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Sentiment Analysis of Student Evaluation for Teachers Using Valence-Aware Dictionary and Sentiment Reasoner

Kristel Anne B. Telmo*, Kervie V. Alviola, Jazler Jhon S. Desamparado, John Nathaniel A. Cabigan, Cereneo S. Santiago Jr., Richard Aries A. Shimada
Department of Information and Technology, Cavite State University, Cavite, Philippines

*Corresponding Author Email: kristelanne.telmo@cvsu.edu.ph

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Abstract. This paper analyzed the quality of teaching using the Student Evaluation of Teaching (SET). The Valence Aware Dictionary and Sentiment Reasoner (VADER) was utilized to assess textual comments, providing a comprehensive view of teaching effectiveness beyond numerical ratings. The objectives were to identify faculty strengths and areas for improvement based on student feedback, analyze sentiment toward teaching methods, and determine the optimal number of clusters within the dataset. The analysis included 28,222 student comments from three semesters, preprocessed through tokenization, stopword removal, part-of-speech tagging, and lemmatization. A word cloud visualized common terms, while K-means clustering and the Elbow method identified five as the optimal number of clusters. Results indicate that most comments are positive, emphasizing effective teaching methods' role in creating a positive educational experience. The findings suggest integrating machine learning with VADER and expanding the dataset for broader insights. Institutions should develop effective teaching strategies, prioritizing regular feedback collection and analysis.

Keywords: Teaching effectiveness; Student Evaluation of Teaching (SET); Sentiment analysis; Feedback collection.

1.0 Introduction

Student Evaluation of Teaching (SET) is frequently used in higher education to collect feedback from students on the quality of instruction. The goal is to improve teaching methods and obtain perspectives that standard evaluations may not capture. Initially, standardized questionnaires with multiple-choice or Likert scale ratings became more prevalent for evaluating course organization, instructor communication, and student involvement. Student evaluations of teaching (SETs) continue to be widely utilized for gathering student feedback, serving various purposes such as guiding improvements in education, influencing staffing decisions, and evaluating academic programs. The reliability and validity of SETs are currently the subject of ongoing scrutiny and discussion. While some studies suggest that student evaluations of teaching can be advantageous, others highlight potential biases, such as students showing a preference for more accessible courses or participating in popularity contests. Higher education institutions depend heavily on student evaluations to enhance teaching, determine faculty hiring, and influence upcoming courses (Newman & Joyner, 2018). Gathering and combining the feedback from these evaluations is usually complicated due to the personal opinions involved. While the numerical scores offer a way of quantifying teaching evaluations, the comments given in prose form are essential. They can be used to show how students view things, their experiences, and even suggestions that may help in the future. It may not be easy to summarize or evaluate this type of subjective response since there are various kinds of replies due to the language being used subjectively.

At the university level, it is essential to assess how effective a teacher is to ensure that the quality of education is attained. The SET is the tool that drives this assessment process. SET is designed to collect feedback from students about their experiences when learning. The system must score instructors based on quantitative data that measures their performance. However, the qualitative comments or thoughts made by the students need more attention but are often ignored. Although they give much insight into what could be wrong with specific methods or materials used during lectures, such statements are frequently not taken seriously enough, and they miss out on being constructive critics in this way. Quantitative data provides general knowledge, but qualitative feedback offers more detailed and nuanced insights, which may improve teaching evaluations' overall comprehension and efficacy. Yuan and Yang (2019) presented a text analytics model for analyzing comments in Student Evaluation of Teaching (SET) forms. The comments are grouped into three categories: course content, teaching style, and instructor performance, going beyond simple feeling analysis. This allows instructors to discover specific areas they need to improve by using student perceptions. Herold (2019) noted that other institutions can utilize these same remarks for evaluation and peer learning. Emphasizing growth over judgment helps create a culture of ongoing improvement in teaching practice. One is advised to combine numerical scores with sentiment analysis methods. A profound difference exists between rating something and knowing why it was rated that way, providing deeper insights into students' experiences. Moreover, the intrinsic subjectivity of qualitative data (Cheng & Li, 2022) adds even more complexity, highlighting the importance of inter-rater reliability when analyzing comments. This ensures that multiple readers consistently understand the tone and meaning behind them.

This study analyzed student evaluations of teaching at Cavite State University—Silang Campus. The researchers used the Valence-Aware Dictionary and Sentiment Reasoner (VADER) to examine the students' sentiments. Li et al. (2023) stated that student feedback is essential in evaluating effective teaching and giving directions for faculty growth. The research aims to identify the strengths and areas for faculty improvements based on student feedback, analyze overall sentiment toward the instructors' teaching methods, and determine the optimal number of clusters for the 2022-2023 and 2023-2024 first semester datasets. This research aims to add to discussions on effective teaching techniques and evaluating student attitudes. It intends to provide direction for faculty development programs, promote specific improvements in teaching methods, and enhance the overall education experience for teachers and learners. By examining all angles, this study uncovers various dimensions of appraising instruction at higher levels, which will continuously improve and promote innovation in university teaching.

2.0 Methodology

2.1 Research Design

The researchers employed a quantitative, non-experimental method to investigate how students perceive teaching quality, assess feedback, and examine sentiment. The data for this study was obtained from the Student Evaluation of Teaching (SET) at Cavite State University – Silang Campus Human Resource Management. Quantitative research methods are valuable for revealing the relationships between variables and their outcomes. Li et al. (2023) highlighted the impact of project-based learning on enhancing student performance by examining data from various studies, emphasizing the importance of quantitative approaches in educational research. This approach was chosen because it provides unbiased assessment and evaluation, enabling precise numerical descriptions of student opinions, responses, and feelings.

Moreover, using quantitative methods allows for applying statistical methods to detect patterns and trends in the data, which improves the ability to generalize findings because of the larger sample sizes commonly used. Based on the existing SET data, a non-experimental method proved feasible and effective, avoiding additional experimental procedures. The credibility and verification offered by well-known quantitative tools like VADER for sentiment analysis further reinforced the choice, guaranteeing precise and practical insights to enhance educational practices.

2.2 Data Source

The dataset was obtained from the Human Resources (H.R.) department, specifically the Student Evaluation for Teachers (SET) data from 2022 to 2024. The dataset was compiled and anonymized to ensure a comprehensive and representative dataset. Although not directly involved in the research, students contribute essential feedback as

their evaluation forms serve as the primary dataset for sentiment analysis using VADER (Valence Aware Dictionary and sEntiment Reasoner). Their input is crucial for understanding the perceived effectiveness and quality of teaching. Teachers are included as indirect participants as they are the ones being evaluated. The evaluation primarily examines the feelings conveyed in student feedback about teachers' performance, aiming to recognize patterns and potential areas for enhancement. Ethical concerns have been taken into account by anonymizing the data and securing the required permissions from the educational institution, thereby adhering to ethical standards to safeguard the privacy and confidentiality of all individuals involved.

2.3 Research Instruments

Researchers used various methods to organize the gathered data systematically during the data analysis phase. Researchers provided a detailed description of each algorithm used in the study to ensure complete understanding. To enhance the quality of the textual data, the researchers utilized the Natural Language Toolkit (NLTK) and its functionalities for tasks such as tokenization, removal of stop words, and stemming. The initial step involved preparing the input text adequately for sentiment analysis and language translation. For sentiment analysis, the researchers used the VADER method and the Vader Sentiment library to evaluate sentiment polarity quantitatively. VADER is specifically designed for social media text and can differentiate between positive, negative, and neutral expressions, which helps in better understanding the sentiments expressed in the gathered student feedback.

In the language translation phase, ChatGPT was used for its natural language processing capabilities to provide accurate and contextually relevant translations of Tagalog text. The translated material underwent validation by an English evaluator, and sentiments expressed in both English and Tagalog were thoroughly analyzed in a bilingual way. Matplotlib, Tkinter, and WordCloud were used to display the sentiment analysis results visually. Matplotlib and Tkinter generated charts, graphs, and a user interface, providing a comprehensive visual depiction of sentiment distributions. The dataset was divided into distinct groups using K-means clustering to identify strengths and areas requiring improvement. The elbow method, a cluster analysis approach, was used to determine the best number of clusters. Additionally, a WordCloud was used to visually present commonly used words in the comments, offering further insight into the primary themes conveyed in the feedback.

2.4 Ethical Considerations

The researchers maintained anonymity and confidentiality by keeping participants' information private and inaccessible to third parties. The dataset was anonymized.

3.0 Results and Discussion

3.1 Strengths of the Faculty Using VADER

Table 1 shows the most common comments for faculty strengths based on students' evaluations. These comments give an idea about teachers' characteristics or actions that students find meaningful.

Table 1. Most frequent comments on the strengths of the faculty

Frequency	Comments
3238	Professional
943	They value the concerns of their students.
903	Good at teaching
527	Mastery the lesson
364	Knowledgeable
356	Explains well
343	Kind, discipline, and creativity
326	Strong communication skills
286	The professors push us to do our best in every activity and meeting.
244	She always makes sure we learn from her.
168	Time management and teaching methods
161	Active listening
123	She has strong communication skills. Also, she demonstrates professionalism.
97	Gives appropriate examples and maximizes time
41	They can make the students feel at ease when learning something new.

The professionalism of professors was mentioned 3238 times showing how much students care about them being on time, ready for class, and polite, among other things. This was followed by 943 comments that stressed how valuable it is for lecturers to listen to students' worries and then act on them – indicating understanding, empathy, and support to students. Also, among the critical factors cited was good at teaching, with 903 mentions, 527 mentions for mastery of the lesson, 364 mentions for knowledge, 356 mentions for explaining well, and strong communication skills with 326 mentions. Likewise, teachers with good command over subject matter while simplifying complex ideas were equally recognized by the students. Good communication, which includes attentive listening, is consistently highlighted as crucial for successful and engaging teaching. The ability to promote and support student's academic development is highly valued, as is the significance of well-organized and innovative teaching strategies that incorporate different approaches and efficiently use time.

Analyzing most comments in student assessments provides a distinct representation of the qualities and actions highly esteemed by educators. Characteristics such as professionalism, articulate communication, successful instruction, encouragement, and structured teaching approaches are fundamental factors that enhance the quality of the learning process. By concentrating on these elements, teachers can improve their instructional methods and successfully fulfill their students' needs and demands. Educators with extensive expertise can better engage students and promote a deeper comprehension of the subject matter (Wieman, 2019). Furthermore, a thorough assessment of teacher effectiveness shows that professional knowledge, encompassing both subject matter and pedagogical knowledge, significantly impacts teaching quality and student results (Kaliris et al., 2022).

3.2 Positive Attributes and Areas for Improvement of the Faculty

Table 2 provides an overview of common student feedback regarding ideas for improving their educational experience. The frequency of each comment can determine the level of agreement among students.

Table 2. Most frequent comments on suggestions for improvements

Frequency	Comments
150	Be more engaging
87	Nothing
85	Please refrain from canceling classes when only 1-2 hours are left before the class.
68	Teaching should be slowed down because it is too fast, and the work should be reduced because there are too many activities and homework.
66	It would be better to master what she teaches because sometimes the students make too many corrections.
63	I do not have any suggestions because Ma'am is good at teaching.
46	There is nothing more because she has fulfilled all the qualities of a good teacher.
45	Teach the syntax or how to code one by one because most of the sections cannot keep up…
39	Expand the teaching further.
33	You are already okay with me, ma'am. Keep it up.

Leading the list with 150 mentions is the suggestion that instructors should increase their involvement in their teaching methods, showing a preference for a more dynamic and participative classroom environment. Some students are content with the existing teaching methods and course structure, as they have not suggested any specific changes. Issues regarding last-minute class cancellations have been raised, indicating that improved schedule communication is necessary. Several students feel that the pace of instruction is excessively rapid and the workload is overly burdensome. In addition, there are worries regarding the instructors' knowledge in the fields. On a bright note, 63 comments praise teaching excellence, and 46 comments acknowledge that the instructors exhibit all the attributes of effective teaching. Students seek a systematic method to grasp syntax in technical or coding-oriented courses. Additionally, 39 comments express a wish for a wider range of topics to be covered, while 33 comments emphasize the importance of upholding the current teaching standards.

The student experience could be improved by implementing some suggestions. Despite the positive feedback, it will take a focused effort to address the challenges, boost engagement, improve communication, adjust the teaching pace, and ensure a thorough understanding of the subject matter. The potential exists for these changes to enhance the quality of education in schools, benefiting both students and teachers. It is achievable to uphold high standards while continuously pursuing educational excellence by adopting a comprehensive approach. Research shows that adjusting the pace of instruction can significantly impact student satisfaction and learning. For example, a meta-analysis discovered that students experience benefits from a well-balanced teaching pace that neither rushes nor drags, leading to improved comprehension and retention of information.

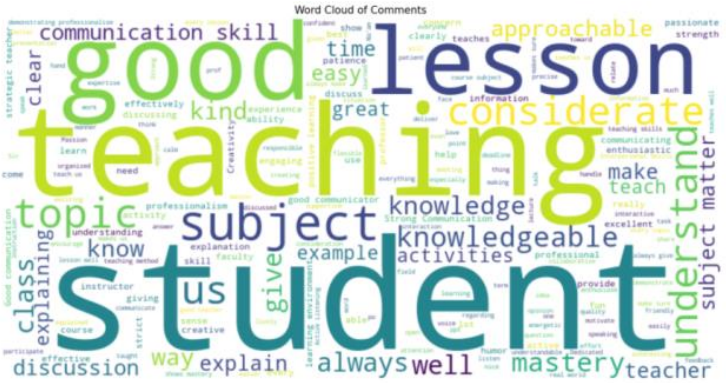

Figure 1. Word Cloud Visualization for strengths of the faculty

Figure 2. Word Cloud Visualization for suggestions for improvement

The most common terms in student feedback are highlighted in a word cloud, with their size reflecting both frequency and relevance. The researchers determined the significance of the words in the word cloud by examining word association, which involved analyzing the frequency and co-occurrence of words in the feedback comments to identify key terms that best represented student opinions. It was crucial to analyze how often certain pairs of words appeared together and the connections between them to uncover the important terms that represented student viewpoints. By examining co-occurrences and contextual relationships, the researchers could pinpoint words associated with positive, neutral, or negative feelings. The word cloud was created diligently to precisely encapsulate the primary themes and concerns in the students' feedback, thereby providing an effective representation. Data visualization simplifies identifying large datasets' patterns, trends, and irregularities (Brush, 2023).

The word association provides a comprehensive understanding of how students view their instructors' strengths and areas for growth. Students' favorable comments underscore their emphasis on effective communication, a strong understanding of the subject matter, approachability, and engaging teaching approaches. Students value instructors who are well-prepared, knowledgeable, and thoughtful. Critical feedback points to areas where instructors can improve their teaching methods. Key themes include the necessity for more precise and slower explanations, improved time management, and more interactive and engaging discussions. The recommendations include providing detailed demonstrations of coding problems, improving the management of workloads and due dates, and ensuring effective communication and understanding with all students. When combined, these observations offer a thorough understanding of the faculty's strengths and areas for development, enabling focused actions to improve the overall educational experience.

Table 3. Word association of Word Cloud visualization for strengths of the faculty

Word	Comment
Student	She can communicate with her students, unlike others. Always caters to what the students need.
Teaching	She is extremely skilled at teaching and can convey even difficult lessons. She enjoys teaching and is good at it.
Good	Approachable and good at explaining lessons. Good at making PowerPoint presentations.
Lesson	He is excellent at explaining lessons and assigned activities. He masters the lesson he teaches, knows every detail, and has answers even if students keep asking questions.
Considerate	Sir is very kind, easy to talk to, and very considerate. Very considerate incredibly to students and ready to help when we do not know what to do.
Subject	She is great, especially since she is already familiar with the subject. Has extensive knowledge of the subject been taught.
Knowledgeable	Ma'am is knowledgeable in what she teaches. He is super-duper knowledgeable about the lessons; of course, he is a walking DSM-5 TR.
Approachable	He is approachable. He is not intimidating because when you meet Sir, he always smiles, which is infectious. He is also approachable and good at explaining lessons.
Topic	Sir is good at discussing topics; he explains every topic properly and makes it easier to understand.
Well	He teaches well, and I learned much from him as a student. He explains the lesson well.
Always	She is excellent and proficient, always prepared, and updates her resources. She also always teaches and explains the lesson well.
Understand	It finds a way to make us understand the lesson. She explains what she teaches clearly in a way that students understand.
Mastery	Excellent at teaching and demonstrates mastery of the subject being taught. Mastery of the subject he teaches.
Activities	The teaching is good, and some activities help hone our abilities. She teaches well and is hands-on with activities.
Discussion	He explains the discussion clearly. Engaging discussion.

Table 4. Word association of Word Cloud visualization for suggestions for improvement

Word	Comment
Student	Avoid speaking too fast, as sometimes students cannot hear it. Also, listen to other students, not just one student.
Nothing	Nothing; she is already excellent. Nothing to say.
Teaching	Expand the teaching further. Expand the teaching further.
Lesson	Please explain the lesson more clearly so we can understand it better. Do not rush through the lesson too much.
Please	Please reduce the workload given, especially in asynchronous tasks. Even if it is not her schedule, she still gives them, and the assignments lack sample outputs. Please announce immediately when there will be an activity
Understand	Provide more demonstrations of actual coding problems so students can better understand and apply them in real-time. It is somewhat complicated to understand if the logic in coding is not demonstrated. Understand the students who cannot run the code he gives.
Ma'am	Ma'am, I hope you lower the standard of your exam questions because they were challenging. Ma'am provides PowerPoint presentations, but I do not think everything is explained thoroughly.
Activities	It would be better to teach the other activities first before assigning them. Please take it slow with activities, especially with due dates; do not make them all simultaneously.
Sometimes	Sometimes, I cannot hear what sir is saying. Sometimes, his teaching does not match the materials he provides, his computations are unclear, and he does not reply properly when we have concerns.
Time	It is just about time... we feel short on time, like when answering exams. The time is not enough to finish... it is still fun to take a math exam. He should come to class on time and dismiss class on time.
Subject	I suggest that he pay more attention to students struggling with his subject, be more active during class, and show more interest.
Hope	I hope his explanation of computation is clearer, and when he corrects computations, he makes sure they are correct. I also hope she reduces the right-minus-wrong way she checks our exams because it is stressful, and her exams are already difficult.
Better	Proper teaching approaches would be better. Please explain the lesson more clearly so we can understand it better.
Discussion	Please speak louder during discussions. Discussions should be more interactive.
Need	Discussions need to be more interactive. Sir needs to speak slower because sometimes we cannot keep up.

3.3 Overall Sentiments of the Students

As shown in Table 5, out of 28,222 student responses, 67.8% (19,178 comments) were positive, 28.2% (7,917 comments) were neutral, and 4.0% (1,127 comments) were negative. The prevailing positive feedback suggests that most students are content with their instructors' teaching approaches, course materials, and class participation. The analysis of student feedback identified the most frequently used words and their corresponding comments, offering insight into students' primary themes and feelings. A summary table has been prepared to display the top 15 commonly used words, their frequencies, and sample comments illustrating the context in which these words are used.

Table 5. Most occurring words, frequency, and sample comments in the overall sentiment of the students

Rank	Word	Frequency	Sample Comment	Sentiment
1	Students	5818	They value the concerns of each student	Positive
2	Good	5170	Good Teacher	Positive
3	Teaching	4010	Very good at teaching	Positive
4	Lesson	2590	She is good at explaining her lessons	Positive
5	Subject	2512	Good teachers Have a mastery of the subject and keep the students' interest.	Positive
6	Teacher	2329	A very interesting teacher, kind and good at discussing our lesson	Positive
7	Class	1677	Holds classes as much as possible despite his busy schedule. Effective way of teaching. Humorous and knowledgeable not only by the book but also in life	Positive
8	Approachability	1575	Her strength is her approachability. That is why talking to her and raising concerns is easier.	Positive
9	Time	1499	Always provide PPT on time for the class discussion	Positive
10	Well	1376	Kindness, understanding the students well, and fun when	Positive
11	Great	1352	teaching. I thought she was strict, but she was not as the days went by. She was doing her best to be a great leader so we could be better	Positive
12	Clear	1309	students. He emphasizes every word clearly and clearly and gives a	Positive
13	Understand	1269	positive environment. We understand that we have to meet the timeline of the lesson, and we appreciate that you are giving us 5 mins. to breathe and	Positive
14	Appropriate	1249	relax ourselves	Negative
15	Considerate	1192	Respond in a more appropriate manner Be more considerate, especially on working students.	Negative

The frequency analysis of words uncovers the main themes in students' feedback, providing important insights into their concerns and priorities in the educational setting. The repeated use of the word "students" with 5818 mentions underscores a focus on their needs, underscoring the significance of addressing them to enhance the overall educational experience. Furthermore, the amount of positive feedback regarding the quality of teaching, as demonstrated by words such as "good," with 5170 mentions, 4010 mentions for "teaching," and 2329 mentions for "teacher," indicates a high degree of satisfaction with the skills and delivery of educators. Moreover, the importance that students attach to the effectiveness of lessons and the clarity of the content emphasizes the significance of well-explained and easily understandable material. Students greatly value instructors' mastery and expertise in the subject, as indicated by terms like "knowledgeable" and "subject expertise."

It is important to acknowledge that students appreciate friendly and approachable teachers because they help create an environment of support during learning. Stressing the importance of well-organized lessons and punctuality depends on timely delivery and reasonable arrangement of class activities. The educators are supposed to show effective communication skills, empathy, and respect towards others, which learners highly respect. These views contain useful tips for instructors wishing to enhance student satisfaction and academic performance. These ideas are helpful for teachers who want to make their students happy and do well in school. One way teachers can understand how kids feel about their classes is by using sentiment analysis. This will tell them if their teaching style is good and what needs to be changed (Kastrati, 2021). Giving feedback is essential in improving students' learning experiences and teaching quality at tertiary level education. Conventional ways of providing feedback have been said to only partially take care of student's needs for improvement (Mamoon-Al-Bashir et al., 2016).

3.4 Optimal Cluster for Student Evaluation

Cluster analysis must be performed to examine data analysis and pattern discovery. Usually, data are divided into k-clusters using the K-means clustering method based on their similarities. Determining the correct number of clusters (k) in K-means clustering is difficult. The Elbow Method is a rule-of-thumb technique that involves graphing the within-cluster sum of squares (inertia) against the number of clusters to find the most suitable k. The primary idea of partitioning objects into classes (or clusters) so that the similarity between having things in one cluster is made higher than when having them placed within different clusters should be applied to several data sets as it helps promote cohesive units while differentiating amidst disparate elements (Liu, 2022b).

Figure 3 shows the findings of grouping data into k-means clusters for two principal components by comments made on student evaluation of teachers. To improve clarity, the dataset has been condensed to two principal components, with the x and y axes denoting the first and second principal components. Each comment is represented by a point on the scatter plot and is assigned a color based on its cluster. Using the clustering algorithm, the data has been segregated into distinct groups, each indicated by a different color. This visualization indicates the presence of underlying patterns in the data. Clusters with closely grouped points suggest strong similarities among the comments, whereas widely dispersed points indicate weaker similarities.

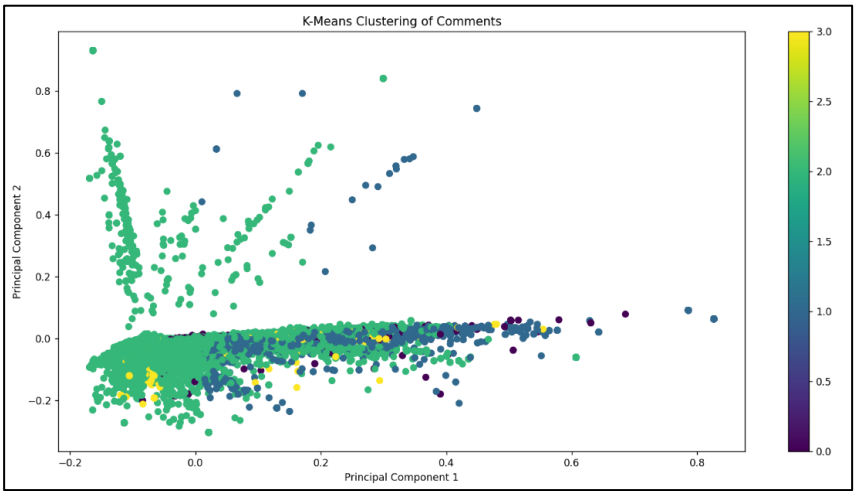

Figure 3. Scatter Plot

The Elbow Method chart (Figure 4) plays a fundamental role in determining the best number of clusters by displaying the inertia against the number of clusters. Inertia represents the total squared distances from the samples to their nearest cluster center (Hegab et al., 2022). It gauges how closely the data points are grouped around the centroids. The graph begins with a high inertia value at one cluster, signaling subpar clustering. As the cluster count rises, the inertia notably decreases up to three clusters, indicating better clustering. The decline rate then becomes less rapid, causing a distinct change in direction at around 4 to 5 clusters. This change means the point at which adding more clusters results in only a small decrease in inertia, indicating that the additional clusters have little impact on improving the model. Thus, the most suitable number of clusters is about 4 or 5 since it considers detailed segmentation and model complexity requirements. With k= 5, researchers strike a balance that avoids too few clusters (underfitting) and too many clusters (overfitting).

The graph shows that inertia decreases rapidly from k= 1 to k= 5, meaning adding more clusters leads to significantly better clustering quality. Nevertheless, after k= 5 onwards, this decrease is not so fast anymore. This suggests that extra groups created beyond five do little to reduce variance among points within each group. If the researchers choose k= 4, it implies that four different groupings best capture the structure of our data. Here, intra-similarity is maximized while preventing clusters from becoming too specific.

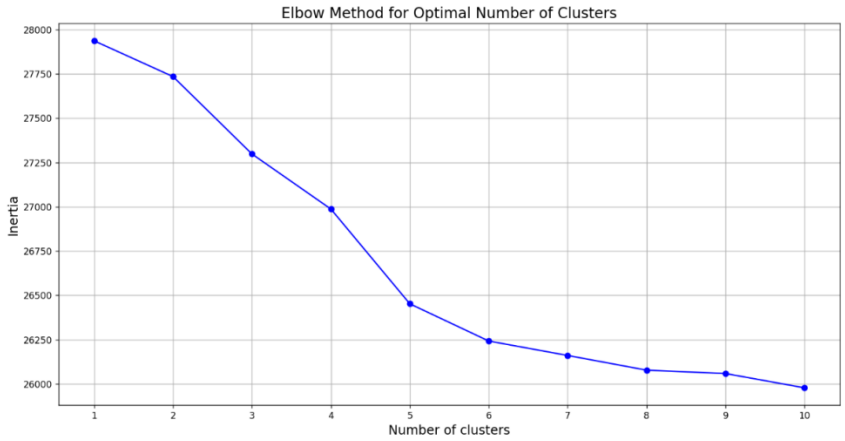

Figure 4. Elbow Method

The graph supports this result visually, demonstrating that the most marked decrease in inertia is when moving from four to five clusters, and then this decline steadies. Such a dramatic shift on the inertia curve—often called an "elbow"—indicates that additional clusters above k=5 do not significantly lower within-group diversity. Thus, according to the examination of the elbow method, including numerical information and its graphic representation, it can be assumed that k=5 is a perfect number of clusters, considering both numerical results and visual representation. Having such value will make the model less complicated but still practical enough for comments segmentation, which is meaningful.

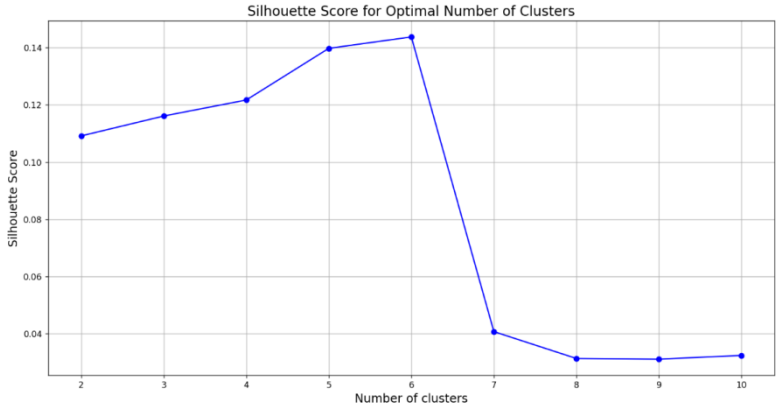

Figure 5. Silhouette Score

Another method to consider when determining the ideal amount of clusters is the Silhouette Score plot (Figure 5), as it evaluates the clustering quality. Ranging from -1 to 1, the silhouette score measures how alike each point in a particular cluster is to other points; -1 indicates that points are most dissimilar, while 1 indicates most similar. A higher score represents better-defined and more consistent clusters according to this metric. As the plot suggests, adding clusters increases this value until it peaks at around 5 clusters, which equals 0.14. After 6 clusters, however, the silhouette score decreases rapidly – especially after 6 clusters – signifying that clusters become less distinguishable and more likely to overlap. The decrease indicated that extra clusters did not significantly improve the clustering quality and might worsen it. Consequently, according to the silhouette score, the best number of clusters is approximately 4 or 5, consistent with findings produced by the Elbow Method. Hence, researchers determined that 5 clusters are the optimal cluster in this study.

Figure 5 shows an analysis of the silhouette score, which makes it clear that the best number of clusters ranges from about 4 to 5. The silhouette score has a peak of 0.14 at 5 clusters, indicating that the clusters are most well-defined and separated; it evaluates cluster cohesion and separation. When 5 clusters are established, there is a

noticeable drop in silhouette scores, which shows poor clustering quality; the same findings are supported by The Elbow Method. As a result, the researchers determined that 5 clusters present the most dependable and understandable clustering solution for the dataset.

4.0 Conclusion

As proven by student feedback, professionalism, clear communication, and effective teaching methods are the key factors that play an essential part in creating a meaningful educational experience. The only way to achieve a good learning environment is to give priority and do the right things, like being early, having knowledge of instructional materials, and having empathy. It is of the highest importance to consider the preferences for improvement to keep up with the student's satisfaction and academic succession, such as enhancing engagement, making necessary changes in schedule communication, and speed and volume of the course work.

The analysis of student feedback reveals the importance of prioritizing the necessity of putting students' needs at the center of the learning experience, as well as communication and the teacher's subject knowledge. The good impressions, teaching quality, orderliness, and compassionate conduct indicate a good starting point and ways to improve them. Using these observations to enhance teaching effectiveness and address student requirements can create a more interactive and encouraging learning atmosphere, ultimately improving student contentment and academic achievements.

Based on the Elbow Method, inertia significantly decreases beyond 5 clusters, while the Silhouette Score peaks at 5 clusters, indicating clearly defined and separate clusters. Consequently, utilizing 5 clusters guarantees a productive and significant categorization of the comments.

5.0 Contributions of Authors

Kristel Anne Telmo – drafting, editing, writing, supervising, data analysis; Kervie V. Alviola – drafting, data analysis, encoding, writing; Jazler Jhon S. Desamparado – drafting, writing; John Nathaniel A. Cabigan – drafting, writing, Cereneo S. Santiago Jr. – supervising, data analysis, editing, Richard Aries A. Shimada – supervising, data analysis, interpretation

6.0 Funding

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7.0 Conflict of Interests

The authors declare no conflict of interest.

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