



## Article

## Exploring the use of content and language integrated learning for online learning in Chemistry major

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Article Information	Abstract
<p><b>Keywords:</b>            Content            Language Integrated Learning            Cognitive            Communication            Culture</p> <p>Received 21 October 2021            Received in revised form 1 March 2022            Accepted 21 March 2022            doi: <a href="https://doi.org/10.33750/ijhi.v5i1.140">10.33750/ijhi.v5i1.140</a></p>	<p>The world of education is mainly presented in the form of bilingual learning, such as in universities. Furthermore, some departments prepare majors with international class programs. This research focuses on analyzing the chemistry students' perceptions and the practice of the subject on the use of content language Integrated learning. The samples were seven students who learned and one lecturer who taught chemistry major for an international class in Universitas Negeri Makassar. The researcher took them by using purposive sampling. The research instruments were interview protocol for semi-structured interviews, observation checklist, and documentation. Based on data analysis by using thematic analysis, it gathered results; first, from the chemistry students' perceptions towards the use of the content and language integrated learning, the researcher found several themes for each aspect: perception of content was content material, language use, medium of instruction, and teaching style; perception of cognitive were classroom condition, critical thinking, problem-solving, and learning motivation; perception of communication was learning difficulties, English use, learning style, and reason for learning style; perception of culture were code-mixing use and learning-interaction. The perceptions are also mainly influenced by factors of expectations and experiences. Second, from the learning process of the Analytic Chemistry subject that practiced the CLIL, the researcher found that in all of the stages in the learning process: pre-activity, main-activity, and post-activity. English and Indonesian also play a role in this learning process. The lecturer actively combines these two languages to deliver the material, and the students respond to the lecturer. Therefore, it is recommended that in using and developing content and language integrated learning, the university may consider the perceptions of these students and difficulties for lecturers and students in the learning process, especially in bilingual online classes at the university level.</p>

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## 1. Introduction

Current globalization has made aspects of community life internationally integrated, including language. In terms of education, the bilingual program is widely used globally. It is implemented at any level of education, from pre-school to the university level, to develop students' proficiency in bilingual learning (Palmas & Canaria, 2018). In Indonesia itself, most Indonesians become bilingual and even multilingual. They acquired their first language from the native language, then studied Indonesian, learned Arabic to learn the Koran, and eventually learned a foreign language such as English when

entering elementary school. Thus, the students have to learn language skills and elements because they can develop their language proficiency. Students have to focus on the spoken and written form of the language more. Therefore, they will learn how to communicate through speaking and writing, especially in bilingual education. Bilingual education is popular in many countries, especially in Europe. Students in this program will learn two languages or more to improve their knowledge. They communicated in those languages in some classroom practices. This program focused on making the students master the two languages. Thus, their knowledge of the two languages is balanced and integrated. It is known as Content and Language Integrated Learning (CLIL).

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CLIL has been implemented in some countries, and several researchers discussed this topic. For instance, Hofstadler et al. (2020) focused on the professional subjective wellbeing (SWB) of CLIL teachers from an ecological perspective in Austria. The SWB of teachers is built by some level of their ecology, and the implementation of CLIL in the teaching process is the factor that cannot be separated from the teachers. Moreover, Mensel et al. (2020) focused on the CLIL approach for the CLIL students with English and Dutch language background in Belgian French. Socioeconomic status has a role in comparing them and non-verbal intelligence. Furthermore, Fernández et al. (2019) focused on analyzing of scientific competence of the students through the first language (L1) and second language (L2) by comparing the students in the CLIL program and non-CLIL program in Spain. The students who learned science using L1 were better than those using L2.

Indonesia also has implemented the CLIL program, and several researchers in Indonesia researched CLIL. For instance, Hapsari (2012) argued that the implementation of CLIL has to be considered again because the students got difficulties in understanding the content subject. Also, Rohmah (2019) assumed that the implementation of CLIL is feasible and effective in assessing students' English proficiency. It proved that the English proficiency of the students has increased. In short, students accepted the influence of CLIL implementation. According to Baker (2011), the CLIL learning process is 50:50 and 90:10, but it can be 60:40, 75:15, or 80:20, depending on the students' grades. The realization of CLIL in Faculty of Math and Natural Science students, Universitas Negeri Makassar, showed that the learning process used two languages: English and Indonesian. CLIL focuses on mastering the language and content of the subject taught through teaching that subject using the target language.

The targeted languages here are English and Indonesian. Lecturers and students are still using these two languages in theoretical and practical subjects. This also happens in the subject of Analytical Chemistry. Lecturers also teach the subject with characteristics suitable for teaching in a CLIL program, such as having sufficient ability in terms of the language to be used, namely English or being a foreign graduate. Through the researchers' informal observation, the use of CLIL focused on language development, which only understood the content of the subject.

Moreover, the learning process is run using an online system. Therefore, the differences in the learning process can create a variation in students' perceptions of the use of CLIL based on their learning experiences, especially in Bilingual classes for Chemistry majors. Besides that, the practice of CLIL on the subject also has several stages where each stage still involves two languages. Considering that reason, the researcher will further explore the use of CLIL in the Faculty of Math and Natural Science, especially in the Bilingual class for Chemistry major of Universitas Negeri Makassar, to explore the students' perceptions toward the use of CLIL and the use of CLIL in teaching a subject that delivered by a lecturer.

The use of CLIL in Indonesia is widespread increased. Many educational institutions labeled themselves by using an international standard. The learning process in every institution involves the content subject and mastering the international language, especially the English language. Content subject and language have to be balanced even though English is still a foreign language in Indonesia. Kusuma (2019) asserted that English is used broadly and in many fields. For instance, English has been used to make song lyrics in the art field, English has been used in presenting projects in business fields, and English has been used to make documents in governments.

For this reason, English has to use in developing education fields. In current Education fields, specifically for bilingual education, CLIL has been used at any level of education. In higher education, the institution served regular classes and CLIL classes. The use of CLIL must pay more attention to how the principle of CLIL is used. Coyle et al. (2010) stated that CLIL implementation focused on the principle of CLIL that consists of Content, Cognitive, Communication, and Culture. Perceptions of students in higher education toward the use of CLIL are different. Their perceptions are different based on their experience in the classroom learning process in terms of the online bilingual class. This research aims to explore the perception of Chemistry students towards the use of CLIL in the online bilingual class of higher education. This research also aims at exploring the use of CLIL in teaching subjects delivered by a lecturer in the online bilingual class for the Chemistry students of higher education. Thus, the researcher develops two research questions in this research as follows:

- What is the perception of Chemistry students towards the use of CLIL for the online bilingual class of higher education?
- How does the lecturer deliver the subject by using CLIL in the online bilingual class for the Chemistry students of higher education?

## 2. Literature Review

### 2.1. Theories Dealing with CLIL

Globalization has significant effects on education, especially on language learning. Thus, it forces them to develop their language knowledge, and it is implemented based on students' needs in learning content (Coyle et al., 2010). The teachers also have to be ready for the CLIL program. As Luisa et al. (2016) said, teachers, need training in linguistics competence, intercultural competence, theoretical aspects, methodological aspects, teaching materials, and teaching resources in CLIL. The integration function means that students are expected to understand the whole learning process. The students can integrate the content and language because it is not taught separately (Baker, 2011). They have to allow the teachers or lecturers to consider the development of the CLIL learning context to find the effectiveness of CLIL itself for oral skills like listening skills and speaking skills (Luisa et al., 2017). CLIL emphasizes that they act in communication by integrating various learning media (Sarip, 2019). However, we still have to focus on learners' age (Martínez et al., 2019). The teachers' readiness is also related

to the teaching process's communication practice to do class activities like opening the class, presenting the materials, giving instruction, moderating the discussion, making question and answer sessions, and closing the course (Ulfiani, 2016)

The focus of the effectiveness of CLIL is not only oracy skills but also literacy skills. In the curriculum, genres are the language resources interrelated to the content and language (Morton, 2020). The proper context of textual resources of learning material can develop the learners' literacy skills to create their writing required to the genres and associate it with the content subject (Whittaker et al., 2011). The use of course books affected literacy skills. CLIL included in the use of course books must be characterized by (1) Correlation between specific content subject and the curriculum in the first language; (2) Contents simplification; and (3) Developing reading skill and order thinking task dominantly (Banegas, 2014). Scaffolding strategies in reading skills also play an essential role. It covered the learners' needs, developing learners' pedagogy (Li & Zhang, 2020). CLIL positively affects reading skills and vocabulary mastery, both receptive and productive, because it provides the situations contextually and meaningfully (Bayram et al., 2019). The learners are also exposed to more abstract and technical vocabulary mastery (Tragant et al., 2016). Finally, CLIL could be described as a methodology or approach to teaching a second language or foreign language through content subjects. This methodology could be marked as the learning objectives focusing on language skills and content subjects (Schroeder, 2015). The CLIL feels ambivalent in experimentation because it cannot achieve all potential or linguistic goals and indeterminacy in implementation (Codo, 2020).

## 2.2. CLIL in the Higher Education

Marsh and Frigols (2012) asserted that CLIL is a dual-centered educational technique in which a different language is used to master and coach each content material and language. The students learn the subjects through English, but on the other hand, they learn how to apply the English itself. Therefore, specific purposes of CLIL, namely 4C's: Content, Communication, Cognition, and Culture (Coyle et al., 2010). CLIL is sometimes related to the English for Specific Purposes (ESP). However, there is a fundamental difference between CLIL and ESP even though it is related. CLIL and ESP needed more exploration because they have some aspects like focusing on implementation, facing future hegemony, and the feedback (Martin, 2017).

However, defining ESP as an approach can confuse the learners. Teaching English for some specific academic or occupational with a text-centered system would not be considered ESP (Katerina, 2015). The teachers or lecturers needed to adopt methods and combine them from ESP to CLIL by using schema theory (Nashaat et al., 2013). CLIL involves some higher education issues, such as the lecturer's role as a deliverer of the subject, how the subject is practiced, and feedback. It is also implemented in some stages: Analysis of needs, Material review, Analysis of CLIL, and CLIL's plan (Morgado et al., 2015).

## 2.3. Basic Concept of Perception

Perception is how our behavior responds to sensory information to present the description of data based on situations experienced by humans. Robbins et al. (2017) described perception as organizing and interpreting individuals' sensory impressions to give meaning to their environment. Thus, the individual can perceive different from reality, and differences in perception can be distinct, the differences in which some factors cause those perceptions. Besides that, the factor that influence perception is divided into three contexts: the situation, the target, and the perceiver. The person's thinking tends to the attributives in another person. In their interactions, the condition can affect the perception. Some situations can bring the person to behave based on the situation. In this situation, we can perceive others based on their physical appearance. It plays a significant role in a person's perceptions, and we can observe it and then conclude the relation.

## 3. Method

### 3.1. Research Design

In this research, the researcher applied the qualitative method. This method interprets the condition and creates more visible information (Mertens, 2014). Moreover, Creswell et al. (2018) mentioned that the design of the qualitative method is a case study. Thus, the researcher classified the design of this research as a case study. This research was analyzed by using thematic analysis. It is a way to identify themes or patterns of meaning from a set of data (Braun & Clarke, 2013). It began with the students' interview, the researcher observed the teaching and learning process in the online class, and the document supported the interview and observation.

### 3.2. Participant

The research is conducted in the Bilingual class for Chemistry major, Faculty of Math and Natural Science, Universitas Negeri Makassar. The sample is chosen by using purposive sampling to select the number of subjects (Mills & Gay, 2019). For this reason, the criteria subject of the research was: (1) The students are from Chemistry Education for International Class Program (ICP); (2) The students are in the 4th semester; (3) The students have passed English courses and have a minimum grade of B; (4). The students have a Grade Point Average (GPA) minimum of 3.40.

### 3.3. Data Collection

The research instrument for Chemistry students' perceptions of the use of CLIL was the interview protocols. Meanwhile, the research instrument for the use of CLIL in the subject for Chemistry majors was an observation checklist and documentation in terms of students' achievement reports. Semi-structured interviews are the interview method that is commonly used in qualitative research (Leavy, 2017). The interview is used to gather information regarding Chemistry students' perceptions. The researcher interviewed seven students and recorded them through an audio recorder from the Chemistry major who matched the given criteria. Observation is a method that focuses on the activities and behavior that occur in a particular place (Cohen et al., 2018).

The researcher observed learning in one of the subjects in the Chemistry major. This observation was in 3 meetings and used an observation checklist. This observation focused on the pre-activity, main-activity, post-activity, and using media to gather information about the use of CLIL in the subject. The document can be found in the reports (Ary et al., 2014). The researcher used students' achievement reports as students' private documents to gather information supporting interview data.

### 3.4. Data Analysis

The researcher described the information in data analysis from observation and documentation manually and from an interview using thematic analysis. Computer-assisted qualitative data analysis (CAQDAS) can analyze qualitative data, namely Nvivo (Edwards, 2014). Braun & Clarke (2013) mentioned several steps for data analysis:

- **Transcription.** The researcher reviewed the collected data to decide which parts should be transcribed. We must ensure that the collected data is organized correctly to facilitate the analysis process.
- **Reading and familiarization;** taking note of items of potential interest. The researcher read the transcription carefully to understand the information deeply. The researcher made notes or highlights on transcription assigned to make the researcher easy to understand and remind. Thus, the data were easier to reduce and could be coded into the data. Then, the use of coding to get the meaning and relation of data structurally.
- **Coding—complete;** across the entire dataset. The data was refined, linked, and identified into codes. This step's focus is on reviewing all codes and finding the theme.
- **Searching for themes.** In this step, the researcher started to analyze the different codes to form the themes. The result showed the categories and their relationship to developing emergent themes.
- **Reviewing themes.** The researcher devised the candidate themes, and the result was the mind map or thematic map to show the themes and their sub-themes. The use of the thematic map made the researcher easier to review the themes. It used this review to search for the connection across emergent themes and generated it.
- **Defining and naming themes.** The researcher defined the themes that present data analysis, and the final themes were the sign that the researcher found the initial themes. It was the end of the data analysis step because the researcher could define the initial themes related to the research.
- **Writing—Finalizing the analysis.** The themes were arranged and interpreted descriptively, and it was related to the Chemistry students' perceptions and the use of CLIL in the subject. For the final analysis, the researcher displayed the data and concluded.

## 4. Results

This section reports Chemistry students' perceptions of the use of CLIL and CLIL in the subject of the Chemistry major. As a result of the first step of the analysis, four themes were

identified: (1) Content; (2) Cognition; (3) Communication; and (4) Culture. Each of these themes contains two to four sub-themes. Per theme, we discuss sub-themes that are mentioned the results separately to present the aspects of CLIL. Then, the use of CLIL in the subject of Chemistry class because of activities was identified: (1) Pre-activity; (2) Main activity; (3) post-activity; (4) Media. Each activity discusses the learning process for three meetings and focuses on the language used.

### 4.1. The Chemistry Students' Perception on CLIL

#### 4.1.1. Content

As shown in Table 1, the students frequently referred to some sub-themes of content in CLIL for online learning.

Table 1. Aspect of Content

Sub-theme	Description
Content material	The use of content material during online learning
Language use	The languages that the lecturer use in giving material and interacting with the students
Medium of instruction	The use of English as a medium of instruction
Teaching style	The way of lecturer in teaching the subject

Table 1 above indicates that students explicitly perceived that online learning used English and Indonesian as target languages. The lecturer and students used its language as content material for subjects and medium of instruction during the learning process, especially digital content learning. Thus, both the lecturer and students actively used it in online learning, such as PowerPoint, YouTube, and video conference applications to support the online learning.

#### 4.1.2. Cognitive

As shown in Table 2, the students frequently referred to some sub-themes of Cognitive in using CLIL for online learning.

Table 2. Aspect of Content

Sub-theme	Description
Learning difficulties	The difficulties that students found during online learning
English use	The student's understanding of the use of English in subjects
Learning style	The type of learning style of students
Reason for learning style	The students' reason for the learning style that they used

Table 2 shows that students explicitly perceived that CLIL subject during online learning has content and language goals to develop students' understanding. Thus, the students have their learning styles based on their condition and need to understand the subject. But, in practice, the students have difficulties in learning. Not only about the connection during online learning but also about the use of English that can impact the learning process. They found that they could not speak English fluently. Moreover, they lacked vocabulary, making it difficult to understand the material or listen to the lecturer's explanation.

#### 4.1.3. Communication

As shown in Table 3, the students frequently referred to some sub-themes of communication in CLIL for online learning. They explicitly perceived that the communication during the online learning process showed the language transition of Indonesian-English or English Indonesian, and it happened both during the interaction between lecturers and students and in the content material's language.

Table 3. Aspect of Content

Sub-theme	Description
Code-mixing use	The use of code-mixing in presenting the material during the learning process
Learning interaction	The use of languages in interaction how it affects the student's English ability in online learning

Thus, the lecturers who used English in explaining will give an additional explanation in Indonesian. The code-mixing also made them easier to understand. Although some students still got difficulties because of their lack of ability in English.

#### 4.1.4. Culture

As shown in Table 4, the students frequently referred to some sub-themes of culture in CLIL for online learning.

Table 4. Aspect of Content

Sub-theme	Description
Classroom condition	The difference of condition in class between offline classes and online class
Critical thinking	The effect of the online learning on the way of students in thinking critically
Problem-solving	The effect of the online learning is that make students can solve the learning problem independently
Learning motivation	The students' feedback refers to their motivation for online learning

Table 4 above shows that students explicitly perceived the difference in conditions when studying offline and online. Its conditions such as learning discipline and flexible habits. However, these different conditions certainly make them think critically and solve the online learning process problems. This process feels more independent for the students as they study from home and rely on video conference applications. Moreover, the available online material made them easier to re-learn at home. In addition, this learning condition also makes them motivated to study better.

### 4.2. Using CLIL in the Subject of Chemistry Class

#### 4.2.1. Pre-activity

During the pre-activity of the subject, the lecturer opened the meeting on Google Meet and then greeted in English and Indonesian. Their response can see the student's readiness after being asked to turn on their camera in English and Indonesian. Furthermore, the student's response was seen by turning on the camera and microphone. Some students are also still in and out of the room due to their internet connection. Finally, the lecturer gave the students the reviews of the last material.

#### 4.2.2. Main activity

During the main activity of the subject, the lecturer reminded students about the last material and asked them questions related to the previous material to find out students' understanding. Students have to answer questions in English, and if students answer in Indonesian, she will remind them to respond in English. After asking several students, she tried to explain deeply to them. Then, she informed them about the homework or material uploaded on the e-learning called Syam-OK in English and Indonesian. Finally, the lecturer started the material by explaining it in Indonesian and English. The lecturer also gave them questions while discussing the material in Indonesian and English. She also allows students to ask questions about the material explained.

#### 4.2.3. Post-activity

During the post-activity of the subject, the lecturer allowed students to ask questions and conclude the material in English and Indonesian. She also talked about the following topic of material to be studied for the next meeting in English and Indonesian. Before closing the meeting, the lecturer discusses the schedule for the next meeting to agree on whether students want to use the existing schedule or change it. Furthermore finally, the lecturer closed the meeting by greeting, and the students responded in English and Indonesian. Then, students leave the meeting on Google Meet.

### 5. Discussion

Based on the research findings, the students of Chemistry have different perceptions. They perceived it based on content and language integrated learning that they have learned. Coyle et al. (2010) revealed that the use of CLIL focused on four aspects, namely 4C (Content, Cognitive, Communication, and Culture), and this aspect as themes in this research. The students perceived content subjects they learned using CLIL for the online class. It is being depicted by Chemistry students who confessed that the content in the material, especially digital content material in online learning, is used optimally. Besides that, the students also use bilingual as instruction in class. In short, the use of content material and instructions in class is a combination of English and Indonesian.

The use of language depends on the lecturer because the lecturer does not teach them in 100% Indonesian or 100% English (see table 1). Its portion in the learning process affected the students' understanding, especially for online learning. Their ability to understand the material is supported by the learning style that is appropriate to them. Most used visual and auditory, but they combined it with reading and writing. Besides that, they got some difficulties in learning that become obstacles for them, especially in the online learning process, and they even feel uncomfortable while studying (see table 2). How the lecturer and students can solve the difficulties interact. The interaction consists of the lecturer discussing the material with the students. The discussed material is generally in PowerPoint and delivered using a video conference application. Not only material but the language that lecturers explain and discuss with students in two languages, English and Indonesian (see table 3).

Reflecting on the interaction, the lecturer and students can build the academic culture that occurred as a class condition during the learning process as proof their appearance when joining online classes, attendance, completion of assignments, and students' intention to turn off the camera during the learning process. Thus, the students struggled to think critically, solve problems in the learning process, and be motivated in learning (see table 4).

Thus, this research found that the student's perceptions of the use of CLIL were influenced by their learning experience and the form of the material they used. It was supported by the theory of Robbins et al. (2017) that the influencing factors of perception are the perceiver's experience aspect and the target or object of the perceiver in terms of size. The new learning system also being the factors from their learning experience by using learning styles appropriate to the conditions that make them give those perceptions. It means that factors are the perceiver (experience and interest), the situation (time and work setting), and the target or object in terms of novelty. The use of CLIL also related to the classroom learning arrangements that showed interactions between lecturers and students. The interaction also involves using language in which the lecturer applies code-mixing in the learning process. Interactions like this allow them to provide perceptions. By this interaction, the influencing factors of perception are the perceiver in terms of experience and attitude aspect. Then, the target or object of the perceiver in terms of motion and situation in terms of work setting. Besides that, the academic culture built from the interaction influenced by perception factors is the perceiver's experience, motives, and attitude aspect. Then, factor in the target or object of the perceiver in terms of novelty and motion. Lastly, the situation in terms of time and work setting.

The findings showed that the lecturer of the subject in the Chemistry ICP study program had several steps in the online teaching process by using CLIL. It showed several stages in the teaching and learning process, such as pre-activity, main-activity, and post-activity. The stages integrated the content and language in teaching the subject. The lecturer greeted the subject at the pre-activity and then ensured the students' learning readiness. Their readiness can be seen from their response when the lecturer wants them to turn on the camera due to online learning.

Then, in the main activity, the lecturer reviewed the material given at the previous meeting while checking whether the students understood it. After that, the lecturer provided new material and explained it. The provision of material is also interspersed with question-and-answer sessions and directly asks the lecturer if the students do not understand. The material given is related to the previous material. Thus, the session can refresh the students' understanding of the earlier material. The methods used by the lecturers seemed like teacher-centered learning. However, lecturers will combine other methods so that both lecturers and students can be equally active in the learning process and adapt to the conditions and capacities of students because online and offline learning conditions are very different.

The lecturer closed the lesson after having discussed all the material. Then, the lecturer will provide a conclusion for

the material that the lecturer has given to students. Then remind students about the learning schedule for the next meeting and give homework or instructions to prepare for the next meeting. Moreover finally, the lecturer closed the meeting by greeting and thanking him. The learning process cannot separate learning media. The media used in this class mostly use e-books and power points. The applications or learning platforms used are Google Meet and Syam-OK.

The way the lecturer planned the CLIL subject is run as Coyle et al. (2010) asserted that in planning, the CLIL has to consider the content and connect it to the students' cognition. Then, the lecturer ensures the students' understanding as the lecturer develops content and language goals. It is related to conceptual content understanding rather than grammatical awareness.

## 6. Conclusion

It can be supposed that according to the interview, the perception of Chemistry students towards the use of CLIL for the online bilingual class of higher education, students' perceptions are most influenced by their experience and their expectation. Therefore, the conclusion is that their perceptions are influenced by the perceiver and are supported by the target and situation. Furthermore, their experience and expectation can be seen in the learning process that the Content and Language Integrated Learning (CLIL) used in the online class.

It can be supposed that according to the observation, the use of CLIL in the subject of Chemistry major applies three steps of the teaching process: pre-activity, main-activity, and post-activity. The use of CLIL is actualized in the main activity, but the lecturer always uses two languages in all steps. On the other hand, the use of media during the learning process plays a role in which the online media made the students and lecturer easier in the teaching and learning process. Most media they use is PowerPoint for presentation, Google Meet as media to bring out the meeting, and Syam-OK/WhatsApp as media to share information about the schedule, homework, and material.

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