



## Enhancing Syntactic Competency Of Engineering Students In English Using CLIL

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### Abstract

*Content and Language Integrated Learning (CLIL) may be seen as a type of instruction where students can study foreign languages and specialized material concurrently, depending on the subject matter. By striking a balance between professional education and the acquisition of foreign language abilities, CLIL greatly enhances students' motivation, responsibility, and personal growth. CLIL is a type of bilingual education where students study foreign languages and subject material at the same time. Through teaching trials, the efficacy of the CLIL technique as an academic subject for second-year mechanical engineering students was examined in this study. Mechanical engineering second semester students are taken into consideration. Subject and English professors provided ideas for the "definitions" for the elements utilized in the Engineering Practice Lab, which were taken from the Professional English curriculum. Only mechanical engineering students taking English as a supplement are the topic of this study. The main research approach is educational experiments; alternative research methods include survey questionnaires that are used as pre- and post-tests at the start and finish of the study. Based on the survey questionnaire responses, a statistical assessment of the students' syntactic proficiency was conducted. The study's findings demonstrate students' interest in developing their definition-building abilities with favorable opinions on CLIL.*

**Keywords**—CLIL, English syntactic competence, definitions, content and Language Integrated Learning, mechanical engineering, performance-based tests

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### 1. Introduction

One of the top concerns of European Union (EU) is integrating CLIL into instruction at all educational levels, including higher and technical education. EU emphasizes that CLIL, in which students study topics through a foreign language, significantly contributes to language learning goals in its action Plans in terms of Language Learning and Linguistic Diversity. Instead of acquiring new language skills now to use them later, CLIL can provide students effective utilization opportunities. It gives a greater variety of students' access to language, enhancing the self-assurance of younger students and who fared badly when learning from

traditional language approaches in secondary education.

CLIL enables language exposure without adding to the program's duration, which is advantageous in a professional situation. The multidisciplinary collaboration and integration that CLIL entails builds bridges across many fields of study and native languages. Hence, CLIL focuses on combining the study of both languages and subjects rather than just one or the other separately. CLIL's objectives are The commonly referred to as 4Cs (Refer Figure 1).



**Fig. 1.** The 4C's Framework

This framework laid the foundation for integrating various CLIL facets and assisting in the creation of CLIL pedagogies. CLIL aims to challenge students and provide them the tools to develop their own understanding. This paradigm highlights how successful CLIL education differs greatly from traditional educational systems in terms of its operational principles and outcomes and includes four major elements for any effective CLIL training which are detailed below:

- Content: the development of information, abilities, and comprehension related to certain programme components;
- Cognition: cultivates critical thinking abilities connecting the development of abstract and/or concrete concepts, understanding, and language;
- Communication: employs a foreign language while learning to use a foreign language.
- Culture: Exposure to multiple viewpoints promotes variety, tolerance, and cultural awareness.



**Fig. 2.** Re-conceptualizing language learning: language triptych

In India, most technical educational institutions are getting more interested in CLIL and is viewed as tools for communications and subjects. This study examines CLIL principles with an emphasis on combining L2 and academic subject instructions in relation to the needs of potential employers and students. This work aims to explain integration of SLA (Second Language Acquisition) into academic subjects. CLIL's efficacy in dual-focus instructions, content-based foreign language motivations, and enhanced vocabularies were investigated and compared between two groups of students namely (CLIL and control). Developments and improvements in syntactical and communication competence acquisitions have been made in recent years while using CLIL and specifically in technical education increasing evidence of such research shows it impacts students' performance levels.

### A Historical introduction to CLIL

The phrase CLIL, which refers to teaching languages in a fashion that places more emphasis on the content than the form, became one of the most popular during the 1990s. The main driving force behind the adoption of CLIL principles was to break down conventional barriers in teaching foreign languages and specialized contents of technical topics in professional institutions. CLIL implies bilingual educational models that enable students to simultaneously learn subjects and language based foreign languages.

CLIL has a significant historical background and over a period of time, specific organizational strategies and methods have been developed. In his book *Content and Language Integrated Learning in European Schools* (1994), David Marsh, a pioneer in the field of content and language integration, coined the acronym CLIL. Various historical, sociopolitical and cultural factors have contributed to the diversity of outreach approaches. The practice of learning a foreign language in a focused, authentic learning environment stems largely from bilingualism or multilingualism, which is the formal coexistence of multiple languages.

CLIL was first introduced in historical writings by the influential educator J. A. Komensk (1592–1670), who was of Czech descent. In *Orbis Pictus* and *Janua Linguarum Reserata*, he emphasized the importance of quality language instruction. Before 1970, various geographic, demographic, social, and economic circumstances led to the emergence of programs that emphasized integrations of languages and contents, specifically in bordering areas for students to study in multilingual environments and enhance their communication skills with other residents in the area. Immersion education programs are used in nations with multiple official languages.

The Canadian Immersion Programs, which were effective, start teaching the target language in kindergarten or the first year of primary school (Naves, 2009). Parents, school boards, and administrators demanded an evaluation of the immersion program due to concerns about how much content was taught to students in their second language (Naves, 2009).

Immersion education extended to United States and Europe from Canada. In the 1970s and 1980s, the term "immersion" came to refer to bilingual education. The Canadian immersion education model had a significant impact on bilingual education in Europe. CLIL students learn language abilities along with subject contents. The European Union has always emphasized language diversity as one of its top goals. Discussions about language education in Europe in the 1990s, *Lingua* program (1990), emphasized on fostering innovations in foreign language instructions and novel teaching techniques.

EU intervened in the domain of CLIL and mentioned it a major challenge in the Council Resolution of 31 March 1995, first legislative documents adopted by Council of EU emphasizing on the development of diverse languages. It aimed to improve effectiveness of language acquisitions using a variety of advanced methods in educational institutions. The Council emphasized the importance of improving communication skills, with particular focus on techniques that promoted reading, text, listening comprehensions along with oral expressions, as well as teaching courses study in foreign languages. in addition to bilingual education.

The Resolution affirmed increasing counts of technical and vocational schools included language instructions in their curriculum and recommended action in education and training were developed by EU Commission in their White Paper, "Training and apprenticeship policies, which are fundamental for improving employment and competitiveness, must be strengthened, especially continuing training."

Article 127 of the Treaty on the European Communities states: "The Community shall implement a policy of professional training aimed at supporting and complementing the actions of the Member States". Furthermore, as is standard in European schools, the Commission has recommended that secondary school students take a certain number of courses in the first foreign language they learn (Eurydice, 2006). Any teaching strategy that uses L2 to teach specific subjects is called CLIL, with the exception of language lessons. The methodological tenets of CLIL encourage the acquisition of subject-based syntactic competence by placing learners in circumstances that foster real conversation.

Many non-linguistic abilities that are crucial to language mastery are referred to as being competent in academic language (The Glossary of Education Reform, 2013):

- Organizational, planning, and research skills in the classroom; -cognitive (critical thinking, problem-solving, interpreting, analyzing, memorization, and recall) skills;
- learning styles (experimenting, thinking, observing, and asking questions);
- work ethics (tenacities, self-controls, curiosities, conscientiousness, and responsibilities);
- additional types of literary forms (technologies, online, media, multi-cultural, etc.).

## Methodology

Researchers use questionnaires to collect data from study participants in a procedure known as survey research. To arrive at significant study findings, the survey data will be statistically analyzed. It comprises of questions from a structured survey that elicit responses from participants. This is a quantitative approach that uses a series of survey questions to collect data from a group of respondents. This kind of research, which was utilized in this study to inform respondents about her CLIL patterns, entails the collecting and interpretation of data by a person. Additionally, the approach was predicated on cross-sectional survey research, in which investigators poll target populations at certain intervals to gather insights. When doing

descriptive analyses of data, researchers use the cross-sectional survey research approach. This work used Analytical Cross-sectional survey research as they are fast, prompt and give outcomes within brief periods of time.

Language learning is based on research into learners' access to basic concepts and abilities related to the subjects and related contents like vocabularies/terminologies, structures, sentences and grammar specifics. The fundamental goal of studying in engineering institutions is to achieve a specific level of engineering (content) knowledge: knowledge of specialized engineering disciplines. However, for technical university graduates to thrive in labor markets, language proficiencies and communication efficiencies are crucial. CLIL helps students receive specialized academic and language support using external language vocabularies.

The primary hypothesis posed that CLIL students would do better on the technical subject-based lexical acquisition test than non-CLIL students. The first stage in designing a CLIL programme is to plan the interdisciplinary themes to be studied and to explicitly specify learning goals and outputs. Each topic's key words have been carefully chosen and defined. Reading comprehensions with case studies and practices were compiled according to two programme majors. This pre-instructional preparation enables teachers to gather the knowledge they need and establish action plans for their classroom encounters. The mechanical properties of materials used in wood and welding work in engineering were the subject-related topics covered and CLIL-style lessons offered at the first year second semester engineering level titled 'Engineering Practices Laboratory' for providing hands on training to the students on Drawing pipe lines, sawing, making joints in wood materials, wiring various electrical joints in common house hold electrical wire works, soldering and testing simple electronic circuits.

This course consisted of two groups namely Civil and Electrical with two parts in Group A, and in Group B, Mechanical Engineering practices and Electronic engineering practices. The topics, 'wood work' in part I from Group A (Civil & Electrical) from the syllabi and - 'welding work from Group B (Mechanical and Electronics), were selected with related components based on the suggestion of content teachers to formulate 'Definitions' for acquiring syntactical competence. A questionnaire with 20 questions related to CLIL evaluated students' levels uof satisfactions/attitudes. The questionnaire included closed-ended questions for measuring learners' responses on 5-level Likert scales: Strongly Agree (SA), Agree (A), Neutral (N), Disagree (DA), Strongly Disagree (SD).

Students in language classes spent a total of 5 hours each week studying English, the target language. The lessons were delivered using a soft CLIL approach, where the teacher focuses on tools use while keeping linguistic goals in mind. Although the emphasis is on L2 syntactical and communicative acquisition, it is typically intended for a shorter length of time during which the students acquire subject-matter information (Ball et al., 2015). The L2 teacher brought academic language input into the lesson plan. The next step was to do practical activities with the help of the learned material. At the conclusion of the lessons, vocabulary and language structures based on content were practiced through the use of activity-based tasks that encouraged student interactions in pairs or groups. Fifty students were asked to complete a comprehension tests with sections on grammar, sentence corrections, combinations, and transformations for the groups.

### **Validation of Employed Methods**

The goal of the study was to determine the efficacy of applying CLIL principles to promote learning specialized English as a second language (ESL) integrated into a particular academic subject. The primary distinction was in how students interacted with one another and how much they participated in the learning process. The students' results from both groups showed varying degrees of proficiency in English. Data collected at end of experiments demonstrated differences in the progresses of subject-based lexical competence acquisitions when initial and final proficiency levels were compared for student groups. Quantitative research was used in assessments. The following were used as part of the experimental verification of applied CLIL: pre-tests in the English language to gauge the students' level of proficiency; evaluation of pre-test results by creating study, instructional, and systematic materials and post-test analyzing the students' cognitive knowledge acquisition in English as a second language with a focus on the evaluation of the acquiring syntactical competency in a foreign language.

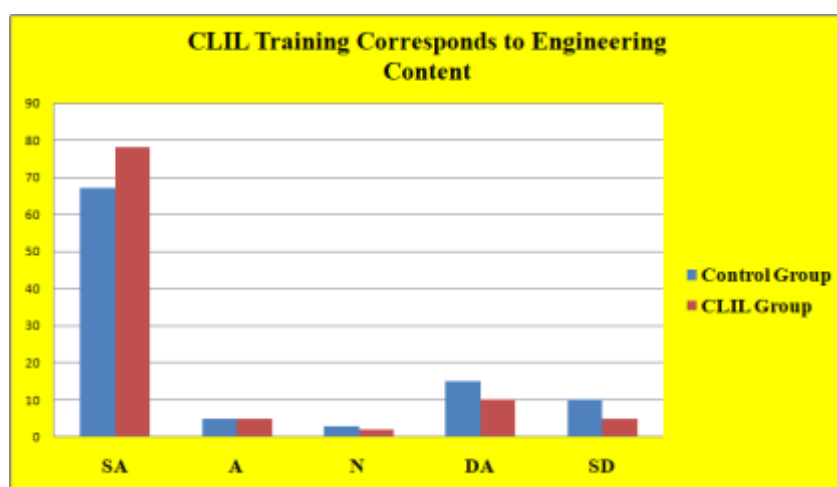
### **Results and Discussion**

This research was carried out amongst 50 Engineering students in their second semester of study. The experiments of second semester mechanical engineering were used to examine the efficacy of CLIL

principles that were incorporated into formulating 'definitions'. To compare the results and the students' attitudes toward learning L2 in this way, the experiment featured two groups (CLIL, Control) of students. The five-session English learning involved five stages, as follows; (1) divide students into groups, distribute materials, describe assignments and how to complete assignments; (2) control students who have worked on their topic in groups; (3) each group presents its work according to each aspect; (4) Students work in groups to prepare reports and presentations for the class that are reviewed and commented on by teachers. Students are also encouraged to give their opinion on the type of activities that can be organized at school. The expectations of students on the use of foreign languages in their future employments were also examined Figures 3 and Table 1 demonstrates the level of students' interest in using CLIL on Likert scale of 5: SA, A, N, DA, SD.

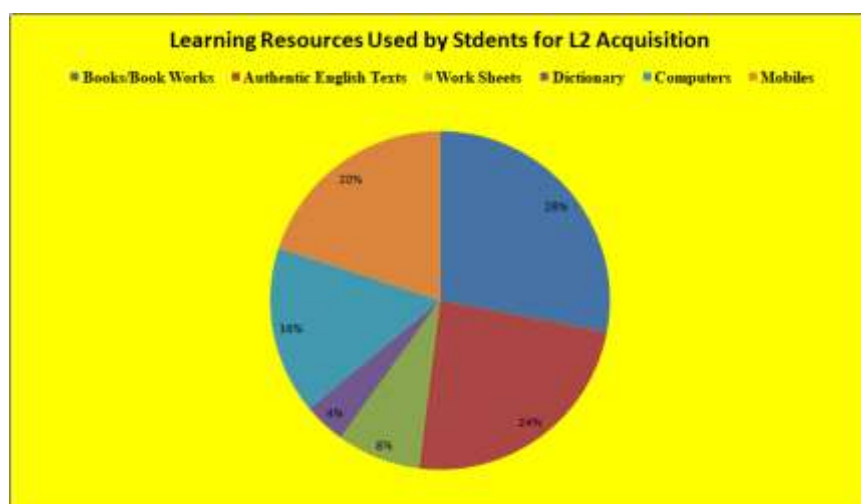
**Table 1** - Students' interest in using CLIL Methodology

| Students' interest in using CLIL |    |   |   |    |    |
|----------------------------------|----|---|---|----|----|
|                                  | SA | A | N | DA | SD |
| Control Group                    | 67 | 5 | 3 | 15 | 10 |
| CLIL Group                       | 78 | 5 | 2 | 10 | 5  |

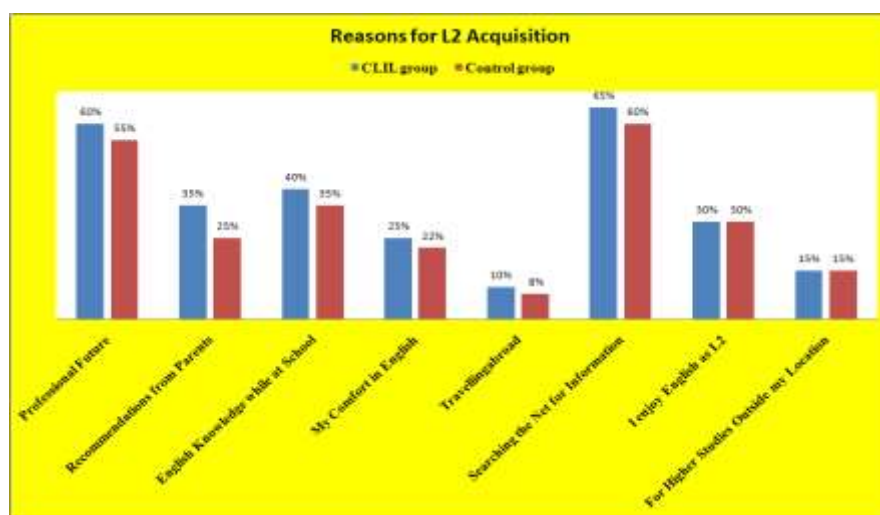


**Fig. 3** – Student responses for usage of CLIL

It is evident from the above figure and table that most students agreed for CLIL based teaching. Figure 4 depicts the results of survey questionnaire on learning resources used for foreign language acquisition. The questionnaire covered many aspects including the use of supplementary study materials and information and communication technologies (ICT) while Figure 5 shows factors influencing their interests in L2 acquisition.



**Figure 4** - Learning Resources for learning English as L2 by Students



**Fig. 5 - Motivation for studying English**

As regard motivations for learning english were based on the following reasons for CLIL and Control Groups

- Professional Future 60% 55%
- Recommendations from Parents 35% 25%
- English Knowledge while at School 40% 35%
- My Comfort in English 25% 22%
- Travelling abroad 10% 8%
- Searching the Net for Information 65% 60%
- I enjoy English as L2 30% 30%
- For Higher Studies Outside my Location 15% 15%

The integration of practical technical articles adapted for educational purposes allows for a better understanding of the exact meaning of terminology in speech. The result is the availability of practical technical documentation in foreign languages with a high content of technical vocabulary with clear meanings, diagrams, diagrams, etc. are useful teaching tools. Collaboration with text can be achieved through group activities such as collaborating on common projects that require information organization relevant to tasks.

Interpretation and presentation of the students' findings with their attitude to a specific problem develop both critical thinking and motivation in students. This works formal definitions are divided into three parts: (1) words to be defined; (2) the classes, groups, or idea to which term belong; and (3) special qualities that distinguish them from others or specific uses/information. Example definitions are provided below.:

1. Chisel: A chisel is a hand held tool with characteristically shaped cutting edge of blade\_on its end. It features a distinctive cutting edge for carving and cutting hard materials such as wood, stone, and metal\_
2. Mallet: A mallet is a tool with a large, barrel-shaped, head. It's often made of rubber or sometimes wood, that is smaller than a maul or beetle. It is used to pound on something.
3. Jack plane: Jack planes (or fore planes) are general-purpose wood work bench planes, used to dress timbers down to correct sizes in preparations for truing and/or combining edges.

Students with components in their hands were able to present by viewing their shapes, identifying classes and continued explaining their characteristics and usage learnt from the content teachers and based on syntax from L2 teachers who supported students in achieving subject-matter mastery using instructional scaffolding. Figure 6 displays an matching pairs that students created gradually over the course of lessons using instructional scaffolding.



**Fig. 6 – Matching Pairs**

Students were able to organize their knowledge in accordance with what they already knew, what they wanted to learn, and what they had discovered about the topic. One technique used to help students improve their motivation and speaking abilities while attaining both topic and linguistic objectives was matching pairs related to a specific subject. An Example of student's explanation of a chisel after CLIL is shown below:

**Chisel: Chisels are tools with characteristically shaped cutting edges of blades on their ends; for carving or cutting hard materials like wood, stone, or metals. These hand-held tool features distinctive cutting edges made on purpose for carving and cutting hard materials including wood, stone, and metals.**

The effectiveness of CLIL was measured with a Task-based and Communicative Activity 'Show and Tell'. Both groups of students had the same English level of English proficiency as data collected from pre-tests. The vocabulary proficiency test (VLT) created by Schmitt et al. (2001) was used to determine participants' vocabulary size or the number of terms they knew. The subjects' pre-test and post-test VLT scores were examined first, based on the mean score and standard deviation value. Table 2 summarizes relevant results:

**Table 2: VLT Scores**

| VLT       | N  | Mean*  | SD      | Min. | Max. |
|-----------|----|--------|---------|------|------|
| Pre-test  | 50 | 31, 65 | 15, 969 | 5    | 62   |
| Post-test | 50 | 42, 21 | 14, 485 | 16   | 69   |

\* The values considered for 96, the max. score that is possible in tests

About 20% of the VLT terms were known by the participants, according to Table 2's pre-test results ( $X = 31.65$  out of 96). Following the test, the mean score rose ( $X = 42.21$  out of 96), indicating that participants' vocabulary knowledge improved as a result of CLIL education. Stated differently, the findings demonstrated that participants learned new terms by being exposed to them during CLIL training. A paired-samples t-test analysis was conducted on the mean total VLT score in order to support this interpretation and determine whether there was a statistically significant difference between the pre-test and post-test mean scores.

**Table 3: Paired Sample t-test Total Mean Scores of VLT**

| Paired Sample Tests |                    |           |             |                              |        |        |                 |       |
|---------------------|--------------------|-----------|-------------|------------------------------|--------|--------|-----------------|-------|
|                     | Paired Differences |           |             |                              | T      | df     | Sig. (2-tailed) |       |
|                     | Mean               | Std. Dev. | Std. Er. M. | 95% Conf. Inter. of the Dif. |        |        |                 |       |
|                     |                    |           |             | Lower                        |        |        |                 | Upper |
| VLT_Pre - Post      | -10,366            | 6,513     | 1,755       | -14,870                      | -6,803 | -5,374 | 20 ,000         |       |

\*significance level is .001

The findings of the t-test sample comparison indicate that the average score of the pre-test ( $X = 31.65$ ,  $SD = 15.996$ ) and the post-test ( $X = 42.21$ ,  $SD = 14.845$ ) differs statistically significantly.,  $p < 0.001$ ,  $t(10) = -5.734$ . It is therefore possible to claim that as a result of receiving CLIL teaching, individuals' vocabulary knowledge levels changed over time. Put differently, Table 3 suggests that learners acquire new vocabulary when they are exposed to CLIL training. The individuals' general and academic vocabulary sizes were evaluated across frequency ranges in addition to their total vocabulary size. The following displays the frequency band analysis results:

**Table 4:** Descriptive Statistics of the Three Frequency Pre-Test and Post-Test

|      | Pre-Test<br>(n = 11) |        | Post-Test<br>(n = 11) |        |
|------|----------------------|--------|-----------------------|--------|
|      | Mean                 | SD     | Mean                  | SD     |
| 2000 | 8, 29                | 6, 728 | 12, 19                | 5, 178 |
| 3000 | 5, 19                | 4, 145 | 9, 90                 | 4, 587 |
| AWL  | 7, 63                | 6, 158 | 20, 38                | 5, 664 |

The range of learners' vocabulary varied depending on the frequency range required in the VLT, as shown in Table 4. Specifically, participants' average score for the 2,000th word range, considered the vocabulary at high frequency, was lower in the pre-tests ( $X = 8.29$ ) than in the post-tests ( $X = 12.19$ ). It was claimed that participants knew approximately one-third of the total number of words offered at the beginning of the semester, taking into account the highest score (30) possible in the 2,000-word pool of the VLT. After completing CLIL training, an individual's vocabulary knowledge increases by nearly 50%.

## Conclusion

The demand for businesses to hire people with fluency in multiple foreign languages has led to requirements for quality education. This propensity can be encouraged by incorporating the CLIL principles into classroom instruction. In recent years, CLIL has had a significant impact on the European educational scene through a variety of projects and programmes for teaching English to speakers of other languages. By providing degree programmes taught in English, many higher education institutions want to gain more respect and recognition on a global scale. There may be several drawbacks to the CLIL-style lessons. The creation of study materials and the subsequent preparation of those resources take time. However, the CLIL technique has the benefit of emphasizing critical thinking in students as well as teamwork, international awareness, professional vocabulary acquisition, and communication skills. practice based on the individual experiences of the pupils, etc. A greater collaboration between the subject matter experts and the language experts helps ensure the viability of CLIL lessons. There are no classifications of languages because learners utilize simpler and more complicated forms, but teachers need to identify and group intended usage of language in the text. In addition to specific discourse markers, adverbial phrases, or prepositional phrases, learners may require languages in comparisons or explanations. Semi-fixed expressions, and well-known phrases could also get extra attention when used alongside academic and subject-specific vocabularies. The use CLIL in engineering can develop confidence in students while improving their cognitive and communication skills. These students can reach significantly higher levels of SLA acquisition in comparison to traditional teaching methods as demonstrated in this work.

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