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Assessing the Efficacies of CLIL for Science Track Students

(A Case Study of Qassim University, KSA)

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ABSTRACT

The present study aims at examining the effectiveness of proposing multiple methods of teaching Scientific Terminologies to Science Track Students in English, particularly those terms connected to Chemistry and Biology. It focuses on the researcher's practical online recounts and experience of using integrated teaching methods to teach an optional course titled "Scientific Terminologies" during the academic year (1442 -1443) in addition to the researcher's experience in teaching the course during the preparation of this study at Qassim University. The course aims to enable Science Track Students to learn the concept of Scientific terminologies within the Chemistry and Biology department curricula as a college requirement before they are converted to the English department at Qassim University, College of Science and Arts. At first, the researcher endeavours to identify the students' expectations towards the course and the expected problems through online discussions as well as interview questions as they are not department students and the course was the first time to be taught by the department of English. As a result, their responses around problems encountered with learning the Scientific Terminologies were mainly focused on issues such as translation problems, weaknesses of speaking skills, and problems of learning the English grammar rules as well as spelling challenges for some students, for instance, words are very long to memorize as they clearly stated. Communication problems are also encountered which means that they fear communication and they also reported that the word parts known as suffixes and prefixes are difficult to learn. The above-reported weaknesses in addition to the fact that they are not department students and the course was the first time to be taught by the department of English, were more than enough to let the researcher choose to use integrated multiple teaching methods including the more traditional ones such as the grammar-translation method. The experience of using integrated methods of teaching proved effective for the science students.

Keywords: Scientific terminologies, Science Students, learning difficulties, prefixes, suffixes

1. Introduction

In recent years, content and language integrated learning (CLIL) has been heavily deployed in many educational institutions worldwide. These institutions offer English instruction in disciplines like History, Math, and Science in addition to the English language. However, the science track students the researcher works with at Qassim University, College of Science and Arts, Ar Rass find it extremely difficult to learn some scientific terminologies in English. These difficulties are due to the fact that Scientific terminologies within the Chemistry and Biology departments' curricula as a college requirement were taught in Arabic before they are converted to the English department. In other words, we can say that students who learn science in Arabic struggle to understand scientific terminology while studying it in English. As a result, they are unable to read the majority of scientific terminologies and comprehend the affixes attached to them. The present study attempts to examine the effectiveness of proposing multiple methods of teaching Scientific Terminologies to Science Track Students in English, particularly those terms connected to Chemistry and Biology. The examined strategy is anticipated to help learners improve their overall awareness of the scientific terms, and show abilities when interacting with scientific materials as well as enhance their strategies for future scientific terminology learning. Thus, the researcher attempts to use integrated multiple teaching methods including the more traditional ones such as the grammar-translation method in teaching the course. The literature review will address the concepts of terms and terminology that are of great interest, particularly in light of recent developments in computational and textual terminology, as well as the rapid development of its applications (Condamines 1995; Felber 2002). References to theories addressing the facets of language learning from which CLIL developed the fundamentals of its programs will be included in the review of the literature. The theories are the constructivist theory, the sociocultural theory, the second language acquisition theory of Krashen (1982), and immersion.

1.1 Background of the Study

The literature reviews show that the concepts of terms and terminology are of great interest, particularly in light of recent developments in computational and textual terminology, as well as the rapid development of its applications (Condamines 1995; Felber 2002).

The reviewed literature also displays several teaching programs associated with teaching science vocabulary, among which is the second theory of language acquisition. This concept is based on Krashen's (1982) theory of second language learning, in which he claims that Adults can learn a second language in one of two methods. The first method is Language acquisition is a subconscious or implicit learning process that is akin to learning a new language for communication purposes similar to how children learn their first language as clearly stated by Krashen (1981). Secondly, competence is consciously or explicitly developed through

language learning which enables learners to become aware of its rules according to Krashen (1982).

The constructivist theory, which CLIL has incorporated as one of its tenets, states that during the learning process, students always attempt to connect the new content to what they already know about it as cited in (Richardson 2003, p.1623), Resnick (1989) precisely clarifies it as follows: it is a theory generally understood to focus on learning or meaning-making, according to which people develop new understandings through interactions between what they already know and believe and new ideas and information with who or what they interact with. Additionally, in CLIL sessions, (Casal, 2008) instructors provide the material in a participatory and cooperative setting that enables students to negotiate meaning, ask questions to clarify word meaning or grammar structures, and have the opportunity to practice their language skills as well as connecting new knowledge to what they currently know about the subject. People also learn by engaging with the sociocultural context in which they live, and then interact through intermediaries generated by human civilization (Lantolf, 2006).
Concerning the immersion program, the literature review shows that it focuses on teaching students math, science, history, and other subjects while utilizing a second language. The immersion program enrolls students in kindergarten or first grade, and they remain enrolled throughout the immersion years (Chamot and El-Dinary, 1999).

1.2 Statement of the Problem

Scientific terminologies as a course were initially taught within the Chemistry Department curricula as a college requirement where Arabic is the medium of instruction before converting to the English department at Qassim University, College of Science and Arts, Ar Rass. The students' expectations after the eligibility of teaching the course by the department of English is that the medium of instruction will undoubtedly be English. These expectations are the result of the Science track students' responses to the main question that was put forward through the blackboard platform during the academic year (1442 – 1443) amid the shutdown of the educational institutions due to the Covid-19 pandemic in addition to the researcher's classroom observations during the preparation of this study at Qassim University. The debate has evolved to include their English language problems, which can be summarized as follows. The problems reported were issues of translation as most of the study subjects find it difficult to translate from Arabic into English and vice versa, poor speaking skills were also among the difficulties encountered by the majority of participants in addition to problems associated with common grammatical mistakes as well as spelling difficulties and reading problems as the majority of the participants think that some words are very long to memorize. To address such difficulties, the researcher uses integrated multiple teaching methods including the more traditional ones such as the grammar-translation method.

1.3 Research Questions

The present study aims at examining the effectiveness of proposing multiple methods of teaching Scientific Terminologies to Science Track Students in KSA. To achieve the above objectives, the paper is designed to seek answers to the following questions:

- What are some weaknesses encountered when learning English?
- To what extent do these weaknesses influence learning the scientific terminologies?
- How these weaknesses are overcome?

2. Methodology

The researcher used a quantitative data collection method to collect the required data for the present study. The study targeted a group of science track students at Qassim University consisting of (26) students who were interviewed via blackboard platform to determine the difficulties they have encountered with learning scientific terminologies during the academic year (1442 – 1443) amid the Covid 19 pandemic due to the educational institutions in addition to the researcher's classroom observations during the preparation of this study at Qassim University. However, almost (21) subjects representing (80%) of the total participants have actually contributed to conducting the present study by sharing their viewpoints. The researcher was the first to teach the mentioned group the course of the scientific terminologies after the official decision has been made to be taught within the department of English instead of the chemistry and biology departments at the College of Science and Arts, Ar Rass, Qassim University. The interview questions aimed to identify the most important difficulties faced by students when learning scientific terminology as the course is suggested to be taught through English medium instruction. Additionally, the interview questions were mostly centered on identifying how they attempt to overcome challenges associated with learning English in general. And finally, the study subjects effectively participated in conducting the study by responding to the following interview questions:

- What are some weaknesses encountered when learning English?
- To what extent do these weaknesses influence learning the scientific terminologies?
- How these weaknesses are overcome?

3. Results and Discussion

While responding to the first question the majority of the study subjects were asked via blackboard about the main problems facing them in learning the English language the problems reported were issues of translation, speaking, grammar, as well as spelling. The participants also reported that

some words are very long to memorize. In most of the study subjects' responses, communication problems are encountered, which means that they fear oral communication. And also find it difficult to distinguish between affixes (prefixes and suffixes) when learning scientific terminologies. Thus, the researcher focuses on how affixes are mainly taught to science track students as English is not their major and they find it difficult to communicate in it, and immediately after he collected the necessary data the researcher undoubtedly adopts the grammar-translation method among the multiple integrated ones to teach the course and to enable students to learn the main terminologies as they find it difficult to communicate in English and they also have to cover the course within a semester which is 3-4 month maximum. When asked about their learning strategies to overcome difficulties, the majority argue that they regularly watch videos while one study subject says that he often memorizes ten words a day to enrich his English vocabulary.

To learn the teaching staff's opinions on the potential problems they regularly face when teaching the course, the researcher has designed interview questions. The interview questions aim at collecting the necessary data concerning the concept of the scientific terminologies as well as their vital need to science track students. The study subjects consisted of four professors who were randomly selected from the department of Chemistry and Biology the two departments where the courses were taught before their conversion to the English department. The responses of the participants to the following questions certainly support the collected data to investigate the present study.

1. What is the overall concept of the scientific terminologies and their vital need to science track students?
2. To what extent using multiple approaches in teaching scientific terminologies is effective?
3. To what extent is the implementation of the grammar-translation method in scientific terminology classes is effectual?

The first study subject from the biology department argues that for the most part, scientific terminologies are names of living organisms or fragments of larger organisms and have agreed–upon naming rules principles. So, students had to master their knowledge as it is a key success for further awareness of the living organism or the specific part of the living organisms subject of the study.

In his reflection on the second interview question, the study subject claims that students should be allowed to use their own language in the classroom simply because when we consider the fact that the language of instruction for them was originally not English. And immediately after taking the course which was newly converted to the English Department, they will study the remaining courses in their own language as is usual in scientific departments such as Chemistry and Biology. Thus, for the participant applying grammar-translation as a teaching approach is extremely important and will facilitate the student's learning of the scientific terminologies.

According to the second study subject a professor from the biology department, scientific terminologies as a concept represents the fundamental area of knowledge that lead to further understanding of the entire courses that students have to cover within the department action plan. In other words, scientific terminologies accounted as a prerequisite for several science subjects, and consequently, their overall understanding is vital to science track students before they are actually involved in Chemistry and Biology courses.

In reflecting on his experience, the participant thinks applying an interactive teaching approach is extremely important when learning scientific terminologies. For example, we can teach the term " biology " which is defined as a science of living organisms by displaying pictures of some actual living organisms such as birds and then pointing to them we ask students if these are living organisms before comparing the displayed pictures with objects such as chairs and tables. Certainly, through repetition students will learn that any living organism is classified under the term biology. Additionally, we can apply the traditional teaching methods that totally depend on both the initiation and memorization approaches when necessary. As clearly stated by the study subject, at the beginning students may find this approach somewhat harder, but finally, they are going to adopt it and will find it useful since realia is used to facilitate their learning. He finally says that throughout his experience in teaching terminologies to science track students, he prefers not to allow students' own language within classes and that everything should take place within the language of instruction which is English.

For the first study subject from the department of chemistry, understanding the concept of the scientific terminologies is the main gateway for students to further knowledge of the subject that enables them to higher levels of education. Additionally, some scientific terminologies cannot be translated correctly, so it is preferable to be studied as a scientific term in English. This proves the importance of using multiple teaching methods in such classes which are more effective compared to the traditional teaching ones such as grammar–translation where teaching specific words and their corresponding meaning in English is the main teachers' concern. It is preferable to use English as a medium of instruction so that we don’t lower the students’ level by allowing the usage of their own language in which the meaning can be interpreted.

When responding to the first interview question, the second participant states that knowing scientific terminologies is extremely important for science track students. Surely, they need it throughout their educational and professional life since all instructions, laboratory, and factory devices are written in English; therefore, dealing with them requires knowing the colour of the ink. And that is why the participant thinks that only English as a medium of instruction should be used while teaching scientific terminologies. Therefore, to get used to using it in the upcoming future, students’ own language should be banished as the study subject believes, but what is important according to his refection to the last

interview question is that it must be taught by a science specialist because it falls under the direct specialty of the students which is the science track and thus only professors who are specialized in science are competent enough and familiar with these scientific specificity courses. In light of what was presented throughout the two different interview questions where the problem and some suggested solutions have been clearly stated, and to facilitate learning of the scientific terminologies the researcher decided to start with clarifying affixes first. As clearly detailed above, affixes and root words were among the difficulties faced by science track students when reflecting on the interview questions. Hence, the awareness of affixes is extremely important because learning terminologies required knowing when the prefixes and suffixes were added to the root words. Analyzing the various components of a word and its meanings is one way to study the connotations of new words. However, for the students of the science track; analyzing a word and its meaning is not an easy job as the majority of study subjects reported when referring to interview questions. Therefore, we can say that implementing multiple teaching methods including the grammar-translation method is vital. In other words, it is effective simply because the main aim of teaching them scientific terminologies is to facilitate their overall learning of science subjects such as chemistry and biology which are not English medium instruction courses at Qassim University as reported by the second group of the study subjects (professors from the above - mentioned departments. In our focus on the study of the scientific terminologies and the role of affixes in facilitating its concept, the literature review shows that many new words are created by beginning or ending a Latin or Greek root or root word with an affix, but we don't think numerous science track students can clearly differentiate between them. Moreover, when communicating this concept, the researcher also thinks that they can adopt the students' mother tongue as a medium of instruction. In so doing, we started the introductory lectures by clarifying the overall concept and the scopes of affixes and how scientific terminologies are constructed out of them. As students are interested in knowing that prefixes and suffixes are word's part added to the beginning of roots or root words in a plain and easy way, the researcher has displayed some simple examples to illustrate the point.

For instance, we can attach the prefix (re) to words such as "read" and "write" attempting to give new meanings to words. Furthermore, the most prevalent prefix, un, for example, signifies not or the opposite of. If you add un- to the word happy, the new word becomes unhappy, which means not happy. When affixes are added to the end of roots or root words, they are called suffixes. The most prevalent suffixes are -s and es, which denote multiple instances of a word or the plural. for instance, the word "wish" takes on the sense of several wishes when the suffix -es is added. As a vivid example, we have provided the scientific terminology "Spectrophotometer" to determine the scopes of affixes on the term in which a later unit " meter" and a previous unit "spectro" are mediated by the root word "photo". Finally, we can then draw the following equation that may be applied to a lot of scientific terminologies.

Scientific term =prefix+(root)+ suffix

Example: Spectrophotometer = spectro +photo +meter

To sum up this section, we can say that understanding word components can help science track students decipher new scientific terminologies. Thus, to comprehend the meaning of the entire words we need to sum up the word components and learn the following major word parts.

Prefixes –are word components that are inserted at the start of a word.

Suffixes – are tacked on to the word's end.

Roots or bases - the primary component of words. These are the elements to which prefixes and suffixes are added. After a detailed explanation of the word structure, including the attachment of the prefixes and suffixes to the root words, the following table shows each unit's meanings. We can say that this method deepens the students' concept of studying scientific terminologies. Thus, it is important here to help students understand them regardless of the teaching method used to communicate that concept.

Table 1. Common word parts often used in science

Prefixes	**Roots**	**Suffixes**
endo – inside	**aqua** – water	-**able,** able to be -**ible** (something
esco – outside	**astro** – star	-**arium**, place related to
extra – beyond	**bios** – life	-**ate** to act on; to cause to become
hypo – under	**chrom** – colour	-**er -or** one who
hyper – excessive	**chron** - Time	-**fy, -ify** to make
meta – change	**derm** – skin	-**ine** of or relating to
micro – small	**geo** – earth	-**ist** one who specializes in
photo – light	**hydro** – water	-**itis** disease or inflammation
poly – many	**logy** – science	
pre – before	**mar** – see	**-ity**, quality, state
proto – first	**meter** – measure	-**ly** in acertain manner
tele – far	**phon** – sound	-**ness**, state, condition
un – not	**phys** – nature	-**ous** having
	scop – look / see	
	terr- earth, land	
	them- heat	
	zo- animal / life	

Table 1. shows common word parts often used in science. To promote students' understanding of such terminologies, we almost used some selected affixes, root words, and suffixes from the above table in practical multiple-choice exercises and the results were excellent. Many students described this method as effective in the process of facilitating the concept of the scientific terminologies within the class. For instance, one of the methods implemented was to choose an affix, simplify its concept or definition, and then students have to choose the correct answer (a) or (b) as clearly stated here.

1. hypo

Meaning: under, beneath, lower

The oxidation state of chlorine in hypochlorous acid

a) is lower than in chlorous acid.

b) is higher than in chlorous acid.

2. co, con

Meaning : with, together

Conjugate acids and bases

a) exist with each other

b) Do not exist with each other

3. c r y

Meaning: c o l d , cool

Crystals form when supersaturated solutions are

a) cooled

b) heated.

4. en, endo

Meaning: In. Inside

Endothermic reactions

a) release heat to the outside environment.

b) absorb heat in the environment.

5. pro

Meaning: before, positive, in favour of

proton is the

a) Smallest unit of negative charge

b) Smallest unit of positive charge.

Recommendations

The study accordingly forwards the following recommendations:

1. Proposing multiple methods of teaching Scientific Terminologies to Science Track Students in KSA is vital today.
2. Placing the learning material associated with the Scientific Terminologies in a meaningful context as well as utilizing cooperative and communicative strategies in the classroom is extremely important.
3. There is a vital need to connect the information to prior knowledge by encouraging Science track students to discuss what they have already learned about any given topic.

4. Conclusion

To sum up the findings, we can say that implementing multiple methods of teaching certainly facilitates learning and teaching the Scientific Terminologies to Science Track Students. This hypothesis is proved by the data generated by the two sets of interview questions. For instance, it is clearly illustrated ahead that understanding the concept of the scientific terminologies is the main gateway for students to further knowledge of the subject that enables them to higher levels of education. Additionally, some scientific terminologies cannot be translated correctly, so it is preferable to be studied as a scientific term in English. And that is why the majority of the study subjects who responded to the second interview questions nearly (75%) of the entire contributors think that only English as a medium of instruction should be used while teaching scientific terminologies. Therefore, to get used to using it in the upcoming future, students' own language should be banished. The results also show that students' comprehension of the scientific terms and the affixes attached to them is improving, which may benefit the science track students in their future academic endeavors.

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