as material for evaluating the learning process (Cairns et al., 2015). Therefore, this study intends to identify the relationship between student learning behavior and learning achievement which is shown based on learning activity history data (learning logs) at LMS using the Pearson correlation method.

## Research Methods

The method used in this study is a quantitative method to analyze the level of relationship between learning behavior and student achievement. The object of research was 105 students at Muhammadiyah University of Enrekang who programmed introductory information technology (PTI) courses from 5 different classes but taught by the same lecturer. The total number of processed activity histories (after data preprocessing) is 6500 records, while the total number of logs before data preprocessing is 19386 records. Analysis of research data using k-means clustering and Pearson Correlation methods.

## Result and Discussion

The results of research conducted by applying descriptive analysis first, before preprocessing the data. Data preprocessing is the process of cleaning unnecessary data (cleaning), selecting data (selected) and transforming data.

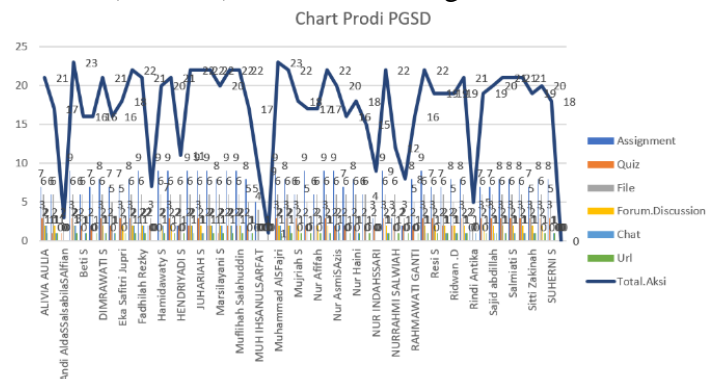


Figure 1. Preprocessing of PGSD study program data

Based on the statistical results of pre-processing data on the PGSD Study Program, it shows that the highest total action is 23 activities and the average action is 17 activities. From the total 54 student participants, the most dominating activities were assignment activities and files or material viewed or read.

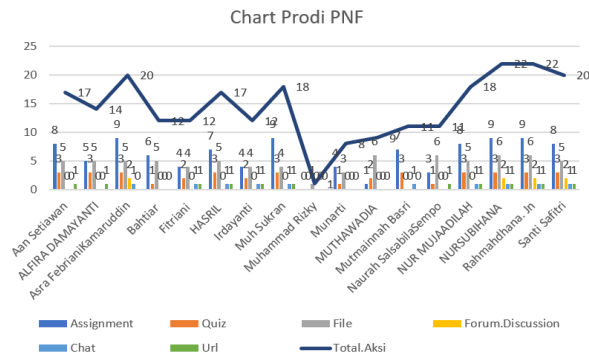


Figure 2. PNF Study Program data preprocessing

Then the data preprocessing statistics for PNF study program showed that out of 17 PNF students who carried out learning activities at LMS, the highest total action was 22 activities and the average activity carried out was 14 activities.

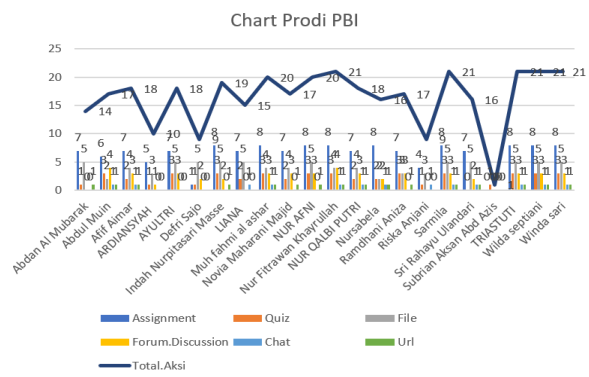


Figure 3. Preprocessing of PBI study program data

Furthermore, the results of the pre-processing of the data in the study program explained that the highest total actions carried out by PBI students

in LMS learning were 21 activities and the average activity carried out was 16 activities out of 22 participants PBI

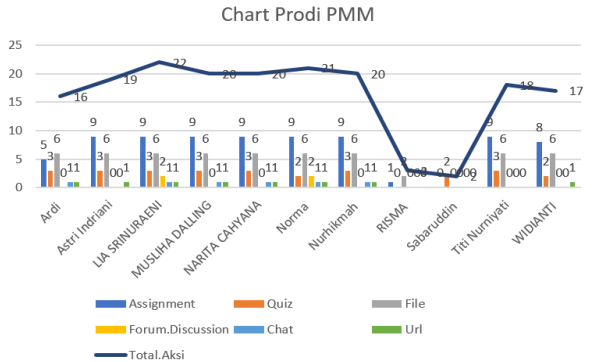


Figure 4. Preprocessing of PMM study program data

Meanwhile, the results of the pre-processing of the PMM study program data explained that of the 11 students who took part in learning at the LMS, the highest total action was 22 activities and the average action was 16 activities.

According to Sugiyono (2012) correlation analysis is used to calculate the strength of the influence between the independent variables and the dependent variable. The problem of correlation will arise if the researcher is faced with the question whether there is a relationship between one variable and another in the data set being investigated, and also to find out how far the relationship between the three variables is. Correlation analysis was carried out to determine whether there is a relationship of harmony or linearity between the two variables expressed in the correlation coefficient. The correlation coefficient is a value that shows the strength or not of a linear relationship between two variables. The correlation coefficient is usually denoted by the letter r or pearson where the value of r can vary from -1 to +1. The following is the interpretation of the correlation coefficient.

Table 1. Interpretation of the Correlation Coefficient

Coefficient Intervals	Relationship Level
0.0 – 0.19	Very Low
0.20 – 0.39	Low
0.40 – 0.59	Medium
0.60 – 0.79	Strong
0.80 – 1.00	Very Strong

There are two of several correlation techniques that are very popular until now, namely the Pearson Product Moment Correlation and the Spearman Rank Correlation. Pearson correlation is a simple correlation involving only one dependent variable and one independent variable. Pearson correlation produces a correlation coefficient that serves to measure the strength of the linear relationship between two variables. If the relationship between the two variables is not linear, then the Pearson correlation coefficient does not reflect the strength of the relationship between the two variables being studied, even though the two variables have a strong relationship. This correlation coefficient is called the Pearson correlation coefficient because it was first introduced by Karl Pearson in 1990 (Firdaus, 2009). In this study, researchers used the Pearson method to analyze how much the relationship between one variable and another.

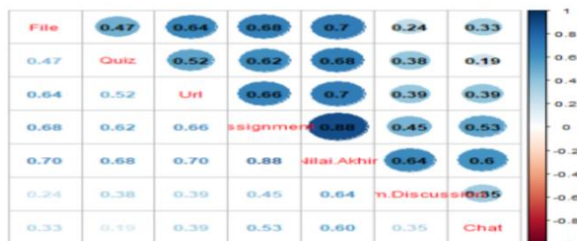


Figure 5. Correlation Analysis Visualization

The correlation value between activities is relatively strong as shown in Figure 4.20, the greatest correlation between activities is in the assignment correlation with a final score of 0.88 followed by files and urls to a final grade of 0.70, then the quiz variable to a final grade of 0.68 and the smallest correlation, namely chat and forum discussion correlations, are equal to 0.64 and 0.60. If it is interpreted more deeply regarding the results of the highest correlation between learning activities in the LMS learning log data in Figure 4.20, it can be seen that the assignment variable has a very strong influence on the final grade because among the six student learning behavior variables, this assignment variable is visited or worked on more by students then followed by variable files or presentation of material, Quiz, Forum Discussion and chat. In addition to analyzing the correlation or relationship between log LMS activities, it also analyzes the relationship between student learning behavior which includes assignments, quizzes, files, forum discussions, chat and urls on variable (X) on student learning achievement which includes student final grades on variable (Y) as shown in table 2.

Table 2. Analysis of Learning Behavior and Learning Achievement

No	X.Learning Behavior	Y Learning Achievement	Correlation
1	Assignment	Final Score	0,88
2	Quiz	Final Score	0,68
3	File	Final Score	0,70
4	Forum Discussion	Final Score	0,64
5	Chat	Final Score	0,60
6	Url	Final Score	0,70

The output in table 2 can be concluded that

there is a significant relationship between assignments and student final grades. This can be seen in the correlation value which reaches 0.88, which means that the relationship between these variables is very strong, while the lowest value of the correlation coefficient is 0.60 which shows a very low relationship between the chat variable and the final score.

Based on the results of the research that has been carried out by applying descriptive analysis and data mining analysis using the K-means clustering method, it can be seen that in the implementation of online learning in the introductory information technology course of data visualization with tables which is carried out in the odd 2020/2021 period, the average action taken by each participant is 16.2 actions. This shows that the average participant participation in this course is quite high because the minimum action that must be carried out in this course is 14. Then the average action is based on the characteristics of the study program in the introductory information technology course. When viewed based on the number of participants by study program, the number of participants in Elementary School Teacher Education was much higher than that of Mathematics Education, Non-Formal Education and English Education, but the average action taken by Elementary School Teacher Education was much higher compared to study programs with a small number of students. The average actions that are often carried out by students are assignments, files and quizzes, while the lowest are forum discussions and chat. This shows that students often see material and do assignments, but in question and answer activities through the forum feature it is still very low.

Before conducting a cluster analysis of the six LMS log data variables, data standardization (data scale) was carried out first. Then determining the optimal number of clusters found

K = 2 with the Elbow method.

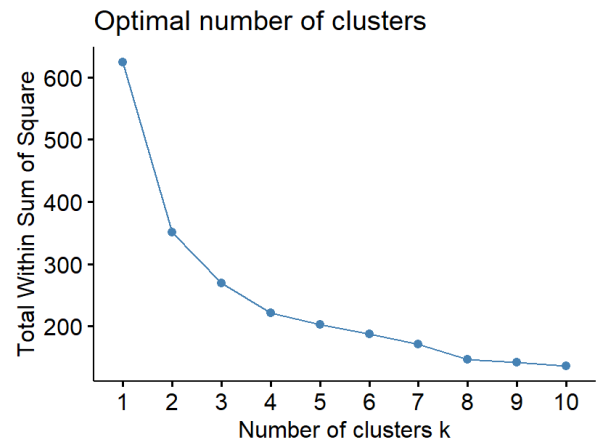


Figure 5. Elbow method

the optimal K value with the elbow method which produces optimal K = 2 divides the activeness of online learning participants into 2 groups through the k-means clustering method. which means there are 2 groups with a tendency for different activities in online learning participants with clustering analysis Data Visualization with K-means.

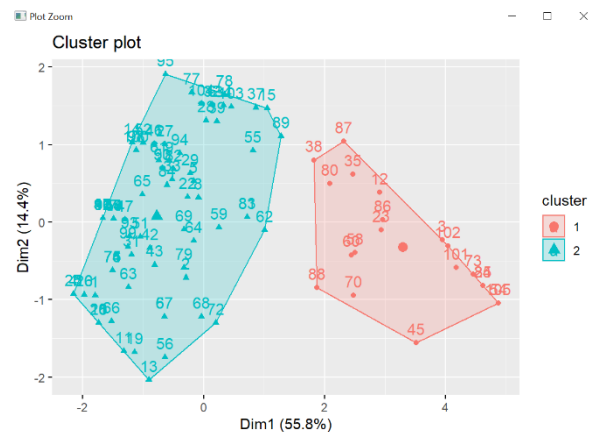


Figure 6. Visualization results K = 2

The characteristics of the group formed at K = 2, namely the first cluster with 20 members, as a group of inactive students and the second cluster



with 85 members as an active student group.

```
> k2
K-means clustering with 2 clusters of sizes 20, 85

Cluster means:
  Assignment    Quiz      File Forum.Discussion    Chat      Ur1
1 -1.6200725 -1.2568798 -1.4952789 -0.8962698 -0.8355948 -1.7588531
2  0.3811935  0.2957364  0.3518303    0.2108870  0.1966105  0.4138478

Clustering vector:
[1] 2 2 1 2 2 2 2 2 2 2 2 2 1 2 2 2 2 2 2 2 2 1 1 2 2 2 2 2 2 2 2 2 2 1 2 2 1 2 2 2 2 2
[68] 2 2 1 2 2 1 2 2 2 2 2 2 1 2 2 2 2 1 1 1 1 2 2 2 2 2 2 2 2 2 2 2 2 1 1 2 2 1

Within cluster sum of squares by cluster:
[1] 69.59701 281.76560
   (between_SS / total_SS = 43.7 %)

Available components:
[1] "cluster" "centers" "totss" "withinss" "tot.withinss" "betweenss"
   "size" "iter" "ifault"
```

Figure 7. Description of the results of clustering K = 2

The first group shows the cluster center point for Assignment, File, Forum, Quiz, Chat and Url variables with negative values. This indicates that the first cluster has very low activity compared to the other groups so that it can be referred to as a cluster with low or inactive learning performance. Meanwhile, the second group shows the center point for all variables with positive values. Namely, assignments are worth 0.3811935, Quizzes are 0.2957364, Files or materials are 0.3518303, Forum Discussions are 0.2108870, Chat are 0.1966105 and Urls are 0.4138478. All activity variables are positive, and the average action variable for each activity is the highest compared to first group. The group with the second cluster has participants who have very high action in all learning activities. Furthermore, each type of action is analyzed based on Pearson's correlation (r) to see if there is a relationship between types of activity. The results of the analysis show that there is a fairly high relationship between students who do assignments and see the material, with a Pearson correlation value of 0.68. This relatively high correlation value occurs because course participants who open the course tend to look at the material and do assignments. Then followed by the correlation between the Assignment and the Url with a Pearson correlation value of 0.66. Overall based on the Pearson significance test for

each correlation between actions is significant and interconnected because the resulting correlation value does not have a negative value. In addition to analyzing the interrelationships between student learning behavior variables which include assignments, files, quizzes, discussion forums, chat and URLs also analyzing the relationship to student learning achievement which includes student final grades, there is a significant or strong relationship between the achievement variable (X) and student learning achievement variable (Y). 68 and a fairly strong value can also be seen in the chat correlation value and the student's final score of 0.60. All of the above variables show a strong relationship between student learning behavior and student achievement.

### Conclusion

The relationship between student behavior and student learning achievement is quite strong and one-way, it can be seen that the strongest correlation is the assignment of the final grade because these variables are mostly worked on by students then followed by files, quizzes, discussion forums, URLs and chat. this is proven by the correlation value between the variables of student learning behavior and the average final score of 0.80 and no negative values are generated while the resulting confidence interval values reach 95%, which means that the greater the learning activities that are participated in or carried out by students in online learning, it will have a significant or strong effect on learning achievement or student final grades, this is also in accordance with research conducted by (Ririn Kurnia et al, 2019) which states that high or low learning outcomes are caused by high learning behavior.

## REFERENCES

- [1] Fuzzy C Means pada Data Knowledge User Modelling. Seminar Nasional Teknologi Informasi, Komunikasi dan Industri (SNTIKI). Pekanbaru 19 Mei 2017
- [2] Agusriandi, Elihami, Syarief, I., Samad, I.S. (2022). Model analisis aktivitas tutor dalam learning management system berdasarkan data log menggunakan K-Means dan deteksi outlier. *Jurnal Teknologi Informasi dan Ilmu Komputer (JTIK)*. Retrieved from <https://jtiik.ub.ac.id/index.php/jtiik/article/view/4764>
- [3] Cairns, A. H., Gueni, B., Fhima, M., Cairns, A., David, S., & Khelifa, N. (2015). Process mining in the education domain. *International Journal on Advances in Intelligent Systems*, 8(1/2), 219–232
- [4] Cenka, B. A. N., Santoso, H. B., & Junus, K. (2022). Analysing student behaviour in a learning management system using a process mining approach. *Knowledge Management & E-Learning*, 14(1), 62–80. <https://doi.org/10.34105/j.kmel.2022.14.005>
- [5] Hasibuan, ZA, & Santoso, HB (2005). Penggunaan e-learning menuju paradigma pembelajaran baru: Studi kasus lingkungan e-learning yang berpusat pada mahasiswa di Fakultas Ilmu Komputer - Universitas Indonesia. Dalam *Prosiding Konferensi Internasional IEEE Kelima tentang Teknologi Pembelajaran Lanjutan (ICALT'05)* (hlm. 1026– Bousbia, N., Rebaï, I.,
- [6] Labat, JM, & Balla, A. (2010). Menganalisis hubungan antara gaya belajar dan perilaku navigasi dalam sistem pendidikan berbasis web. 1030). IEEE
- [7] Hung, H.C., Liu, I.F., Su, Y.S. (2020). Applying educational data mining to explore students' learning patterns in the flipped learning approach for coding education. *Symmetry*, (213), 1-14. Retrieved from <https://www.mdpi.com/2073-8994/12/2/213>
- [8] Ikhsan, E. (2021). Penerapan K-Means clustering dari log data moodle untuk menentukan perilaku peserta pada pembelajaran daring. *SISTEMASI: Jurnal Sistem Informasi*, 10(2), 414-422. Retrieved from <https://scholar.archive.org/work/qcjefkeksfdnlhmtaxa7nzeote>
- [9] Junaedi, Hartanto., Herman, Budianto. (2011). Data Transformation Pada Data Mining. *Prosiding Konferensi nasional “Inovasi dalam Desain dan Teknologi”*. IDeaTech 2011.
- [10] Kadoic, N., & Oreski, D. (2018). Analysis of student behavior and success based on logs in Moodle. In *Proceedings of the 41st International Convention on Information and Communication Technology, Electronics and Microelectronics (MIPRO)* (pp. 654– 659). IEEE.
- [11] Kalpit G.S., & Patel. A. (2017). Comparative Analysis of K-means and K-medoids Algorithm on IRIS Data. *International Journal of Computational Intelligence Research*, 13 (5), 899-906. Moodle. (2018). Retrieved from [https://docs.moodle.org/37/en/Moodle\\_app\\_features](https://docs.moodle.org/37/en/Moodle_app_features)
- [12] Nichols, M. (2003). A theory for eLearning. *Educational Technology & Society*, 6(2), 1-10, Available at

<http://ifets.ieee.org/periodical/6-2/1.html>

[13] Pannen, P. (2021). Penjaminan mutu dalam pembelajaran online dalam skala besar di Lembaga Pendidikan Siber Indonesia. Dalam S. Ra, S. Jagannathan, & R. Maclean (Eds.), *Menggerakkan Masyarakat Belajar Selama Zaman*

Gangguan (hlm. 121–134). Peloncat.

[14] Romero, C., Romero, J. R., & Ventura, S. (2014). A survey on pre-processing educational data. In A. Peña-Ayala (Ed.), *Educational Data Mining: Applications and Trends* (pp. 29–64). Springer.

[15] Sugiono, Nurdiani, S., Linawati, S., Safitri, R.A., Sapura, E.,P. (2019). Pengelompokan perilaku mahasiswa pada perkuliahan E-learning dengan

[16] K-Means clustering. *Jurnal Kajian Ilmiah*, 19(2), 126-133. Retrieved from [https://repository.bsi.ac.id/index.php/unduh/item/289883/JKI Pengelompokan-Perilaku-Mahasiswa-Pada-Perkuliahan-E-](https://repository.bsi.ac.id/index.php/unduh/item/289883/JKI_Pengelompokan-Perilaku-Mahasiswa-Pada-Perkuliahan-E-)

*Learning dengan-K-Means-Clustering.pdf*

[17] Yasar, O., & Adiguzel, T. (2010). A working successor of learning management system: SLOODLE. *Procedia- Social and Behavioral Sciences*, 2(2010), 5682-5685. Retrieved from [https://www.researchgate.net/publication/248607284\\_A\\_working\\_sucesor\\_of\\_learning\\_management\\_systems\\_SLOODLE](https://www.researchgate.net/publication/248607284_A_working_sucesor_of_learning_management_systems_SLOODLE)

[18] Syah, Muhibbin. 2006. *Psikologi Belajar*. Jakarta : PT Raja Grafindo Perkasa\Anni, Catharina Tri. 2007. *Psikologi Belajar*. Semarang : Unnes

[19] Arisandi,Deni..2012.Pengertian Perilaku dalam [http://arisandi.com/pengertian\\_perilaku/](http://arisandi.com/pengertian_perilaku/) (diunduh pada Senin, 19 Maret 2021 19.03 WIB)

[20] A.M, Sardiman. 2011. *Interaksi & Motivasi Belajar Mengajar*. Jakarta : PT RajaGrafindo Persada2007. [Online]. Available: *Australasian Digital Theses Program*.