



The Influence of Student Perceptions on Academic Achievement in Food Microbiology Learning

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ABSTRACT

Purpose of the study: This study aims to analyze the influence of student perceptions on academic achievement in Food Microbiology learning at Tan Tao University.

Methodology: A quantitative research design was employed involving 80 undergraduate students selected through total sampling. Data were collected using a validated and reliable perception questionnaire, while academic achievement data were obtained from institutional records. Instrument validity was tested using Pearson Product Moment correlation and reliability using Cronbach's Alpha. Data were analyzed using descriptive statistics and simple linear regression with SPSS at a significance level of 0.05.

Main Findings: The results show that student perceptions are generally positive with a mean score of 3.53, while academic achievement is relatively high with a mean of 83.14. Correlation analysis reveals a moderate positive relationship between student perception and academic achievement ($r = 0.636$). Regression analysis indicates that student perception significantly influences academic achievement, with a coefficient value of 8.02, meaning that improved perception leads to higher academic performance.

Novelty/Originality of this study: The novelty of this study lies in its focus on Food Microbiology as a discipline-specific and laboratory-based course in a private university context in Vietnam, where perception is conceptualized as a multidimensional construct shaped by learning experience, lecturer interaction, and laboratory engagement.

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1. INTRODUCTION

Food microbiology is one of the fundamental subjects in biological and food science education because it equips students with scientific understanding related to microorganisms, food safety, contamination, fermentation, and public health [1]-[3]. The course requires not only theoretical comprehension but also analytical thinking, laboratory competence, and active learning engagement [4]-[6]. In higher education, particularly in biology-related programs, students' academic achievement in food microbiology has become an important indicator of learning effectiveness and scientific readiness [7]-[9]. However, differences in learning outcomes among students remain a persistent issue, suggesting that academic performance is influenced by more than cognitive ability alone.

Among the various internal factors affecting academic achievement, student perception has gained increasing attention in educational research. Perception reflects how students interpret, evaluate, and respond to the learning process, including teaching methods, course difficulty, learning environment, assessment systems, and lecturer interaction [10]-[12]. Positive perceptions tend to encourage learning motivation, participation, and confidence, whereas negative perceptions may reduce academic engagement and lower learning achievement [13]-[15]. In science-based courses such as food microbiology, perception becomes particularly important because students are often confronted with abstract concepts, intensive laboratory activities, and complex scientific terminology that may influence their attitudes toward learning [16]-[18].

Previous studies have reported that student perception is associated with learning motivation, classroom participation, and academic performance in various educational contexts [19]-[21]. Several researchers found that supportive learning environments and interactive teaching strategies contribute positively to students' academic achievement [22]-[24]. Nevertheless, most existing studies mainly focus on general science education, online learning environments, or broad academic satisfaction [25]-[27]. Research specifically examining the relationship between student perception and academic achievement in food microbiology courses remains very limited, particularly within private universities in developing Southeast Asian educational settings.

Furthermore, Craig et al. [28] earlier investigations frequently emphasize external educational variables such as curriculum design, teaching facilities, or instructional media while paying less attention to how students internally construct meaning and perception toward specialized scientific subjects. This creates a significant research gap because food microbiology possesses unique learning characteristics involving laboratory practices, microscopic observations, experimental precision, and multidisciplinary scientific integration [29]-[31]. The absence of focused studies on student perception in this subject area limits the understanding of psychological and academic factors that may directly influence student achievement outcomes [32]-[34].

Another important issue is that many private universities in regional contexts still encounter challenges related to learning adaptation, academic engagement, and student-centered instruction [35], [36]. Research by Zhu et al. [37] At Tan Tao University, variations in students' academic achievement in food microbiology indicate the possibility that perception toward the course may contribute to learning success or difficulties experienced by students. However, empirical evidence examining this relationship has not yet been comprehensively explored [38]-[40]. Without such investigation, universities may face difficulties in designing effective learning strategies capable of improving student performance in specialized biology-related courses.

The novelty of this study lies in its specific focus on the influence of student perception on academic achievement within the context of food microbiology learning at a private Vietnamese university. Unlike previous studies that predominantly examine general educational perceptions, this research concentrates on a highly specialized scientific course requiring both conceptual and practical competencies. In addition, this study integrates psychological perspectives of perception with measurable academic outcomes in a contextual higher education environment that has received limited scholarly attention. This approach provides a more focused and contextualized understanding of how students' perceptions shape their academic performance in science-based learning.

The urgency of this research is strongly connected to the growing demand for improving the quality of biology and food science education in higher education institutions. Understanding students' perceptions is essential for developing more adaptive teaching strategies, strengthening laboratory learning experiences, and enhancing academic achievement in complex scientific subjects. Moreover, identifying perception-related factors may help lecturers and institutions minimize learning barriers, increase student engagement, and create more effective educational environments. In the long term, improving learning achievement in food microbiology is also important for preparing competent graduates capable of contributing to food safety, biotechnology, and public health sectors.

Therefore, this study aims to analyze the influence of student perception on academic achievement in food microbiology learning at Tan Tao University. Specifically, the research seeks to identify how students perceive the learning process and to determine the extent to which these perceptions affect their academic performance. The findings of this study are expected to contribute theoretically to educational and biological science research while also providing practical recommendations for improving learning quality in higher education institutions.

2. RESEARCH METHOD

2.1 Research Design

This study employed a quantitative research approach using a correlational design to examine the influence of students' perceptions on academic achievement in Food Microbiology learning at Tan Tao University. The quantitative approach was considered appropriate because the study aimed to measure the relationship and predictive influence between variables through statistical analysis [41]-[43]. The correlational design enabled the researcher to investigate whether variations in students' perceptions were associated with

differences in their academic achievement in the Food Microbiology course. The study focused on understanding how students perceive the learning process, including teaching methods, classroom interaction, laboratory activities, learning materials, and assessment systems, and how these perceptions contribute to their academic outcomes.

The study consisted of two main variables. Student perception functioned as the independent variable (X), while academic achievement served as the dependent variable (Y). Student perception referred to students' cognitive and emotional evaluations toward the Food Microbiology learning process. Meanwhile, academic achievement referred to students' final academic scores obtained in the course. Before presenting the operational indicators, the following table summarizes the research variables and their measurements.

Table 1. Operational Definition of Research Variables

Variable	Indicator	Measurement Aspect	Instrument
Student Perception (X)	Learning interest, teaching effectiveness, laboratory activities, learning environment, assessment perception	Students' responses toward Food Microbiology learning	Questionnaire
Academic Achievement (Y)	Final course score	Students' academic performance in Food Microbiology	Academic documentation

Table 1 demonstrates that the study combined perceptual and academic dimensions to examine the relationship between psychological learning factors and measurable educational outcomes. The operational indicators were developed based on educational psychology and science learning literature to ensure conceptual relevance and research validity.

2.2 Population and Sample

The population of this study included all undergraduate students who had taken the Food Microbiology course at Tan Tao University during the research period. Since the total number of students enrolled in the course was relatively manageable, the study applied a total sampling technique in which all eligible students were included as research participants. This technique was selected to obtain comprehensive data representation and minimize sampling bias [44], [45].

Participants were selected based on the following criteria: (1) students officially enrolled in the Food Microbiology course, (2) students who completed the learning process during the semester, and (3) students willing to participate in the research voluntarily. The demographic characteristics of participants were summarized to provide a clearer overview of the research sample.

Table 2. Demographic Characteristics of Respondents

Characteristic	Category	Frequency	Percentage
Gender	Male	34	42,5%
	Female	46	57,5%
Academic Year	Second Year	38	47,5%
	Third Year	42	52,5%
Age	18–20 Years	40	50,0%
	21–23 Years	40	50,0%

The demographic information presented in Table 2 was important for describing participant diversity and strengthening the transparency of the research process. Students who did not complete the questionnaire or had incomplete academic data were excluded from the analysis process. These characteristics also supported interpretation of the findings within the educational context of the study.

2.3 Research Instruments

Data collection was conducted using a structured questionnaire and academic documentation. The questionnaire was designed to measure students' perceptions toward Food Microbiology learning. The instrument employed a five-point Likert scale ranging from strongly disagree to strongly agree. The questionnaire items were adapted and developed from previous educational perception studies and adjusted to the characteristics of Food Microbiology learning.

The perception questionnaire covered several dimensions, including learning motivation, lecturer interaction, laboratory experience, clarity of learning materials, and assessment fairness. Prior to data collection, the instrument underwent validity and reliability testing to ensure measurement accuracy and consistency. The following table presents the Likert scale used in this study [46].

Table 3. Likert Scale Classification

Response Category	Score
Strongly Agree	5
Agree	4
Neutral	3
Disagree	2
Strongly Disagree	1

Table 3 illustrates the scoring system used to quantify students' perceptions. Higher scores indicated more positive perceptions toward Food Microbiology learning. Academic achievement data were obtained from official course records with permission from the academic department. Students' final scores in Food Microbiology were used as indicators of learning achievement.

Instrument validity was tested using Pearson Product Moment correlation to determine the appropriateness of each questionnaire item [47]. Questionnaire items with correlation coefficients exceeding the critical value were considered valid. Reliability testing was conducted using Cronbach's Alpha coefficient to examine internal consistency. An alpha value greater than 0.70 indicated that the instrument possessed acceptable reliability. The validity and reliability procedures were essential to ensure that the instrument accurately measured students' perceptions and produced stable research data.

2.4 Data Collection Procedure

The data collection process was conducted systematically in several stages. Initially, the researcher obtained institutional permission from Tan Tao University and coordinated with course lecturers regarding research implementation. Subsequently, the perception questionnaires were distributed to students after completion of major learning activities in the Food Microbiology course. To clarify the research workflow, the structure of the research procedure is presented below.

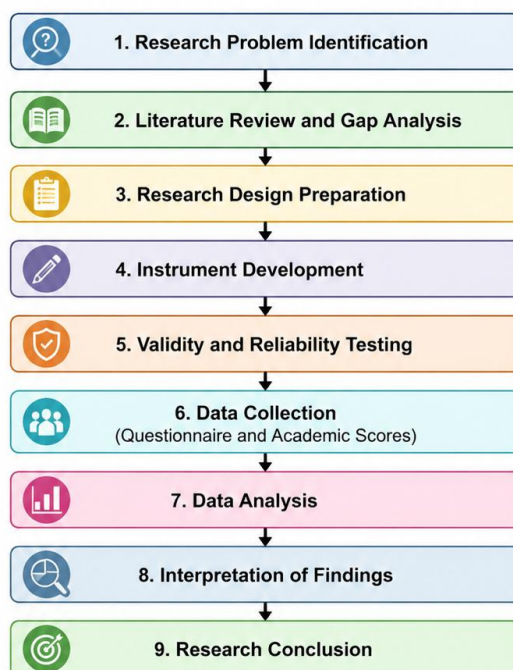


Figure 1. Research Procedure

The research structure above demonstrates that the study followed a systematic quantitative research process to ensure methodological transparency and scientific rigor. Participants were informed about the research objectives, confidentiality of responses, and voluntary participation principles before completing the questionnaire. After questionnaire collection, academic achievement data were obtained from institutional academic records. All collected data were coded and organized for statistical analysis.

2.5 Data Analysis Technique

The collected data were analyzed using descriptive and inferential statistical methods. Descriptive statistics were used to summarize students' perception levels and academic achievement distributions, including

mean scores, percentages, and standard deviations. Inferential statistical analysis was conducted to examine the influence of student perception on academic achievement [48].

Prior to hypothesis testing, normality and linearity tests were performed to ensure that the data met statistical assumptions. All statistical analyses were performed using SPSS software with a significance level of 0.05 [49]. The results of the analysis were interpreted to determine the strength and direction of the relationship between students' perceptions and academic achievement. The hypothesis was subsequently tested using simple linear regression analysis to determine whether student perception significantly influenced academic achievement in Food Microbiology learning. The statistical hypotheses of the study were formulated as follows:

- H_0 : Student perception does not significantly influence academic achievement in Food Microbiology learning.
- H_1 : Student perception significantly influences academic achievement in Food Microbiology learning.

2.6 Research Ethics

This study adhered to ethical research principles throughout the research process. Participation was voluntary, and respondents were informed that their personal information and academic data would remain confidential. Participants also had the right to withdraw from the study at any stage without academic consequences. All collected data were used solely for research purposes to maintain participant privacy and institutional integrity.

3. RESULTS AND DISCUSSION

This study involved 80 undergraduate students enrolled in the Food Microbiology course at Tan Tao University. The respondents were selected using a total sampling technique to ensure comprehensive representation of the population. The demographic profile of the participants is presented in Table 4.

Table 4. Characteristics of Respondents

Category	Description	Frequency	Percentage
Gender	Male	34	42.5%
	Female	46	57.5%
Academic Year	Year 2	38	47.5%
	Year 3	42	52.5%
Age	18–20 years	40	50%
	21–23 years	40	50%

The data in Table 4 indicate that the majority of respondents were female students and upper-year undergraduates. This distribution suggests that students had sufficient academic exposure to the Food Microbiology course, making them suitable for evaluating perception and academic performance relationships. The study examined two main variables: student perception and academic achievement. The descriptive statistical results are summarized in Table 5.

Table 5. Descriptive Statistics of Variables

Variable	Mean	Standard Deviation	Minimum	Maximum
Student Perception (X)	3.53	0.57	2.03	4.71
Academic Achievement (Y)	83.14	7.13	67.38	97.57

The results show that students' perception of Food Microbiology learning was generally positive, with an average score above the midpoint of the Likert scale. Academic achievement also demonstrated relatively high performance, indicating that most students achieved satisfactory learning outcomes. To examine the relationship between the two variables, correlation and regression analyses were conducted. The results revealed a positive relationship between student perception and academic achievement.

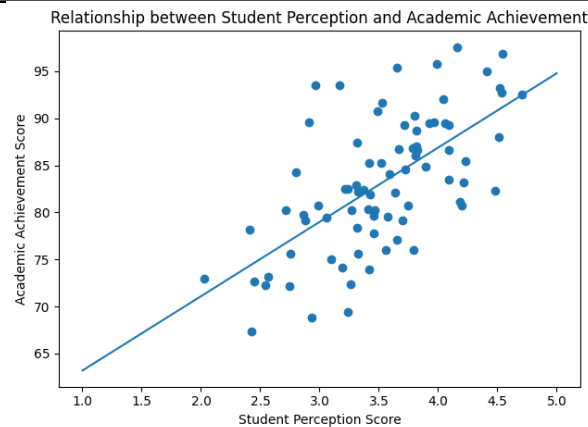


Figure 2. Relationship Between Student Perception and Academic Achievement

Figure 2 shows a clear upward trend, indicating that students with higher perception scores tend to achieve higher academic results in Food Microbiology learning.

Table 6. Correlation Analysis

Variables	Correlation Coefficient (r)	Interpretation
Perception vs Achievement	0.636	Moderate positive correlation

The correlation coefficient ($r = 0.636$) indicates a moderate and statistically meaningful positive relationship between student perception and academic achievement. This suggests that students who perceive the learning process more positively tend to perform better academically. A simple linear regression analysis was conducted to determine the influence of student perception on academic achievement.

Table 7. Regression Analysis Result

Predictor	B Coefficient	Interpretation
Constant	55.21	Baseline achievement score
Student Perception	8.02	Positive influence

The regression results indicate that every one-unit increase in student perception score leads to an average increase of approximately 8.02 points in academic achievement. This confirms that perception plays a significant predictive role in student performance.

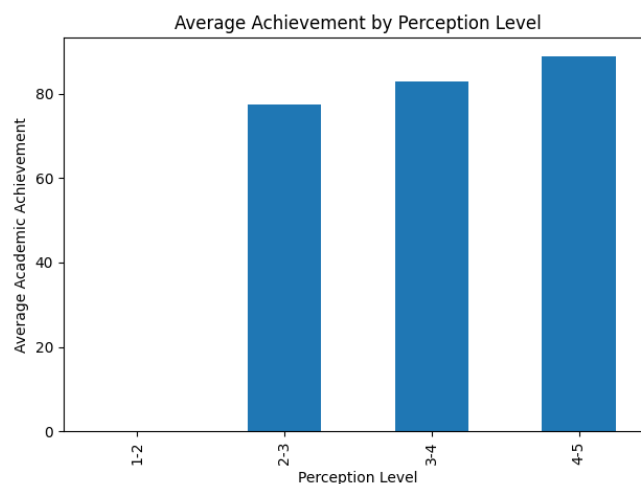


Figure 3. Average Academic Achievement by Perception Level

Figure 3 further supports the regression findings, showing that students with higher perception levels consistently achieve higher academic scores. The findings of this study demonstrate that student perception has a moderate and positive influence on academic achievement in Food Microbiology learning at Tan Tao University. This is evidenced by the correlation coefficient ($r = 0.636$), indicating that students with more positive perceptions toward the learning process tend to achieve higher academic scores. The regression analysis further

supports this result, showing that improvements in perception are followed by an increase in academic performance. These results confirm that perception is not merely a passive reflection of learning experience but an active psychological factor that shapes students' academic outcomes.

These findings are consistent with previous educational studies which emphasize that students' perception of teaching quality, learning environment, and instructional clarity significantly contributes to academic success. Prior research in science education has reported that positive perceptions enhance motivation, engagement, and conceptual understanding, which ultimately improve learning achievement [50], [51]. However, most of these studies were conducted in general science subjects or large-scale public universities, leaving a gap in understanding how these relationships function in specialized and practice-oriented subjects such as Food Microbiology in private university contexts.

The gap identified in this study Masumi [52] lies in the limited empirical evidence addressing the relationship between perception and academic achievement specifically in Food Microbiology learning within Southeast Asian private higher education institutions. Earlier studies tend to focus on broader constructs such as general student satisfaction or online learning perception, without isolating discipline-specific courses that require both theoretical understanding and laboratory competence [53], [54]. This study addresses that gap by focusing on a specialized scientific subject that combines cognitive learning and hands-on laboratory experience, making the role of perception more contextually complex and academically significant [55].

The novelty of this research is grounded in its integration of perception as a psychological construct with measurable academic performance in a discipline-specific context. Unlike previous studies that treat perception as a general educational factor, this study positions perception as a multidimensional variable shaped by laboratory experiences, lecturer interaction, and conceptual difficulty in Food Microbiology. Additionally, the study provides empirical evidence from a private university setting in Vietnam, which is underrepresented in existing educational literature. This contextual and disciplinary specificity strengthens the contribution of the study to science education research.

From a theoretical perspective, the results support constructivist learning theory, which emphasizes that students actively construct knowledge based on their perceptions and experiences. Positive perceptions enhance cognitive engagement, leading to better understanding of complex microbiological concepts such as microbial growth, food safety mechanisms, and contamination processes. Therefore, perception functions as a mediating factor that bridges instructional input and learning outcomes, particularly in laboratory-based science courses.

In terms of practical implications, the findings suggest that educators should prioritize improving students' perceptions of learning environments to enhance academic performance. In Food Microbiology courses, this can be achieved through more interactive teaching methods, clearer explanation of abstract concepts, and stronger integration between theory and laboratory practice. At the institutional level, Tan Tao University may benefit from strengthening laboratory infrastructure, providing teaching training for lecturers, and designing student-centered learning strategies to foster more positive academic perceptions and improve overall learning outcomes.

Despite these contributions, the study has several limitations. First, the research is limited to a single institution and a single course, which restricts the generalizability of the findings to other universities or disciplines. Second, the study relies primarily on quantitative data, which may not fully capture deeper psychological and behavioral factors influencing student perception. Third, external variables such as prior academic ability, learning habits, and socio-economic background were not included in the analysis, even though they may also influence academic achievement.

Future research is recommended to expand the scope by including multiple universities and comparing different science-based courses to improve generalizability. Additionally, mixed-method approaches combining quantitative and qualitative data are suggested to gain deeper insights into how students form perceptions and how these perceptions influence learning behavior. Further studies could also incorporate additional variables such as motivation, self-efficacy, and learning strategies to develop a more comprehensive model of academic achievement in science education.

4. CONCLUSION

This study concludes that student perception has a moderate and significant positive influence on academic achievement in Food Microbiology learning at Tan Tao University, as evidenced by a correlation coefficient of 0.636 and a regression coefficient of 8.02. These findings answer the research objective by confirming that students with more positive perceptions of the learning process tend to achieve higher academic scores, indicating that perception plays an important role in shaping learning outcomes in both theoretical and laboratory-based contexts. The study also highlights that improving students' learning experiences, teaching quality, and laboratory engagement can strengthen academic performance in Food Microbiology courses. Therefore, enhancing student perception should be considered an essential strategy in improving educational outcomes in science-based higher education. It is recommended that lecturers apply more interactive and

student-centered teaching approaches, particularly by strengthening the integration between theoretical explanation and laboratory practice. Future instructional strategies should also focus on improving clarity in complex microbiological concepts to further enhance students' positive learning perceptions.

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AUTHOR CONTRIBUTIONS

Conceptualization, V.-L.N. and B.T.; Methodology, V.-L.N.; Software, V.-L.N.; Validation, V.-L.N. and B.T.; Formal Analysis, V.-L.N.; Investigation, V.-L.N.; Resources, B.T.; Data Curation, V.-L.N.; Writing – Original Draft Preparation, V.-L.N.; Writing – Review & Editing, V.-L.N. and B.T.; Visualization, V.-L.N.; Supervision, B.T.; Project Administration, B.T.; Funding Acquisition, B.T.

CONFLICTS OF INTEREST

The authors declare no conflict of interest.

USE OF ARTIFICIAL INTELLIGENCE (AI)-ASSISTED TECHNOLOGY

Not applicable.

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