

The impact of CLIL on L2 vocabulary development and content knowledge

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ABSTRACT: This paper examines whether students involved in CLIL are able to learn content through the medium of L2 and simultaneously exhibit significant gains in L2 vocabulary knowledge. Two experiments were set up in two public primary schools. Two groups of 6th grade students participated in each experiment. The first group was taught three 80-minute Science lessons through the medium of L2 English, while the second group was taught the same content through the medium of L1 Greek. The outcomes demonstrated a significant effect of CLIL ($p = .001$) on L2 vocabulary knowledge of the experimental groups, which outperformed the control groups that were not exposed to CLIL. A significant effect ($p = .000$) of treatment on content knowledge was shown for both experimental and control groups. Observation of three video-taped Science lessons provided more information about the learning processes allowing benefits for CLIL students. Avenues for further related research are discussed.

KEYWORDS: CLIL (Content and Language Integrated Learning), L2 learning, subject matter learning, experimental study, action research.

INTRODUCTION

Increasing attention to Content and Language Integrated Learning (CLIL) is due to the European aspirations of providing a multilingual education (Van de Craen, 2001). The European Union seeks to promote Content and Language Integrated Learning, hoping that students “might benefit from the experience of content and language integrated learning (CLIL)” (Council of Europe, 2005, p. 32). The European Commission urges in the White Paper that “secondary school pupils should study certain subjects in the first foreign language learned, as is the case in the European schools” (European Commission, 1995, p. 51), where the L2s serve as language of instruction for certain subjects.

A basic principle regarding modern languages, on which the Committee of Ministers of the Council of Europe has based its work to prepare the Common European Framework (CEF), is that “only through a better knowledge of European modern languages will *it* be possible to facilitate communication and interaction among Europeans...in order to promote European mobility, mutual understanding and co-operation” (Council of Europe, 2001, p. 2). Among the variety of general approaches outlined in the Common European Framework is the direct exposure to authentic use of language in L2 in several ways such as “participating in courses in other curriculum subjects which employ L2 as a medium of instruction” (p. 143).

Theoretical groundings of content and language integrated learning

CLIL is based on theories assuming that language is acquired implicitly (Krashen, 1982), in interaction with the social environment and through the scaffolding of

facilitative language learning (Vygotsky, 1978). Knowledge is constructed when linked with prior knowledge (Piaget, 1963), and both the academic and social aspects of language can be acquired simultaneously (Cummins, 1981).

Implicit acquisition of language

Content and language integrated instruction was influenced by Krashen's theory of second language acquisition (1982). Krashen argued that acquisition takes place when the language skills are developed through use in a way similar to how native speakers learn grammatical rules. Otherwise, when language ability is developed through formal instruction, this conscious knowledge is called learning. Krashen held that only meaning-focused instruction can meet the first condition.

These suggestions imply that second language instruction primarily needs to be based on meaningful material, just as natural language is always learned in meaningful situations (De Graaff, Koopman, Anikina & Westhoff, 2007). CLIL is a meaning-focused learning method, where language knowledge is not the ultimate aim but rather a vehicle for instruction (Van de Craen & Mondt, 2003).

Social constructivist theory

Vygotsky's (1978) social constructivist theory emphasises the importance of constructing mediation. It is assumed that language is the tool which mediates mental functioning. In this regard, learning is facilitated by teacher and peers who help the individual reach the zone of proximal development (ZPD), that is, the area between the person's actual developmental level and the level of their potential development. Van de Craen and Mondt (2003) assert that a CLIL class is an ideal environment for scaffolding to occur. Teacher and learners interact in their effort to make sense of activities and get messages across.

Cognitive constructivist theory

A cognitive constructivist theory of learning postulates that learning involves the individual construction of knowledge which builds on prior learning (Piaget, 1963). Constructivist theory suggests that meaningful contexts are a prerequisite for learning to occur, providing a rationale for the CLIL approach. In this perspective, learning is more powerful when many strong connections are created. New material which is linked to prior knowledge is likely to be better retained, as knowledge is interconnected.

In CLIL classes, content acts as the driving force for students making connections between new and prior knowledge. The more the number of connections relate to prior knowledge, the greater learning is enhanced. In contrast, facts and language skills taught in isolation need much more practice and rehearsal before they can be internalised.

Language development theory

Another hypothesis providing support for content enriched language learning is the belief that humans develop two different kinds of language proficiency: social and

academic language (Cummins, 1981). Social language is informal and cognitively less demanding as a result of being contextualised. Academic language is more formal and cognitively demanding. CLIL instruction seems to promote both sides of the target language simultaneously. By using content-area texts and tasks as a vehicle for strengthening L2 proficiency, educators may enable the development of both academic concepts and target language skills.

The common factor stressed by all four theories described above is that learners require substantial and meaningful contextualised language input. This idea meets the requirements of the European Council (2001) as described in the Common European Framework, that the “most important thing a teacher can do is provide the richest possible linguistic environment in which learning can take place without formal teaching” (p. 139). This rich linguistic environment may require increased exposure to L2 in a content-oriented, discourse-based language teaching environment such as CLIL. In this framework, students can be exposed to contextualised language learning.

Research related to implementing content and language integrated learning

Content-based instruction in L2 has been put into practice in Canada’s immersion education from the 1970’s onwards (Harley, Allen, Cummins & Swain, 1990) and later in the “foreign language across the curriculum” movement in the U.S. and Britain. However, a wide applicability of content-based instruction has taken place the last 15 years, with its being implemented in countries such as Hong Kong, Australia, Indonesia and Argentina.

The CLIL approach is a fast developing phenomenon in Europe, too. The Eurydice survey notes that “the initiatives in the field of CLIL have increased in recent years” (European Commission, 2005, p. 55). CLIL-type provision is part of mainstream school education in most countries at primary and secondary levels.

Research findings regarding students’ academic gains are at a preliminary stage. Stoller (2004, p. 264) reports that students involved in such courses exit the courses with improved language abilities and content-area knowledge gains. Langam (2003) investigated English language learners in middle-school classrooms. The researchers observed retention of vocabulary and content concepts. More recently, CLIL implementation in Estonia revealed development in the four language skills of the target language. The students in Russian-language schools were taught at least half of the subjects of the national curriculum through the medium of L2 Estonian by focusing on content, negotiating the meaning of language and content and being involved in active learning. Results showed that they met curriculum expectations in mathematics and science (Mehisto & Asser, 2007).

However, a number of studies involving immersion settings did not exhibit the results that were anticipated. For example, evaluation of the Canadian, bilingual education experience did not show the advantages that were predicted, that is, improved language skills (Harley et al., 1990). However, this could be attributed to the focus of teaching being placed on content, following a content-driven approach that leaves language learning to be incidental.

Collectively, the results of research findings suggest that CLIL may have positive outcomes on learners' L2 proficiency. However, scientific research regarding CLIL implementation is still at an embryonic stage. Researchers do not seem to have reached a consensus on the efficacy of the particular program in respect of both content and L2 knowledge. More longitudinal studies are required in order to examine the linguistic and academic outcomes of CLIL. This study aims to contribute to this discussion by examining the results of two experiments involving content learning through the medium of L2 and through L1 as well as discourse in CLIL classes.

RESEARCH METHODOLOGY

The current study employed both a qualitative and a quantitative methodology in order to ensure triangulation of data provided by the various sources, that is, presenting data from more than one source. An experimental pretest/posttest research design provided quantitative data about the impact of the CLIL program on content knowledge and L2 vocabulary development. Three CLIL lessons were video-taped, allowing observation of the students' reactions to learning content and vocabulary in this environment.

Quantitative measurements: Quasi-experiments

Two quasi-experiments were set up collecting data from intact/sixth grade classrooms which were formed for teaching purposes. It was not practicable to rearrange students into different groups as this would raise objections on the part of the students and their parents, since the former would be separated from their friends for a whole year. Analysis of covariance was used to balance possible initial differences between the groups.

Internal validity was improved by adding more than one experimental and control groups. The two experiments aimed to compare teaching content through two different approaches. The first experiment was carried out by the researcher who implemented CLIL in Science, while the second experiment was carried out by another teacher who repeated the first experiment. This research design provided two experimental and two control groups.

Each teacher had to teach the same content to two different classes. The first class was taught content through L1 whereas the second class was through L2. The two teachers strictly adhered to the same lesson plans in order to control for differences in the teaching styles between them. Instruction in both experimental and control groups promoted inquiry learning. Lessons in both L1 and L2 included problem identification, hypothesis formation, brainstorming of solutions, investigation through experimentation, data collection and analysis, discussion, forming conclusions, and reaching generalisations. The three 80-minute science lessons were carried out once a week lasting three weeks. It was hypothesized that students in the CLIL class would a) have significant gains in L2 vocabulary knowledge out-performing their counterparts who were not involved in CLIL, and b) exhibit significant improvement in content knowledge development.

The subjects involved in both experiments were 77 11-year-old, Grade 6 learners attending an urban and suburban school in Cyprus. The first experiment involved 31 children while the second involved 46. Two intact classes were involved in each experiment, being assigned to experimental and control groups. Figure 1 illustrates the procedure followed:

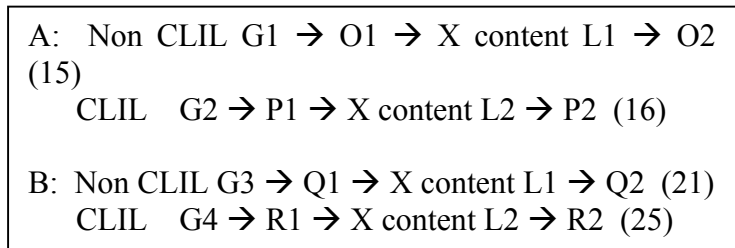


Figure 1. The experimental design of the study

In the first case, G1 stands for the control group which was taught content through L1 for five, 40-minute lessons and finally reached state O2. G2 is the experimental group, starting from stage P1, which was taught content through L2, reaching state P2. In the second case, G3 represents the control group which started from stage Q1, was taught content through L1 and reached state Q2, whereas G4 is the experimental group which started from stage R1, was taught content through L2 and finally reached stage R2.

Initially, the children in the two groups were administered L2 vocabulary knowledge pre-tests and on completion of the unit they were administered the same post-tests.

The experimental groups: Class information

The experimental group of the first experiment included sixteen students, of which eight were boys and eight were girls, while the control group involved fifteen subjects, of which six were boys and nine were girls. Participants attended a suburban school. The experimental group of the second experiment included 25 children, 16 boys and 9 girls, while the control group involved 21 pupils, 8 boys and 13 girls. The pupils of the second experiment attended an urban primary school in Cyprus for Grades 1 to 6. The first primary school was small, having 106 students and situated in a suburban area with a mixed socioeconomic profile, while the second one was a big school having more than 400 students, with the majority of them having middle-class parents.

The children were heterogeneously grouped into their class, as regards academic/linguistic performance and gender, being taught English as a foreign language twice a week for a 40-minute period each time. Participants spoke Cypriot Greek as their L1. Students of both groups attended private English classes.

The two female teachers who participated in the study were selected (on the school inspector's advice) for their enthusiasm in teaching. Both teachers had a good relationship with their students. They were certified elementary school teachers for all subjects and had a good command of English (level C1 at the CEFR scale), both having pursued studies in the UK. The first one had an MA in Education from a

British University, while the second held an MA in Applied Linguistics. They both had a long experience in EFL teaching.

The teacher in the first experiment had 18 years of teaching experience but hadn't taught CLIL before. The teacher in the second experiment had 17 years of teaching experience and was teaching CLIL for the second time. Treatment materials were developed specifically for the experiment, following the objectives of the state curriculum.

Vocabulary and content tests

The subjects in the control and experimental groups were administered pre- and post-treatment tests in order to strengthen the internal validity of the study. Vocabulary pre-post tests assessed vocabulary breadth, that is, how many words the learner knows and not depth. The vocabulary test required students to give the equivalent in L1 to 100 lexical items given in L2. The items were related to content words of the Geography unit and the maximum score was 100. Subject-matter tests included true-false, matching, multiple-choice and completion (short answer) tasks. Content tests assessed only cognitive objectives. L2 students were given the test items in both L1 and L2 in order to allow for greater understanding of the interactions among the test-takers' L1 and L2 knowledge, their content knowledge, and the linguistic and content demands of the test.

Qualitative measurements

Qualitative data from experimental classrooms were collected in order to enable the interpretation of the quantitative data. These include observation data which provided more details on the learning process. Data were mechanically recorded in the form of audio and video recordings in order to safeguard the internal reliability of the results.

RESULTS AND ANALYSIS

Experiments

Experiment 1

The t-test showed that there were no significant differences between the two groups on content ($p = .454 > .05$) and vocabulary knowledge ($p = .724$) at the outset of the study.

Pre-tests were administered one week before treatment, while post-tests were administered four days after the day of attending the last lesson in order to examine retention of learning. The subject matter tests included test items in both L1 and L2 (Solano-Flores & Trumbull, 2003). Paired sample t-tests were carried out in order to compare the pre-test/post-test performance of the two groups' content and vocabulary knowledge. The CLIL experimental group exhibited a significant increase in content knowledge ($p = .000$) with a mean difference of 36.95. The CLIL group also showed a significant difference $p = .000$ on vocabulary knowledge indicating a positive effect of the treatment. The mean difference (9.06) indicated a positive impact of CLIL on L2 vocabulary knowledge.

The group which was taught content through L1 exhibited a significant improvement in content knowledge ($t= 8.72$, $p= .000$). The control group did not exhibit a significant difference in vocabulary knowledge ($t= 1.89$, $p= .079$). The small mean difference (1.86) could be attributed to out-of-school English language learning experiences, such as taking private EFL classes.

A content post-test comparison between the experimental and control groups was carried out. The test revealed non-significant differences, suggesting that both groups learned subject-matter content ($p= .413$). A vocabulary post-test comparison between the two groups showed a non-significant difference between the groups ($p= .094$), although there was a mean difference (6.24), suggesting that more language oriented activities could enhance L2 vocabulary development.

Experiment 2

The t-test showed that there were no significant differences between the two groups on content ($p= .527 > .05$) and vocabulary ($p= .395$) knowledge at the outset of the study.

Paired sample t-tests showed that the CLIL experimental group exhibited a significant increase in content knowledge ($t= 6.29$, $p= .000$) with a mean difference of 21.20. The CLIL group also showed a significant difference $t= 5.47$, $p= .000$ on vocabulary knowledge indicating a positive effect of the treatment. The mean difference (6.24) indicated a positive impact of CLIL on L2 vocabulary knowledge, that is, students acquired a significant amount of receptive vocabulary.

The group which was taught content through L1 exhibited a significant improvement in content knowledge ($t= 7.30$, $p= .000$). The control group did not exhibit a significant difference in vocabulary knowledge ($t= .748$, $p= .463$). The small mean difference (0.38) could be attributed to out-of-school English language learning experiences such as taking private EFL classes.

Content post-test comparison between the experimental and control groups was carried out. The tests showed a non-significant difference, suggesting that both groups were successful in learning subject-matter content ($p= .086$).

A vocabulary post-test comparison between the two groups revealed a significant difference ($p= .002$; mean difference, 7.23) favouring the CLIL group, indicating the beneficial effect of CLIL on L2 vocabulary development.

Experiments 1 and 2

The scores of both experiments were considered to investigate the effects of the medium of instruction on content and vocabulary knowledge. Students were allowed a 40-minute period to complete each test.

Pre-tests showed non significant differences between the two groups in content ($p= .305$) and L2 vocabulary ($p= .769$) knowledge at the outset of the study. Results showed that CLIL instruction was significantly better ($p= .001$) than teaching through L1, in promoting L2 vocabulary development. Further, a non-significant difference ($p= .078$) was revealed in subjects' post-tests, suggesting that students were able to

learn science content equally well when they are taught through the medium of L2. These outcomes seem to provide support for the two hypotheses.

Observation data

Acquiring language in meaningful settings

Observation data showed that CLIL provides opportunities for acquiring language in meaningful settings. For example, the paper experiment enabled the pupils to learn the word “neutralise” in a pleasant and meaningful way. The tin experiment helped the children to conclude that by reducing part of the air from the inside, the pressure in the inside of the tin was reduced and the tin was deformed by the pressure exercised from the outside. Target words were encountered in a meaningful context, for example, “deformation”. Such a meaning-focused processing enabled connections to knowledge allowing exposure to language to be effective (De Graaff et al., 2007).

Interacting with the teacher

CLIL lessons provided numerous opportunities for the pupils to interact with the teacher. For example, after the hypothesis formation of the tin experiment, the experiment was carried out, and then teachers and students jointly formed the conclusion. The teachers asked for explanations about some applications of the atmospheric pressure. They asked questions such as “What happens?” “Why?” “What do you think?”.

Teachers also repeated and expanded students’ answers, for example:

- T: What can you see on the picture?
 S: An octopus.
 T: Yes, the octopus hooks with its suction cups on the man’s hand...

The second teacher used the oral gap-filling strategy, that is, students completed the teacher’s phrases, using target or other content words, for example:

- T: The atmospheric pressure presses the suction cups on the man’s.....
 Ss: Hands

Building on prior knowledge

Pupils were invited to construct new learning on pre-existing knowledge. Code-switching was used when necessary in order to facilitate knowledge retrieval. For example, subjects were called to report how they realise the existence of air. They reported answers such as, “It moves the leaves,” and “It raises dust,” and so on. Students’ L1 was used to recall experiences (Experiments 1 and 2, Lesson 1).

Promoting both social and academic sides of the target language

The teachers drew students’ attention using phrases such as: “Have a look...”, thereby enriching their social language. Added to this, at the end of each experiment, the teachers restated the conclusion using academic language in the L2.

PEDAGOGICAL IMPLICATIONS

In general, findings seem to provide support for the positive impact of CLIL on content and L2 vocabulary development. CLIL provides increased opportunities for exposing learners to L2 vocabulary knowledge in meaningful situations. Attaching words to their surroundings increases the likelihood of comprehension and retention (Schmitt & Schmitt, 1995, p. 133). Teacher-student interaction allows scaffolding and constructing knowledge. Further, activating background world and linguistic knowledge (Piaget, 1963) through discussion creates a fertile ground for content and language learning. Certainly, linguistic interaction carried out exclusively in L1 can allow more opportunities for interaction than in L2. However, the L2 benefits occurring alongside content learning in CLIL environments may justify employing the approach.

CLIL students may encounter difficulties in conveying and constructing content-related meaning in the way CLIL is delivered, that is, task-based learning on its own. Therefore, CLIL methodology needs to be developed. Strategies that make input comprehensible seem to be necessary. Perhaps the use of particular strategies by the teacher such as visuals may enhance the communication of content (Short, 1994). Simultaneously, drawing attention to language features through both L2 medium strategies, that is, through synonyms or paraphrasing, and L1 medium strategies, that is, through code-switching, may enhance L2 benefits (Coonan, 2007; De Graaff et al., 2007).

LIMITATIONS: DIRECTIONS FOR FURTHER RESEARCH

The current research raises a number of issues requiring further investigation. To begin with, variables such as habits, student motivation and personal exposure to other language learning environments were not controlled in the present study. Added to this, some variables related to lesson delivery could not be controlled, such as the teachers' personality, abilities and attitudes, all of which could have made a difference to the outcomes.

Certainly, more rigorous research in the area of CLIL is required to corroborate and enhance the present findings and to fill in gaps. The small sample employed in the study imposed limitations on interpretation. Both space and time triangulations are required to ensure the validity of this type of study. Further comparative research is required across specific populations.

The post-tests administered in this study examined subjects' immediate performance. However, a delayed test might have examined whether learning is retained or atrophied over time. Re-testing participants in the years to come is likely to shed more light on the long-term benefits of CLIL. CLIL could be implemented using as content areas, subjects other than Science, such as History, Geography and Maths, in order to enhance the generalisability of findings.

Another line of investigation is to explore the experimental group's oral and written discourse level (productive skills) in relation to that of the students being taught the content subject in L1.

Equally pressing is the need to explore the optimal conditions of language and content integrated programs, such as the choice of texts either adapted to students' level or authentic, and the kind of instructional strategies being used. A lesson planning tool may need to be developed.

Although definitive conclusions cannot yet be reached regarding the exact value of CLIL in content and language learning, the results of the present study suggest that the issue of learning content through a foreign language is a fertile ground for further research.

CONCLUSION

Empirical evidence derived from this study suggests that learning content through the medium of the L2 provides opportunities for learning content and language in meaningful settings, activates background knowledge, allows linguistic interaction with teacher and peers which allows scaffolding to occur, and promotes both the academic and social aspects of the target language. Clearly, language development depends heavily on various factors such as cultural and linguistic affiliation with the teacher and the teacher's pedagogical approach.

The results of the two small-scale experiments provide support for Kaufman's (2004) claim that the symbiosis of foreign language and content seems to be promising in enhancing foreign language acquisition. The findings also indicate benefits in content learning. However, they also highlight the need for developing CLIL methodology for primary-school learners that would allow reaping more benefits out of this approach.

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