

Unpacking Freshmen Aspirations and Expectations in Their Enrolled College Degree Programs: A Sentiment Analysis Approach

Arlene Mae C. Valderama
College of Computer Studies & Engineering
Jose Rizal University
Mandaluyong City, Philippines
arlene.valderama@jru.edu

Amelita H. Ortiz
Office of the President
Jose Rizal University
Mandaluyong City, Philippines
amy.ortiz@jru.edu

Rhoda D. Fabe
Quality and Linkages Office
Jose Rizal University
Mandaluyong City, Philippines
rhoda.fabe@jru.edu

Ronel F. Ramos
College of Computer Studies & Multimedia Arts
FEU Institute of Technology
Manila, Philippines
rframos@feutech.edu.ph

Ari Happonen
School of Engineering Science
LUT University
Lappeenranta, Finland
ari.happonen@lut.fi

Manuel B. Garcia
Educational Innovation and Technology Hub
FEU Institute of Technology
Manila, Philippines
mbgarcia@feutech.edu.ph

Abstract—The decision to select a college degree program plays a fundamental role in shaping students' academic and professional futures. While much research has examined the factors affecting students' choices prior to enrollment, fewer studies have explored their perceptions and expectations after they have entered their chosen programs. This study seeks to bridge this research gap by investigating the visions and aspirations of freshmen using natural language processing techniques. The textual analysis involves text tokenization, word frequency counts, visual representation of data through word clouds, and sentiment classification. The findings suggest the demand for tailored academic support and curriculum development that align with the specific aspirations of students in different disciplines. Overall, this study contributes to the growing literature on student decision-making and expectations of degree programs, while demonstrating the value of sentiment analysis as a tool for understanding students' academic trajectories.

Keywords—Sentiment Analysis, Natural Language Processing, Student Vision, Aspirations, College Degree Programs

I. INTRODUCTION

Selecting a college degree is one of the most important decisions that a student makes, as it can significantly shape their future career path, professional opportunities, and overall personal growth [1]. This decision carries immense weight because it not only reflects the individual's aspirations but also aligns with their perceived strengths, interests, and societal expectations, which often involve long-term planning and commitment. Various factors influence this choice, including personal motivations such as passion for a particular field of study, intrinsic goals like self-fulfillment, and extrinsic motivators like financial stability [2]. Additionally, family expectations, cultural background, peer influence, and the perceived demand in the job market play substantial roles in the decision-making process [3]. Economic prospects, including the potential for employment and earning power after graduation, can further steer students toward specific degree programs. The availability of resources such as career counseling, mentorship,

and academic guidance also shapes how students view their options. Understanding the motivations and influences behind these decisions has been an important endeavor for educational institutions to ensure tailored support in the academic journey of their students. These insights into what shapes college degree selection are essential for creating programs that align with students' aspirations and career goals.

While understanding the motivations behind selecting a college degree has been extensively explored, particularly in terms of pre-enrollment decision-making, there is a growing recognition of the importance of examining students' aspirations and expectations after enrollment, particularly at the start of their academic journey when their evolving perceptions and visions for the future are still being shaped. These aspirations, which may evolve as students engage with their chosen degree programs and interact with faculty, peers, and academic content, offer valuable insights into how students envision their future careers, the skill sets they hope to acquire, and their personal development within their fields of study [4]. Additionally, these expectations often influence their academic performance, retention rates, and long-term satisfaction with their degree programs [5]. However, despite the significance of these post-enrollment perceptions, research on this area remains limited, with most prior studies focusing primarily on pre-enrollment factors (e.g., motivations and external influences). The research gap in understanding how freshmen view their enrolled programs—what they aspire to achieve, how their initial expectations match their academic experiences, and how they perceive their future professional paths within their chosen fields—highlights the need for further investigation.

This study aims to address this gap by exploring the visions and expectations of students as they begin their college education, providing new insights that can inform program development, student support services, and academic advising. Using a sentiment analysis approach, this paper focuses on first-year students enrolled in professional education programs as

they embark on their first major course in Computer Programming. The study captures students' justifications for their perceptions through information extraction techniques. Specifically, it employs word tokenization on student responses, conducts a frequency count of the words used, visualizes the data through a word cloud, and categorizes word tokens by their positive or negative polarity, followed by sentiment scoring. By analyzing these responses, the paper provides a detailed view of the students' visions that contribute to the broader understanding of their academic experiences and aspirations.

II. BACKGROUND OF THE STUDY

Sentiment analysis is a powerful tool for investigating and interpreting textual data [6-8], using a combination of content analysis, natural language processing (NLP), and computational linguistics [9] to systematically identify, extract, and evaluate subjective information. It is commonly used to assess opinions, attitudes, or sentiments expressed in text, originating from various sources such as customer reviews, survey responses, social media posts, online forums, and feedback forms [10]. The primary goal of sentiment analysis is to determine the emotional polarity of a given text, typically classifying it as positive, negative, or neutral. This is particularly important in fields where understanding the subjective stance of individuals—such as customers or students—can provide actionable insights, guiding decision-making processes or shaping interventions. The use of sentiment analysis is vital in assessing the relevance and emotional intensity of a speaker, author, or subject in relation to a specific topic, event, or discussion. It offers a structured way to process large volumes of textual data, filtering opinions that are otherwise difficult to quantify. Whether it is analyzing customer reviews to improve product features [11] or gauging public reaction to a particular event on social media [10], sentiment analysis provides a clear view of how people feel and think about the subject in question. For example, in an educational setting, it can be used to evaluate student feedback on course content [12, 13], revealing trends in satisfaction or areas that need improvement that facilitate targeted changes.

Sentiment analysis can be performed using three primary approaches: machine learning, rule-based, and lexicon-based. In a machine learning approach, sentiment classifiers are trained on pre-labeled datasets using algorithms to detect the polarity of the text [14]. This method relies heavily on data to create accurate models that can generalize across different domains. The rule-based approach, on the other hand, assesses text by applying predefined linguistic rules, such as identifying negation words, idioms, or emoticons, and assigns polarity based on these patterns [15]. This method is effective when working with texts that have clear syntactical structures. Lastly, lexicon-based sentiment analysis calculates the semantic orientation of words or phrases by referencing a sentiment dictionary to measure their positivity or negativity [16]. Each of these approaches can be applied at different levels of analysis—document, sentence, or aspect level—depending on the granularity of insights needed.

Sentiment analysis proves particularly useful in educational research [17, 18], such as analyzing the visions and expectations of students in their enrolled degree programs. By applying sentiment analysis to students' feedback or written reflections, educators can uncover patterns of optimism, apprehension, or

satisfaction, providing insights into how students perceive their academic journey. For example, word tokenization and polarity scoring can reveal whether students view their degree programs positively or negatively, guiding improvements in curriculum design or student support services. Through sentiment analysis, institutions can ensure that student voices are heard and that their educational experiences are aligned with their aspirations.

III. METHODOLOGY

A. Setting and Participants

This study was conducted at a private higher education institution (HEI) in Metro Manila, focusing on the College of Computer Studies and Engineering. Two technology-related degree programs were involved in this research: the Bachelor of Science in Information Technology (BSIT) and the Bachelor of Science in Entertainment and Multimedia Computing, Major in Digital Animation Technology (BSEMC-DAT). A total of 156 freshmen students were enrolled in a Computer Programming course during the 1st year of their program curriculum. The respondents included students from the BSEMC-DAT ($n = 41$) and BSIT ($n = 115$) programs. Convenient sampling was employed, as one of the researchers was the faculty member handling these students in their Computer Programming course. The study aimed to gather responses from students regarding their visions and expectations for their chosen degree programs.

B. Text Preprocessing

In the data preprocessing phase, tokenization and stop-word removal were implemented. Tokenization is the process of breaking down text into individual words or tokens, which allows for easier manipulation of the data. Stop-word removal involves filtering out common, non-meaningful words like "and," "the," or "is," which do not contribute significant meaning to the sentiment analysis. These steps help ensure that only the most relevant words are included in the analysis. After stop words were filtered, a frequency count of the remaining words was performed to ensure no duplicates were present and to verify the authenticity of the data. The frequency count yielded 63 unique words from BSEMC-DAT respondents and 112 words from BSIT respondents. This process was conducted using Python coding via the Anaconda Navigator platform, which offers an integrated environment for developing and executing the scripts used in data preprocessing. The use of Python libraries such as NLTK (Natural Language Toolkit) and Pandas allowed for efficient handling and analysis of the data.

C. Sentiment Analysis

Each sentence from the dataset was analyzed to determine its sentiment score. The sentiment scoring process involved comparing the dataset to a predefined list of 119 positive words and 95 negative words. These word lists were selected based on previous research in sentiment analysis, ensuring that they were suitable for educational contexts. Sentiment scoring was applied by counting the number of positive and negative words in each response. The overall sentiment score was calculated as the difference between the positive and negative word counts, with higher scores indicating a more positive sentiment. The results were visualized through a word cloud, which allowed for a clear depiction of frequently occurring words. This visualization helped to identify common themes in students' responses.

Additionally, by applying sentiment scoring, the study was able to determine the polarity (positive or negative) and subjectivity of the words used in the responses. Subjective sentences generally refer to personal opinions, emotions, or judgments, whereas objective sentences convey factual information. This distinction provided an understanding of how students expressed their visions for their degree programs.

D. Part of Speech Tagging

Part of Speech (POS) tagging is a critical step in NLP, as it identifies the grammatical role of each word (e.g., noun, verb, adjective) and provides contextual information about the neighboring words. POS tagging is useful for stemming, which assists in retrieving information on morphological affixes (Saha, 2019). In this study, POS tagging was applied to better understand the structure and meaning of the responses. After cleansing the data, ten (10) randomly selected student responses were analyzed for their parts of speech. This process helped to identify common grammatical patterns, such as whether students used more descriptive or action-oriented language when discussing their visions and expectations. For instance, frequent use of adjectives may indicate a strong emotional response, while verbs may suggest action or future intentions. The use of POS tagging allowed for a more nuanced analysis of the students' responses beyond simple sentiment classification.

IV. RESULTS

The dataset comprises the responses of students from a one-question survey that asked why they selected their respective degree programs. There were 115 responses from BSIT students and 41 responses from BSEMC-DAT students, respectively. A frequency count was conducted to identify the most commonly used words in their responses. This analysis highlights the key themes and motivations expressed by students when explaining their reasons for selecting their degree programs. Table 1 presents the top words from both BSIT and BSEMC-DAT students, along with their respective word counts.

TABLE I. TOP WORDS FREQUENCY COUNT OF BOTH PROGRAMS

	BSIT		BSEMC-DAT	
	Word	Count	Word	Count
1	program	22	education	4
2	learn	18	improve	4
3	demand	16	learn	4
4	programmer	13	animator	4
5	computer	12	location	4
6	technology	10	program	4
7	course	8	technology	4
8	knowledge	7		

From the BSIT responses, words such as "program" (22 occurrences), "learn" (18 occurrences), and "demand" (16 occurrences) were frequently mentioned. This suggests that BSIT students are focused on the practical aspects of their degree, particularly its relevance to the job market and their desire to develop valuable skills. The presence of words like

"programmer" and "technology" reflects their career aspirations in fields like software development and IT-related professions. The emphasis on "computer" and "knowledge" also indicates that students perceive their degree as an opportunity to deepen their expertise in computing and technology. For BSEMC-DAT students, the word "education" appears most frequently (4 occurrences), followed by words like "improve," "learn," and "animator." This indicates that students in this program are motivated by a desire to enhance their skills and education, with a particular emphasis on animation and technology-related fields. The term "location" also appeared multiple times, suggesting that the geographical convenience or reputation of the institution may have played a role in their decision. Words like "program" and "technology" are shared between both groups, reflecting a common recognition of the importance of technological skills in their respective fields.

A. Tokenization

In terms of word frequency, the following figures exhibit the results of the tokenization process. After removing stop words and other non-word characters (such as symbols) using the NLTK, a total of 110 unique words were generated from the dataset. Figures 1 and 2 illustrate the frequency counts for BSIT and BSEMC-DAT students, respectively.

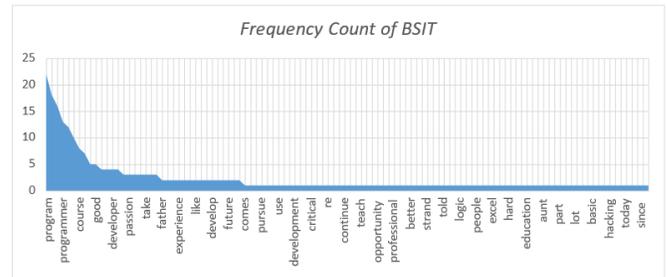


Fig. 1. Frequency Count of BSIT Responses.

Figure 1 shows that "program," "programmer," and "computer" appear frequently in the responses of BSIT students. These terms highlight the focus of BSIT students on technology and career preparation. Words like "developed" and "passion" further underscore the students' desire to enhance their skills and their enthusiasm for the field of information technology.

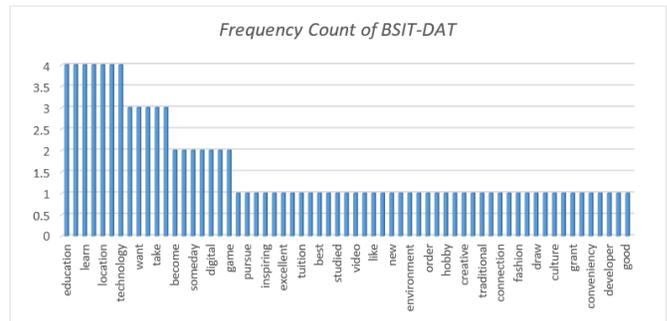


Fig. 2. Frequency Count of BSIT-DAT Responses.

Meanwhile, Figure 2 depicts that words such as "education," "learn," and "technology" are among the most frequently used words among BSIT-DAT students. This finding suggests that they emphasize the importance of learning in digital animation



Fig. 3. Word clouds depicting the most frequent words from general, positive, and negative responses of BSIT and BSEMC-DAT students.

technology. The frequent appearance of "location" implies that geographical convenience may have influenced their decision. In addition, creative-oriented words like "inspire" and "creative" emphasize their artistic motivations in pursuing their degree.

In terms of the overall comparison, the word frequency analysis highlights clear differences between the two programs. BSIT students focus more on technical skills and career development, whereas BSIT-DAT students are driven by creativity, education, and factors such as convenience. These distinct word choices provide insight into the unique priorities and expectations of students in each program.

B. Word Cloud

As shown in Figure 3, the word cloud visually represents the most prominent words in the student responses, offering a snapshot of the key themes that emerged from the data. This visualization provides an opportunity to generalize the tone and sentiment of the students' responses based on both the frequency and prominence of important terms. For BSIT students, the word cloud highlights terms that suggest optimism and a clear focus on professional growth, career development, and skill acquisition. While some words reflect that students anticipate challenges in their academic journey—such as grappling with complex coursework or technical demands—these are balanced by other terms that reflect determination, resilience, and a strong desire to succeed in their chosen field. Similarly, the word cloud for BSEMC-DAT students offers valuable insights into their primary concerns, aspirations, and expectations regarding their academic journey and future careers. Students in this program often express enthusiasm for creative endeavors and the desire to develop specific skill sets in multimedia and animation. The word cloud underscores their passion for innovation, artistry, and personal development while acknowledging the hurdles they may encounter along the way, such as mastering new technologies or meeting industry expectations. Overall, the word cloud reveals a complex mix of emotions, perspectives, and aspirations. While students from both programs are optimistic about their future prospects, they also demonstrate a realistic understanding of the challenges they will face as they work toward their academic and professional goals.

C. POS Tagging

To illustrate the POS tagging process, ten random student feedback responses were selected to exhibit the steps of tokenization, removal of stop words, and part-of-speech tagging. Table 2 presents the results for both BSIT and BSEMC-DAT programs, displaying the original statements, tokenized words, cleansed text (where stop words and unnecessary elements were removed), and the corresponding POS tags assigned to each word. This comprehensive breakdown allows for a deeper understanding of the students' language patterns, highlighting how they express their motivations, expectations, and concerns within the context of their academic journeys.

TABLE II. PRE-PROCESSING OF STUDENT RESPONSES

	Statement	Tokens	Cleansed Text	POS Tag
1	interest in Multimedia	['interest', 'in', 'Multimedia']	['interest', 'Multimedia']	[('interest', 'NN'), ('Multimedia', 'NNP')]
2	wants to become an inspiring animator	['wants', 'to', 'become', 'an', 'inspiring', 'animator']	[('wants', 'become', 'inspiring', 'animator')]	[('wants', 'VBZ'), ('become', 'VBN'), ('inspiring', 'JJ'), ('animator', 'NN')]
3	wants to be a cinematographer and excellent photographer	['wants', 'to', 'be', 'a', 'cinematographer', 'and', 'excellent', 'photographer']	['wants', 'cinematographer', 'excellent', 'photographer']	[('wants', 'VBZ'), ('cinematographer', 'PRPS'), ('excellent', 'JJ'), ('photographer', 'NN')]
4	tuition and location	['tuition', 'and', 'location']	['tuition', 'location']	[('tuition', 'NN'), ('location', 'NN')]
5	JRU gives the best education	['has', 'experience', 'JRU', 'gives', 'best', 'education']	['JRU', 'gives', 'best', 'education']	[('JRU', 'NNP'), ('gives', 'NNP'), ('best', 'NNP'), ('education', 'NNP')]

	Statement	Tokens	Cleansed Text	POS Tag
		[';', 'course', 'is', 'in', 'demand']		('gives', 'VBZ'), ('best', 'JJS'), ('education', 'NN')]
6	loves to hack	['loves', 'to', 'hack']	['loves', 'hack']	[(('loves', 'NNS'), ('hack', 'VBP'))]
7	has experience; course is in demand	['has', 'experience', ';', 'course', 'is', 'in', 'demand']	['experience', 'course', 'demand']	[(('experience', 'NN'), ('course', 'NN'), ('demand', 'NN'))]
8	because the program is in demand and one of the highest paid job	['because', 'the', 'program', 'is', 'in', 'demand', 'and', 'one', 'of', 'the', 'highest', 'paid', 'job']	['program', 'demand', 'one', 'highest', 'paid', 'job']	[(('program', 'NN'), ('demand', 'NN'), ('one', 'CD'), ('highest', 'JJS'), ('paid', 'VBN'), ('job', 'NN'))]
9	his mother wants it; in demand in the USA	['his', 'mother', 'wants', 'it', ';', 'in', 'demand', 'in', 'the', 'USA']	['mother', 'wants', 'demand', 'USA']	[(('mother', 'NN'), ('wants', 'VBZ'), ('demand', 'NN'), ('USA', 'NNP'))]
10	wants to explore more and learn how to program/make websites	['wants', 'to', 'explore', 'more', 'and', 'learn', 'how', 'to', 'program/make', 'websites']	['wants', 'explore', 'learn', 'program/make', 'websites']	[(('wants', 'VBZ'), ('explore', 'NN'), ('learn', 'JJ'), ('program/make', 'NN'), ('websites', 'NNS'))]

D. Sentiment Classification

The polarity and sentiment of the dataset were derived using the sentiment analyzer method in Python. This method computes polarity scores of the raw data, providing insights into the negative, neutral, positive, and compound sentiments expressed by the students. The overall sentiment polarity of the entire dataset is presented in Table 3. Based on the polarity scores, the overall sentiment of both BSIT and BSEMC-DAT students is determined to be neutral to positive, with compound scores of 0.9966 and 0.9989, respectively. These scores suggest that while students express a balanced view of their degree programs, there is a slightly more positive outlook overall.

TABLE III. POLARITY SCORE OF THE DATASET

Category	BSEMC-DAT	BSIT
negative	0	0.033
neutral	0.751	0.793
positive	0.249	0.175
compound	0.9966	0.9989

V. DISCUSSION AND IMPLICATIONS

The results of this study offer valuable insights into the perceptions and sentiments of students regarding their degree programs. The sentiment analysis, tokenization, and POS tagging reveal key differences in how students from both programs view their academic journeys and future career paths. First, the sentiment analysis indicates that both BSIT and BSEMC-DAT students hold predominantly neutral to positive sentiments about their chosen degree programs. The overall compound scores reflect a generally optimistic outlook, despite the challenges that students may anticipate [19]. BSIT students exhibit a strong focus on career development and the acquisition of technical skills, as their responses consistently emphasize professional growth in the field of information technology. In contrast, BSEMC-DAT students express aspirations centered around their education and personal creativity, reflecting their interest in pursuing careers within the creative and entertainment industries. These findings suggest that while both groups of students express a degree of uncertainty about their academic challenges, they are largely hopeful about their future prospects. The higher positivity score among BSEMC-DAT students may be attributed to the creative nature of their field, which often allows for greater expression and personal fulfillment [20].

Words like "course," "track," and "learn" were common across both groups, pointing to students' recognition of the academic challenges ahead. This observation aligns with research indicating that students are often aware of the academic rigor associated with their chosen degree programs and the skills they will need to develop to succeed [5, 21]. Despite these anticipated challenges, the sentiment data reveals that students remain determined to overcome obstacles and succeed. This determination is critical, as it reflects the resilience required to navigate the demanding curriculum of both degree programs. The neutral sentiment observed in both groups suggests that while students are not overly optimistic or pessimistic, they maintain a realistic understanding of their academic and professional trajectories. Institutions can leverage these insights by providing targeted support to students, particularly in areas that they find challenging, such as technical skills development for BSIT students and creative skills for BSEMC-DAT students.

The results highlight the importance of aligning academic programs with students' expectations and career goals. For BSIT students, who are focused on becoming "programmers" or working with "technology," it is essential to ensure that the curriculum provides ample opportunities for hands-on learning, coding, and exposure to real-world applications of information technology. Research suggests that experiential learning (e.g., project-based learning and problem-solving tasks) significantly enhance programming skills and help students better grasp complex technical concepts [22]. In addition, offering courses that incorporate industry-standard tools can help students stay current with the evolving demands of the IT industry [23]. Incorporating more experiential learning opportunities, such as internships or collaborative projects with industry partners, could help meet these students' expectations and keep them engaged in their academic journeys. Studies have shown that real-world experience gained through internships or industry collaborations is crucial for preparing students for technical careers, boosting their confidence and job readiness.

For BSEMC-DAT students, who are motivated by words like "creative" and "inspiring," the curriculum should continue to foster creativity while providing technical skills in digital animation and multimedia computing. Research in creative fields indicates that a balance between artistic freedom and structured technical training is vital for fostering innovation and preparing students for industry challenges. Providing opportunities for students to work on real-world animation projects or collaborate with industry professionals could further enhance their learning experience and career readiness. Furthermore, offering mentorship programs or collaboration opportunities with professionals in the creative industries could bridge the gap between academic learning and practical applications in the workforce, helping students transition smoothly from academic environments to industry roles. Studies suggest that mentorship in creative and technical fields not only builds professional networks but also improves students' confidence and job placement rates after graduation.

VI. CONCLUSION

In an era where understanding student experiences and motivations is increasingly critical, this study sheds light on the diverse factors that influence students' decisions when selecting their college degree programs. The insights gained from this study underscore the importance of aligning academic programs with student expectations to advance success. Educational institutions can use these findings to enhance curriculum design, ensuring that courses and learning experiences are more closely tailored to students' professional aspirations and personal development goals. Furthermore, the distinct challenges and opportunities identified in each program highlight the need for specialized support mechanisms that address the unique needs of students in different fields. By assessing student perspectives at the start of their academic journey, this research contributes to the growing body of literature on educational choices and student satisfaction. The methodology used in this study not only provided a thorough analysis of student responses but also offered valuable implications for institutions looking to improve their program offerings and support services. Overall, the findings of this study can help better understand the complex motivations behind students' degree selections, enabling them to create more meaningful and supportive academic environments.

REFERENCES

- [1] A. S. Aldosary and S. A. Assaf, "Analysis of Factors Influencing the Selection of College Majors by Newly Admitted Students," *Higher Education Policy*, 1996, doi: 10.1016/S0952-8733(96)00013-X.
- [2] S. Cortes et al., "Factors Influencing Students' Intention to Enroll in Bachelor of Science in Biology: A Structural Equation Modelling Approach," *Cogent Education*, vol. 10, no. 2, p. 2273635, 2023, doi: 10.1080/2331186X.2023.2273635.
- [3] S. Sathapomvajana and B. Watanapa, "Factors Affecting Student's Intention to Choose IT Program," *Procedia Computer Science*, vol. 13, pp. 60-67, 2012, doi: 10.1016/j.procs.2012.09.114.
- [4] A. Tomlinson, A. Simpson, and C. Killingback, "Student Expectations of Teaching and Learning When Starting University: A Systematic Review," *Journal of Further and Higher Education*, vol. 47, no. 8, pp. 1054-1073, 2023/09/14 2023, doi: 10.1080/0309877X.2023.2212242.
- [5] M. Pinquart and M. Ebeling, "Students' Expected and Actual Academic Achievement – A Meta-Analysis," *International Journal of Educational Research*, vol. 100, pp. 1-11, 2020, doi: 10.1016/j.ijer.2019.101524.

- [6] M. B. Garcia and A. Cunanan-Yabut, "Public Sentiment and Emotion Analyses of Twitter Data on the 2022 Russian Invasion of Ukraine," presented at the *2022 9th International Conference on Information Technology, Computer, and Electrical Engineering (ICITACEE)*, 2022, 10.1109/ICITACEE55701.2022.9924136.
- [7] A. Lighthart, C. Catal, and B. Tekinerdogan, "Systematic Reviews in Sentiment Analysis: A Tertiary Study," *Artificial Intelligence Review*, vol. 54, no. 7, pp. 4997-5053, 2021, doi: 10.1007/s10462-021-09973-3.
- [8] Y. Mao, Q. Liu, and Y. Zhang, "Sentiment Analysis Methods, Applications, and Challenges: A Systematic Literature Review," *Journal of King Saud University - Computer and Information Sciences*, vol. 36, no. 4, pp. 1-16, 2024, doi: 10.1016/j.jksuci.2024.102048.
- [9] J. R. Jim, M. A. R. Talukder, P. Malakar, M. M. Kabir, K. Nur, and M. F. Mridha, "Recent Advancements and Challenges of NLP-Based Sentiment Analysis: A State-of-the-Art Review," *Natural Language Processing Journal*, vol. 6, pp. 1-30, 2024, doi: 10.1016/j.nlp.2024.100059.
- [10] M. B. Garcia, "Sentiment Analysis of Tweets on Coronavirus Disease 2019 (COVID-19) Pandemic from Metro Manila, Philippines," *Cybernetics and Information Technologies*, vol. 20, no. 4, pp. 141-155, 2020, doi: doi:10.2478/cait-2020-0052.
- [11] H.-B. Yan and Z. Li, "Review of Sentiment Analysis: An Emotional Product Development View," *Frontiers of Engineering Management*, vol. 9, no. 4, pp. 592-609, 2022, doi: 10.1007/s42524-022-0227-z.
- [12] D. K. Dake and E. Gyimah, "Using Sentiment Analysis to Evaluate Qualitative Students' Responses," *Education and Information Technologies*, 2023, doi: 10.1007/s10639-022-11349-1.
- [13] A. M. Valderama, A. Vinluan, and S. D. Moraga, "Mining Students' Feedback in a General Education Course: Basis for Improving Blended Learning Implementation," *International Journal of Computing Sciences Research*, 2021. <https://stepacademic.net/ijcsr/article/view/214>
- [14] F. Jemai, M. Hayouni, and S. Baccar, "Sentiment Analysis Using Machine Learning Algorithms," presented at the *2021 International Wireless Communications and Mobile Computing (IWCMC)*, 2021, 10.1109/IWCMC51323.2021.9498965.
- [15] N. Saraswathi, T. Sasi Rooba, and S. Chakaravathi, "Improving the Accuracy of Sentiment Analysis Using a Linguistic Rule-Based Feature Selection Method in Tourism Reviews," *Measurement: Sensors*, vol. 29, pp. 1-7, 2023/10/01/ 2023, doi: 10.1016/j.measen.2023.100888.
- [16] M. Ojeda-Hernández, D. López-Rodríguez, and Á. Mora, "Lexicon-Based Sentiment Analysis in Texts Using Formal Concept Analysis," *International Journal of Approximate Reasoning*, vol. 155, pp. 104-112, 2023, doi: 10.1016/j.ijar.2023.02.001.
- [17] S. Falcon and J. Leon, "How Do Teachers Engaging Messages Affect Students? A Sentiment Analysis," *Educational Technology Research and Development*, 2023, doi: 10.1007/s11423-023-10230-3.
- [18] J. Zhou and J.-m. Ye, "Sentiment Analysis in Education Research: A Review of Journal Publications," *Interactive Learning Environments*, vol. 31, no. 3, pp. 1252-1264, 2023, doi: 10.1080/10494820.2020.1826985.
- [19] A. M. Valderama, J. B. Tuazon, and M. B. Garcia, "Promoting Student Thinking and Engagement Through Question-Based and Gamified Learning," presented at the *2022 IEEE 14th International Conference on Humanoid, Nanotechnology, Information Technology, Communication and Control, Environment and Management (HNICEM)*, 2022, 10.1109/HNICEM57413.2022.10109470.
- [20] T. Lomas, "Positive Art: Artistic Expression and Appreciation as an Exemplary Vehicle for Flourishing," *Review of General Psychology*, vol. 20, no. 2, pp. 171-182, 2016, doi: 10.1037/gpr0000073.
- [21] H. Wu, S. Bai, Y. Liao, and C. Tan, "The Academic Performance and Upward Mobility of Students in Education Program," *Journal of World Englishes and Educational Practices*, vol. 6, pp. 137-166, 2024, doi: 10.32996/jweep.2024.6.1.6.
- [22] M. B. Garcia, "Facilitating Group Learning Using an Apprenticeship Model: Which Master is More Effective in Programming Instruction?," *Journal of Educational Computing Research*, vol. 61, no. 6, pp. 1207-1231, 2023, doi: 10.1177/07356331231170382.
- [23] Y. Kovaleva, A. Happonen, M. B. Garcia, and J. Kasurinen, "Female-Inclusive Practices for Software Engineering and Computer Science Higher Education: A Literature Review," presented at the *Proceedings of the Annual Doctoral Symposium of Computer Science*, 2024.