Less is More: Content Compression in CLIL

Menos es más: compresión de contenido en AICLE

Menos é mais: compressão de conteúdo em CLIL

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ABSTRACT. Pedagogical practices that are effective in content courses are often effective in CLIL courses too, yet one such practice – content compression – is generally neglected. Content compression is the purposeful reduction of the content to be taught; however, the CLIL literature often warns against the reduction and simplification of content for fear that it might harm students' understanding of the subject content. This paper explains the ostensibly paradoxical result that content compression improves students' understanding of content and shows why it is well suited to CLIL, if applied correctly. It presents content compression principles and techniques that are appropriate to content production and teaching practice in the CLIL classroom and shows how it was used to enhance language acquisition by students in a CLIL business course at a Colombian university over a period of three semesters. This experience suggested that content compression, in combination with other pedagogical practices, not only increased students' linguistic confidence, but also enhanced their perceived learning in both content and language.

Keywords (Source: Unesco Thesaurus): CLIL materials; content compression; critical ideas; big ideas; business education.

RESUMEN. A menudo, las prácticas pedagógicas efectivas en los cursos de contenido también lo son en los cursos AICLE; sin embargo, una de estas prácticas —la compresión de contenido— usualmente se deja de lado. La compresión de contenido es la reducción intencionada del contenido que se va a enseñar; sin embargo, la literatura sobre AICLE a menudo no aconseja la reducción y simplificación del contenido por temor a que pueda dañar la comprensión de los estudiantes del contenido de la asignatura. Este artículo explica el resultado, aparentemente paradójico, de que la compresión de contenido mejora la comprensión de los contenidos por parte de los estudiantes y muestra por qué se adapta bien a AICLE, si se aplica correctamente. Presenta principios y técnicas de compresión de contenido que son apropiados para la producción de contenido y la práctica docente en el aula AICLE y muestra cómo se utilizó para mejorar la adquisición del lenguaje por parte de los estudiantes en un curso de negocios AICLE en una universidad colombiana durante un período de tres semestres. Esta experiencia sugirió que la compresión de contenido, en combinación con otras prácticas pedagógicas, no solo aumentó la confianza lingüística de los estudiantes, sino que también mejoró su aprendizaje percibido tanto en el contenido como en el idioma.

Palabras clave (Fuente: Unesco Thesaurus): Materiales AICLE; compresión de contenido; ideas críticas; grandes ideas; educación en negocios.

RESUMO. Muitas vezes, as práticas pedagógicas eficazes em cursos de conteúdo também são eficazes em cursos CLIL; no entanto, uma dessas práticas — compressão de conteúdo — costuma ser negligenciada. A compressão de conteúdo é a redução intencional do conteúdo a ser ensinado; no entanto, a literatura sobre CLIL muitas vezes não aconselha a redução e simplificação do conteúdo por medo de que isso possa prejudicar a compreensão dos alunos sobre o conteúdo da disciplina. Este artigo explica o resultado, aparentemente paradoxal, de que a compressão de conteúdo melhora a compreensão do aluno sobre o conteúdo e mostra por que ela é adequada para CLIL, se for aplicada corretamente. Apresenta os princípios e técnicas de compressão de conteúdo apropriados para a produção de conteúdo e prática de ensino na sala de aula CLIL e mostra como foi usado para melhorar a aquisição de linguagem por alunos de um curso de negócios CLIL em uma universidade colombiana durante um período de três semestres. Essa experiência sugeriu que a compressão de conteúdo, em combinação com outras práticas pedagógicas, não apenas aumentava a confiança linguística dos alunos, mas também melhorava sua percepção de aprendizagem tanto no conteúdo quanto na linguagem.

Palavras-chave (Fonte: Unesco Thesaurus): Materiais CLIL; compressão de conteúdo; ideias críticas; grandes ideias; educação de negócios.

Introduction

Content and language integrated learning (CLIL) is an approach that uses an additional language to simultaneously promote the learning of subject content and language (Coyle et al., 2010). Effective CLIL should enable students to learn an additional language, but without impeding the learning of the subject content. For this to be possible, the learning of content must be the primary focus but taught in a way that results in language learning.

The content in CLIL courses often takes the form of adaptations of existing materials or creating materials from scratch, and the design of such materials is a major obstacle to CLIL implementation (Ball, 2018). Poor content can harm the integration of content and language learning, and this often results from a lack of availability of appropriate CLIL-based materials (Gondová, 2015), a lack of clear guidelines (Meyer, 2010) or limited design skill (López-Pérez & Galván-Malagón, 2017). This paper argues that content compression, in conjunction with sound CLIL pedagogical practices, can be used to address these and other problems with respect to the design of CLIL materials and the choice of content and its teaching.

Content compression is the purposeful reduction of the content to be taught by the teacher based on the understanding that not all content contributes equally to student learning (Wiggins, 1989). When selecting and developing CLIL content, content compression can be useful, but it must be done with care. While content compression may create more time for language acquisition activities, if it were merely about content reduction, it would reduce the value gained from CLIL-based courses. In fact, when instructors adapt materials for CLIL purposes, they are warned not to reduce the quality of the content through simplification, since the level of learning should be comparable to similar courses taught in students' native language (Costa & D'Angelo, 2011). The purpose of content compression is not merely to reduce content — its main purpose is to enhance understanding and, thus, promote learning. It is used by the most skilled professors to prepare students to become content experts by concentrating on the deeper principles and concepts in a topic or subject (Bain, 2004; Ambrose et al.,

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2010). Learning science suggests that appropriate content compression leads to deeper and longer-lasting understanding compared to conventional practices that attempt to cover as much content as possible (Bransford et al., 2000).

Content compression first emerged as a general pedagogical strategy for use in conventional content courses (Wiggins & McTighe, 2005). Even in such courses, which have no additional language teaching requirement, there is usually too much content to cover (Frank, 2011, Wiggins, 1989). In CLIL courses, which do have additional language teaching requirements, the amount of content can generate excessive cognitive load, so it becomes an important consideration. Coyle et al. (2010) suggest that pedagogical strategies that are effective in content courses can improve CLIL courses as well and, given that content compression can improve content learning while reducing cognitive load, it appears ideal for CLIL.

The literature that informs the practice of content compression are those related to concepts such as "big ideas" (Wiggins & McTighe, 2005) and "threshold concepts" (Meyer & Land, 2003). There is some research in CLIL that shows awareness of this literature (García-Herreros, 2017; Aikawa et al., 2021), but it generally focuses on "backward design" and not on content compression as such. In fact, CLIL generally neglects content compression strategies as an approach to guide production of CLIL content and the use of such content during class. The research on the production and use of content usually takes the form of providing principles and general guidelines (Ball, 2018; Mehisto, 2012). Those who offer more specific advice, such as Gondová (2015), concentrate on text simplification as opposed to content compression. Some claim that reducing the quantity of content may harm its quality (Costa & D'Angelo, 2011), but there appears to be no literature that promotes content compression nor any that offer a sound pedagogical basis for doing so in CLIL.

This paper contributes both theoretically and empirically to the CLIL literature. Firstly, it shows that content compression in CLIL is pedagogically sound, since it can, in fact, enhance the quality of the subject content and improve the understanding of such content. Secondly, it practically demonstrates how content compression can be used in conjunction with CLIL and how they mutually support each

other, by drawing on the author's experience in a CLIL course that ran for three consecutive semesters. Finally, it considers the experience of the students in this course to establish how this methodology affected their perceived learning of both language and content.

How Content Compression Enhances Learning

Even in courses taught in the students' native language, the content is often too much, and few instructors teach everything — not only because there is often too much to teach, but also because much of the content is not necessary for understanding. This is why studies of exemplary professors find that they do not merely know what to teach — they know what *not* to teach. Bain's (2004) study of exemplary college teachers revealed that they recognise the critical ideas in a topic, and, similarly, Ambrose et al. (2010) found that they grasp the essential deeper principles. This influences their teaching, as well — they do not try to cover most facts in a course, but rather explore a small number of ideas from different perspectives (Bransford et al., 2000). Content compression aims to achieve the same as such educators, which is to increase the level of learning by engaging with what is critical and ignoring ideas that do not significantly contribute to learning.

These educators most likely know that too much content increases the cognitive load placed on students, and the literature confirms that remarkable improvements in recall and understanding are observed when excessive cognitive load is reduced (Moody, 2004). There is a more profound reason to pay attention to the amount of content: The choice of content influences students' understanding and the learning that is possible as a result. Understanding is associated with the ability to discriminate between essential and redundant ideas, which enables one to compress information into a few critical ideas or regularities in order to achieve an objective (Gromov, 2011). If there were no redundant ideas, understanding would not be needed and everything would have to be memorized. In contrast, it is possible to understand most subjects taught in schools and universities, because they can be compressed into a few "critical ideas" from which further ideas follow

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logically. Those who recognise regularities or patterns in knowledge soon realize that only a fraction of the content is needed to capture these patterns and that most other ideas can be derived from them. This is a principle that the "great explainer," Nobel Prize-winning physicist Richard Feynman, understood well. In his famous "Feynman Lectures," he made the point that a multitude of individual scientific facts can be compressed into a few regularities. In fact, in the very first of these lectures, he reduced physics to one sentence (Feynman, 2011):

> If… all of scientific knowledge were to be destroyed, and only one sentence passed on to the next generations… what statement would contain the most information in the fewest words? I believe it is… that all things are made of atoms – little particles that move around in perpetual motion, attracting each other when they are a little distance apart, but repelling upon being squeezed into one another. (p. 4)

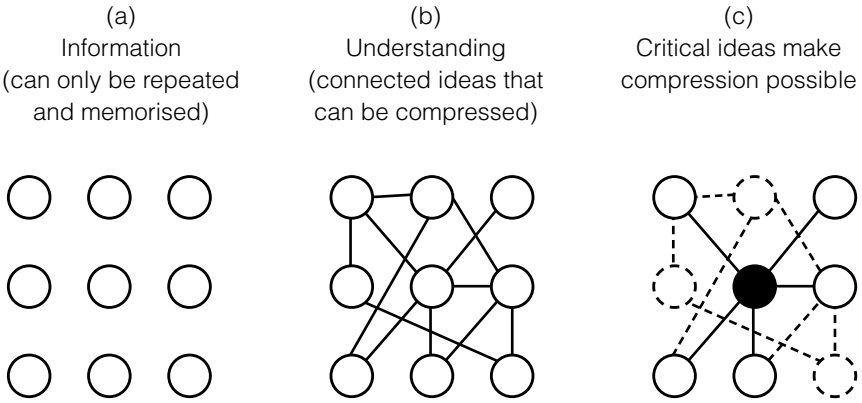
For Feynman, this sentence captured the critical idea from which all physics knowledge could be derived through reasoning and hypothesising. Like other exemplary professors, he believed that learning occurs when one is able to recognise the few critical ideas and connect them to form further ideas.

The notion that some parts of our knowledge are significantly more important than others is related to the so-called Pareto principle: that 20% of the effort (or causes) generates 80% of the results (or consequences) (Lipovetsky, 2009). This is particularly true in networks, especially scale-free networks, in which one finds hubs where a small number of nodes possess a disproportionately large number of connections. Such networks accurately describe the structure of various knowledge organisations, such as the World Wide Web, and social networks that organise knowledge such as academic citations (Barabási & Bonabeau, 2003). While the structure of the human brain is not fully known, there is evidence that its networks, too, resemble a scale-free network (Eguíluz et al., 2005), which can help to explain the brain's efficiency and plasticity (Forlim et al., 2019).

The Pareto principle cannot apply to systems that are merely lists of facts, such as a telephone directory. A list of unconnected facts (Figure 1a) cannot be compressed. Every fact is independent and cannot be used to derive other facts in the list. If one memorises 20% of the

facts, one only gets 20% of the benefit of the list. There are no critical ideas, and the Pareto principle does not apply.

Figure 1. Understanding and content compression



Source: Wentzel (2019).

However, when facts are related to each other to form patterns or larger ideas, knowledge can convert into understanding. Understanding one idea enables us to perceive the ideas that are connected to it by logic or experience, and this forms the foundation of learning. To find the critical ideas, one looks at the connectedness between the ideas in a topic. The central idea in Figure 1b has more connections than the others and, if this figure represented a topic, it would be wise to learn this idea before the others. Like Feynman's statement, the central idea gives us access to most of the other ideas, so one could compress the content to this idea and its connections, as highlighted in Figure 1c.

The degree of connectedness is described in network theory by the concept of *degree centrality* (Marsden, 2005). The larger the number of relationships a node has with other nodes, the higher its degree centrality. If most knowledge structures are scale-free networks, then learning will be most efficient when it is focused on the best-connected ideas.

Learning theory has long recognised the Pareto principle, as found in the work of Meyer and Land (2003) on "threshold concepts" and Wiggins (1989) on "big ideas." Threshold concepts are well-connected ideas that many students initially find difficult, but, once they are understood,

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these concepts transform students' understanding of a subject. Likewise, Wiggins (2010) explains that a big idea helps to "make sense of lots of confusing experiences and seemingly isolated facts. It's like the picture that connects the dots… in a complex field." Both threshold concepts and big ideas emphasise that effective learning and teaching starts with an understanding of the critical, well-connected ideas.

To summarise, in any subject that can be understood, there will be only a few critical ideas. Through intelligent content compression, CLIL instructors can take advantage of this, and so not only to enhance students' learning of content, but also to create more time for language-based activities that encourage reasoning with these critical ideas.

How Content Compression Improves Integration

The most obvious benefit of reducing content is that it also reduces the time spent on content that does not significantly contribute to learning. Not only does this allow for more time to be spent on tasks that integrate language and content, it also reduces the cognitive load on students while learning new content. Cognitive load is an even more important consideration in CLIL than in conventional courses, since students are learning language in addition to the new content (Raitbauer et al., 2018).

When one teaches too much content, there is also the danger of spending too much of the time in class on mere knowledge transmission and passive learning. One of the strengths of CLIL is that it tends to encourage a constructivist approach to learning that actively involves students (Ting, 2010). However, if an instructor focuses on covering a large volume of content in class, this potential may not be exploited. Students will not only be encouraged to memorise, but the language they learn will also most likely be limited to definitions, vocabulary, lists and the kind of descriptive language one expects to find when operating at the lower levels of Bloom's taxonomy.

Reducing the content to the critical ideas is not sufficient; it must be combined with the act of connecting these ideas. Students have to be shown how the critical ideas are connected and how to derive more

knowledge from them through reasoning, as Feynman (2011) explained. Any idea results from connecting other ideas in new ways, so with sufficient guidance and scaffolding, students can be led to apply the critical ideas to new contexts and reason from these critical ideas to further ideas. Such reasoning requires language. Such sense-making implies that content compression needs to be used in conjunction with constructivist pedagogical practices mediated by language.

Meyer's (2010) core elements of CLIL framework identifies the critical practices. The first one is to provide authentic and relevant *input* in the language being learned. When used in conjunction with content compression, this means that the expression of the critical ideas should be the principal input. It will likely be a written text, supported by additional input in other modes that elaborate on the critical ideas. This allows students to develop their reading and listening skills. The second element is to organise the learning around *tasks* that encourage meaningful interaction with the content and higher-order thinking using the target language. This is vital when content compression is used. Students need to be encouraged to think using the critical ideas and shown how to apply these ideas to the world around them and so construct a more elaborate understanding of these ideas. The third element is to use these tasks to push students to produce verbal and written language *output* in the target language. Coyle et al.'s (2010) CLIL matrix offers a useful framework here, recommending that the initial tasks make low linguistic and cognitive demands on the student, followed by tasks with higher cognitive demands and ending with tasks that combine both higher cognitive and linguistic demands. The fourth element, *scaffolding*, occurs in all the previous elements. Scaffolding reduces cognitive load and maintains students' motivation by supporting their ability to understand language input (for example through pictures, graphic organisers, or vocabulary support) and by providing structure for their language production (for example through templates, demonstrations, or group activities).

Not explicitly mentioned in Meyer's framework is the question of assessment. Formative assessment, in which assessment generates feedback that are used by both teachers and students to promote learning, is a key constructivist pedagogical practice (Black et al., 2003). Both formative assessment (assessment for learning) and the more

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common summative assessment (assessment of learning) need to be used to promote learning in CLIL.

How to Compress Content to Enhance Learning

Content compression is about finding the critical ideas and connecting them to other ideas. To find the critical ideas requires insight, but even with insight it is hard, so it is best done by a content expert. Fortunately, there are techniques that make it easier and faster. There are several techniques of content compression as reviewed by Wentzel (2019) though I will only explain one — the "expanding elevator speech" — since it was the one used in the course discussed in this paper.

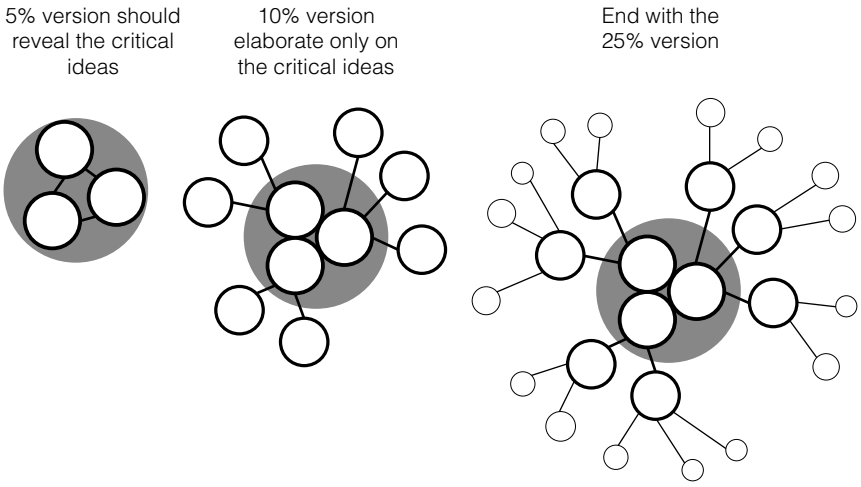
In an elevator speech, one tries to explain something in the time it takes to ride an elevator. It does not try to cover all the facts but, rather, aims to provoke questions that will then lead to a longer conversation if the listener is interested. An expanding elevator speech starts with generating the critical ideas and then gradually growing related ideas from them (see Figure 2). To produce an expanding elevator speech, ask the following questions consecutively:

1. If I had only 5% of the time available to teach a class, what would I teach? What is the logical order of these ideas? This version reveals the critical ideas.
2. If I had only 10% of the time, what would I teach? These ideas should build on the critical ideas.
3. If I had 25% the time, what would I teach? These ideas should build on the 10% version.

If one is adapting content from an existing text, the final 25% version will not contain everything in the text. It will only contain the most important ideas that are ultimately derived from the 5% version. Using this technique is not merely deleting content from a text; it involves generating a new text with the *maximum potential for connection* to other ideas.

There are no examples in the CLIL literature of how to apply content compression in practice, so the next section shows how the theoretical discussion up to now was implemented in an actual course.

Figure 2. The expanding elevator speech



Source: Own elaboration.

Methodology

To show how content compression can be implemented and how it affected students, a case study was used. This case study drew on descriptions of my work in developing the course, my observations about the results of that work (Section 5.1) and a survey of the students at the end of each semester (Section 5.2).

The course on which the case study is based was an elective course called "Entrepreneurship, innovation and business management," available to students in the Faculty of Engineering. This course was selected for reasons of convenience, since I taught it and, therefore, had first-hand experience to draw upon. Table 1 shows that it was taught for three consecutive semesters to relatively small classes that consisted mainly of males. While no information about age was collected, it appeared that most were in their early twenties.

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Table 1. Background information

	2019-1	2019-2	2020-1
Registered students	19	14	25
Male	16	9	18
Female	3	5	7

Source: Own elaboration.

The course took place under severe constraints. Firstly, most of the students' communicative ability in English was quite limited. While I did not do a pre-test of the students, based on my interactions with them in the first class and the activities during the first three weeks, I estimated that 15% of the students in 2019-1 and 2019-2 and 25% in 2020-1 had achieved intermediate skill in English (as described by the Common European Framework of Reference (CEFR) by the time they joined the course. Since the course had no entry requirements, this was something I had no control over. Another constraint was time. Classes were scheduled from 18:00 to 20:00 every Monday. However, most students worked full time, and most of them were tired and only able to arrive between 18:15 and 18:30 due to work commitments and traffic on rainy days. Effectively, I usually had only 1½ hours per weekly class.

Course preparation

The course aimed to enable students to identify business opportunities that may be converted into internal or external entrepreneurship and innovation, and design strategies to exploit such opportunities. From this overall objective, I derived the "big idea" (as mentioned before) of each lecture.

For each lecture I developed a short text (the compressed content), using the elevator speech technique (see Appendix 1 for an example). This text was made available to students in text and audio formats. The first lecture on "what is business strategy?" was one paragraph long, with another paragraph students had to read for homework. So, the content, which in most textbooks would take anything from 5 to 25 pages, was reduced to half a page. The text was gradually expanded to three pages (with visuals) toward the end of the semester. Some of the

three-page texts contained the critical ideas of an entire book. In the first few classes, I presented only the 5% version – I only used the 25% version for the more complex topics in the second half of the semester.

This text was the core content and was the foundation for the learning of the content. This text was also used to achieve the language learning objectives of the course. The course aimed to improve students' reading through the learning of vocabulary and their listening through audio recordings of the text and correcting major pronunciation errors (the reason for this was that, in my experience, poor pronunciation makes it difficult for Spanish speakers to recognise spoken English words that deviate significantly from the expected Spanish pronunciation). It also aimed to improve writing skills through written tasks and speaking skills through class activities (and, to a lesser degree, through feedback on their pronunciation).

The simple text for every class that explained the compressed content was written with the aid of Simplewriter to ensure that it contained only the 1,000 most common words in English. Simplewriter is a free online tool that highlights all English words in a text that are not among the 1,000 most frequently used words. I then converted it into a more complex text that used the vocabulary most likely to be used in the discipline, which resulted in a more authentic text.

I identified around 40 to 50 vocabulary words based on that week's and the following week's texts and entered them into Memrise (a free spaced repetition system that enhances long-term memory). Spaced repetition is known to be one of the most effective and least effortful methods for learning vocabulary (Wyner, 2014). I found that including vocabulary from the following week's topic helped many students to be better prepared to understand the texts used in class. The first time I presented the course (2019-1), I mainly included words from the complex text in Memrise, but it became clear that many students had less difficulty understanding the complex text due to the large number of cognates. So, in subsequent semesters, I also included words in the simple text that I noticed many students did not understand.

Next, I prepared the learning guide for the class. This guide contained the simple and complex text of every topic used during every class, class activities, the vocabulary list, and homework tasks (see Appendix 2).

LACLIL ISSN: 2011-6721 e-ISSN: 2322-9721 VOL. 14, No. 1, JANUARY-JUNE 2021 DOI: 10.5294/laclil.2021.14.1.1 PP: 9-40

At the start of each class, we reviewed the homework activities, and students identified words that they did not understand or struggled to pronounce. We proceeded with the tasks following the guidelines of Coyle et al. (2010) in the following sequence:

1. The first in-class activity consisted of a few alternate-choice and completion questions that tested the comprehension of the simple text, so it placed low linguistic and cognitive demands on the students (see part C of Appendix 2 for an example). Students were asked to complete these activities individually in writing, check their answers with another student, and they were then called upon to report their answers verbally.
2. The second activity involved comparing the simple and complex texts, becoming aware of cognates and circumlocution strategies.
3. The next activity required students to think about the application of the ideas to real-world situations and using templates for scaffolding new language (see part E of Appendix 2 for an example), so it increased the cognitive demands on the students, while offering linguistic support.
4. The independent practice done outside the class (explained next), which involved the highest linguistic and cognitive demands.
   Every week students had to complete three tasks for homework:
   a. Review the vocabulary on Memrise every day.
   b. Complete a written task that applied the ideas in the text of that week's topic to a company of their choice (this focused on the practical application of the content and on writing).
   c. A recording of a part of their own written task or part of the following week's simple text (this focused on pronunciation and helped to improve their listening and speaking abilities).

The written task was more open-ended than the tasks in class since they had to be applied to a real-world company, but students were still given a template to guide them (see Appendix 3 for an example). Recording this task allowed them to get feedback on their pronunciation and to help them with pronunciation. They did not receive explicit instruction in pronunciation except for the first few minutes of every class where I reviewed pronunciation that gave them trouble. To further support them, they were shown how to use free online tools such as forvo.com and Google Translate. As mentioned earlier, the

purpose of this was to improve their ability to recognise spoken English words and improve their confidence in speaking.

Assessment aimed to be formative. No single assessment determined their final mark, and students could resubmit their written tasks and recordings based on the feedback they received. I provided feedback within two days or less. Many students submitted between two and three versions of every task. To assess the written task, I used two criteria: 1) correct application of the ideas to the company they chose; and 2) whether an English speaker would be able to understand their writing. While I did correct spelling and grammar, the second criteria meant that I did not penalise them for spelling and grammar mistakes, as long as their writing was comprehensible. Due to the use of formative assessment, students' grades were both an indicator of progress and, by the end of the course, a measure of their learning. The overall grade for the course was calculated from a weighted average of the grades for the weekly homework activities and class participation.

The experience of the students

To determine if students perceived having learned and whether they perceived that their content and language learning was integrated, they completed an anonymous survey about their experience at the end of the semester (see Appendix 4). The first part contained closed-ended questions using a Likert scale, followed by open-ended questions that asked them to reflect on their answers to the closed-ended questions. The analysis of the closed-ended questions was done by calculating the average scores and ratios between these scores, while the answers to open-ended questions were organised by themes. For the sake of clarity, students were allowed to answer the open-ended questions in Spanish, so all quotations that appear here were translated by the author. In the first semester of 2019, 17 of 19 students completed the survey, in the second semester of 2019, it was 13 of 14, and in the first semester of 2020, it was 22 of 25.

The first eight questions asked students to rate (on a scale of 1–10) their perception of their ability to speak, listen, write and read in English about business matters at the start of the semester compared to the end of the semester. Since their evaluation was not done based

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on an objective measure, the perceived gain is only meaningful if expressed as a ratio (perceived final ability divided by perceived initial ability). For example, the gain ratio of 2.3 in 2019-1 resulted from the average rating of how they perceived their ability at the end of the semester (6.3) divided by the average rating of how they perceived their ability at the start of the semester (2.7). Relative to their initial abilities, students perceived that they improved dramatically (see Table 2). All the ratings were greater than two, which means that most students perceived that their abilities more than doubled during the semester.

Table 2. Perceived gain in English communication ability

ABILITY	Gain 2019-1	Gain 2019-2	Gain 2020-1
Speaking	2.3	2.3	2.4
Listening	2.7	2.4	2.2
Writing	2.8	2.4	2.5
Reading	2.8	2.2	2.2

Source: Own elaboration.

The next eight questions asked students to rate their confidence speaking, listening, writing, and reading in English about business matters, and this too was expressed as a ratio (Table 3). Relatively speaking, students felt that their confidence increased even faster than their abilities. At the start of the semester, most students' confidence levels were well below their perceived abilities (especially in speaking), so, by the end of the course, their confidence levels had risen to a level that was very close to their perceived ability.

Table 3. Perceived gain in confidence in English communication in business

CONFIDENCE	Gain 2019-1	Gain 2019-2	Gain 2020-1
Speaking	3.2	3.1	2.9
Listening	3.2	2.4	2.6
Writing	2.9	2.3	2.6
Reading	2.9	2.3	2.4

Source: Own elaboration.

Students' perceptions of their improvement in their abilities were exaggerated, in my opinion, and were probably a better reflection of their higher motivation and confidence. Indeed, humans tend to perceive gains relative to some reference levels (Kahneman & Tversky, 2013). In this case, the students' reference point was their perceived initial ability. Given how limited their English ability was at the start, it is to be expected that they would perceive even small improvements in their abilities differently than an objective observer and that this would result in an increase in their confidence. The dramatic increase in students' confidence in their English abilities is encouraging because self-confidence positively enhances language learning (Rubio, 2007). The main strength of the course seems to have been that it enhanced the motivation to learn. Research suggests that CLIL does indeed contribute to students' motivation, partly because it generates a more positive attitude to language learning (Lagasabaster & Sierra, 2009) and combats lack of interest (Navarro, 2018). Motivation improves when students feel that their learning is relevant and has value (Martin, 2016) and when they experience success or believe that success is possible (Zimmerman, 2000). The course was designed to encourage constant improvement through feedback and resubmission and so put success within their reach.

Students were asked to rate their understanding of business. Table 4 shows that they perceived a similar gain here compared to their perceived gain in language abilities.

Table 4. Perceived gain in understanding of business

	Gain 2019-1	Gain 2019-2	Gain 2020-1
Understanding of business	2.6	2.6	2.1

Source: Own elaboration.

In the open-ended questions, when they were asked to explain why they thought they improved, the most important reason given for their perception of improved English, all the groups in all three semesters agreed that it was due to the continuous practice and their expanded vocabulary. The weekly tasks encouraged students to continuously

LACLIL ISSN: 2011-6721 e-ISSN: 2322-9721 VOL. 14, No. 1, JANUARY-JUNE 2021 DOI: 10.5294/laclil.2021.14.1.1 PP: 9-40

practice learning vocabulary, pronunciation, reading, and writing. One student summarised the reason for the improvement as follows: "I improved due to the constant revision of vocabulary and the compulsory work in the guide and the topics in English, we had no choice but to interact and try to understand the texts."

They also agreed on the reason why they believed their understanding of business improved, which was the novelty of the knowledge (learning new techniques, new terminology, and new strategies) and the fact that the knowledge was applied to the real world of business. One student stated: "Now I have wider range of tools and methodologies to be a businessperson," while another believed that the learning resulted from "the concepts presented in class and the way they were transferred to practice through the tasks, this gave us an overall perspective and at the same time personalized according to the focus that we had."

The three groups agreed when asked what helped them the most during the classes. Most of them thought it was the learning of vocabulary and the constructive feedback received. One student identified the most useful factor as: "participation in class because I lost the fear to speak English in public," to which another student added "the confidence encouraged by the professor without fear that one makes mistakes." Students were often reminded in class that the best way to learn anything is by making mistakes and being responsive to the feedback.

Students were asked what helped them the most in doing the tasks. Again, in all three groups, the majority thought, overwhelmingly, that it was the feedback received (on the content and recordings of the homework tasks). One student put it like this: "The method of feedback is specific and resolves doubts."

When asked what the most important thing was that they learned in the course, responses were more or less divided between those who focused on what they learned in English and those who focused on what they learned in business, with learning of English perceived as being somewhat more important, as shown below (Table 5).

Table 5. Most important thing learned

	2019-1	2019-2	2020-1
English	35 % (6)	23 % (3)	41 % (9)
Business	29 % (5)	23 % (3)	23 % (5)
Both	29 % (5)	38 % (5)	27 % (6)
Other	18 % (3)	15 % (2)	9 % (2)

Source: Own elaboration.

This relatively even spread suggests that course was not perceived to favour content over language, or language over content. When asked if they believed that the simultaneous learning of English and business interfered with each other or supported each other (see Table 6). The results from both Table 4 and 5 suggest that students perceived content and language learning to be integrated.

Table 6. Perceived integration

	2019-1	2019-2	2020-1
Support	16	11	20
Interfere	0	0	1
Not answered	1	2	1

Source: Own elaboration.

One student captured the typical experience of the integration as follows: "I liked the way that the two were mixed, for people like me who have not mastered English or business it was a very efficient way to learn both. At the start it was very difficult, but it ended up being an enjoyable experience." In addition, several students mentioned that they found the combination of English and business very useful because they will need both in their careers.

LACLIL ISSN: 2011-6721 e-ISSN: 2322-9721 VOL. 14, No. 1, JANUARY-JUNE 2021 DOI: 10.5294/laclil.2021.14.1.1 PP: 9-40

Discussion

The literature on content compression suggests that it can enhance the understanding of content. It shows that there need not be a trade-off between the quantity of content and understanding, but that content compression is actually employed by some of the most effective instructors and that less content can, in fact, lead to better understanding. However, when used in CLIL, this understanding has to be converted into the integrated learning of content and language. Used correctly, content compression makes the learning of content more efficient, generates more time for active learning and so creates the opportunity to better integrate the learning of content and language. For these reasons, it appears suited to help CLIL instructors to address time constraints, and relieve the cognitive load on students, while at the same improving the quality of learning.

To exploit the potential of content compression, students need to make connections between the critical ideas, other related ideas, and the world around them. Even in conventional content courses, these connections are made through language, but, in CLIL, the role of language is made explicit. This suggests that it is not only the case that content compression can enhance CLIL, but that CLIL can amplify the effectiveness of content compression. For this to occur, the design of the learning experience (input, class activities and tasks) is critical to help students form more elaborate connections around the critical ideas through language, and this includes the application of content to reality, appropriate sequencing of learning activities, scaffolding, continuous formative assessment, regular practice, and constructive feedback. These practices are integral to CLIL.

The students confirmed the value of using content compression in combination with CLIL. They perceived an increase in both their learning of the content (due to new knowledge and examples and activities that applied that content to the business world) and in their learning of language (due to their expanded vocabulary and the continuous practice inside and outside the class). As a result, their confidence in using English increased even faster than their perceived learning, so that most students were no longer under-confident relative to their

perceived ability by the end of each semester. While some students initially found it difficult, all except one believed that the combination of language and content complemented each other.

Conclusion

This paper argued that content compression, if executed correctly, can facilitate the integrated learning of content and language. It not only explained how content compression can be applied, but also how this was done in an actual CLIL course. The students' experience in this course suggested that this approach increased their linguistic confidence as well as their perceived learning of both content and language.

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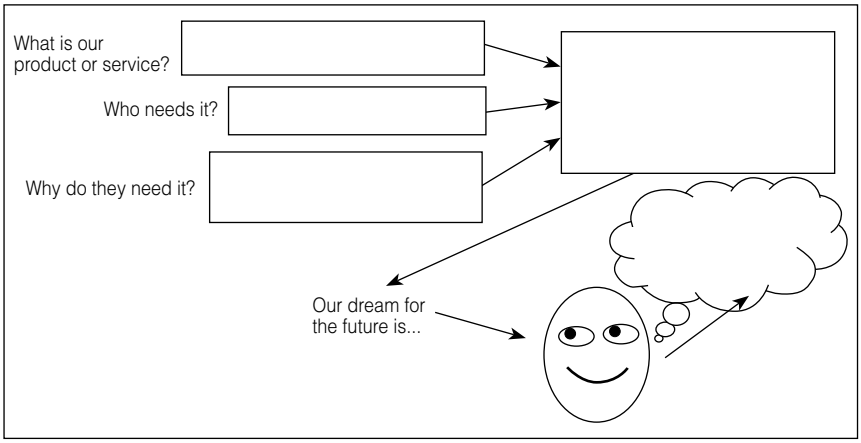
APPENDIX 1: Example of content compression (Topic 2: Vision and mission statement)

The discussion of mission and vision statements in textbooks can easily cover 10-15 pages, discussing their nature, their various components and the process for writing them in detail. To find the 5% version I considered my previous experience in helping companies develop such statements, and the information they needed to create the first draft vision and mission statement. The result is shown here:

The purpose of an organization is to create value for society. If it can achieve this, it will be profitable.

A mission statement describes the purpose of an organization. It should be brief. A mission statement should not describe the product or service of the organization. Rather it should state why people need that product or service. For example, a poor mission statement is: "we sell paint to individuals". However, a better one would be: "we exist to help people to improve the appearance of their apartments".

From the mission statement we derive a long-term objective. This long-term objective is called the vision statement and it describes the desired future of the organization. The vision statement should be short, concrete and ambitious. For example, a small paint shop in Bogotá may have a vision like this: "In 20 years, we want to own five branches in Bogotá."



LACLIL ISSN: 2011-6721 e-ISSN: 2322-9721 VOL. 14, No. 1, JANUARY-JUNE 2021 DOI: 10.5294/laclil.2021.14.1.1 PP: 9-40

APPENDIX 2: Content of the learning guide for a topic

The guide contained the simple and complex text, class activities and a description of the activities students needed to complete during the week. Parts C and E show some actual activities from the guide of topic 2 of the course.

The structure of the guide was:

A. Simple text
B. Complex text
C. Simple activities (low cognitive demand and low linguistic demand)

   A mission statement says what a company produces | why a company exists.

   The vision is a short-term | long-term objective.

   An ambitious vision is easy | difficult to achieve.

   The statement: 'we exist to make people more intelligent' is an example of a vision | mission statement.

   The statement: 'in 15 years, we want to have forty thousand students' is an example of a vision | mission statement.
D. Comparison of the simple and complex text to raise awareness of circumlocution and identify cognates
E. More complex class activities (higher cognitive demand and low linguistic demand)

   Evaluate every mission statement according to the criteria in the table

- Microsoft: We exist to give every person and every organization the power to achieve more.
- Southwest Airlines: We exist to give excellent customer service with a smile
- Astor University: We exist to offer degrees and diplomas in management, economics, medicine, architecture, engineering, law, physics, biology and tourism.
- Disney: We exist to make people happy

	Short and easy to remember	Explains why customers need the product of service
Example	yes	no
Microsoft		
Southwest Airlines		
Astor University		
Disney		

I think that the mission statement of ___ is the best because ___
I think that the mission statement of ___ is the worst because ___

F. Independent work
- Simple text to prepare for the next class
- Link to Memrise for practicing vocabulary
- Link to audio recording of the text (made by the instructor)
- Link to a short YouTube video (<5 minutes) explaining the idea in a different way than the instructor
- Written task (higher cognitive demand and higher linguistic demand) – see Appendix 3
- Instructions for making a recording of a chosen text (either a part of the class text or part of their own task)

LACLIL ISSN: 2011-6721 e-ISSN: 2322-9721 VOL. 14, No. 1, JANUARY-JUNE 2021 DOI: 10.5294/laclil.2021.14.1.1 PP. 9-40

APPENDIX 3: Written task

The following is an example of a task (Topic 2: Vision and mission statement):

1. My company's name is _____ and it specialises in _____.
2. What is its most important product or service?
   Its most important product or service is _____.
3. Who needs this product or service? _____ need it.
4. Why do they need this product or service?
   They need it because _____
5. So, a good mission statement for the organization is: 'we exist to _____.'
6. What could be the dream of the organization?
   An ambitious vision for the organization could be _____

APPENDIX 4: Survey about course experience and perception of ability

PART 1: ENGLISH

1a My ability to speak about business in English at the start of this semester

1 I cannot speak at all	2	3	4	5	6	7	8	9	10 I am completely fluent

1b My ability to speak about business in English at the end of this semester

1 I cannot speak at all	2	3	4	5	6	7	8	9	10 I am completely fluent

2a My ability to understand when people speak about business in English at the start of this semester

1 I understand nothing	2	3	4	5	6	7	8	9	10 I understand everything

2b My ability to understand when people speak about business in English at the end of this semester

1 I understand nothing	2	3	4	5	6	7	8	9	10 I understand everything

3a My knowledge of how write about business in English at the start of this semester

1 I cannot write anything	2	3	4	5	6	7	8	9	10 I can write fluently

3b My knowledge of how write about business in English at the end of this semester

1 I cannot write anything	2	3	4	5	6	7	8	9	10 I can write fluently

LACLIL ISSN: 2011-6721 e-ISSN: 2322-9721 VOL. 14, No. 1, JANUARY-JUNE 2021 DOI: 10.5294/laclil.2021.14.1.1 PP. 9-40

4a My confidence to speak about business in English at the start of this semester

1 I have no confidence at all	2	3	4	5	6	7	8	9	10 I am very confident

4b My confidence to speak about business in English at the end of this semester

1 I have no confidence at all	2	3	4	5	6	7	8	9	10 I am very confident

5a My confidence to understand when people speak about business in English at the start of this semester

1 I have no confidence at all	2	3	4	5	6	7	8	9	10 I am very confident

5b My confidence to understand when people speak about business in English at the end of this semester

1 I have no confidence at all	2	3	4	5	6	7	8	9	10 I am very confident

6a My confidence in writing about business in English at the start of this semester

1 I have no confidence at all	2	3	4	5	6	7	8	9	10 I am very confident

6b My confidence in writing about business in English at the end of this semester

1 I have no confidence at all	2	3	4	5	6	7	8	9	10 I am very confident

PART 2: BUSINESS

7 Before this course, my understanding of business was:

1 I had no understanding	2	3	4	5	6	7	8	9	10 I was an expert

8 After this course, my understanding of business is:

1 I still have no understanding	2	3	4	5	6	7	8	9	10 I was an expert

PART 3: COMMENTS

[Leave blank any parts that do not apply to you]

a) My English ability in this course improved | did not improve because _____
_____
_____

b) My understanding of business improved | did not improve because _____
_____
_____

c) What helped me the most in this course during class was _____
_____
_____
_____

d) What helped me the least in this course during class was _____
_____
_____
_____

e) What helped me the most in the homework was _____
_____
_____
_____

f) What helped me the least in the homework was _____
_____
_____
_____

LACLIL ISSN: 2011-6721 e-ISSN: 2322-9721 VOL. 14, No. 1, JANUARY-JUNE 2021 DOI: 10.5294/laclil.2021.14.1.1 PP. 9-40

g) The most important thing(s) I learned was _____
_____
_____
_____
_____