

Transforming Student Feedback into Institutional Action Plans: A Data-Driven Approach

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Abstract: Surveys serve diverse purposes within most organizations. Floating them has evolved into a way for the voice of the customers to express themselves, whether anonymously or brazenly. Several learning institutions and universities have institutionalized data-driven processes and allow students to answer surveys to collect feedback covering their satisfaction in the entire course as the semester concludes. In Jose Rizal University, student feedback is gathered in several survey instruments. One is the Canvas Experience Survey, through which students share their views on their blended learning experience. It seeks feedback on areas where the teaching and learning process could be improved. This research seeks to develop a system that empowers an educational institution to enhance their blended learning offerings by analyzing student feedback for areas of improvement. An analysis of the student responses from Canvas experience survey is presented quantitatively and a qualitative text mining approach comprising of text pre-processing using lemmatization and n-gram, aspect extraction, sentiment analysis employing VADER, and strategic recommendatory statement action plans shall be accessed by institution's respective groups supporting them to the continuous improvement of the teaching and learning cycle implementation of blended learning courses. As aspects were extracted from responses to each question, statement action plans are accessed by the respective office to address these concerns. It expedites the University stakeholders in course improvement cycles in courses offered under the blended learning programs of the University. A concise and periodical implementation of this study is advocated to collect student feedback in a manner where actual comments from students undergo mining and thus evolved to the most important aspects which leads to recommendatory action plans.

Keywords: student feedback, student learning experience, text mining, action plans

1. Introduction

The importance of student feedback in the teaching and learning cycle cannot be overstated. Academic institutions using traditional face-to-face, blended, and completely online learning as underlying methodologies are in the same pace. Student feedback holds useful statistics about their intellectual experiences in gaining appropriate knowledge. It can include facts about teaching methodologies, evaluation design of student assessment, utilization of institution facilities, and other elements of teaching. This can shape a key factor for educators and school owners aiding them in advancing their internal policies and systems. In this paper, the acquisition of student feedback through mining their comments that come directly from student views will be acquired, mined, and translated to action plans. Shankararaman, et. al. (2017) illustrated the incessant learning and teaching improvement cycle as follows. Step 1, the learners' experience when the instructor delivers the course. Step 2 details on when feedback is given by students about their experience. This feedback may contain both quantitative and qualitative information. In step 3, the lecturer analyzes the feedback, and lastly in step 4, the instructor re-designs the teaching approach and the curriculum content based on the findings of the analysis.

Surveys have evolved into customs of gathering customer-related data and have

become the anonymous or brazen expression of the customer's voice. Many learning institutions and universities have made it a routine to have students fill out surveys to gather feedback on their overall satisfaction as stakeholders in the entirety of the course that has ended or before it culminates. Whether or not these Rizalians are overjoyed with their environment in learning and experience, their treatment as customers has always been fundamental to the University's academic divisions in accordance with the institution's mission and vision. These surveys include Likert-scale and subjective questions, which are classified as quantitative and qualitative, respectively. These findings are certainly measured and analyzed. Lower items of outcome are subject to action plans for phasing out and disposing.

By analyzing students' comments on assessment, problems students are struggling with can be identified and provide appropriate solutions for decision makers to address them to enhance the learning process (Ibrahim et.al., 2018). The development of online delivery has changed how it is acquired and shared. The faculty are keen on improving web based taking in can profit with getting formal and casual feedback flows existing in in-person classes and how this engages transfer on the web (Meikleham, 2018).

A growing body of survey analysis has been implemented in the University and has investigated customer satisfaction, specifically on laboratory, library, and services. In the academic side, there are classroom learning experience surveys and the Canvas experience survey. However, little attention has been given to students' written feedback as resolutions for this were maintained and perceived to address based on the quantitative results of the survey. There are only focus group discussions dealing with low-standard results of the investigation method. This study investigates and addresses the disparity in the students' slants of written feedback with emphasis on their emotional responses and sentiments as their written comments are analyzed and will serve as the basis for the improvement of their blended learning experience.

2. Blended Learning and Student Interactions

Blended learning, as defined by Irawan et al. (2017) and Thorne et al. (2003), allows for the integration of innovative advances in technology that pertains to interactional online learning and student participation in traditional mode of learning. Blended mode of learning is a form of education that combines the use of technology with conventional instructor-led classroom training (Bersin, 2004). Husamah (2014) identifies four key components of blended learning: 1) technology-enhanced learning; 2) a combination of face-to-face learning, autonomous learning, and online mode of learning; 3) learning effectively; and 4) parents and the faculty as facilitators as well as supporters.

In the objectives of this study as modeled in the research questions, it is mentioned to create a system that appertains to course feedback mining, it allows educational institution heads to examine deficiencies in the learning experiences of their clients from the blended mode of learning process and accordingly upgrade them. Because many scholastic institutions place high value on quantitative inputs, and to the process of measurable correlations, decomposed and presented to the administrators of the University. In any case, a student's subjective remarks are not completely impeded. The conceptual framework of the research in this paper focuses on collecting and examining critical information from students' perceptions. Similarly, this framework provides a basic structure for implementing a course feedback mining system that universities can utilize to respond to findings from their learning management systems.

Jose Rizal University has been implementing this framework since 2007 when it challenged the application of blended learning modalities. Selected General Education courses have been designated as Course Redesign Programs (CRPs) by the institution. In-class face-to-face meetings with the students were decreased to 1.5 hours in the Course Redesign Program (CRP), and students from a variety of General Education courses were greeted with an online collaborative set of learning activities. The Rizalian learners appreciate their independence to complete online assignments and activities in their spare time, on or off campus. The University has established a separate office, the Institute of Technology-Based

Learning (ITBL) for the time being who is in charge of the supervision of courses under the blended mode of learning. The Institute of Technology Based Learning (ITBL) is under the mandate of the Vice President of the University for Quality, Linkages, and Technology-Enabled Learning. ITBL offers thirty-three courses at several colleges within the university. Rizalians have long owned the benefits of mixed learning, and the academic council has enhanced course learning outcomes (CLOs) through this initiative.

2.1 Understanding the Blended Learning Model using Canvas LMS

ITBL operates as a medium that provides a mixed approach to processes from a canvas learning management system. It is correspondingly one of the ingenuities of ITBL to conduct the Canvas Experience survey which aims to gauge on the consummation of the students in its use.

According to some researchers, the origins of LMS can be tracked as rudimentary training management systems, which later evolved into e-learning platforms (Kats, 2010). LMSs bond the students with the learning gist and content in a normalized way through software and programs explicitly created for their learning. They oversee learning point, substance, and learners and control and manage with the learning forms and the presentation of the students by methods for recording the activities on computers and showing statistics and plans (Alenezi, 2018). Every school year in two semesters, the Institute of Technology-Based Learning (ITBL) conducts the Canvas Experience Survey twice, in the prelim term and in the final term.

Jose Rizal University uses surveys because it is successful and requires customer experience management (CEM) programs to collect, integrate, analyze, and disseminate customer metrics. In summarizing survey responses, it applies the calculation of metrics using the Top Box Score. This is the percentage of respondents who gave the best answers on the scale. Two examples of these surveys in the academic division are the Classroom Learning Experience survey and the Customer Satisfaction Survey. The responses of the top box score, which the "strongly agree" is obtained due to the following advantages: a) it simplifies the analysis, reviewing only 1 item instead of 5 or more, b) The comparisons are quick and simple, and they compare results across variables, top box scores allow for more efficient side-by-side comparison of results, and c) trends become easier to spot, as the survey is conducted every end of term, tracking metrics over this time, the Top 2 Box scores help identify trends in the data.

3. Research Questions

With the goal of calculating a large amount of comment responses from students in the blended mode of learning course, there is little to zero concentration given to qualitative student opinions, this paper intended to principally mine student feedback using text mining approach. More so to support administrators of the blended learning programs of the University and prescribe course improvements action plans making the system adaptive to the student learning experience. The focal intention of the study was to create a system for mining feedback that embodies the mining of the student feedback leading to the prescription of recommendatory action plans to the corresponding administrative division.

Specifically, the study ought to answer the following research questions as pursues:

Primarily, the study seeks to address the research question on how key themes can be identified from student feedback on their blended learning experience. Second, how can sentiment analysis be used to determine the overall sentiment towards different aspects of the feedback, thereby enabling the development of targeted recommendations. Lastly, how would the feedback mining system embody its recommendations to the administrators and key personnel of the blended learning program?

The goal of this project was to look into student comments about their participatory involvement in a blended mode of learning. It sought to comprehend and apply a variety of actionable information known as topic sentiment in order to improve the process of learning

and teaching process and provide the Rizalians with a more constructive blended mode of learning experience.

4. Research Design

Jose Rizal University's instrument is the Canvas Experience Survey, it is to be used in this research's data collection. The Canvas Experience survey consists of 27 questions divided into three sections. The first section includes three course information questions. The second section comprises 21 Likert-scale questions related to accessibility, instruction, assessment, and collaboration. The final section contains three open-ended questions about students' least and best Canvas features, as well as suggestions for improvement. Anonymity is the method by which students respond to online surveys. The responses of the students will come from one course in the blended mode in the University's ITBL-managed courses list. In the conduct of this study, the students shall answer the survey using the 21 Likert questions and the 3 qualitative questions from which they will be asked to type down their opinions and ideas that concern them relating to their actual Canvas experience. In this interval, the course information is removed to secure anonymity of the responses.

For course selection, the researcher crafted an analysis of the 4 surveys conducted. Under the blended learning program of the university, there are 18 courses enrolled in the first semester and 15 in the second semester.

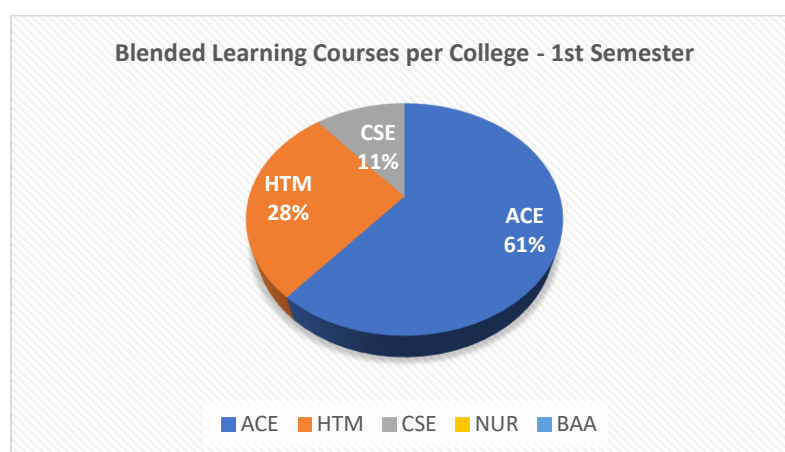


Figure 1. Percentage of Blended Learning Courses 1st Semester

The course distribution illustrated in Figure 1 reveals that the College of Arts, Criminology, and Education (ACE) houses the majority of courses with 61% (11), followed by Hospitality and Tourism Management (HTM) at 28% (5). Computer Studies and Engineering (CSE) contributes 11% (2) to the total, while Nursing (NUR) and Business Administration and Accountancy (BAA) have no course offerings.

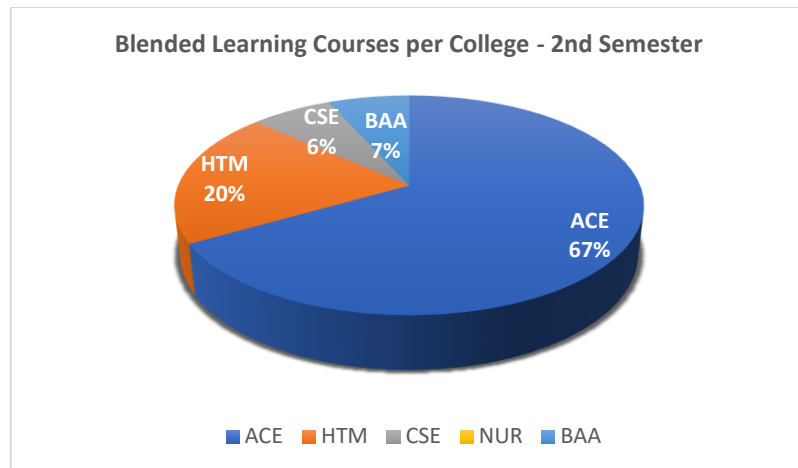


Figure 2. Percentage of Blended Learning Courses 2nd Semester

As illustrated in Figure 2, the course distribution for the second semester shows 10 courses from ACE, 3 from HTM, and 1 each from CSE and BAA. Nursing did not offer any courses. To determine which courses elicited the most negative feedback on Canvas, the study aggregated responses selecting the "Strongly Disagree" option (Bottom Box) from Likert scale questions, as opposed to the "Strongly Agree" option (Top Box). Question 15, which measured the perceived connection between Canvas materials and classroom instruction, is an example of such a question which says, "I notice that course materials on Canvas have connection with the face to face (classroom) lesson content."

Table 1. *Likert Scale - Bottom and Top Box*

Bottom Box				Top Box
Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
1	2	3	4	5

The bottom box quantifies the most unsatisfied students as seen in Table 1. Here are the stages on how the course was identified with the most Strongly Disagree responses:

- 1) For each Likert-scale question in this survey, the total number of responses of the bottom-box (Strongly Disagree) was retrieved.
- 2) Per total Strongly Disagree responses in each question, the course with the highest bottom-box response is derived.
- 3) From this result, an aggregate count of all courses with the greatest number of Strongly Disagree response is stemmed.

From the data of the survey conducted in the Preliminary term of the first semester of SY 19-20, the course HIS C101- Readings in Philippine History appeared 26 times as the highest number of students who responded Strongly Disagree in the questions. A total of 506 bottom box responses were recorded. In the Final term of the same semester, the same course, HIS C101- Readings in Philippine History appeared 23 times as the highest number of students who responded Strongly Disagree in the questions. A total of 768 bottom box responses were recorded. In the second semester of the same school year, the Preliminary term run of the survey recorded the course, HUM C102 Art Appreciation with 14 times appearance as the highest number of students who responded Strongly Disagree in the questions. A total of 204 bottom box responses were recorded. For the Final term of the second semester in the same school year, the course NST C102 National Service Training Program 2 has appeared 22 times as the highest number of students who responded Strongly Disagree in the questions. A total of 683 bottom box responses were recorded.

Table 2. *Summary of Strongly Disagree Responses*

Canvas Experience Survey Run	Course	# of Appearance with SD Responses in Each Question	Total SD Responses	# of Respondents	%
Prelim Term 1st Semester SY 19-20	HIS C101 - Readings in Philippine History	26	506	2914	17.4
Final Term 1st Semester SY 19-20	HIS C101 - Readings in Philippine History	23	768	3935	19.5
Prelim Term 2nd Semester SY 19-20	HUM C102 - Art Appreciation	14	204	6679	3.1
Final Term 2nd Semester SY 19-20	NST C102 - National Service Training Program 2	22	683	1520	44.9
			2161	15048	14.4

An analysis of the tables reveals that HIS C101- Readings in Philippine History consistently received the most negative feedback (bottom-box responses) during both 1st semester evaluations. A summary of these findings is presented in Table 2.

HIS C101- Readings in Philippine History is overseen by the History department under the College of Arts, Criminology, and Education (ACE). It is a course offered across all programs of the University every first semester and by petition of 17 or more students in the second semester or if a request from graduating students.

Looking at this data, the researcher has turned its focus on this course. HIS C101 is a code for Readings in Philippine History. It is a part of the General Education curriculum in the University in the late 2000s. As it is categorized as a General Education course, it focuses on the meaning and significance of history and the key role that historians play in society. It introduces the students to the disciplines and major schools of thought that affect the hermeneutics and writing of history. The students are trained to collect, organize, and examine information and write sequential narratives in several styles of academic history through understanding the primary activities of the historians, their assumptions and limitations, and their social responsibility. HIS C101 is a blended learning course delivered through a weekly 1.5-hour face-to-face session and online Canvas activities. To enhance the learning experience for Rizalian students, their feedback on the course will be analyzed using text analytics. This study will focus exclusively on comments from students who are officially enrolled in the course.

4.1 Mining Learner Feedback

The purpose of text analysis implies text data mining or text mining. This is to derive high-quality information from the text. Typical text mining tasks include classifying texts, creating detailed classifications of text clustering concepts or entity extraction, summarizing sentiment analysis documents, and modeling correlations and entity relationships (Gottipati, S. et al, 2017).

Throughout this study, the next step demonstrates a text analysis approach. The first stage of the completes the data collection. Learner comments worked with input of preprocessed data. The second step is to use the tokenizer to extricate individual phrases and sentences. Tokenization refers to splitting text into various units during data preprocessing. Text may be tokenized into a single word, phrases, sentences, and paragraphs. The delimiters used in this stage differ depending on the data set (GI Nitin et al, 2015). The most commonly used words in English will be removed in the stop word removal, rendering them useless in text mining. Stop words are language-specific practical words that have no meaning and are thus eliminated from documents throughout the data preprocessing stage (GI Nitin et al, 2015). The process will also include POS tagging and transform cases. The topics are extracted using clustering techniques in the third phase. The final stage is visualization.

4.2 Learner Motivation from LMS Experience

The study utilized quantitative and qualitative design using expert sampling to capture knowledge rooted from the students enrolled in the blended mode of learning program. The study also used content analysis. To enhance learner motivation, students in all sections of HIS C101 – Readings in Philippine History in the first semester were the participants of this study. The questions of the Canvas Experience Survey as the questionnaire instrument were developed by experts composed of the University Vice President for Quality, Linkages, and Technology Based Learning, the Director of the Institute of Technology Based Learning, and an ITBL consultant. The researcher subjected the computation of the Cronbach alpha score

for internal consistency and validity checking.

Nonetheless, to motivate students, the facilitation of opinion mining was conducted, the 21 Likert-scale questions had 3 questions asking for their further opinions and remarks. These questions were used to allow participants to articulate, elicit, and elaborate on their experiences in the context, with the goal of collecting an anonymized qualitative collection of ideas, opinions, and suggestions. This phase of data collection will be based on text data feedback provided by students in text format. To ensure the integrity of the collected feedback, the feedback will be collected after students have completed the entire course. A pilot test of the survey was conducted to N=21. The Canvas Experience Survey was categorized by the experts into Accessibility, Instruction, and Assessment and Collaboration.

5. Results and Discussion

In the first and second research questions, 1) how key themes can be identified from student feedback on their blended learning experience and 2) how sentiment analysis can be used to determine the overall sentiment towards different aspects of the feedback, thereby enabling the development of targeted recommendations, the following are discussed.

Employing the text mining and analytics process, the student comments underwent the text pre-processing stage. Twenty-one Likert scale questions were used to gather student views. The dataset used were the comments of the students who attended the courses under the blended learning program. The comments were collected during one of the two feedback cycles in the second semester of the academic year. There was a total of 140 student comments utilized as responses evaluated in this study. As their comments went through pre-processing, student responses have undergone stop words removal, lemmatization, n-grams, and POS tagging were employed in the program.

140 student feedback responses were used, and aspects were generated for the entire survey questions. Using term frequency-inverse document frequency (TF-IDF), the aspects' frequency was determined. From these results, NN, NNS and NNP are the most important POS for identifying keywords. These words can be used in different senses and their positive and negative scores may be different in other senses. It is equally important to calculate the sum of positive and negative score from all sense of the tags (Saqib, et. al, 2020). In the course of extracting the aspects, these POS tags are the most derived.

Mounting from the aspects and its frequency, a summary of the Canvas Experience Survey questions, the aspects, and its top frequency count is presented. Gaging from the questionnaire, the aspects, frequency of the aspects, the sentiment score of the comments written by students for each question was computed using VADER sentiment analysis tool and the compound scores which is derived from the sum of the valence scores of each word in the lexicon which is then normalized between -1 and + 1, most extreme negative and most extreme positive, respectively. Using bigrams, the results evaluate two words at a time before assigning an overall sentiment to the comment. This allows evaluation of double negatives which permits an enhanced valuation of the sentiment.

Table 3. *Summarized Aspect Terms*

Question #	Aspects	Frequency	Numerical Value	Sentiment Score	Sentiment
1	Canvas Account	10	3.84	0.097426	Positive
2	Access Course	17	3.68	0.086712	Positive
3	Access Canvas Account	20	3.83	0.084185	Positive
4	Canvas Account	20	3.67	0.098726	Positive
5	Help	35	3.52	0.026009	Negative
6	JRU	26	3.81	0.06834	Positive
7	Canvas	5	3.61	0.155156	Positive
8	Course	17	3.78	0.203494	Positive
9	Version	18	3.82	0.246295	Positive

10	App	20	3.54	0.118517	Positive
11	Course	18	3.61	0.08526	Positive
12	Help Course	18	3.66	0.279807	Positive
13	Course	16	3.66	0.294793	Positive
14	Course	16	3.73	0.176621	Positive
15	Instructor	19	3.84	0.118729	Positive
16	Instructor	17	3.76	0.249228	Positive
17	Canvas	20	3.83	0.170013	Positive
18	Canvas	22	3.56	0.149984	Positive
19	Canvas	9	3.79	0.110239	Positive
20	Course	29	3.74	0.07221	Positive
21	Time	45	3.57	0.117794	Positive

Table 3 presents a summary of the Canvas Experience Survey question #, the aspects, frequency, numerical score value, its corresponding sentiment score, and the sentiment. To maximize the presentation of results, a correlation between the student responses in the Likert scale acquiring their numerical value alongside their qualitative comment with its sentiment score were retrieved and Pearson correlation value is $r = -0.426445$ which denotes a moderate relationship. These results show only a restrained link as they correlate their agreement to the Likert responses vis a vis the sentiment of their comment. The correlation analysis between quantitative scores and qualitative comments stated in this study is performed on all the courses between the Canvas Experience Survey questions as they are linked to the aspects within the qualitative feedback. This would allow the ITBL and the Academic council to profit more meaningful rationalizations for the high or low quantitative scores for the student evaluation questions.

Consequently, the results show the most important aspects of the student responses and their sentiments. These identified aspects within the run will be clustered upon which is the nearest topic available based on the aspects detected as shown in Table 3. Aspects were extracted from each question and the most positive retort is “*time*” which denotes enough time was given to solve assessments in Canvas. The most negative is “*help*” which is associated in denoting less or no easy help is received with Canvas account related concerns.

For the last research question, how would the feedback mining system embody its recommendations to the administrators and key personnel of the blended learning program, on the aim of this study to develop a course feedback mining system that extracts student comment responses to gain their sentiments, alongside this goal is the provision of recommendatory action plans to improve the learning and teaching cycle of courses in a blended learning environment.

To the learners, the interface of the system starts with the Login page with user credentials shown in the top left of Figure 3. The system allowed the students to answer a survey subjecting on their experiences encountered while partaking into a learning management system, identified to be the Canvas LMS. A presentation of the Canvas Experience Survey questionnaire is available for the students. Institutions implementing traditional face-to-face, blended, and fully online learning leverage on feedback analysis as influential approach in its modernization of design in quality, efficiency, and effectiveness.

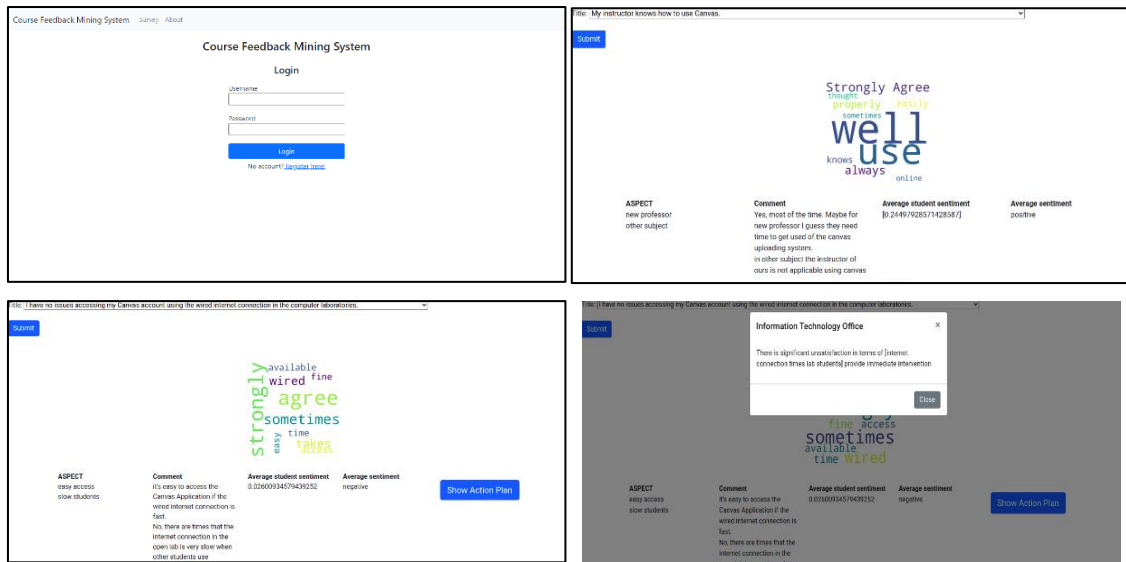


Figure 3. System Screenshots

To the faculty and administrators, as the result of topic modelling and aspect extraction of this study, the aspects shall then be integrated to generic action plans that forward or present to the specific division of the University that is capable of handling the overall aspect of the student feedback as shown in the top right screenshot in Figure 3, a question item from the survey that displays a result for a positive sentiment. It shows a word cloud of the aspects, the aspects, student feedback, the sentiment score, and the sentiment interpretation. The word cloud allows the administrative users of the system the most frequent aspects from the student responses as how they feel about the related question. At the bottom left screenshot in Figure 3 is a result of a negative sentiment and its word cloud which powerfully visualizes what the students feel and think.

As the study values the use of visualization, the system exemplifies a view of the sentiment polarity score of the student responses for each question in the survey for which when hovered reveals the actual score. This is a pleasing way to examine the results of the sentiment classification results of the study. The results of the feedback analysis will be the source of the action plan recommendation, which will be based upon the sentiment of the students. An algorithm is devised to stack aspects that forwards 3 offices in the University. The recommendatory action plan will result from an analysis of the sentiment results and their aspects.

Reports shall then be presented through the system as it displays the results of the feedback, numerical values, sentiments through visuals and summary-based presentation. The system also presents the real-time visualization results as the Canvas Experience Survey is conducted in the course which equates to the 18-week course term student feedback. Action plans may easily be the basis for decision-making to support the administrators as they are formulated and retrieved for accomplishment and compliance through the appropriate office as another run of the survey is on before the end of the 18-week term. Figure 3 bottom right screenshot shows an interface of the action plan that is intended for the Information Technology Office. The aspects have been filtered for the three divisions in the University who shall acclimatize the necessary action plan.

6. Conclusions

Student motivation is equally important to fostering a sense of agency and participation in the learning experience. Most significantly in this study, the feedback analysis initiated from the processing of the student feedback, hence, their comments. These comments underwent the text mining approach that employed preprocessing, aspect extraction, and sentiment analysis. From these progressions, an interface of a complete feedback mining system developed for

the students under the blended learning program was established and it allowed the ITBL, the office of the vice president of the academic affairs of the College division, and the Information Technology office of Jose Rizal University to utilize the output of the system embodied through recommendatory action plans to improve how the students may continue to use the major platform Canvas as the learning management system as the it takes into consideration that the source of the plans came out from student feedback directly. Students under the blended learning program chiefly use the Canvas Learning Management System as the main portal for the learning materials, assessments, source of studying paraphernalia, including communication with the faculty. It is therefore imperative that any circumstance that any stakeholder deems to experience, the feedback that is tantamount to their journey must be properly addressed by the authoritative body, for such the offices in the University. This shall increase learning capability procured by the students and improve the performance of the providers and emancipators of the leaning process flow, thus the faculty. Further, this study which engenders the feedback mining system alleviates the ITBL office and the Information Technology office to address the trepidations of the learners as to ease of access supplementing ease of use as immediate as their feedback has emerged and thus empowering them that they are genuinely addressed.

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