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Teacher-students interactions and Students' attitude at international science faculty classes: in the context of biology and chemistry departments

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Keywords: Students' attitude, Classroom interaction, International class, Science class	**ABSTRACT** In the context of globalization of education, where students often come from diverse cultural and academic backgrounds, interactions between teachers and students play a key role in effective learning experiences. This research emerged from awareness of the need to understand how interactions between teachers and students occur in international classrooms, particularly in biology and chemistry departments. This research aims to analyzed differences in student interactions in international classes based on science faculties. This research is comparative research obtained through random sampling. The sample for this research was 88 students who were enrolled in the international class program at the science faculty. Data was collected used an in-class interaction instrument with 29 items. The analysis technique uses descriptive and independent sample t-test. These findings indicate that there are significant differences in the level of interaction between students majoring in biology and chemistry in international classes. Apart from that, classroom interaction also provides opportunities for collaboration between students so that they can increase their self-confidence in their learning abilities. Building strong relationships among students also contributes to increasing positive attitudes towards learning through motivation and engagement.
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Introduction

The phrase of "classroom interaction" refers to certain actions that a lecturer and the students take during the learning process. It demonstrates how allowing kids to express their thoughts, emotions, and ideas in the classroom (Brown, 2000). Regardless, the achievement of the teaching and learning process is greatly influenced by the importance of the teacher (Mu'in et al., 2018). For instance, a teacher could ask questions to students to stimulate their interest or encourage their involvement in the classroom. The classroom interaction activities will surely encourage students to communicate and discuss ideas during interactions and moreover, it subsequently influences students' attitudes, both positively and negatively, toward the teaching and learning process.

Classroom interaction can have a significant impact on students' attitudes toward learning by creating a positive learning environment that promotes enthusiasm and motivation among students. When students are actively involved in the learning process and possess a feeling of achievement in their knowledge, they are more likely to develop a positive attitude toward learning (Ferrer et al., 2020). Additionally, classroom interaction that promotes respectful communication, active listening,

and collaborative problem-solving can help to build positive relationships among students (Johnson et al., 2013). When students feel comfortable expressing their ideas and opinions, and are encouraged to consider and appreciate the perspectives of their peers, they are more likely to develop positive attitudes towards their classmates. Lastly, the application of classroom interaction by connecting to real-world situations and allowing students to explore and apply concepts in meaningful ways, teachers can help students to develop a deeper appreciation for the subject. This can increase their motivation and engagement in the learning process, as they see how the material can be applied in their lives outside of the classroom, especially in science (Maeng and Chen, 2016). Thus, classroom interaction has the potential to influence students' attitudes in profound ways. By creating a supportive and engaging learning environment that emphasizes active participation and collaboration, teachers can help to foster students' positive attitudes in learning process.

However, the application of classroom interaction is still not implemented properly. It may result in negative attitudes in students, such as low motivation and interest, poor academic achievement, and a lack of critical thinking skills. The teacher plays a key role in the implementation of effective classroom interaction strategies. The teacher's ability to facilitate and guide classroom interaction can have positive attitudes on students' motivation, engagement, and learning outcomes (Cheng et al., 2016). Thus, the lecturer needs to be aware of some of the issues that still surround classroom interaction. For some issues according to the brief observation, the teaching technique is still teacher-centered, with the teacher providing the main source of knowledge and the students acting as passive recipients (Mu'in et al., 2018). Moreover, the habit of students avoiding participation in classroom activities. During the teaching and learning process, the students of international class programs use English as the medium of instruction. The students tend to lack communication skills, especially in English. It is assumed that some of the students are hesitant about speaking English in class because they are worried about being laughed at if they make mistakes in expressing their thoughts or ideas during the learning process (Dharmawati, 2020). As a result, there may be little possibility of the students understanding the material because of low motivation and participation.

Moreover, several studies have discussed about students' attitude and classroom interaction in different points of view. Based on the study which was done by Yuwono (2016), it was found that the students in junior high school have positive attitude towards classroom interaction including having a positive thought, feelings, and behaviour. The result is quite similar with the study conducted by Boukhari (2014). This study concludes that the students and also the teachers are aware of the importance of classroom interaction since it is believed that by promoting classroom interaction, they can get a chance to have comprehensible input and output which are related to the student's performance. This result is supported by Havik and Westergard (2020) that found that the students who get a high-quality of classroom interaction will engage to the classroom activities. In addition, Mujaddidah (2020) from her study believed that teachers have done a good interaction in classroom. Furthermore, Ameiratrini and Kurniawan (2020) found that the teachers have used balanced portion in praising, motivating, and clarifying their idea in classroom, especially online classroom.

Considering the importance of attitudes towards classroom interactions, this research will examine students' attitudes in classroom interactions in international science classes. In addition, considering the problems above, only a few studies have discussed student attitudes and class interactions in science faculties, especially in international classes. This research emerged from awareness of the need to understand how interactions between teachers and students occur in international classrooms, particularly in biology and chemistry departments. This research aims to analyzed differences in student interactions in international classes based on science faculties.

Methods

This research was conducted to determine students' attitudes towards class interactions in international classes at the science faculty, Universitas Negeri Padang (UNP). Quantitative methods with comparative research designs are used to compare and statistically analyze data between two

or more groups or variables. Quantitative research is a method used to measure objective theories (Cresswell, 2014). The participants in this research were 88 students from the Biology Department and Chemistry Department, Faculty of Science

The questionnaire consists of 29 statements about students' attitudes towards classroom interactions. Questions regarding classroom interaction were adapted from Flanders' (1970) theory, which is divided into several categories, namely; receiving feelings, praise or encouragement, accepting or using student ideas, lecturer questions, explaining, giving directions, criticizing or justifying authority, lecturer responses, student responses, student initiations, student questions, and peer responses. Meanwhile, attitudes based on Ajzen & Fishbein (2005) can be divided into positive attitudes and negative attitudes. In the questionnaire, students are expected to choose whether they strongly agree (strongly agree), agree (agree), slightly agree (less agree), or disagree (disagree). As for one example of a statement from the class interaction instrument "When the lecturer does not accept my answer or opinion, I feel increasingly curious" This measuring instrument has good validity and reliability with an Alpha coefficient of 0.92.

This research employs descriptive data analysis to provide a comprehensive summary of the collected data. Through descriptive statistics, the researcher aims to summarize and present the main features of the data, such as central tendency, variability, and distribution, in a clear and understandable manner. In addition, the research utilizes the independent sample t-test to compare the means of two independent groups and determine whether there are statistically significant differences between them.

Results and Discussion

Based on the results of the questionnaire, the frequency of students' positive attitudes towards class interactions in international science classes is very positive. This condition is proven from table 1 which explains the high average interaction value of international classes majoring in biology and majoring in chemistry. However, the average class interaction score in the chemistry department (M = 99.91) is higher than that in the biology department class (M = 95.68)

Table 1. Descriptive test of student interactions in class based on science majors

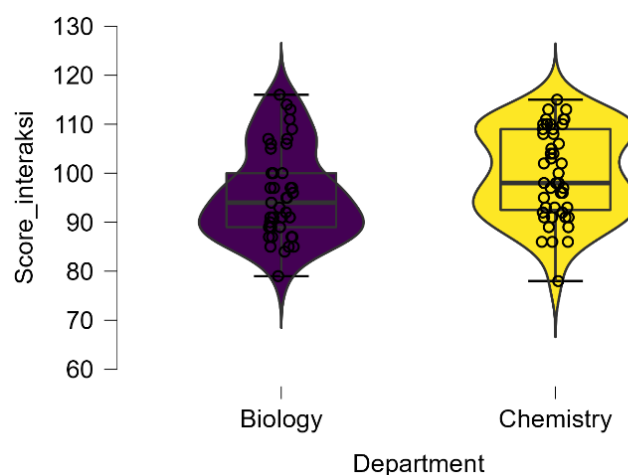|	Department	N	Mean	Std. Deviation	Std. Error Mean
Score_ interaction	Biology	41	95.68	9.30	1.45
	Chemistry	47	99.91	9.14	1.33

Figure 1. Data Distribution Using Boxplots

Figure 1 shows the data distributions from the Biology Department (indicated by the purple boxplot) and the Chemistry Department (indicated by the yellow boxplot). The Chemistry Department has a slightly higher average score compared to the Biology Department, as seen from the comparison of the lines indicating the average scores of student interactions in the classroom. Additionally, the data distributions for both departments are in good condition, as there are no outlier data points. Furthermore, to clarify the distribution of interaction data for international classes majoring in biology and chemistry, you can see the following variable maps. The left side describes the distribution of people and the right side describes the distribution of items. There are two blue lines that depict the qualities of person and item. It can be seen that students tend to be able to answer interaction items, even the most difficult item, namely item P13. The person distribution depicts two separate sections, the international class of biology majors marked with code "B" and chemistry majors with code "C".
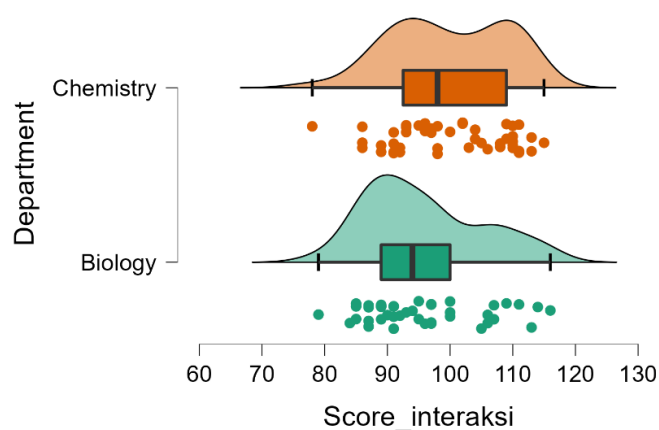

Figure 2. Data condition with Raincloud

Figure 1 displays the distributions of interaction scores for the Biology and Chemistry departments, represented by green and orange boxplots respectively. The score ranges for the Chemistry department extend approximately from 80 to 120, while for the Biology department, the scores range from about 85 to 115. The median score for the Chemistry department is slightly higher than that for the Biology department, indicating that students in Chemistry tend to have higher interaction scores on average. Both departments show relatively normal distributions of scores, as indicated by the violin plots surrounding the boxplots. The Chemistry department exhibits more variability in interaction scores, as evidenced by the wider spread of data points and several outliers. In contrast, the Biology department shows fewer outliers, suggesting a more consistent range of interaction scores. Overall, the Chemistry department has slightly higher average interaction scores but with greater variability compared to the Biology department.

In addition, Figure 3 also provides additional confirmation of previous findings which state that the average interaction in international classes of chemistry majors tends to be higher compared to biology majors. This suggests that chemistry courses may attract more participation, or may have teaching approaches that are more effective in encouraging interaction between students in an international context. There are 15 items that are clearly accepted by all students from both departments, indicating that the essence of the material measured by these items has been well understood by all students. This phenomenon reflects the existence of strong common ground in the essential understanding or skill being tested, even between two different disciplines. These similarities may indicate that certain aspects of the international classroom curriculum have been implemented equally and effectively in both majors, resulting in a uniform level of understanding among students.
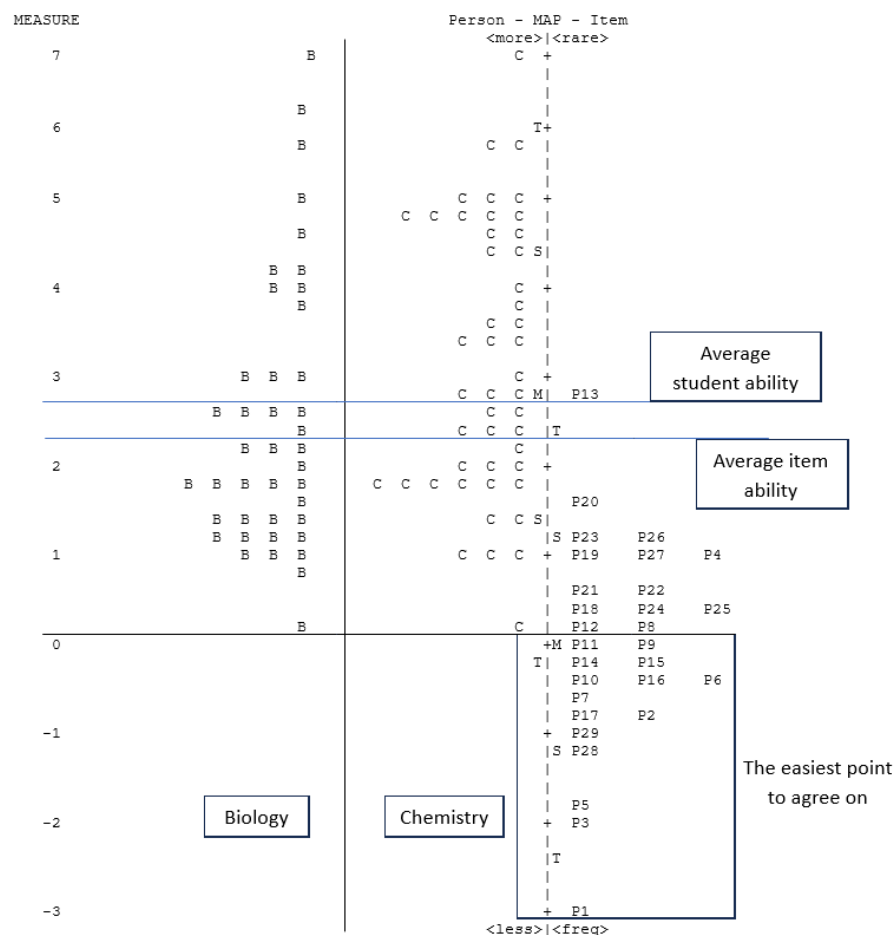
Figure 3. Students' Attitude towards Classroom Interaction

Further analysis is needed to more clearly reveal differences in interactions between international classes of biology majors and chemistry majors. In this context, a more detailed study could provide deeper insight into the dynamics of communication, collaboration, and participation between students in the two majors. Differences in international class interactions in biology majors and chemistry majors in the following t-test table.

Table 2. Test of Differences in Student Interactions in Class Based on Science Majors

	Levene's Test for Equality of Variances		t-test		
	F	Sig.	T	df	Sig. (2-tailed)
Score_ interaction	.095	.758	-2.146	83.959	.035

The analysis results in Table 2 show a t test to assess the difference in average interactions between the two groups of students. The t test results show a t value of -2.146 with degrees of freedom of 83,959. The p value (Sig. 2-tailed) is 0.035. A p value lower than the significance threshold (< 0.05) indicates that the difference in interactions between students from the two science majors is statistically significant. Thus, these findings indicate that there are significant differences in the level of classroom interaction between students majoring in biology and chemistry. This research was conducted in order to find out the students' attitudes towards classroom interaction in international science class. The result of this study shows that the students have very positive attitude toward classroom interaction that can be seen from the study results. The students have very positive answer related to the categories of classroom interactions which is adapted from Flanders's classroom

interaction categories (1970). The main discussion will focus on the three highest very positive categories of classroom interactions which are accepts feeling, lecturers' response, accepts or uses students' idea, explaining, criticizing or justifying authority, and praises and encouragement.

The highest positive attitude on classroom interactions is related to the students' accepting feeling where the students love to have a friendly lecturer in their class. Asbah and Rajiman (2015) in their study also states that the lecturers can start the class by giving a smile, giving motivation, and building the students' confident. It is in line with the study conducted by Havik and Westergard (2020) that the friendly manner, such as giving a support to the students, makes the students work harder in the classroom. These kinds of friendly atmospheres can help the students to get ready and adapt with the learning situation. Besides, it also breaks the ice especially for the students who get nervous and anxious in the class. It is also important to strengthen the relationship between the lecturer and the students (Nisa, 2014; Amatari, 2015). To clarify students' attitudes when interacting in class, it can be seen from the research results.

Accepts Feeling and Lecturer's Response
The students show a very positive attitude related to their feeling for studying and how the lecturer give responses to their action in the classroom. The result of the questionnaire is depicted in Table 3.

Table 3. Accepts Feeling and Lecturer's Response

Statements	Students' Responses			
	SA	A	LA	D
Accepts Feeling				
The students like the lecturers who teach in a friendly manner.	90%	10%	0%	0%
The students showed their ready-to-learn attitude when the lecturer starts the opening greeting.	62%	38%	0%	0%
	100% (Very Positive)		0%	
Lecturer's Response				
The students feel that the lecturer answers their question nicely in and a friendly manner.	49%	51%	0%	0%
The lecturer's answer helps them to understand Biology/Chemistry clearly.	57%	43%	0%	0%
	100% (Very Positive)		0%	

Table 3 shows the result of the questionnaire related to students feeling and lecturer' response have a perfect score, that is 100%, which indicates a very positive attitude. This is the highest positive category shown by the students in the classroom. In accepts feeling, almost all of the students (90%) chose strongly agree that they like the lecturer who teach in a friendly manner. Besides, 62% of the students answered strongly agree and 38% answered agree that they prepared well for the study by showing ready-to-learn attitude. Furthermore, related to the lecturer's response, 51% of the students agree and 49% chose strongly agree that they feel that the lecturer answer their question nicely and in a friendly manner. The lecturers' answer also help all of the students (57% strongly agree and 43% agree) to understand the material (Biology/Chemistry) clearly.

Accepts or Uses Students' Idea and Explaining
The second highest positive category of classroom interactions are accepting and using students' idea and explaining. The score for both categories are 97% which can be categorized as very positive. The detail of the questionnaire result can be seen in Table 4.

Table 4. Accepts or Uses Students' Idea and Explaining

Statements	Students' Responses			
	SA	A	LA	D
Accepts or Uses Students' Idea				
Students are enthusiastic when the lecturer clarifies my opinion.	51%	43%	6%	0%
The students feel motivated to study when the lecturer summarizes and retells their opinion again.	56%	44%	0%	0%
	97% (Very Positive)		0%	
Explaining				
The students like studying biology/chemistry because the lecturer explains the material in a clear and structured way.	49%	47%	4%	0%
The students can understand the lecturer's explanation in teaching biology/chemistry because the language is clear.	38%	60%	2%	0%
	97% (Very Positive)		3%	

Based on the questionnaire, the students are enthusiastic when the lecturer clarifies their opinion. There are 51% of the students answered strongly agree and 43% of the students chose agree with this statement. In the other hand, only 6% of the students that feel not enthusiastic when the lecturer discusses their opinion. In addition, 56% of the students chose strongly agree and the rest chose agree to the statement that said the students feel motivated to study whenever their lecturer summarizes, retells and makes use of their answer or opinion for further explanation about the topic being explained (Table 4).

In addition, there are also some criteria mentioned in questionnaire related to the category of explaining. From the result of the questionnaire, 49% of the students answered strongly agree and 47% of the students answered agree that they like to study science since the lecturer explains the materials in a clear and structured way. Meanwhile, only 4% of the students answered disagree. Furthermore, the students can understand the lecturers' explanation in teaching science because the language is clear. There are 60% of the students agree with this statement and the 38% of the students chose strongly agree.

Criticizing or Justifying Authority and Praises or Encouragement

The third highest positive category of classroom interactions that should be taken into account are criticizing and justifying authority and also praises and encouragement. The students' answer in the questionnaire is depicted in Table 5.

From the result of the questionnaire, it is clear that the students' responses to the statements related to criticizing and justifying authority are also positive. More than a half of the students answered positively that they accept the advice and correction from the lecturer since it can possibly mean to the students that the lecturer listened and helped them to understand lesson or the topic being learnt better. Only 5% of the students answered less agree with this statement. Besides that, 53% of the students answered agree and 46% answered strongly agree that the lecturers seemed to give an advice in a nice and friendly manner. While only 1% of the student answered in the other way (Table 5).

Furthermore, related to the praises and encouragement, 79% of the students chose strongly agree that they are more enthusiastic in answering the questions when the lecturer give them praise. While 19% of the students agree and 2% answered strongly agree. More than a half of the students feel

confident when the lecturer asks them to explain their answer. In the other hand, there are 10% of the students chose less disagree and 2% of the students chose disagree with this statement. In addition, 72% of the students chose strongly agree and 28% answered agree that they can be more motivated when the lecturer gives some jokes during the learning process.

Table 5. Criticizing or Justifying Authority and Praises or Encouragement

Statements	Students' Responses			
	SA	A	LA	D
Criticizing or Justifying Authority				
The students can accept it when the lecturer gives them advice or correction.	49%	46%	5%	0%
The students feel that the lecturer gives them advice nicely and in a friendly manner.	46%	53%	1%	0%
	96% (Very Positive)		4%	
Praises or Encouragement				
The students are more enthusiastic in answering the next questions when the lecturer gives praise.	79%	19%	0%	2%
The students feel confident when the lecturer asks them to explain their answer.	28%	60%	10%	2%
The students are motivated to learn when the lecturer inserts jokes during the learning process.	72%	28%	0%	0%
	96% (Very Positive)		4%	

In conclusion, the students are mostly having positive attitude towards classroom interaction at international science class. This positive attitude is a result of meeting the needs of the students in international science class, such as in Biology and Chemistry class, where they need to use their critical thinking, details description, clearly explaining the concept, and also their response on the task/work is used by the teacher in the process of teaching in a friendly manner. This will lead them to be active and motivated participating in classroom.

Related to the lecturer's response, the students also show a very positive attitude. The students react positively when the lecturers give them a friendly response and explanation on the question given by the students. This response helps the students to understand the concept on Biology/Chemistry better. It also gives a chance for the students to negotiate meaning and creates a learning opportunity (Saswati, 2018). The lecturers' response based on Chin (2007) can be divided into two which are responses for a correct answer, and responses for an incorrect answer. For a correct answer, the lecturers can affirm the answer and reinforce it, or the lecturers also can accept the answer and then ask another related and/or related questions. While for the incorrect answers, the lecturers can give a response by giving explicit correction with the explanation, or the lecturers can give the neutral comments with the reformulation of the questions and then challenge them with another related questions. However, the response is not only about verbal communication, but it can also in form of eye-contact, facial expression, gesture, and touch (Sundari, 2018).

Accepting and using students' idea also get another strong positive attitude from the students. They appreciate when the lecturer clarifies and retells their opinion in class. It may indicate that the students' ideas are accepted and the lecturer make use of those ideas to be explained further in the class. This result is in line with the study conducted by Putri (2015) that the teachers in this study usually accept and use the student's idea to clarify and improve the existing idea. The lecturers need to clarifies, builds, interprets, summarizes, and develops ideas which are suggested by the students, but at the end the ideas should still recognized as the students' contribution (Dj and Musfirah, 2019). The same tone also appears in the result of the study done by Pujiastuti (2013) that accepting and

using students' idea come as the third highest of teacher talks used in the classroom. In addition, accepting and using students' idea are highly related to the students' attitude towards the lecturers and also the class work (Amatari, 2015).

The next category of classroom interactions with the second highest percentage of the students' positive attitude is explaining since the lecturer explains the materials in clear and structured way. So it helps them to understand the materials in the easiest way. The same result also found by Panggabean and Ginting (2022) that the teachers is good in teaching and the students like the way the teachers teach them. The teachers will explain the materials until the students understand. In the same topic, Ayunda et.al (2021) study about the direct influence of teachers talk in the classroom. The result shows that the most essential type of the teachers talk is lecturing, where the lecturers explain the materials in a particular way so that the students would be well-understood about it. More specific, the study conducted by Li and Arshad (2013) in science class also suggest that the lecturers can focus on giving explanation and giving instructions in order to help the students understand the materials even better.

Criticizing and justifying authority stands as the third highest percentage of the students' positive attitude towards classroom interaction. The students accept the correction and advice given by the lecturer in nicely and friendly manner. The same line also provides by Pujiastuti (2013) that the students can accept the advice or correction from the lecturer in a friendly manner. Criticizing and justifying authority are intended to change the students' behaviour from something that is non-acceptable into an acceptable behaviour (Mujaddidah, 2020). In details, there are two kinds of criticizing based on Dj and Musfirah (2019). First is the lecturer criticizing the students' behaviour such as trying to change the unacceptable behaviour, communicating anger, etc. The second type is the lecturer criticizing the students' response such as telling the students that their response or answer are incorrect or un acceptable.

The last type of classroom interaction that get the third highest place of students' positive attitude is praises or encouragement. It was found that by getting praise and encouragement, the students can feel confident and enthusiastic in answering and explaining their answer. Besides, giving a praise for what the students have done and build their confident will led to the improvement of the students' communicative competence (Nisa, 2014). In addition, the study conducted by Putri (2015) finds that the teachers tended to give praises when the answer is right. In the same topic, Winarti (2017) states that praise that comes with some comments from the teachers can be said as feedback. The teachers believe that the students love to be praised and it has to be done directly and spontaneous (Sundari, 2018).

Conclusion

These findings indicate that there are significant differences in the level of interaction between students majoring in biology and chemistry in international classes. This shows that there are variations in learning dynamics between the two disciplines. In addition, classroom interaction also provides opportunities for collaboration between students, which can increase their confidence in their learning abilities. Building strong relationships among students also contributes to increasing positive attitudes towards learning through motivation and engagement. Therefore, the important role of lecturers in managing class interactions is very important in creating a conducive and supportive learning environment in international classes. Thus, understanding student attitudes towards classroom interactions and the differences in interactions between biology and chemistry majors can be an important basis in developing more effective and inclusive learning practices at the Faculty of Science.

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