Content & Language Integrated Learning; Didactic Proposal to Strengthen Basic Notions in Chemistry

Aprendizaje integrado de contenido en lenguas extranjeras; propuesta didáctica para fortalecer los conceptos básicos de química.

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Abstract:

This paper aims at showing the results of the implementation of activities framed on Content and Language Integrated Learning (CLIL) methodology with Eleventh Graders at Instituto Pedagógico Nacional (IPN), this proposal included three main topics of the curricula: Chemical Equilibrium, Ionic Equilibrium and Organic Chemistry, topics for which the pre-service teacher planned different strategies to strengthen the learning of its basic concepts, with the objective to promote CLIL as a methodology to motivate students learn chemistry by using English as a Foreign Language.

Key Words

CLIL, Chemistry, Basic Notions, English as a Foreign Language.

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Resumen

El presente trabajo tiene como finalidad mostrar los resultados de la implementación de actividades enmarcadas en la metodología denominada Aprendizaje Integrado de Contenido en Lenguas Extranjeras con estudiantes de Grado Once del Instituto Pedagógico Nacional. Esta propuesta se desarrolló a partir de tres temas principales del currículo: Equilibrio Químico, Equilibrio iónico, y Química Orgánica, para los cuales la Maestra en Formación Inicial planeó distintas estrategias que fortalecen el aprendizaje de los conceptos básicos en química, con el objetivo de motivar a los estudiantes al aprendizaje de la química, usando el Inglés como Lengua Extranjera.

Palabras clave

AICLE, Química, Conceptos Básicos, Inglés como Lengua Extranjera.

Introduction

The main objective was to integrate the teaching of a foreign language in content subjects such as chemistry, using the Basic Notions in Chemistry (BNC) in a methodological approach called Content and Language Integrated Learning (CLIL), in a qualitative study, analyzed through Constant Comparison Method.

The analysis of the performance of students towards the scores obtained from different activities evaluated and graded; achievements, important observations, and the participation level registered on field journals, will allow to evaluate this proposal and its impact in the target population.

This proposal promotes the expansion of the horizons of teaching content through language, to make students feel involved in activities around competitiveness, collaborative work, and overall the use of each specific terms (BNC) of the taught topics, whereby has been observed as the major motivations of students at IPN in their classes.

This proposal will contribute to the necessity of supporting and fostering pre-service teachers at a public school to make them strong enough on the current challenges about teaching content areas such as chemistry. It means the pre-service teacher is going to look for a way to plan her classes by using CLIL as a methodology to motivate eleventh graders at IPN to learn the BNC by using English as a Foreign Language (EFL)

Theoretical Framework

"Bilingualism" in Colombia is understood as "an ideal to reach, for the children who are in school ages, and even is a national goal, the management of English" It is important to notice that bilingualism means the different levels of management in which individuals accomplish to communicate in more than one language. (Revista Cultura, 2014)

Due to the interest of this study, this is considered as one of the most important constructs to address as a dual-focused educational approach in which an additional language is used for the learning and teaching of both content and language (Mehiston, Marsh, & Frigols, 2001), in this case Chemistry and English. For this reason, it is necessary to understand some important aspects such as what it is, its characteristics, and its recommendations to teach content areas through English a Foreign Language (EFL).

According with Marsh CLIL refers to any learning context in which content and language are integrated to respond to specific educational objectives. That means that it can be used to a class in which a language teacher gives explanations about a topic non linked with the language, and equally can be applied in situations in which subject teachers use foreign language in more or less measurement. Thanks to this method it is stablished that natural sciences taught in English give the learners basic vocabulary in which they can express important ideas to describe situations, comprehend readings, context, situations in English. (Bolivar & Reyes, 2015)

Thereby, CLIL is an approach that could represent a high benefit not just to in-service but pre-service teachers as well, when they teach subjects such as Chemistry and where it would be necessary to mix content and language making a balance between

them. The most relevant aspects are to contribute to teachers' development giving the opportunity to use this approach and some aspects mentioned from the theory to make their classes better and understandable. Actively involved in the language; they are immersed in it, surrounded and engulfed in it.

They are using the language but the content, theme and tasks are the driving forces. As a result, when the students are engaged and interested in the topic, they are more motivated to use and learn the language needed to communicate and it also promotes a more natural use of language; simply because the scope of the language is so much wider than the constraints of a traditional EFL, or content lesson. (Marsh 1994)

In the same way as Coyle states (2007), what separates CLIL from some established approaches such as content- based language learning, or forms of bilingual education, is the planned pedagogic integration of contextualized content, cognition, communication.

A Qualitative Research tends to focus on how people or groups of people can have different ways of looking at reality taking into account the complexity by incorporating the real-world context and the different perspectives on board, studies of behavior in natural settings or uses people's accounts as data; and there is usually no manipulation of variables, also it focuses on reports of experience or on data which cannot be adequately expressed numerically and employs a flexible, emergent but systematic research process. (Hancock, Ockelford, & Windrige, 2009)

The grounded Theory is a methodology originated with the work of Glaser & Strauss The main feature is the development of new theory through the collection and analysis of data about a phenomenon, it is phenomenological (this means it attempts to understand how participants make sense of their experiences and does not assume that participants' accounts refer to some verifiable reality).

The Constant Comparative Method by Glaser and Strauss [2](1967, pp. 28-52) describes a process that involves:

- Identifying a phenomenon, object, event or setting of interests, action taken on the first stage of this research.
- Identifying a few local concepts, principles, structural or process features of the experience or phenomenon of interest, as was observed on the first stage of this pedagogical practice with the observation. It was observed that students presented a good level of English.
- Making decisions regarding initial collection of data based on one's initial understanding of the phenomenon, to challenge students to learn in a different and innovative approach as CLIL
- Engaging in theoretical sampling -- the key question is what group or subgroups does the researcher turn to next to collect data? Subsequent sampling decisions should be purposeful and relevant. In this case the analysis of all the activities developed that included Content and Language

Statement of the problem

How CLIL approach can affect eleventh graders Chemistry learning and teaching processes by using English as a foreign Language?

Methodological Design

The population selected for this proposal was comprised by Thirty (30) Eleventh Graders, from Instituto Pedagógico Nacional located in Bogotá Colombia. Its implementation was carried out in a period of four months in the first semester of 2017 since February to May.

2 For the purposes of this investigation the collected data is studied in consideration about students' performance on activities, their level of participation and, their experiences.

This project is classified as a qualitative research in which the collected data are systematized by using a methodology called Constant comparison Method, strategy that combines the inductive generation of categories with a simultaneous comparison of all of the social incidents observed which means that when a social phenomenon, a behavior or an incident is registered, classified assigning a category and it compares them with another classified incidents as well to respond to the main objective.

The overall analysis of the proposal is given through the instruments specifically planned for each lesson, all of them created by the author with the guidance and approval of the main school professor. The activities developed were evaluated in terms of scores and attitudes.

Here is why the most important variable to analyze is regarding to the academic success and progress of the students, to recognize the progresses in terms of language and content. The attitudes and participation level of the students in the activities were analyzed through the notes of the observation of the preservice teachers on journals.

General route to develop CLIL activities in the classroom includes

1. The starting point from the Basic Standards of M.E.N and the curricula of the Institution. To select BNC
2. A class objective or objectives which include both Content and Language acquisition.
3. The previous recognition of the Strengths and Weaknesses of the group.
4. The possible Methodological Strategies for the activity or the explanation.
5. The definition of 4c's that will be used
6. The criteria to evaluate.

The evaluation for each activity was done in a qualitative way, in which students get grades as:

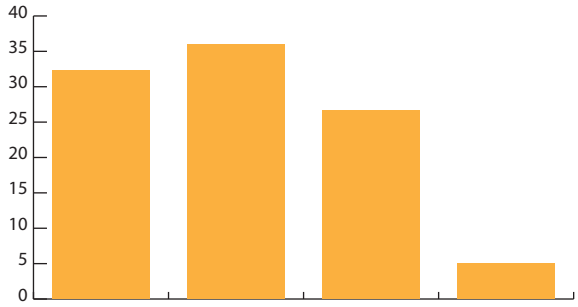
- S for Superior performance
- A for High performance
- B+ for Basic performance
- B- for Low performance

The participation of the group in general was scored on High, Medium, and none.

An example of how a class and an exercise about Ionic equilibrium were planned is shown in figure 1.

Results

The data obtained from scores for each activity were organized by topic and the scores were averaged to recognize the result obtained.

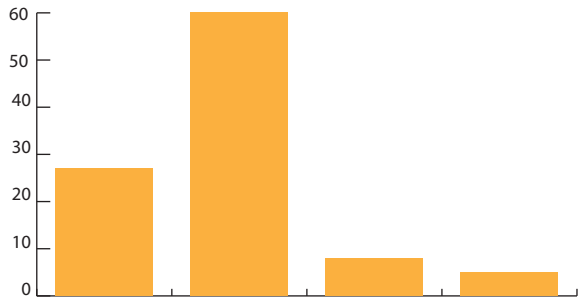


Score	S	A	B+	B-
%A1	63	30	7	0
%A2	0	26	59	15
%A3	34	52	14	0
Average	32,33	36	26,66	5

Figure 1. Average Score for Chemical Equilibrium

Considering the results, itt is observed that most of students have a High performance on Chemical Equilibrium activities that included L2. And the less of the students have Low performance.

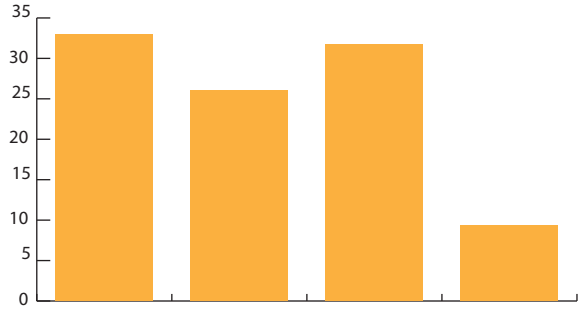
It seems that many students present difficulties on this topic because the level of good performance decreased, although the levels of Basic and Low performance are due to personal reasons of the students and to some institutional activities that affected the regular schedule for the classes, participation on CLIL were well accepted.



Score	S	A	B+	B-
%A1	37	60	3	0
17	17	60	13	10
Average %	27	60	8	5

Figure 2. Average Score for Ionic Equilibrium

Students that developed activities about characterization and naming hydrocarbons showed mostly superior performance, but at this point there is different behavior the next highest performance is the B+ which is really close to the superior, it might be due to the fact of the rigorousness at naming hydrocarbons. Although it isn't a bad result, it shows a different tendency from what was shown on the last topics.



Score	S	A	B+	B-
%A1	17	33	43	7
%A2	56	18	22	4
%A3	26	27	30	17
Average	33	26	31,66	9,33

Figure 3. Average Score Organic Chemistry

Conclusions and Observations

The research literature on CLIL proclaims that it is a safe and promising way of teaching both the foreign language and a content subject. As previously mentioned, one could think that the high language proficiency of students in the experimental CLIL class might help these learners to overcome at least part of the difficulties in relation to content taught in the foreign language, which is why we should now try to correlate the test scores with the students' results from their chemistry classes results.

This proposal benefits students learning, and helps them to improve both language and content skills, as it is stated by most of the researches who had tried CLIL in this case because it gives a pragmatic use of the language, and the basic notions of content are constantly used and that is how they are learning.

Students presented high and superior levels of performance on the three topics explained and evaluated, these results allow the researcher to conclude that English was not an obstacle for them to do the tasks. It seems that the integration of language and content doesn't affect the students' motivation. On the other hand, the results of the PEI survey showed that most of the population considers that the Chemistry learning process through English language is interesting, important and innovative, and help them to be focused on the class to understand the language used.

Also, it was really motivating, that students valued the small efforts and logistic strategies the pre-service teacher used to make students immerse on English language, and to remember basic Notions, as the use of some responses and questions to challenge and motivate them, in different activities, and others, for example the use of the board, and how everything was written in English, making students to question about the meaning of vocabulary. Some difficulties found were about the language barrier to express opinions, this means that the grammar and vocabulary to express opinions needs to be improved on the classes, mostly because

students haven't used these common expressions in a real context like CLIL classroom.

It is also important to recognize the work that the English teachers do at the IPN, because the population have English knowledge and if the selected group wouldn't have a good level of English it could not be possible to carry this project out.

Reading was the main skill that students developed with the implementation of this proposal. Students were risk takers when reading information about a chemistry topic in English. They could understand the main ideas, thanks to the recognition of the basic concepts, although the main problem was on the Content compatible Language used that it is needed to include. Students stated it is important to strengthen some other abilities like speaking, they want to improve pronunciation, stress and intonation.

Students participated actively in the development of this proposal, there were some moments in which they inquired why they have to do the exercises in a particular way (specially from the students which have difficulties in English or chemistry) but this is something that should be observed and registered in the teacher journals; to overcome this obstacle, the teacher should be able to reevaluate the activities that make students feel unmotivated, and to use different methodological approaches that upgrade the exercises.

Proving the direct impact of such mechanisms on the acquisition of content would bring a sensible explanation to the results presented. Moreover, the results of this study have encouraged the researcher to plan further research in this area, hopefully be pursued in the nearest future. There are many unresolved matters when it comes to CLIL, and this paper, which should be regarded as a preliminary report, explores only one of many controversial issues in relation to CLIL, with the hope that the results presented will encourage teachers to begin their own adventures with CLIL on a regular basis. There is a great need for teachers to share their experiences and conclusions about possible improvements in the future. To accomplish these goals, all the attempts at introducing CLIL into classrooms should be valued.

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Attachment.1. This is an example of how a class and an exercise about Ionic equilibrium were planned: Basic Standards of M.E.N &

Basic Standard of Science proposed the M.E.N 11th grade. "To identify chemical changes in the life and the environment." (MEN, Ministerio de Educación Nacional, 2009)
Adaptation in the curricula of IPN "To difference the systems in chemical equilibrium and the concepts of acid-base, Recognizing it's applications on biological processes" (García & Wilches, 2016)
Basic Standard of English proposed by the M.E.N 11th grade "To identify key words on a text that allows to understand its general sense" "To infer, and give hypotheses from the information of a text" (MEN, Ministerio de Educación Nacional., 2006)

1. **BNC:**

Electrolytes, Dissociation processes, Dissociation constants, Acid, Bases.

2. **Class Objective:**

- To define, concepts around chemical equilibrium linking them with previous concepts.
- To read and analyze different daily situations in which PH and POH are involved.

3. **Strengths and weaknesses**

Strengths	Weaknesses
Students presented good development on the previous topic, which is related with the now one .	Students get easily distracted and are very chatty.

4. **Methodological Strategy:** Guides with readings, examples and exercises, and the definition of concepts will be stablish by the students. The guides were provided by the Institution. The first activity proposed is a feedback in which students are going to define those BNC in regards to Ionic Equilibrium. The second activity is the development of an exercise in which students are going to represent and give solution to a problematical situation.

5. **4cs (Coyle, 1999)**

Content	**Communication**
Ionic Equilibrium	I can explain and represent the meaning of a situation in which content is involved
Cognition	**Culture**
I relate correctly basic notions of Ionic Equilibrium, in a common situation	Everyday situations in which ph and poh are included.

6. **Items to evaluate**

- Correct use of the BN on the exercise to define it.
- General understanding of the situation, by a proper representation.
- Accurate development of mathematical operations to give the perfect result
- With the mathematical results, give a solution to the problem situation.