

# Curriculum of Chemistry for Biology Course: A Case Study on the Perspectives of Biology Education Students

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**Abstract:** This research explores the perceptions, beliefs, and experiences of Biology Education students regarding the importance of the Chemistry for Biology course. In the context of higher education, a deep understanding of Chemistry and the integration of Chemical concepts into Biology education are considered crucial. The study aims to understand how Biology Education students perceive the relationship between Chemistry and Biology and to assess the significance of integrating chemical concepts into Biology education. The research methodology employed in this study is a case study, where data was obtained through questionnaires evaluating students' perspectives on this course. The case study was conducted with 51 Biology Education students who had taken the Chemistry for Biology course. The research findings indicate that the majority of the students strongly agree on the importance of understanding the relationship between Chemistry and Biology. They are aware that biological processes, such as digestion, respiration, and metabolism, involve chemical reactions that must be understood within the context of Biology. Biochemistry, as an interdisciplinary science combining Chemistry and Biology, is recognized as a significant outcome of studying Chemistry. Chemical compounds, enzymes, and protein hormones play vital roles in regulating various biological processes in the human body. These findings provide students with a better understanding of the interconnection between these two disciplines. The study highlights the importance of a strong Chemistry foundation for Biology Education students, suggesting future research to address specific challenges or improvements in teaching. Additionally, it underscores the value of interdisciplinary approaches, suggesting further research on innovative pedagogical methods. Educators can enhance the Chemistry for Biology course by leveraging positive student perceptions, creating real-world connections, and fostering collaboration between Chemistry and Biology departments. Overall, the research significantly contributes to improving higher education curricula, emphasizing student perspectives and refining Chemistry integration into Biology education.

**Keywords:** Case Study, Chemistry for Biology, Biology Education, Integration of Chemistry into Biology, Student Perspectives

## Introduction

University play a crucial role in shaping students' understanding and insights into the subjects they study (Kahn, 2014; Holley, 2017; Kahu & Nelson, 2018; Lundin, Bergviken Rensfeldt, Hillman, Lantz-Andersson, & Peterson, 2018; Tomlinson & Jackson, 2019; Bearman, M., Ryan, J. & Ajjawi, R., 2023). In the context of biology education, chemistry holds a significant role as the foundation for comprehending various biological processes and phenomena within life (Kell, D.B., Samanta, S., & Swainston, N., 2020; Marfu'ah & Anwar, 2018;

Marfu'ah, Anwar, & Hendrawan, 2022). A course that integrates the fields of chemistry and biology is "Chemistry for Biology". This course is specifically designed to impart the fundamental principles of chemistry to Biology Education students, enabling them to understand chemical processes or complex interactions within living organisms (Tim Dosen Pendidikan Biologi, 2023).

The Chemistry for Biology course has been conducted in the even semester. However, a reflection on this course is necessary to obtain insights into the perspectives and understanding of Biology Education students regarding the

importance of the Chemistry for Biology course. Furthermore, there has been no research considering the students' perspectives on this course. Revealing the students' views, needs, and challenges faced in comprehending and integrating chemical concepts into the context of biology is crucial for enhancing the quality of learning. Therefore, this study aims to understand how Biology Education students perceive the relationship between Chemistry and Biology and to assess the significance of integrating chemical concepts into Biology education.

### Materials and Methods

The research method in this study was a case study. this study aims to understand how Biology Education students perceive the relationship between Chemistry and Biology and to assess the significance of integrating chemical concepts into Biology education.. The target participants for this study were 51 Biology Education students who had taken this course at one of the state universities in South Sumatra.

Data collection is carried out through analysis of questionnaires given to students. The data collection instrument used was a questionnaire distributed via Google Forms at the end of the semester. This technique was chosen to allow wider participation from respondents and make it easier to collect data in a structured form.

The data analysis process will be carried out carefully to ensure the accuracy and reliability of the research findings. This method provides a solid basis for evaluating the reliability and validity of research results. By combining student views from various aspects, it is hoped that this research can provide in-depth insight into the extent to which the "Chemistry for Biology" course is considered important by Biology Education students.

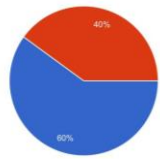
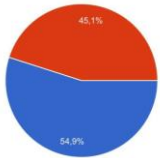
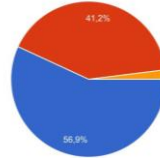
### Results and Discussion

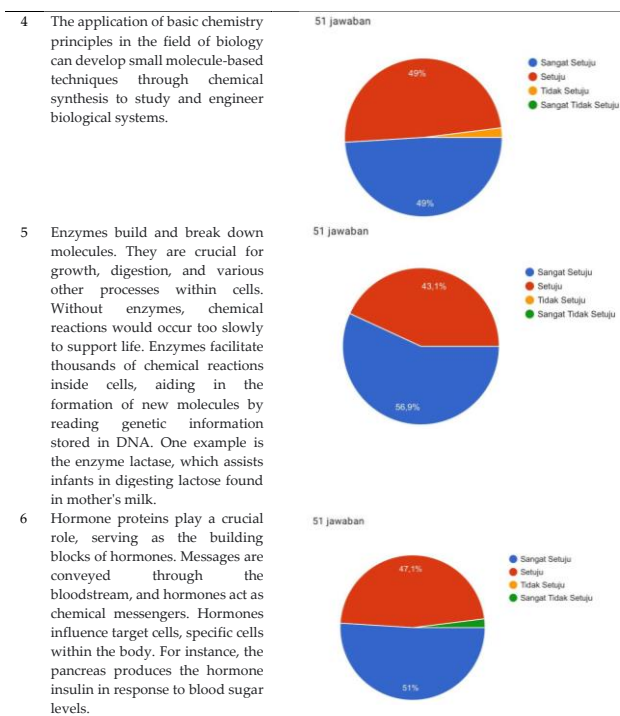
Perception involves a series of processes to acquire and interpret sensory information from the environment in a meaningful way (Ling & Calting ,

2012; Meristin, Sunyono, & Marfu'ah, 2022; Rehman & Perveen, 2021; Niemi & Kousa, 2020; Mohanta, Sen, Adhikari, & Pal, 2023). Students' perception of the importance of the Chemistry for Biology course can provide valuable information to enhance the quality of teaching the Chemistry for Biology course and contribute constructively to curriculum development at the university level. In this regard, students' perception data were obtained through statements categorized as "strongly agree," "agree," "disagree," and "strongly disagree." The use of Likert scales with these categories enables researchers to gather detailed information about students' views and opinions regarding the Chemistry for Biology course material. Such Likert scales provide respondents with the opportunity to express their levels of agreement or disagreement in a graded manner (Pranatawijaya, Widiatry, Priskila, & Putra, 2019; Setyawan & Atapukan, 2018), thereby yielding a more comprehensive understanding of students' perspectives. Here are the research findings regarding students' perceptions of the importance of the Chemistry for Biology course.

### Result

**Table 1.** Questionnaire Results: Students' Perspectives on the Importance of "Chemistry for Biology" Course.

No.	Statement	Students' Perspective
1	Chemistry for Biology is crucial. Chemistry's Role in the Field of Biology. Biological objects consist of chemical elements and compounds. Learning about enzymes and hormones provides examples of chemistry's role in biology. Chemistry is valuable for understanding the mechanisms of metabolism in living cells and studying the roles of various compounds.	50 jawaban 
2	One example of lessons learned from studying chemistry is Biochemistry. Biochemistry, or biological chemistry, is the science that studies the chemical processes that occur within the body and their relationship with living organisms. It is an interdisciplinary field combining Chemistry and Biology.	51 jawaban 
3	Some benefits of chemistry in the field of biology: a. Studying the Composition of Organisms The body of organisms is composed of biomolecules such as carbohydrates, lipids, proteins, and water. The structure and properties of these biomolecules are studied in biochemistry. b. Studying Metabolism in Organisms The respiratory mechanisms in the human and animal bodies, as well as photosynthesis in plants, can be studied, including the biomolecules involved and the amount of energy produced.	51 jawaban 



## Discussion

Survey results based on statement 1, out of 50 respondents, indicate that 60% strongly agree and 40% agree that the Chemistry for Biology course is very important. The majority of students strongly agree with the statement that Chemistry plays a crucial role in Biology courses. They are aware that biological processes such as digestion, respiration, metabolism, and photosynthesis involve chemical reactions that must be understood in the context of Biology.

Survey results based on statement 2, out of 51 respondents, 54.9% strongly agree and 45.1% agree that studying biochemistry is one of the outcomes of studying chemistry. Biochemistry is a science that examines chemical processes within the body and their relationship with living organisms (Mougios, 2019; Britton, 2020; Minchin & Lodge, 2019; Lopez & Mohiuddin, 2020; Hargreaves, Heaton, & Mantle, 2020). It is an interdisciplinary field that combines chemistry and biology (Gumerova & Rompel, 2021; Lang & Bodner, 2020; Gronenborn, 2019; Busta & Russo, 2020). This study shows that understanding Biochemistry, which is a combination of Chemistry and Biology, is highly necessary. Biochemistry enables a deep understanding of chemical processes within living organisms and is directly related to the field of Biology.

Survey results based on statement 3, out of 51 respondents, 56.9% strongly agree, 41.2% agree, and 1.9% disagree with the statement that chemistry is very important in understanding the composition of organisms' bodies and metabolism. Chemical compounds such as carbohydrates, lipids, and proteins form the structure of the body and are involved in vital processes such as respiration and photosynthesis (Alamgir, 2018; Bratosin, Darjan, & Vodnar, 2021).

Survey results based on statement 4, out of 51 respondents, 49% strongly agree, 49% agree, and 2% disagree with the concept of applying basic chemistry principles to biology. This application aids in developing small-molecule-based techniques crucial for understanding and engineering biological systems. This study also reveals the remarkable biological complexity through an understanding of small chemical reactions occurring within cells. Chemical synthesis allows scientists to comprehend and engineer biological systems more effectively (Tang, et al., 2021; Vecchio, Dy, & Qian, 2016; Lee, et al., 2019).

Survey results based on statement 5, out of 51 respondents, 56.9% strongly agree, and 43.1% agree with the importance of enzymes in organisms' lives. Enzymes, chemical products in the body, play a crucial role in various biological processes such as growth, digestion, and hormone regulation in the human body. Students highly recognize the importance of enzyme and hormone functions in the body (Frayn, 2009; Soetan, Olaiya, & Oyewole, 2010; Copeland, 2000; Heaton, Heales, Rahman, Sexton, & Hargreaves, 2020; Martelli, Testai, Colletti, Cicero, 2020).

Survey results based on statement 6, out of 51 respondents, 51% strongly agree, 47.1% agree, and 1.9% strongly disagree with the statement that protein hormones are very important. Protein hormones play a role in regulating target cells in the body (Kelley, Weigent, & Kooijman, 2007; Montesinos & Pellizas, 2019), enabling vital chemical communication in processes such as metabolism, fluid balance, and reproduction. From the research findings, it is clear that Biology Education students are aware of the importance of Chemistry in their understanding of Biology.

## Conclusions

Biology Education students really need chemistry, especially concepts about chemical reactions and molecular structure. This study provides a strong foundation for the development of a curriculum that integrates Chemistry and Biology, giving students a better understanding of the relationship between these two disciplines. Implications for future research and practice are evident. Firstly, the study emphasizes the need for a strong foundation in Chemistry for Biology Education students. Future research could delve deeper into specific aspects of the Chemistry for Biology curriculum that students find most challenging or rewarding. This could inform targeted improvements in teaching methods or content. Secondly, the findings underscore the relevance of interdisciplinary approaches in higher education. Integrating Chemistry and Biology in the curriculum enhances students' understanding of the interconnectedness of these disciplines. Future research could explore innovative pedagogical methods or collaborative teaching strategies that further promote interdisciplinary learning. In terms of practice, educators can leverage the positive perceptions revealed in the study to enhance the delivery of the Chemistry for Biology course. Creating real-world connections between chemical concepts and biological processes, incorporating practical applications, and fostering collaborative projects between Chemistry and Biology departments could enrich the learning experience. Overall, this research contributes significantly to the ongoing efforts to improve the quality of higher education curricula, particularly in the field of Biology Education. It underscores the importance of considering students' perspectives as key stakeholders in curriculum development and highlights avenues for refining the integration of Chemistry into Biology education.

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