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Visualization of Learning Analytics on E-Learning Information System Subject

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A B S T R A C T

E-Learning as the concept of education today that utilize computer network technology to do the learning, but the E-learning at less value in assesing the behaviour pattern of students to learn because E-learning has not been able to provide an appropriate learning features with the character of students doing learning. In order to learning process on the E-learning system attractive and easily evaluated by lecturer or students, it is necessary to visual learning analytics in the system. Visual learning analytics conducted to analyze with the last result in the form of learning-based images, graphs, or diagrams. The system uses E-learning Information systems courses, the system processed by take the log of E-learning as a source to behaviour pattern of user, and then data are group based on determined criteria. The results of these grouping then visualized in form of a speedometer. By implemented this system, lecturer can easily observed, evaluated and asses the behaviour of students in do the learning, and students can evaluated behaviour patterns himself in do the learning. Based on the trial results were applied, overall the systems can be implemented properly by the students and lecturer with an average value of 7.7 out of students and the average value of 8 from lecturers is entered into either good category.

Keywords: E-Learning, Visual Learning Analytics, Information System

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1. Introductions

E-Learning or Electronic Learning is a form of learning that utilizes computer technology and computer or internet networks to conduct distance learning and training. At present E-Learning has been widely used by various types of educational institutions because it is flexible and can save tuition fees. Due to the presence of computer equipment and internet connections that are deemed optimal, this condition has encouraged the campus to pioneer the development of E-Learning. There are several majors that have applied E-Learning as a method of learning, not least in the department of informatics engineering, especially in the Information Systems course. Basically E-Learning that is used in Information Systems courses currently cannot assess student development in learning, as well as students who have not been able to evaluate themselves in learning in E-Learning. With these conditions, there is a need for visualization of learning analysis (Learning Analytics) obtained from log tables as a source to look for patterns of student behavior which are then visualized in various forms such as speedometer, graphics, etc.

Visualization is engineering in making drawings, diagrams or animations for the appearance of information, and data visualization can convert data into visual formats or tables so that the characteristics of data and relationships between data items or attributes can be analyzed or reported [1]. Learning Analytics is the collection and analysis of data related to student learning. The purpose of Learning Analytics is to observe and understand student learning behavior to enable appropriate interventions [2]. The activities of using E-Learning are analyzed into four categories, namely: "course summary, per-student statistics, per-resource statistics, and time-based statistics" [3]. Learning Analytics involves the collection and analysis of data to predict and improve student success. One of the factors driving increased interest in the existence of learning analytics is the tendency to increase accountability at all levels of education. In addition to national-level interests, there are more local goals in Learning Analytics, including predicting student performance, suggesting learning that is relevant to students, increasing student reflection and awareness, detecting unwanted student learning behavior [4].

Dian Kusuma Ningtyas (2008) conducted a study entitled "Analysis of the Behavior of E-Learning System Users in Gunadarma University". In this study, researchers used the Log Data Mining clustering approach to look for patterns of E-Learning user behavior at Gunadarma University. The initial step taken is to analyze the log to find out all activities carried out when accessing the E-Learning system, then to apply the concept of data mining based on clustering techniques. The next step is to look for user access patterns, the pattern of user concern is the user's time in accessing the E-Learning system and activities that are often carried out. The final result shows that there is a lot of student interest in higher subjects and accessing E-Learning is mostly done in the last week [5].

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2. Methods

2.1. System Design

To build a system, the design is needed to simplify the work process because it will be more structured in each process and if something goes wrong it will be easier to overcome them. The following is a picture of the overall system design:

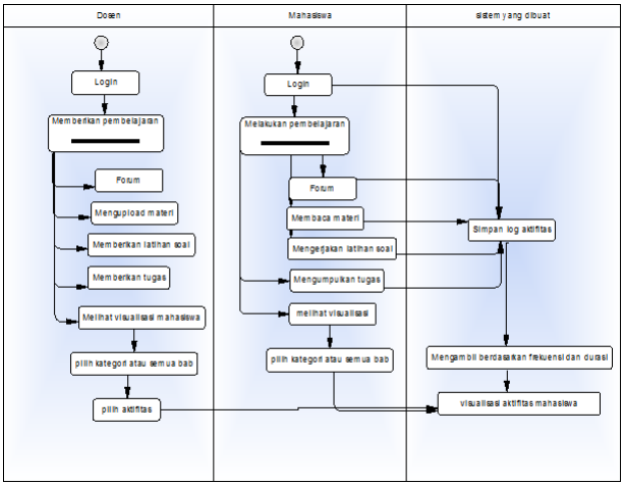

Figure 1. Overall System Design

From the system design in Figure 1, it can be seen that the process of running the system is first logged in after that students can do several kinds of learning activities such as discussion in the forum, reading material, doing exercises and collecting assignments. Activity data that students do will be stored in the log table system, then the system will retrieve data based on the duration and frequency of activities. After the data is processed it is then displayed in the form of a speedometer visualization.

the activities used in this study include the following:

a. Number of tasks performed (assignment)

Every student is obliged to send assignments given by the instructor. In this activity the parameter is the number of assignments sent by students, sometimes there are students who neglected or forgot about sending assignments. If a student sends assignments to a number of assignments given by the lecturer, the results from visualizing student behavior on these criteria will be valuable maximum. The following is the formula (1) used to get the speedometer value on the activity of collecting tasks:

$$Rumus = \frac{\sum tugas\ yang\ dikerjakan}{Jumlah\ Tugas}\ x\ Nilai\ max\ speedometer \quad (1)$$

To calculate the value of the activity of collecting assignments as in formula (1) is the number of assignments done by students compared to the number of assignments given by lecturers, then multiply by the maximum value of the speedometer.

b. Login system

The login system includes the number of times students log in to do learning on the Visual Learning Analytics system. The following is the formula (2) used to get the speedometer value for system login activity:

$$Rumus = \frac{\sum Login\ sistem}{Max\ Login\ sistem}\ x\ Nilai\ max\ speedometer \quad (2)$$

To calculate the value of system login activity as in formula (2) is the number of student logins compared with the most number of logins performed by his friends in one class, then multiplied by the maximum speedometer value.

c. Active in the forum

Active in the forum in question is the number of times a student makes a post or comments on a forum, the system will count how many students make a post and make a comment. The number of posts and comments are taken from the log table and then visualized in the form of a speedometer, the needle will lead to a certain value according to the frequency of the forum. The following is the formula (3) used to get speedometer values on active activities in the forum :

$$Rumus = \frac{\sum postingan}{Max\ Postingan}\ x\ Nilai\ max\ speedometer \quad (3)$$

To find the speedometer value of active activities in the forum in formula (3), the frequency in posting and commenting is compared with the active frequency in the student forum in one class then multiplied by the maximum value of the speedometer.

d. Access material

The material access activity is calculated from the number of times (frequency) and how long (duration) students access the material. The more and more students in reading the material, the speedometer value the bigger, and vice versa. The following are formulas (4) and formulas (5) used to calculate the speedometer value of material access:

$$durasi\ akses = \frac{\sum durasi\ akses\ materi}{jumlah\ akses\ materi} \quad (4)$$

$$rumus = \frac{durasi\ akses}{max durasi\ akses}\ x\ nilai max speedometer \quad (5)$$

To get the speedometer value the first step that must be done is to look for the average value of the duration of access to the material as in formula (4). Duration of material access is added up by the total number of accesses then divided by the number of material accesses. After that, the next step is to find the speedometer value as in formula (5). The average duration of access to material calculated in a formula (4) is then compared with the average access of other students in one class, then multiplied by the maximum value of the speedometer.

e. The amount of work on the exercises

This activity is calculated from the number of times students work on the exercises. The more students in doing the exercises, the greater the speedometer value, and vice versa. The following is the formula (6) used to get the speedometer value to do the exercise questions:

$$Rumus = \frac{\sum Mengerjakan\ Latihan\ soal}{Max\ Mengerjakan\ latihan\ soal}\ x\ Nilai\ max\ speedometer \quad (6)$$

To find the speedometer value doing the exercises in formula (6) is the number of students doing the exercises compared to students in one class, then multiplying by the maximum value of the speedometer.

3. Result and Discussion

3.1. System Display

After the system is tested on students of Information Systems courses, the activity data in the log tables are grouped according to frequency and duration, then the data is visualized. The following is a display of the activities carried out by students and then will be visualized:

Login

Figure 2. Login

In Figure 2 is a display of the login page, the user login system by entering a username and password. The frequency of students logging in will be compared with the frequency of other students, then the results of these frequencies are visualized as shown below:

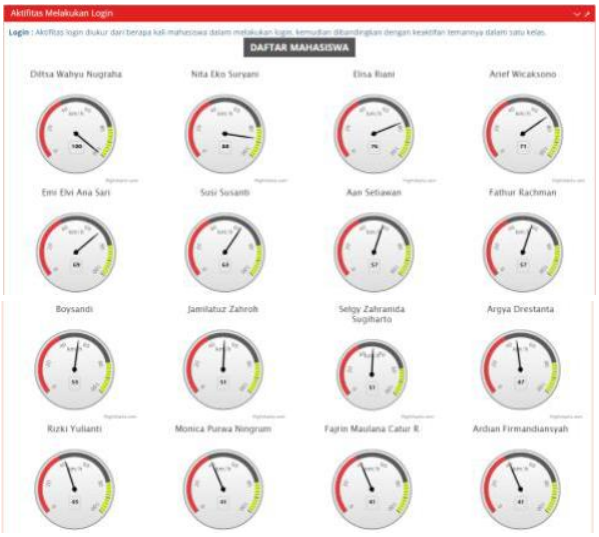

Figure 3. Visualization of login activities

In figure 3 it can be seen that the student who gets the highest speedometer score is Diltsa, while the other students get a speedometer score below 100. This means that diltsa is the student who most frequently login the system when compared with his classmates. From the results of the visualization, lecturers can find out active students and students who are less active in system logins.

3.2. Objectivity Test

To find out whether the system has been made in accordance with the desired objectives, then testing the scenario is done by distributing questionnaires to lecturers and course students

Information system. The assessment given in the questionnaire is further processed with the following stages of the process:

1. Calculate the average value for each variable
2. Grouping the results of the calculation of each variable into three categories, namely:
   a. good, if it's> 7.5
   b. enough, if 7.5 => average => 5
   c. less, if average <5

The following is a graph of the average results of assessments conducted by students:

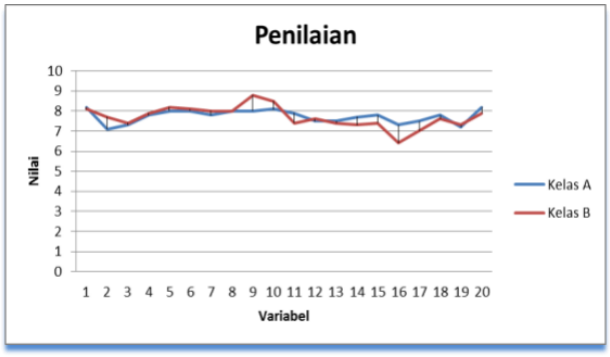

Figure 4. Student Assessment Questionnaire Chart

The following is the average calculation of grade A and B questionnaire assessments:

Table 1. Average assessment of student questionnaires

No	Question	Value
1.	Ease of access to the E-Learning system	8,2
2.	Interface (display) E-Learning system	7,4
3.	The appeal of E-Learning	7,4
4.	Ease of getting information	7,9
5.	Clarity of available information and data	8,1
6.	Clarity of available information and data	8
7.	Ease of operation and can be studied again	7,9
8.	Complete learning activities on the E-Learning system	8
9.	Ease of doing material access activities	8,4
10.	Ease of carrying out activities to collect tasks	8,3
11.	Ease of doing the practice questions	7,7
12.	Ease of operating forum features	7,6
13.	Interface (display) visualization of student learning activities	7,5
14.	The appeal of visualization	7,5

15.	Ease of information obtained from the results of visualization	7,6
16.	The suitability of learning activities with the results of visualization	6,9
17.	Completeness of visualized learning activities	7,3
18.	With the visualization can easily evaluate learning activities	7,7
19.	Ease of understanding the results of visualization	7,3
20.	Assessment of visual learning analytics as a whole	8,1
Average		7,7

From the results of the calculation of the average of each variable in table 1 above, it is obtained the average rating of an overall student score of 7.7. From these results, it can be concluded that the Visual system Learning Analytics falls into the category of both overall variables for students.

4. Conclusion

a. Conclusion

Conclusions from research on visualization of learning analysis (learning analytics) on E-Learning information systems courses:

1. The Visual Learning Analytics system can be used by lecturers and students to monitor learning activities undertaken by students. This is proven by the visualization features found on user pages. Lecturers can see all student activities that are visualized and students can evaluate their learning activities.
2. Visualized student behavior patterns consist of system login activities, active in forums, doing question exercises, and collecting assignments obtained from log tables which are calculated based on the frequency and reading material activities that are calculated based on duration and frequency.
3. The results of the trial conducted from March 12 - April 3, 2016, showed that the Visual Learning Analytics system as a whole is good and can be used to evaluate and monitor student learning. This was obtained from the assessment of students on 20 variables with an average value of 7.7 and the assessment of lecturers on 21 variables with an average value of 8.

b. Suggestion

Suggestions that can be given in this research for system development are:

1. The built visualization only analyzes 5 student activities so that they can be further developed to add activities that can be visualized.
2. Visualization in this system is mostly obtained from the frequency of each activity, so it can be developed to visualize all activities based on duration and frequency.

REFERENCES

[1] Hapsari, A.A. Integrasi Data dan Visualisasi Menggunakan Metode Treemap di PT. Chevron Pacific Indonesia. Riau: Universitas Islam Negeri Sultan Syarif Kasim Riau. 2013

[2] Brown, M. Learning Analytics. April 2011 . URL: //net.educause.edu/ir/library/pdf/ELIB1101.pdf, diakses tanggal 16 April 2016.

[3] Hartono. Analisis Perilaku Pengguna E-Learning. Teknologi Pembelajaran PPS UNY. pp. 148-163. 2014

[4] Uhler, B.D, and Hurn, J.E. Using Learning Analytics to Predics (and Improve) Student Sucess: A faculty Perspektive. Journal of interactive Online Learning. 12:17-26.2013

[5] Ningtyas, D.K. Analisis Perilaku Pengguna Sistem E-Learning Universitas Gunadarma. KOMMIT 2008. Pages 512-516. 2008