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Data Visualization for Students' Perception Toward Online and Offline Learning in Information Technology Education Program

Sulidar Fitri[1*], Taofik Muhammad[2], Cecep Riki[3], Sivaperumal Sampath[4]

[1,2,3]*Universitas Muhammadiyah Tasikmalaya, Jawa Barat, Indonesia, 56196*
[4]*Faculty of Technology, VelTech University, India*

**Corresponding author email: sfitri@umtas.ac.id*

Abstract

The comments from student about online and offline learning can be analyzed to evaluate the learning process learning quality. This study focused on visualizing the data from students' perception comments especially one class in Information Technology Education Program between face-to-face learning and online learning. The learning process is observed in order to gain some insight about the difference number of words appearance in the word cloud. The comparative results of this research will be described through data visualization in word cloud using orange software. The results of this study indicate that the words appear in the comments of students who fill out the survey form display more words refer to their choices to take offline learning compared to online learning.

Keywords: Visualization, Education, Online and Offline Learning, Text Mining, Orange.

1. Introduction

Education is very important for human development, and its impact on a country's progress is significant (Chaturvedi et al., 2021). Education must be carried out in any condition, no matter how difficult, to ensure a consistent level of education for the nation's people. The importance of education in society cannot be denied. It is important to help future generations learn and grow so they can become responsible adults who can contribute to society in the future. Students need to be equipped with the knowledge and skills needed to be active members of society and support the development of shared values and shared identities within a nation, whatever the situation. It means developing personal skills so that you are best equipped to approach a problem in a given situation. Education is the ability to adjust to changing situations and succeed (Idris et al., 2012).

Several universities in Indonesia have decided to continue their online learning courses in place of cancelled classes. School administration, teachers, and students are trying various ways to adjust to the new online learning environment. The COVID-19 outbreak is causing a lot of shock around the world. WHO has declared it a global pandemic because the virus is spreading very quickly and lots of countries around the world were also exposed to it. Indonesia is one of the countries that has been affected by the virus since early March, and as of June 27th, there have been 52,812 confirmed cases of the virus spread across 34 provinces and 415 districts and cities (Task Force for the Acceleration of Handling COVID-19 Indonesia, 2020) (Arifiati et al., 2020).

Many students who have taken MOOCs (Massive Open Online Courses) seem to find them engaging, though little is actually known about what makes these courses work. Some participants say that the use of more challenging assignments helps them learn the material better. The use of real-world examples or problems made the course material very relevant. This helped students connect the concepts or principles taught to their own lives, which sustained their interest and enabled them to learn the material more easily. The study found that MOOC student engagement is increased when certain instructor attributes are present (Hew et al., 2018).

Students appreciated the "tutor's perspective" of the course material, as this learning resource always provided a critical position on important issues that allowed students to develop their views and opinions. It was provided in writing (PDF file) and was an important content that was highly appreciated by students. There was no comment that this is a less valuable learning object for that medium (Slater & Davies, 2020). In distance learning, the teacher-student relationship is an important factor that has a significant impact on the learning process. The second is the issue of material adjustment. Students want to modify their learning materials to adapt to distance learning processes or methods. In other words, the instructor will be asked to change the delivery format of the material. The third concerns

the use of technology as a support system for distance learning. Students believe that skill acquisition is essential to the distance learning process (Suparwito et al., 2021).

The purpose in this article is to describe our experience in using Orange as a data mining tool software to identify surveys distributed to students of the Information Technology Education study program at Universitas Muhammadiyah Tasikmalaya through free-form text comments, which we want to do as part of the program evaluation. We present the elective aspects of online and offline lecture systems of learning that are highlighted by students in distance and on-campus programs. Our findings are very relevant to the current academic climate because the learning approach has changed from being always done face-to-face to online through electronic media. The results of the description through data visualization in the word cloud will provide a perception of the state of the new teaching.

2. Literature Review

Text mining was able to identify the response to the answers to questions about the best aspects of the unit related to good content organization and presentation, and responsive staff. For example, the consistency of comments that suggests that the lecture was considered one of the best aspects of the unit is despite the fact that this factor has also been identified by campus students as the most in need of improvement. Instructive lectures are generally ineffective and difficult to understand in the face of modern evidence that active student involvement is essential to learning (Stupans et al., 2016).

Student posts have made great strides in improving education and learning. Another important factor is the use of graphics and Tag Cloud, and the use of responsive technology to automatically adapt the application to any device that the user sees. The visualization represents a mood analysis of the text created by the student and can assist the teacher in showing the student's mood during the course. The use of mood analysis techniques in the educational system identifies the emotions expressed by VLE (Virtual Learning Environment) students, understands the emotional aspects that affect both positive and negative learning, and helps tutors or intermediaries. Can be profitable because it can provide another tool that can (Santoso & Azis, 2020). Sentiment analysis also can predict the preference of student for online learning or Face to Face using several datamining algorithms (Mounika & Persis, 2019). There are five types of online learning interactions: learner-teacher, learner-learner, learner-content, learner interface, and learner-self, which are important for improving student learning. It is undeniable that interaction in online learning is important to ensure the effective success of students in online learning. These correct ways of interacting can affect the success of online learning (Mutalib et al., 2016).

The study about student performance by synchronous learning method discovered that engaged learners perform better in an online learning environment when the activity level covered the clicks of online teaching content and the live broadcast setting because this mixed learning environment featured both traditional online courses and live instruction (Hung et al., 2020). Collaborative learning depends on interaction, but some study shows that online learners can still gain from studying alone (Shukor et al., 2015). Other related findings included the necessity to give professors regular training in communication and learning management systems so they can participate in continuing conversations about subjects like whether turning on the cameras during online lectures should be required (De Oca et al., 2021).

Compared to face-to-face learning, e-learning has a higher level of engagement, there is a modest difference between the two groups can be seen when they are compared, with the students who had access to just e-learning at the institution recording lower percentages for the levels of involvement during the course (Gherheș et al., 2021). The success of online learning greatly depends on the function of the online instructor. Therefore, in order to overcome the participants' physical distance, online instructors must learn how to humanize the course and identify successful methods for involving students in meaningful learning (Singh et al., 2021).

3. Materials and Methods

3.1. Materials

The participants in this study are students from UMTAS (Universitas Muhammadiyah Tasikmalaya) especially who study in Information Technology Education Department who take all the course in the first year they attend the course especially for academic year in 2021. They are students who have pass the first and second semester students which are conducting study as the freshmen. The learning policy in campus for their first semester is 100% should be conducted through online in LMS (Learning Management System) or any electronic media such as Google meet, Zoom meeting, Whatsapp, Google Classroom, Google form. For second semester it changes to become 50% should be conducted face to face.

In this study, the population was taken from all students in Information Technology Education Department. Based on respondents who returned the questionnaire only 44 respondents from the online questionnaire distributed so that the study sample consisted of only 44 students. More details are given in Table 1.

Table 1: Frequency of the participants

	Male	Female	Grand Total
Online	8	3	11
Face to Face	18	15	33
Grand Total	26	18	44

3.2. Methods

The method that used in this study is a survey method and also analyzed the data by a descriptive quantitative approach. The method of data collection is by distributing questionnaires through google forms which are used to obtain information in the form of perception notes filled out by each student. Filling out the form can really describe the actual learning experience from the student's point of view. Collecting data from the perception survey using question items in the form of student academic identity in the form of student id and name and then the choice of whether they prefer to study online or offline then finally they are asked to fill in the reasons why they choose one of these learning methods.

Data were analyzed using orange (Demšar & Zupan, 2013; Naik & Samant, 2016) software to find the weight of words that describe students' perceptions of the reasons they choose online or offline in participating in learning on campus. Using orange also made a visualization to show the frequency of the weight of the words that are their reasons. An open source tool for data visualization and analysis is called the Orange tool (Amala, 2019) in data mining. The Python language and Visual Programming are both used by the orange tool. The orange tool includes machine learning building blocks as well as bioinformatics and text mining add-ons. The orange tool has a canvas interface that the user may customize with widgets to build a data analysis workflow. data analysis Basic functionalities offered by widgets include reading data, displaying a table, selecting features, training predictors, contrasting learning algorithms, and graphic elements.

The findings will display a word cloud and comparison numbers so that it is easy to understand and draw conclusions so that they can provide reasons for the right decisions in improving the quality of the teaching and learning process in the classroom as Figure 1.

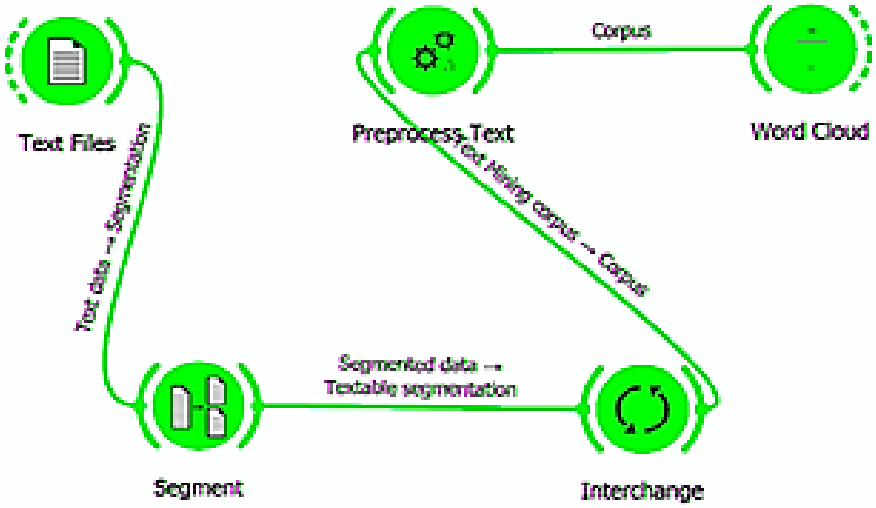

Figure 1: Workflow from orange widgets

After getting the data from participants, the data will be processed using orange shows in figure 1. Existing data is entered into a widget named Text File. The data from Widget Text Files must be segmented into word using Widget Segment. By dividing each original segment into a number of new segments, this widget takes a segmentation as input and produces a new segmentation (*Segment — Orange Textable v2.0.1 Documentation*, 2000.). By dividing each original segment into a number of new segments, this widget takes a segmentation as input and produces a new segmentation. It operates by default on the basis of a description of the new segments' shape (using regular expressions); however, it can also function on the basis of a description of the. Then the segmented data output needs to be converted from segmented data into a corpus so that it can be processed by the text mining toolbox using the Widget Interchange (*Orange Data Mining - Workflows*, 2000.).

In the Pre-process Text Widget needs to do several things, such as Changes all letters to lowercase, eliminate (stop words), words that are less useful such as, connecting words such as and, at, to, from etc and arrange for stopword

processing in Indonesian. Then connect to the widget of Word cloud in Text mining tab. After clicking the widget so that the word cloud will appear.

The stopwords used in this preprocessing text are “dengan, yang, di, yg, kalo, kalua, d, klo, sy, nya, krn ”. Whereas in English, these words are “with, which, di, which, kalo, kalua, d, klo, sy, nya, krn”. Some of numbers and punctuation has been remove using Regexp. Regexp removes words that match the regular expression. The default is set to remove punctuation. The following is a list of punctuation marks to be removed from the corpus:” \.|,|:|;|!|\?|\(|\)|\||\+|'|"| | ' | — | ‖ | ' | \ ' | ... | \ | – | — | \ $ | & | \ *|#|@|%|_|>|<|\/|\[|\]|1|2| 3|4 |5|6|7|8|9|10|”.

4. Results and Discussion

The data in file text become corpus consist of 4808 instances and 2317 tokens. After going through the preprocess text process, word cloud gives an appearance like the figure 2 above. Word cloud can be used to see the frequency of occurrence of the most words. In the image display above, the word cloud is the word cloud with the number of words. The more the frequency of occurrence of a word, the larger the font size in the word cloud. Word cloud is a variation to display the results of the preprocess text stage. The color of the word makes the display more attractive and easier to understand, the picture bellow is the result of the preprocess text stage from the data that previously contained the comment line for the students’ perception.

Based on the data in table 1, only 11 students about 25% chose online learning and the remaining students choose face to face learning with lecturer about 33 students (75%). Here the students expect most about face-to-face learning compare to online learning. The word from students’ comments shown in figure 2 which the big font shows the high number of words appear as Figure 2.

Figure 2: Word cloud from Student Perception toward Online and Face to Face Learning

There are the top 10 words that appear the most from student comments regarding their perception of the type of learning during the pandemic, including “learning, face, stare, lecturer, online (daring), on line, Theory, student, easy, study” as shown in figure 3. Some words appear bigger shows that the students wrote it a lot.

The graph in figure 3 shows the order of words from the most appearing to the least appearing, greater than 10 times. The top 3 are “learning, face, and stare” appear 118, 111, 108 times respectively which mean the choice of the students prefer more to have the face-to-face learning (offline) compare to the words of “online and daring (online)” which only appear 147 times in total. The words translation provides in table 2.

Table 2. Words Translation that look bigger in the word cloud

Indonesia	English
Pembelajaran	Learning
Tatap Muka	Face-to Face
Materi	Theory
Jaringan	Network
Dalam jaringan (daring)	Online
Perkuliahan	Lecture
Teman	Friend
Dosen	Lecturer
Quota	Internet quota
Kendala	Barrier
Belajar	Study
Mahasiswa	Student
Berinteraksi	Interaction

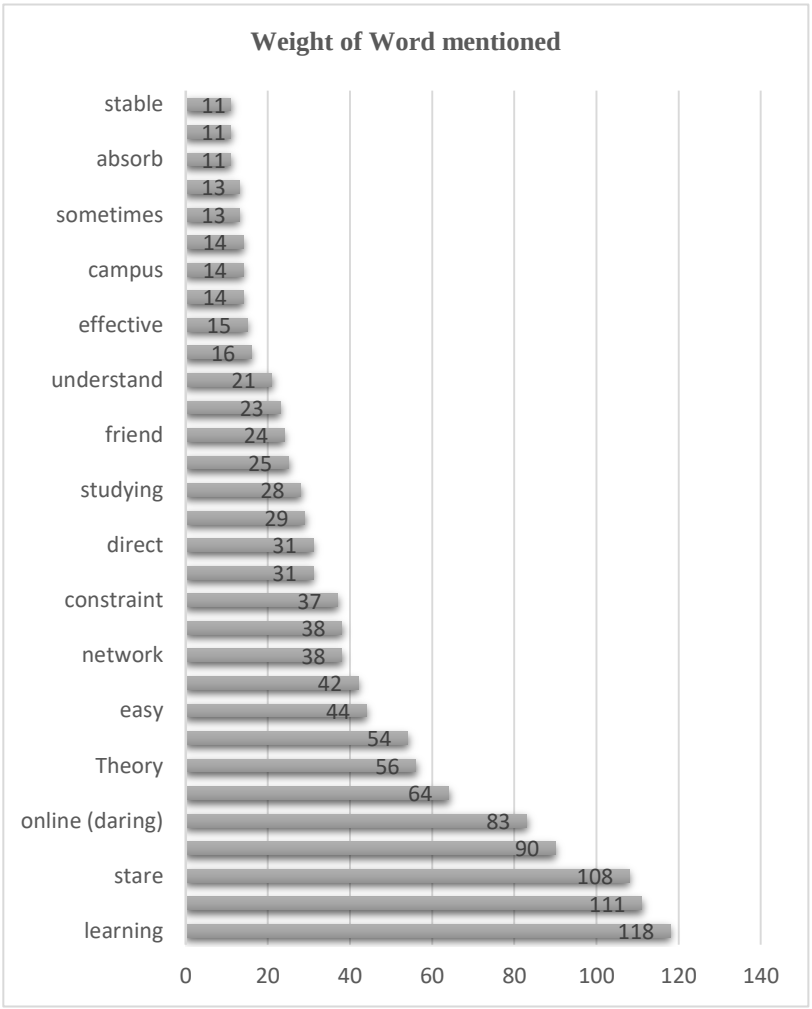

Figure 3: Number of counts appear for each word more than 10 times appearance

In the context of student performance during the pandemic, data visualization plays a crucial role in both informing educators and empowering students. For educators, data visualization allows them to easily track and analyze the performance of their students. They can identify patterns, trends, and areas of improvement more effectively through visual representations of the data.

One effective way to visualize the significance of accurate perception is through the use of word clouds. A word cloud is a visual representation of text data, where the size of each word represents its frequency or importance in the given context (Reyes-Foster & DeNoyelles, 2016). A word cloud is a visual representation of a set of words, typically

in the form of tags, where the attributes such as size, weight, or color are used to represent the features and frequencies of the associated terms (Baumgart et al., 2021). In information visualization, word clouds are graphical representations that depict a collection of words or tags. Using a word cloud, the key terms in a given text are displayed in different sizes or colors to highlight their relative importance or frequency of occurrence The word cloud provides a concise and visually appealing summary of the most prominent words or terms in a given dataset (Mohiya & Sulphey, 2021).

On the data visualization result in the form of word cloud marks the most written words. "Face" are represented as lectures face-to-face. Based on field observations, this is quite natural due to the conditions of student life in the city of Tasikmalaya where many students come from the area around the city. Targeting questionary outcomes spread comprehensively students also explain why they prefer college face-to-face. Some students explained the factors related to the need for an uncomfortable internet network, the need to socialize with friends, even the boredom caused by pandemic situations that isolated them.

The most basic thing it takes to do online learning is a good internet network to access learning materials or meet online to do classroom learning online. Unfortunately, Tasikmalaya is a City that geographical area surrounded by hilly and valleys (Mulyani, 2019). This geographical factor is also a challenge and a barrier that often makes difficulties for students to reach good internet signals.

5. Conclusion

Explain what has been done, and draw conclusions in accordance with the objectives of the research that has been determined. The conclusions are delivered narratively, do not contain equations, tables, and figures. Visualization using orange tool does not require a higher level of programming syntax comprehension. It needs first prepare the data and pre-processing it so that it is easy to analyze using widget and connect to each other. Producing word cloud is one of widget function provide in orange and so easy to use.

Some of students' words included the fact that they choose the genuine contact between students and teachers as well as between students while in class, which might satisfy a basic social human need. Students, however, believe that Face to face is superior to online learning in terms of motivation, spirit, responsibility, and even human ability. In order to learn more about how students feel about online and face-to-face classes, a survey tool was provided to them via an online form.

Universities of UMTAS are now required to offer online learning courses in order to preserve the academic field's educational process. To make the quality of the e-learning content comparable to or better than Face-to-Face Learning, more work should be put into its creation. The majority of the students at Universitas Muhammadiyah Tasikmalaya especially Information Technology Education Department choose more to conduct offline learning after participating in face-to-face instruction in the classroom as opposed to online instruction.

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