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A PARADIGM SHIFT IN INSTRUCTION: DECRYPTING THE IMPACT OF FLEXIBLE LEARNING IMPLEMENTATION TO COMPUTING STUDENTS IN A PHILIPPINE STATE UNIVERSITY AND COLLEGE

Rolando R. Codilan, Ph.D.
Faculty, College of Computer Studies, Eastern Samar State University, Borongan City, Philippines

ABSTRACT

This study aims to examine students' opinions, sentiments, assessments, attitudes, and emotions in written language. Sentiment analysis is one of the most active study fields in natural language processing, as well as a popular topic in data and text mining. In reality, we now have digital access to an enormous amount of philosophical data that can be evaluated. It is known as sentiment analysis and opinion mining and is faced by students taking the flexible learning modality during a baccalaureate degree program administered by Eastern Samar State University with the use of Sentiment Reasoning through Lexicon-Based approaches. This approach can be further classified into dictionary-based approaches and corpus-based approaches. The researcher analyzed and visualized a corpus of texts, including student opinions and attitudes, using machine learning technology. To examine the students' feelings, Lexicon analysis was applied, and Latent semantic indexing topic modeling was used to build topics from the corpus of papers. . The data was gathered from the College of Computer Studies Students (n=403) of Eastern Samar State University during the school year 2020-2021. The collected data is then translated to a digital format and compiled into a single data set. It was observed that the majority of students had a negative or undesirable attitude about the use of flexible learning as a mode of instruction, according to the findings. Themes that were revealed as a result of the compilation were put into a meaningful structure to be presented to the reader. The results showed that the following problems occurred in the process of the students have when faced with flexible learning, according to the topic modeling. It was also discovered that some students were employing survival techniques and experimenting with novel learning practices in order to complete the tasks that had been assigned to them. The main outcome of this study was that the need for an orientation program which will assist students in taking flexible learning modalities.

KEYWORDS: ***Sentiment analysis, opinion mining, text mining, lexicon base approach, flexible learning***

1. INTRODUCTION

The advent of the COVID-19 pandemic has changed our educational landscape, forcing schools to abruptly shift to online classes in lieu of face-to-face classroom setup. In the Philippines, the Covid-19 crisis has affected about 27 million learners, 1 million teachers, and non-teaching staff, as well as the families of learners [22].

Teaching and learning are more than just jobs, they are important obligations. Learning is a mystery to the learner, and the role of the teacher is to assist the learner in discovering the proper methods for unveiling the mystery. Teaching is no longer a performance. It is evolving into an art of comprehending the learner's needs to produce well-educated, and skilled-mannered students according to the needs. The traditional concept of formal education is fading nowadays. The difficulty of engaging students and generating eagerness for learning is maybe one of the most challenging challenges our schools face in this trying time. With the edge of technology, computers and gadgets are now used as one medium of instruction. Currently, many Higher Education Institutions (HEI's) has established their own e-learning system. Most of the e-learning systems are uploaded through the internet. This places the Philippines and its students in a dilemma, because with slack in the internet connection, how can students access e-learning sites with ease. [7]. [24] Argues that often new educational technologies, such as web-based learning, are implemented without any assessment of the impact on students. In order to become a learning economy, the Kenyan government introduced the e-learning policy. This is aimed at bringing about a paradigm shift informal

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education to promote lifelong learning [26]. Easter Samar State University (ESSU), in particular, is a learning institution. It has been carrying out its duties with the primary goal of providing professional institution and training in all fields of study offered by this University, including Computer Studies, in order to develop the Flexible Learning Modality of instructional delivery at the College of Computer Studies.

The College of Computer Studies (CCS)' program is built around core subjects that help students develop their skills. In order to be successful in the field, every CCS student must learn and acquire these computing skills. However, a number of factors affect their ability to comprehend the significance of any computing activity, which may or may not have a direct effect on their performance. As a result, it's critical to analyse and determine the problem's origin in order to effectively unravel it and assist students in enhancing their performance.

The main focus of this study is to analyse the impact of the flexible learning implementation on students with the use of the Orange data mining tool. The use of sentiment analysis and topic modelling for the impact analysis of flexible learning is useful in preparing the administration and faculty to be forewarned of impending flaws and gives adequate time for the impact of flexible learning mitigation efforts to be implemented. However, understanding sentiment analysis as a classification problem where the aim is to label pieces of text by a sentiment orientation, we can use a variety of knowledge-based techniques to perform this task and a variety of machine learning methods to create the necessary classification models (knowledge) from data [3]. Sentiment Analysis is the study that analyzes people's opinions and sentiment towards entities in text B [1]. Data Mining is the process of finding relationships and patterns within large sets of data to predict outcomes through data analysis [9]. Therefore, a mechanism that can automatically distinguish the opinion or viewpoint from the text is needed.

The researcher will classify and assess the points of view in this article as well as the textual sentiment of the student toward the implementation of flexible learning. Sentiment Reasoning through lexicon-based approaches will be used. This approach can be further classified into dictionary-based approaches and corpus-based approaches. In the dictionary-based approach, a small set of opinion words is collected manually as a seed. Then well-known dictionaries [12].

Objectives of the Study

The aim of this study is to focus on records gathered from the College of Computer Studies students. Students' feelings and perspectives on the implementation of a flexible learning modality as a medium of instruction are taken in the texts. The data is fed into a machine learning tool known as Orange, which produces sentiment analysis and topic modelling results. Explicitly, the study sought to answer the following objectives:

1. Classify the textual commonly occurring words in the gathering of data through a word cloud.
2. What is the textual sentiment of the gathering of data using the Lexicon-Based approaches and Heat Map?
3. What are the concealed concerns or topics that are predominant in the different articles as a result of using Latent Semantic Indexing (LSI)?

Lexicon-Based Approach

Application of a lexicon is one of the two main approaches to sentiment analysis and it involves calculating the sentiment from the semantic orientation of words or phrases that occur in a text [6]. For the most part, a piece of the text message is interpreted as a bag of words in lexicon-based approaches. Following this representation of the message, all positive and negative terms or phrases within the message are given sentiment values from the dictionary.

Sentiment Lexicon

The sentiment lexicon constructed contains about 6300 words. It was generated manually with the application of SentiWordNet as a baseline [29]. Each word in the lexicon has assigned a value representing sentiment in the range of −100 (most negative) to 100 (most positive). From empirical knowledge, it is known that some of the positive and negative words sometimes occur with neutral meaning in a sentence context. For example, the sentence "Enjoying my lazy Sunday!!" represents a positive message that contains one positive (enjoying) and one negative (lazy) word. It may be difficult in such a case to decide between positive and negative. In an effort to alleviate this issue, besides the sentiment value, for each word from the lexicon we estimated a conditional probability (denoted by P) as presented in Eq. 1. [15]

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P (positive|w) for positive w
P (negative|w) for negative w

Latent semantic indexing (LSI)

Latent semantic indexing (also known as Latent Semantic Analysis) is a way of evaluating a series of documents to find statistical co-occurrences of words that appear together, which subsequently provides information about the themes of those words and documents. Latent semantic indexing is an extension of the Vector Space Model (VSM) [25]in which the dependencies between terms are explicitly taken into account in the representation and exploited in retrieval. This is done simultaneously modelling all the interrelationships among terms and documents [14]. Latent semantic indexing is an indexing and retrieval method that uses the singular value decomposition (SVD) mathematical methodology to find patterns in the relationships between terms and concepts in an unstructured collection of text. The ability of LSI to extract the conceptual content of a body of text or a bag of words by creating connections between phrases that occur in similar contexts and word counts in documents is a significant characteristic of the technology. The SVD of A is denoted as $A = USV^T$ where U is a t × m orthonormal matrix ($U^TU = I_m$) whose columns define the left singular vectors, V is a d × m orthonormal matrix ($V^T V = I_m$) whose columns define the right singular vectors, and S is an m × m diagonal matrix containing the singular values of A decreasingly ordered along its diagonal: $\sigma_1 \geq \sigma_2 \geq \cdots \geq \sigma_r > \sigma_{r+1} = \cdots = \sigma_m = 0$, where r = rank(A). This decomposition is unique up to making the same permutations of columns of U, elements of S, and columns of V (rows of V^T) [21].

2. METHODOLOGY

Research Design

This study will use investigative analysis which examines evidence or knowledge that is already available in order to make a meaningful evaluation of the results. It entails a thorough examination and evaluation of available data in an effort to clarify a complex phenomenon using an open-source machine learning tool called Orange. The data was gathered from the College of Computer Studies Students (n=403) of Eastern Samar State University during the school year 2020-2021. The students were questioned, "What are your thoughts on the abrupt change in learning from conventional to flexible learning as a means of instruction?". The collected data is then translated to a digital format and compiled into a single data set. The documents included forum and e-mail transcripts. Data were analyzed by structurally and texturally describing the phenomenon [20].

Data Mining Tool

In order to carry out experimentations and implementations, Orange was used as the sentiment analysis tool; it is an open-source data visualization and analysis tool. Orange consists of a canvas interface onto which the user places widgets and creates a data analysis workflow. Different visualizations, such as scatter plots, bar charts, and trees as well as dendrograms, networks, and heat maps, showing a data table, selecting features, training predictors, comparing learning algorithms, have all been highlighted in Orange. The creation of a data analytics system can be achieved by integrating the various widgets Figure 1 depicts the study's data analytics system in which the researcher will employ five different widgets; File, Data Table, Tree, Tree Viewer, and Distribution.

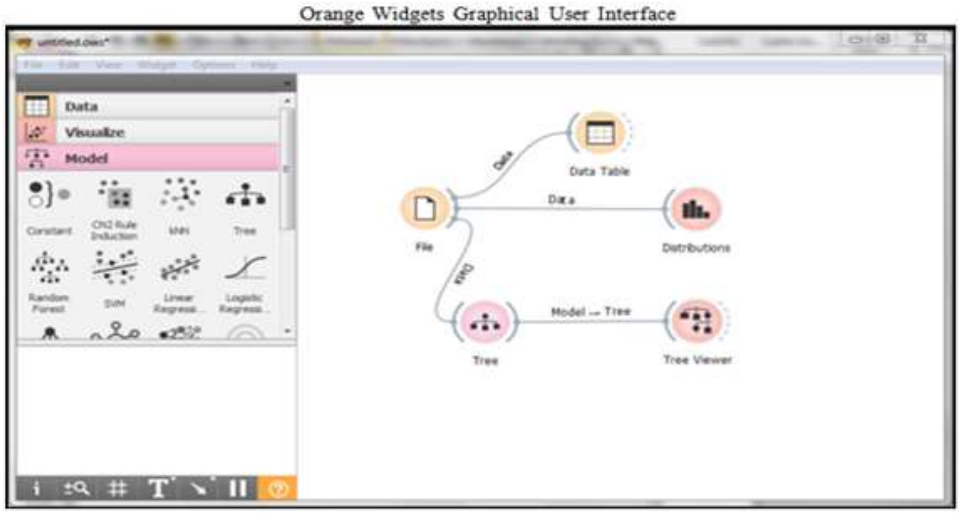

Figure 1. Screenshot view of Orange Widgets

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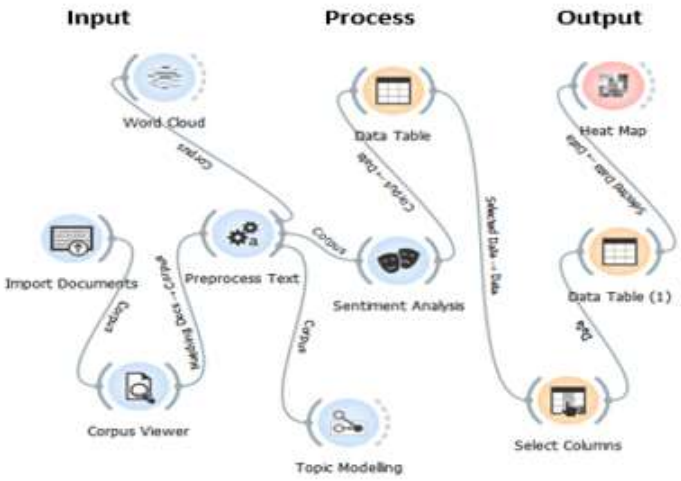

Figure 2. Research Framework base on Orange

3. RESULTS AND DISCUSSION

Based on the results, some interesting influences have been established in this study, which is addressed below. With respect to work on sentiment analysis under the Lexicon-based approach, sentiment analysis receives different terms. Within these common terms, the researcher found the most commonly used terms by the students in their separate answers were displayed in a word cloud produced from the corpus of papers (Shown in figure 3). The terms online, internet, difficult, hard, slow, learning, access, flexible, conventional, time, and challenging were found to be the most frequently used in the corpus of papers, among others. This indicates that students have difficulty understanding and learning about the implementation of flexible learning for computing students.

Figure 3. Word Cloud

The corpus was loaded into a sentiment analysis widget that uses lexical approaches to analyze the sentiment of each document. Table 1, which documents student 2, student 21, student 24, student 25, student 26, and student 31, were deemed to be positive records. This suggests that the students who wrote the aforesaid documents had a favourable sentiment toward the implementation of flexible learning.

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Student 18, student 19, student 20, student 22, student 23, student 27, student 28, student 29, student 3, student 30, student 32, and the rest of the students were categorized as negative documents based on the compound value of their sentiments, as indicated in table 1. This would entail the students using several negative words in their writing which might be attributed to the Table 1.difficulty they have with flexible learning. This information agrees with the results of the word cloud in Figure 3.

Table 1. Documents with positive and negative sentiments analysis results

title	name True	pos	neg	neu	compound
10	Student 18	0.036	0.202	0.762	-0.9757
11	Student 19	0.096	0.219	0.685	-0.9543
12	Student 2	0.102	0.091	0.807	0.5473
13	Student 20	0.043	0.119	0.838	-0.8296
14	Student 21	0.105	0	0.895	0.4767
15	Student 22	0.053	0.139	0.809	-0.6369
16	Student 23	0.016	0.047	0.937	-0.3818
17	Student 24	0.081	0.033	0.885	0.7184
18	Student 25	0.135	0.037	0.828	0.9689
19	Student 26	0.106	0.066	0.828	0.9416
20	Student 27	0.066	0.082	0.852	-0.1307
21	Student 28	0.01	0.07	0.92	-0.7605
22	Student 29	0.047	0.112	0.842	-0.7713
23	Student 3	0.034	0.134	0.832	-0.8102
24	Student 30	0.09	0.091	0.82	-0.024
25	Student 31	0.137	0.045	0.818	0.7717
26	Student 32	0.067	0.403	0.529	-0.9801
27	Student 33	0.066	0.072	0.863	-0.0748

The data generated by the Lexicon model was loaded into a heat map widget to illustrate the sentiment analysis results. The heat map uses a set of colors to represent the thoughts expressed on each page. Negative emotions are represented by the color blue, whereas pleasant emotions are represented by the color yellow. Figure 5 shows that most of the documents lean toward the color blue, implying that most of the students included terms labeled as negative in their answers, resulting in the compound value of most documents being negative.

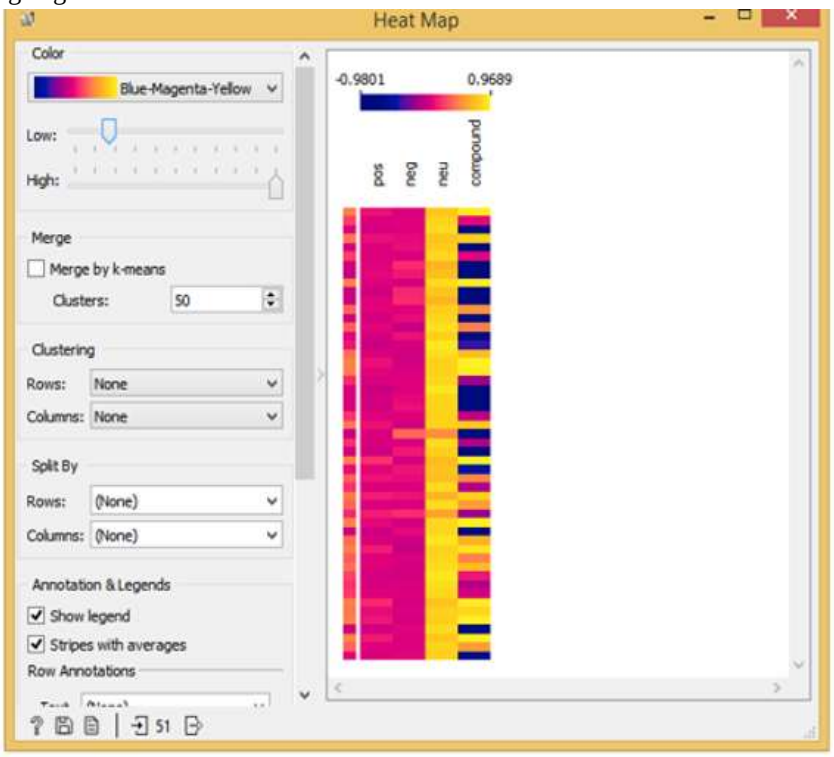

Figure 4. Heat Map

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Latent Themes

The latent topics within the corpus of documents were loaded into a topic modelling widget that used latent semantic indexing to identify them. The model, as illustrated in Figure 5, was programmed to generate five (5) topics, each with ten (10) words. Latent themes for the created subjects were created based on the researcher's theoretical stance (shown in Table 2).

Latent theme topic 1 It discusses the *students' difficulty in learning that students face when using flexible learning.* As an instructor, I've noticed that students who experience barriers and challenges in the field of computers employing flexible learning have poor memory and understanding of the material. Many colleges and students have been forced to move to virtual learning as a result of the Coronavirus pandemic, which has been an adjustment for many who are used to in-person classes. Some institutions have stated that they will continue to offer purely online classes in the fall semester. This crisis has transformed many aspects of life, especially higher education. Recent polling from College Reaction in April showed that 77% of more than 800 college students surveyed said they felt distance learning is worse or much worse than in-person classes [16]. The barriers to participation that external students may experience are particularly evident in collaborative learning tasks through group work, group presentations, and group assessments [10]. Some of the issues experienced can be personal such as anxiety associated with using technology; being out of one's comfort zone; (perception of) inequity in assessment, particularly in "group" assignments; and, the (perceived) inability or difficulty in peer interaction, particularly in presentations [27].

Latent theme topic 2 is that when it comes to flexible learning modalities, *students have a hard time accessing the internet.* Poor internet connection is an exciting and rewarding issue for students who are diligent and eager in accomplishing their activities using a poor internet connection. They view a poor internet connection as a challenge and experiment with various approaches to complete the tasks assigned to them. Students cited poor internet connectivity as one of the major challenges in their online distance learning. According to a study released by the Philippine Institute for Development Studies (PIDS), a bad Internet connection is a more pressing problem in the Philippines compared to poverty and corruption,[23]. Online learning is a form of a live synchronous platform where it requires both parties to have a good and stable internet connection [17]. Educators have worried for years about the "homework gap," where students without high-speed internet access at home earn lower grades and are less likely to attend college [28]. Limited internet access is a major concern in implementing blended learning Garrotte [11].

Latent theme topic 3 talks about the *student's difficulty in addressing the internet connection in accessing flexible learning.* This topic is closely related to the previous one. A student who struggles to learn and grasp using flexible learning approaches is unlikely to complete their assignments. This is due to their incapacity to analyze the fear, which results in their failure to come up with a solution. Internet connectivity is a popular complaint being highlighted among teachers and students as the Philippines is still one of the countries in Asia with slow internet. Wireless connectivity is another challenge as the nation has seen on television or read news reports of teachers and students going up on mountainsides or on hilltops to catch wireless signals to use the internet [2]. According to the Akamai State of Internet Report for the 2nd Quarter 2016, the Philippines ranks 6th out of 15 Asia-Pacific countries with an average mobile internet speed of 8.5 Mbps, Department of Information and Communications Technology (2017). The report shows that the Philippines is still way behind in terms of internet connectivity.

Latent theme topic 4 concerns the *poor internet connection concerning the flexible learning method.* A student who is incapable to perform modest flexible learning exercises feels concerned and unmotivated when faced with major activities. It also found that 56 percent reported an impact on their studies from their lack of access to appropriate online course materials and 52 percent said that a slow or unreliable internet connection had hampered their learning [18]. Students are prone to fear, which causes them to provide an incomplete variety of their assigned tasks. Rost (2019) found that online environments can generate a feeling of anonymity to students which makes it easier for students to withdraw or participate minimally or completely disappear from the course. These theories showed that students in online learning suffered from anxieties that lead to a lack of participation. Having too many activities during online class and less time teaching has left students unmotivated to attend class as their time was devoted to making them instead [5].

Latent theme topic 5 is *students' determination to study their lessons through flexible learning methods.* While some students find flexible learning to be a tough mode of learning, others are finding ways to learn at their own pace and eventually submit their assigned tasks. Some students who are unfamiliar with flexible learning methods use the trial and error method to effectively complete a task. . And while most are learning new things online and navigating the internet, [19] believed that issues of digital literacy will prevent some students from successfully taking full advantage of online learning resources [12].

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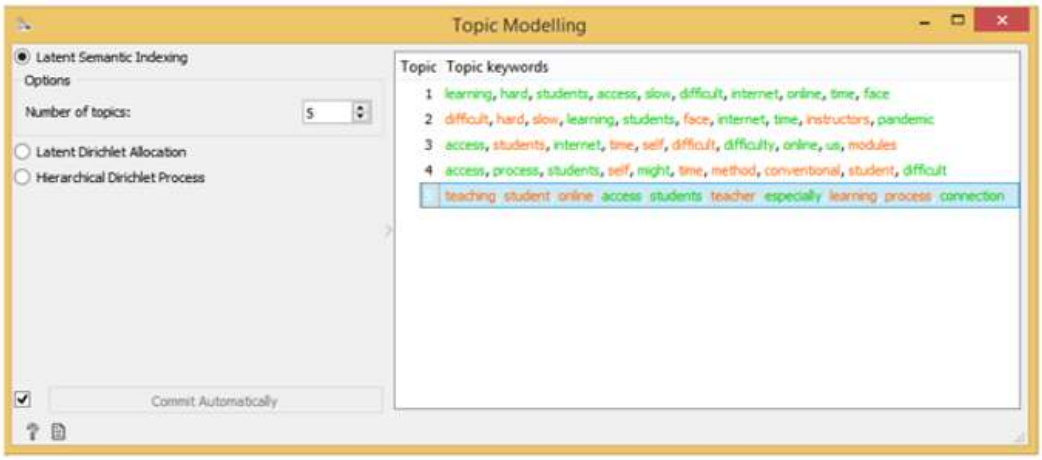

Figure 5. Topics Generated using LSI

Table 2. Latent Themes of the Topics generated through LSI

Topic	Latent Theme
1	Students' difficulty in learning that students face when using flexible learning
2	Students' difficulty accessing the internet
3	Students' difficulty addressing the internet connection
4	Poor internet connection concerning the flexible learning method
5	Students' determination to learn their lessons using flexible learning

4. CONCLUSION

A corpus of papers from students was compiled to identify the thoughts and attitudes of students concerning the deployment of the flexible learning modality. Lexical sentiment analysis and topic modeling module were used to process the documents. It was discovered that the majority of students oppose the use of flexible learning modes of instruction. The fundamental themes revealed by topic modeling were mostly concerned with the difficulties and challenges students face while using flexible learning approaches. Some students have also been observed developing novel learning approaches to address the flexible learning assignments that have been assigned to them.

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