Utilization of Learning Analytic on Measuring Student Participation in Online Learning

S S Adjji* and S Hamda
Faculty of Education and Teacher Training, Indonesia Open University, Tanggerang Selatan, Indonesia

*Corresponding author’s email: srihamda@ecampus.ut.ac.id

Abstract. Learning analytics can be used to measure the level of student participation in online learning. This study is the best practice in conducting student learning assistance services through online learning, and aims to analyze student involvement during the learning process. The study was conducted on subjects offered by the Open University Chemistry Education course. The data were obtained based on the activity of online learning for one semester conducted by tutors and each tutor holding 1 class. The results obtained show that through learning analytic many items that can be assessed by the tutor on student activities during the online learning take place, among which are: 1) the number of overview accesses by the students on each topic or the reading of the tutorial material 2) the number of access made by each student on tutorial material 3) number of student access in reading each discussion material in discussion forum and, 4) number of response given/uploaded by every student in discussion forum. Other information that can be gained through the use of learning analytics is the interaction of learning that occurs between students with students and students with tutors. Interaction patterns are illustrated through graphs and responses among students.

1. Introduction
Currently online learning or online tutorials have been carried out in various universities, both using fully online and hybrid designs. Online learning can be done "synchronous" and "asynchronous" [1]. Open University provide online learning or online tutorial in which the students have to follow this activity. On the online tutorials especially on discussion forums, students are asked and accustomed to give their thougth and arguments. Interactions that occur in online learning generally take place between students and students or students with tutors. Data from this activities can be stored and can be reappeared. Whenever the large amount is analyzed, it will provide meaningful information for many people, and the institutions as well o the institutions that administer online learning.

All data obtained was analyzed through learning analytic so that it gets meaningful information for a learning program.

In the meantime, the online learning outcome data especially in study program of Chemistry Education at the Open University had not been used. Meanwhile the learning analytic will provide meaningful information for the study program. Learning analytic is known as a methodology that applies data analytics from a vast array of sources through the process of collecting, evaluating, analyzing and reporting, the analysis and representation of data about learners in order to improve learning [2-4]. Learning analytic tell of an approach regarding the decision-making in undergraduate
and postgraduate education which is based on proofs. Learning analytics are modelled based on data analytics’ principles, and it can be assumed that institutions can get their hands-on huge amount of data containing patterns and relations which inform and enable, with specific implementation to student learning, actions and decisions that are well-informed and done at favorable times.

2. Methods

This study is the best practise in conducting student learning assistance services through online learning, and aims to analyze student involvement during the learning process. The study was conducted in 4 courses from 20 courses offered by study programs online. The selection of subjects was taken by purposive random sampling, namely choosing 2 subjects representing subjects with fewer than 30 students and 2 courses with more than 30 students. Data was obtained based on learning analytical results during online learning took place.

The data were obtained based on the activity of online learning for one semester conducted by tutors. The indicator used in this study adalah : 1). The number of overview accesses by the students on each topic or the reading of the learning material; 2). The number of access made by learning material; 3). Number of student access in reading each discussion content on discussion forum; 4) Number of response given/uploaded by every student in discussion forum.

As additional data it discussed the interaction activity among students during the online learning occured.

3. Discussion

In online learning all activities can be stored and can be reappeared

3.1. The number of overview accesses by the students on each topic or the reading of the tutorial material

A lot of data obtained during online tutorials takes place both from tutors and students, and the data is recorded so that it can be analyzed. Recorded data can be seen daily, per week, monthly or until learning ends. These data include the number of tutors and students’ access to tutorial materials, discussions and upload tasks. The following are examples of the results of analytic learning throughout the activities of tutors and students.

![Figure 1](image1.png)

**Figure 1.** Example of Participant Activity Data in an Online Tutorial for a Period in the Form of Graphics.

In Figure 1 shows the participation of students, tutors and observers or supervisors in participating in tutorials during one learning period, every week there is always a tutorial for students and tutors who post. Postings from students are generally carried out on discussion forums or task completion for the March - May period. Besides being seen in the graph, data can also be obtained in the form of tables like the following example.


Table 1. The data example of The number of students’ participation.

| Period ending (Week) | Guest | Student | Supervisor | Teacher | All | Logs |
|----------------------|-------|---------|------------|---------|-----|------|
| 26 May 2018          | 36    | 7       | 0          | 241     | 284 | Course Logs |
| 19 May 2018          | 6     | 42      | 0          | 107     | 155 | Course Logs |
| 12 May 2018          | 0     | 27      | 0          | 0       | 27  | Course Logs |
| 5 May 2018           | 1     | 6       | 0          | 40      | 47  | Course Logs |
| 28 April 2018        | 11    | 276     | 0          | 38      | 325 | Course Logs |
| 21 April 2018        | 12    | 327     | 0          | 8       | 347 | Course Logs |
| 14 April 2018        | 23    | 292     | 0          | 64      | 379 | Course Logs |
| 7 April 2018         | 0     | 217     | 0          | 32      | 249 | Course Logs |
| 31 March 2018        | 27    | 502     | 0          | 0       | 529 | Course Logs |
| 24 March 2018        | 4     | 243     | 0          | 80      | 327 | Course Logs |
| 17 March 2018        | 7     | 363     | 0          | 34      | 404 | Course Logs |
| 10 March 2018        | 7     | 296     | 0          | 45      | 348 | Course Logs |

Figure 2. Example of Participant Activity Data in an Online learning in Table Form.

The amount of data can be obtained through analytic learning including data on how much tutorial material presented has been seen or read by students, tutors or managers. There is data on the topic and weekly periods that are the most and the least seen by students. In addition, there is also data on the amount of participation of all online tutorial participants in posting their opinions through discussion forums or the completion of assignments given by tutors.

In addition there are statistics that provide a comparison of student data, namely students who only read tutorial material or post "discussion answers or tutorial assignments as shown in Figures 3 and 4.

Figure 3. Tutor view and posting.  
Figure 4. Student view and posting.

Students tend to read more tutorial material or reading initiation than posting. This happened in almost all the courses, however students and tutor view and post the material on the discussion forum. Students completed their task and tutor examined and assessed students’ assignments.

The existence of learning analytics is useful for institutions to determine the implementation and participation of component components involved in online tutorial activities. Institution or faculty find out whether students and tutors see and "post" the subject matter of ongoing learning.

3.2. The number of access is made by each student on tutorial material

E-learning always take into consideration the individual learner’s differences. Some learners, for instance prefer to concentrate on certain parts of the course, while others are prepared to review the entire course [5].
Analytic learning is able to present each individual's data about how many students access online tutorials or read each topic of the material or reading suggested by the tutor during a learning period. As an example of student activity per individual in the tutorial activities as shown below.

![Figure 5](image1.png)

**Figure 5.** Example of a Student's Activity Data.

![Figure 6](image2.png)

**Figure 6.** Example of student activity data per month during the tutorial.

Through analytic learning can be analyzed all the activities of individual students, such as students who only see the material, students who actively respond to friend discussions, view tasks and upload them. In addition, there are also data about students who have never seen or read tutorial material, participated in discussion forums and worked on assignments. Through these data, study programs and tutors can find out who is active or passive in participating in the online tutorial provided. Based on this data, tutors can take the initiative by inviting students to actively discuss or complete assignments. Besides that, the advantage of analytic learning is that study programs can make decisions about individual students towards their learning outcomes or study programs make a more interesting learning plan so that students can participate. For example, study programs provide counselling services, special guidance for individual students to improve their learning.

Learning analytics becomes a powerful tool for enabling students to stay well-informed and keep track of their ongoing progress in their study. The relevant learning materials can push the students to do better in their learning thus maximize their performance.

### 3.3. Number of student access in the reading of the material in discussion forum

Analytic learning is able to provide material information that is most often seen by students and tutors, as well as topics of discussion that are many or little responded by students.
Figure 7. Examples of Data on the Number of Discussions Viewed by Students.

Through data obtained analytical learning, tutors and study programs can do an evaluation of the ongoing learning program by improving the appearance of the material so that it is interesting for students to read the material and keep following the learning program.

3.4. Number of responses given by students in the discussion forum.

Students can build knowledge if they are directly involved in learning such as building discussions and responding to discussions delivered by friends or tutors. Interaction among online tutorial participants, takes place between students and students and students with tutors. Examples of discussion narratives among students as shown in Figure 9.

Figure 8. Example of the Number of Student Response Data on a Discussion Topic.

Figure 9. Examples of student responses to other students in the discussion forum.

In addition to being given in the graph, there is also the rank data of discussion participants in numbers. For example, in Figure 10, it is stated that the topic of the 6th discussion was attended by 13 participants from 22 tutorial participants. There was a participant responded by 4 other participants, responded by 2 people, and while there was a discussion that raised the topic but had not received a response from other friends. In discussion forum each student raised a topic of discussion and responded by other students including tutors. By giving students the opportunity to bring up the topic of discussion, students are expected to be more motivated in their learning.

While on other discussion topics in the same subject, give the following graph.

Figure 10. Example of Total Student Participation in Discussion Forums.

Figure 11. Example Graph of Student Discussion Results with Discussion Topics from Tutors.
Figure 11 shows the discussion topics raised by tutors and students respond to tutor questions. Interactions that occur tend to be only one direction, because there was no student response to the answers of other students. Unidirectional interactions occur in learning process provide less opportunities and creations for students in expressing their opinions. Knowledge received by students tends to be memorized that made students become passive.

Meanwhile keeping students engaged in online learning activity could be shown through multi-directional interactions that occurred in learning process. Learning with multi-directional interaction patterns develops student activities further optimally to arouse students to be active learners. While there are also graphs that illustrate the discussion topics raised by tutors and students and the responses given as shown in Figure 12.

Through learning analytic, there is a picture of the response of students and tutors in discussion forums, as well as the patterns of discussion that occur, so that study programs can design actions that need to be taken to help students to keep their learning paths and not withdraw in their learning programs. The draft that was drafted included designing the right discussion pattern by considering the activeness of all students.

4. Conclusion
Learning analytic is data collection of students during electronic learning activities such as online learning or online tutorials. A lot of data can be reported through online learning, such as learning activity data for students viewing material, entering in discussion forums or responding to discussions provided, as well as uploading assignments. In addition to students, analytic learning can also be used to view teacher / tutor activities during learning activities. Data obtained through analytic learning can be used to make analysis and predict learning to make improvements to subsequent learning. This is in line with Thorpe who explained that learning must be well designed where students can interact with each other including interacting with tutors [6]. Furthermore Markova, T., Glazkova, I., and Zaborova, E explained that Faculty should understand that online instruction is generating new forms of interaction, learner support and assessment [7]. With the study analytic learning or faculties can get a lot of data about learning that takes place such as the performance of
students, the level of retention of students. Use of learning analytic is useful for institutions or faculties to improve programs and carry out research related to online learning activities, reporting learning activities, and learning outcomes.

5. References

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