An Examination of the Degree of Complexity of Teacher Questions in English-Medium University Courses*

Un análisis del grado de complejidad de las preguntas del profesorado en cursos universitarios impartidos en inglés

Um exame do grau de complexidade das perguntas dos professores em cursos universitários de inglês médio

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* This work was supported by the Ministerio de Ciencia e Innovación with the grant number PID2020-117882GB-I00; and the Department of Education, Vice-consejería de Universidades e Investigación del País Vasco, with grant number IT1426-22.

Received: 08/09/2023 Sent to peer review: 21/09/2023
Accepted by peers: 26/02/2024 Approved: 06/03/2024

DOI: 10.5294/laclil.2022.15.2.6

To reference this article (APA) / Para citar este artículo (APA) / Para citar este artigo (APA)
Lasagabaster, D., & Doiz, A. (2024). An examination of the degree of complexity of teacher questions in English-medium university courses. *Latin American Journal of Content & Language Integrated Learning*, *15*(2), e1526. https://doi.org/10.5294/laclil.2022.15.2.6

LACLIL e-ISSN: 2322-9721 VOL. 15, No. 2, JULIO-DICIEMBRE 2022 DOI: 10.5294/laclil.2022.15.2.6 e1526

ABSTRACT. Research has demonstrated that questions are essential when teachers endeavor to foster students' comprehension and learning of the subject taught. However, there is a scarcity of studies on questioning practices in English-medium instruction (EMI) settings. In this study, we aim to fill this gap by focusing on the linguistic complexity of the questions put forward by EMI lecturers by paying particular heed to whether the disciplinary culture exerts any influence on the complexity of lecturers' questioning practices. The study was conducted at four public Spanish universities in which the classes delivered by nine EMI lecturers from three different disciplines (history, economics, and engineering) were recorded and analyzed. The statistical analyses performed found no significant differences in the lexical and syntactic complexity of the questions posed in the three disciplines, while language at the C level of the Common European Framework of Reference for Languages (CEFR) was conspicuous by its absence. These results lead us to conclude that if students are not widely exposed to language at the C level of the CEFR, oral language development and improvement may not be promoted in EMI courses. Therefore, EMI teacher training should be given more attention.

Keywords: English-medium instruction; teachers; questions; interaction; complexity; disciplines.

RESUMEN. Los estudios han demostrado que las preguntas del profesorado desempeñan un papel fundamental a la hora de fomentar la comprensión y el aprendizaje de la materia impartida por parte de los estudiantes. Sin embargo, hay una escasez de estudios sobre cómo se realizan las preguntas en entornos de instrucción en inglés (EMI). En este estudio pretendemos llenar este vacío centrándonos en la complejidad lingüística de las preguntas planteadas por los profesores de EMI, prestando especial atención a si la cultura disciplinaria ejerce alguna influencia en la complejidad de las preguntas de los profesores. El estudio se llevó a cabo en cuatro universidades públicas españolas en las que se grabaron en vídeo y se analizaron las clases impartidas por nueve profesores del EMI de tres disciplinas diferentes (historia, economía e ingeniería). Los análisis estadísticos realizados no encontraron diferencias significativas en la complejidad léxica y sintáctica de las preguntas planteadas en las tres disciplinas, mientras que el uso del lenguaje en el nivel C del Marco Común Europeo de Referencia para las Lenguas (MCER) fue prácticamente inexistente. Estos resultados nos llevan a concluir que si los estudiantes no están suficientemente expuestos a lenguaje del nivel C del MCER, es posible que no se promueva el desarrollo y la mejora del lenguaje oral en los cursos de EMI. Estos resultados indican que se debe prestar más atención a la formación de docentes de EMI.

Palabras clave: Enseñanza en inglés; profesorado; preguntas; interacción; complejidad; disciplinas.

RESUMO. Pesquisas demonstraram que as perguntas são essenciais quando os professores se esforçam para promover a compreensão e o aprendizado dos alunos sobre a matéria ensinada. No entanto, há uma escassez de estudos sobre práticas de questionamento em ambientes de ensino médio de inglês (EMI). Neste estudo, nosso objetivo é preencher essa lacuna, concentrando-nos na complexidade linguística das perguntas feitas pelos professores do EMI, prestando atenção especial ao fato de a cultura disciplinar exercer alguma influência sobre a complexidade das práticas de questionamento dos professores. O estudo foi realizado em quatro universidades públicas espanholas, nas quais foram gravadas e analisadas as aulas ministradas por nove professores do EMI de três disciplinas diferentes (história, economia e engenharia). As análises estatísticas realizadas não encontraram diferenças significativas na complexidade léxica e sintática das perguntas feitas nas três disciplinas, enquanto a linguagem no nível C do Quadro Europeu Comum de Referência para Línguas (CEFR) se destacou por sua ausência. Esses resultados nos levam a concluir que, se os alunos não forem amplamente expostos à linguagem no nível C do CEFR, o desenvolvimento e o aprimoramento da linguagem oral podem não ser promovidos nos cursos de EMI. Portanto, a formação de professores de EMI deve receber mais atenção.

Palavras-chave: Ensino médio de inglês; professores; perguntas; interação; complexidade; disciplinas.

Introduction

One of the main tenets of sociocultural theory (Vygotsky, 1978) is that interactions between teachers and students pave the way to effective knowledge transmission, which is why questions play a vital role in teachers' teaching practices and in students' comprehension and learning of the subject matter taught. Although research has demonstrated that this is an undeniable fact in L1 and L2 contexts (An et al., 2021; Mercer et al., 2019; Wells, 1999), the number of studies on questioning practices focused on English-medium instruction (EMI) at universities is hitherto strikingly low, especially if we consider that EMI is spreading rapidly in universities around the world (Lasagabaster, 2022; Macaro, 2018). In fact, according to the British Council (2021), English-taught programs have increased by 77% between 2017 and 2021, the vast majority of them (63%) being offered in the European higher education area (EHEA), although other parts of the world (Africa, Asia, and South America) also showed an increasing but less marked trend than that of the EHEA.

This widespread implementation of EMI programs has led researchers to embrace new avenues of investigation, such as examining what is actually going on in classes in which English is used as a means of instruction, but some topics have hardly been tackled so far. This is the case of the degree of complexity of the questions posed by EMI teachers, the research topic that we intend to address in this paper. Since teachers' questions help them to scaffold their students' learning, the impact that the use of a foreign language as a means of instruction may have become an avenue of research to which more attention should be paid. "This is because knowledge has to take the form of an answer to a question and questions arise in the context of dialogue" (Wegerif et al., 2019, p. 2), but such dialogic exchanges may be affected by EMI in general and by the discipline under scrutiny in particular. In this vein, An et al. (2021) underscore that previous studies have revealed that local EMI teachers often lack the necessary linguistic proficiency to engage their students in interaction. Despite these limitations, teachers tend to dominate the interaction and the low level of students' participation is more often than not conditioned

LACLIL e-ISSN: 2322-9721 VOL. 15, No. 2, JULIO-DICIEMBRE 2022 DOI: 10.5294/laclil.2022.15.2.6 e1526

by teachers' questioning practices (Doiz & Lasagabaster, 2023; Macaro & Childs, 2021; Sánchez-García, 2020).

With this in mind, this paper will start by briefly reviewing the previous studies that have analyzed the questions posed by EMI teachers, to later focus on the literature that has tackled linguistic complexity. This will prepare the ground for the presentation of a study in which data from EMI lectures delivered in different disciplines in four Spanish universities was gathered. After analyzing the results concerning the degree of linguistic complexity of the questions made and whether there were differences between disciplines, some conclusions will be reached in the belief that "gaining a closer understanding of classroom participants' interactions may be of great value to enhance the teaching and learning processes" (Sánchez-García, 2020, p. 29).

Research on Questions in EMI University Settings

According to sociocultural theory (Vygotsky, 1978), social mediation through the interactions between the teachers and students, as well as among peers, is conducive to the transmission and appropriation of knowledge and, therefore, to learning (Mercer et al., 2019; Wells, 1999). In this process, teachers should be able to gauge what knowledge students already possess and what knowledge they will only be able to learn through external support. Teacher discourse triggers negotiation of meaning through the questions posed, which is why the examination of teacher questioning practices is essential.

Studies based on EMI teacher training programs (Guarda & Helm, 2017; Morell, 2020) have confirmed that, when EMI lecturers are given the possibility of pondering their questioning practices, they become aware of the need to ask more questions in their lectures. After exposing lecturers to some EMI mini-lessons, Morell (2020) verified that the participants valued more positively the ones that presented more questions and made a more extensive use of multimodal means (i.e., non-verbal materials such as videos or pictures). In a similar study, Guarda and Helm (2017) interviewed EMI lecturers after their participation in professional development courses and observed that EMI lecturers

were more willing to boost students' participation by asking questions themselves and by encouraging students to bring up their own. However, despite this positive evidence, there is a rather limited number of studies focused on the type of questions asked by EMI teachers, which we summarize below.

Sánchez-García (2020) undertook a study in which two business administration lecturers' questioning practices in Spanish-medium (L1) and EMI lectures were observed. She concluded that the questions related to classroom management and organization were much more common in EMI. This means that lecturers paid more attention to students' understanding of the class organization in English than when the classes were delivered in Spanish.

Lasagabaster and Doiz (2023) and Chang (2012) looked into the type of questions posed by EMI teachers who were not English native speakers in the case of the former, and by American English native speakers in the case of the latter from different disciplines. The same general trend was found in both studies. In particular, confirmation check questions happened to be the most habitual ones, followed by display, referential and self-answered questions in all the specializations studied and no statistically significant differences were found.

Hu and Li (2017) conducted the only study we found in the literature that has focused on the cognitive and syntactic complexity of the questions posed by EMI and by Chinese-medium instruction (CMI) teachers at university level. No effect of instructional language was detected. In particular, the results revealed that classroom interactions "were characterized by cognitively lower-order teacher questions and student responses" (p. 197), whereas high-order questions were hardly present in their data. As for syntactic complexity, two units of syntactic complexity were used: mean T-unit length (in words) and clauses per T-unit, a T-unit being defined as one main clause plus any subordinate clauses attached or embedded within it. The authors put the results down to a floor effect since the teacher questions happened to be very simple irrespective of the instruction language. This study paves the way to the next section on complexity.

LACLIL e-ISSN: 2322-9721 VOL. 15, No. 2, JULIO-DICIEMBRE 2022 DOI: 10.5294/laclil.2022.15.2.6 e1526

Complexity and Questioning Practices

With the aforementioned results in mind, in this study, we intend to go a step further by focusing on a detailed analysis of the complexity of the questions asked by EMI teachers. Except for Hu and Li (2017), all the previous studies analyze the type of questions, but not all referential questions, for example, display the same degree of complexity in terms of grammar, vocabulary, subordination, or type of clauses. As An and Thomas (2021) indicate, whereas the language of science tends to show a higher level of abstraction and technicality, the language used in disciplines related to humanities tends to be more concrete and specific. This difference justifies the need to delve into the linguistic complexity of the questions put forward in EMI classes, as this would help to shed light on differences that may have remained hidden by simply comparing the number and the type of questions.

Although linguistic complexity has been tackled by many researchers in second language acquisition, a conclusion to be drawn is that it is neither easy to define nor to measure. As a matter of fact, Bulté and Housen (2014) state that complexity has been ill-defined in the literature. The lack of clarity in the definition of the construct has led to a wide variety of measures across studies, which is why, from a linguistic perspective, we will rely on the definition provided by Rescher (1998, p. 1): "a matter of the number and variety of an item's constituent elements and of the elaborateness of their interrelational structure."

Norris and Ortega (2009) argue that complexity is an intricate construct made up of several sub-constructs, dimensions, and components, each of which can be independently assessed. In an attempt to constrain it, Bulté and Housen (2012; 2014) put forward a taxonomic model of L2 complexity comprised of different components and subdimensions that can be analyzed across different layers of language complexity—lexical, morphological, syntactic, and phonological. These authors' taxonomy clearly illustrates the multicomponential and multidimensional nature of complexity, and, in fact, they found more than 40 different complexity measures in a sample of studies published in the 2005-2008 period, syntactic and lexical complexity being the main target (Bulté &

Housen, 2014). Whereas researchers have thoroughly examined complexity in L2 writing research, L2 speaking complexity has been neglected, which is the language mode we intend to focus on. In this paper, we will refer to two of the perspectives in complexity within the CAF (complexity, accuracy, and fluency) triad: the simple view and the holistic view (Lahmann et al., 2019).

Pallotti (2015) expounded on the simple perspective, whose focus lies on the complexity of the text (in our case classroom talk) rather than on the learner system and how it is influenced by proficiency, processing costs (difficulty) and developmental dynamics (acquisition). Pallotti (2015) proposes a simple and coherent view of complexity based on the number of linguistic elements and their interrelationships. To avoid polysemy, this author "advocates a simple view of complexity, treating it as a purely descriptive category, limiting its use to structural complexity and excluding from its definition any theoretical assumption about when, how and why it increases or remains constant" (p. 119). In the case of lexical complexity, authors such as Jarvis (2013a, 2013b) and Kyle and Crossley (2015) have proposed a selection of measures such as the total number of lexemes in a text or the use of infrequent words.

The second perspective, the holistic view, stresses the interrelatedness of complexity with accuracy and fluency (the other two dimensions of the CAF triad), but it also underscores the importance of contextual factors such as the audience, topic, register, or genre (Ortega, 2012). In our study, one of such contextual factors is the discipline in which the lectures were delivered, because differences between disciplines may be based on the impact of the different disciplinary cultures (Lasagabaster & Doiz, 2023). In fact, authors such as Airey (2015), Kuteeva and Airey (2014), and Sancho-Guinda (2023) consider that researchers should consider that disciplinary literacies are a distinctive feature of each discipline that may exert a greater influence than, for instance, the particular country where a research study is undertaken. This is due to the fact that disciplines are characterized by their specialist discourses, which could impinge on how questions are introduced as well as on their degree of complexity. Lo (2014) conducted one of the scant studies that assessed the influence of the discipline on secondary education teachers' questions and found that in humanities

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questions were more habitual than in science and mathematics. However, Lasagabaster & Doiz, 2023 and Chang (2012) did not detect any differences between disciplines in EMI courses at the tertiary level.

In this vein, EMI is believed to prepare students to cope with the specialized English they will need in their future professional careers (Lasagabaster, 2023), but the question that remains unanswered is whether the disciplinary culture exerts any influence on the complexity of the questioning practices exhibited by lecturers. One of the aims of our study is thus to attempt to answer this question. According to Walsh and Li (2013), the higher the ability of teachers and students to interact in communicatively meaningful and purposeful situations, the higher the degree of learning success. To achieve this successful interaction, the management of the interaction on the part of the teacher becomes essential, and how questions are tackled is distinguished as a key factor. The teacher may foster interaction by different means, such as increasing wait time, seeking clarification from students by asking additional questions or reformulating student responses, to name but a few. The adjustment of the complexity of the questions proposed is one of the interactional features worth considering, as teachers' classroom discourse can create space for learning by increasing question complexity while shaping the students' learning process.

Although current teaching methodologies are aimed at fostering more egalitarian roles in classroom participation, the teacher still holds the upper hand when it comes not only to organizing and leading the classroom but also to distributing the floor (Hu & Li, 2017; Sánchez-García, 2020; Teo, 2016). Larson and Lovelace (2015) observed that instructors attempted to engage their students by regularly asking questions in lecture-based science classes at a large public research university in the United States. However, the cognitive level of questions was mainly lower order, as most questions tended to focus on basic knowledge and comprehension, results which are in accordance with the aforementioned study by Hu and Li (2017) in an EMI university setting. Tan (2007) examined the kinds of questions posed in Chinese university-level English as a foreign language class and found that lower cognitive questions amounted to 87% of the total number of questions, which deprived students of the possibility of thinking critically and independently. The author attributes these questioning practices

to the deeply rooted traditional Chinese culture that fosters "docile, passive, compliant, unresponsive, dependant or uncreative" students" (p. 100). The predominantly monologic and transmissive orientation in classroom talk was also observed by Teo (2016) at a pre-university level in Singapore, to the extent that he defines how teacher questions were framed as anti-dialogical and debilitating of student dialogue and debate. These results can only be labeled as frustrating, especially if we consider that complex questions trigger complex answers and this complexity is important for the linguistic development of students' English (Llinares & Pascual Peña, 2015), one of the objectives of EMI programs.

This is why teachers must be aware of the output they produce in class because it will either facilitate or hamper students' learning development. By analyzing the linguistic complexity of teachers' questions, we will be able to shed some light on the training that EMI teachers may need with a view to improving their classroom talk while delivering subject matter content.

Research Questions

Against this background, this paper addresses the following three research questions:

RQ1: What is the average number of words per teacher-fronted question by discipline?

The idea being that the higher the number of words used, the greater the possibility of the questions being more linguistically complex.

RQ2: Are there any differences regarding the syntactic complexity of the questions posed by the teachers by discipline?

RQ3: Are there any differences concerning the lexical complexity of the questions posed among the teachers by discipline?

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The Study

This study is set in four universities in Spain, which will be referred to as UNI1, UNI2, UNI3, and UNI4. These are public institutions of different sizes: UNI1 had 45,000 students, UNI2 22,000, UNI3 12,000, and UNI4 9,000. The four universities offered EMI undergraduate and graduate programs, although we will be focusing on their undergraduate programs for the purposes of the present study. The ethics committee for the study with human beings at the university of affiliation of the two authors of this study permitted them to conduct the present study.

Participants

There was a total of nine participants, three for each of the disciplines represented in this study: history, engineering, and economics. All of them were male, except for one of the lecturers in economics. The participants, contacted via email, were informed about the general goal of our study, but they did not know that we were going to analyze the questions they posed to the students to avoid any influence over their teaching and questioning practices. The lecturers accredited knowledge of English at level C1 of the CEFR as required by their universities to teach in English. The size of the classes was small (from 4 to 25 students), although there were a few classes that were slightly bigger (30 to 45 students). The lectures lasted 2 hours each. The courses that were recorded were the following: America in the Modern Age, Modern History I, World Economic History (history); Electric Engineering, Computer Engineering, Industrial Engineering (engineering); and Econometrics, Economic History, Business Economics: Organization and Management (economics).

The students' level of English proficiency was at the B2 of the CEFR, although it varied somewhat from student to student. Most of the students were from the area where the universities were located.

Data Collection and Coding Process

We recorded a total of 27 lectures (three classes per lecturer or 9 classes per discipline) after we obtained the lecturers' and the students' permission to observe and record the classes. The research assistant transcribed the lessons word by word and the two authors of this paper revised the transcriptions for accuracy and tried to provide the missing parts in the lecturers' and the students' utterances that the researcher assistant had not understood. Next, the research assistant identified all the teacher-led questions according to our working definition of a question, that is to say, an instance in which the utterance's intonation or syntactic pattern is that of a question (Lasagabaster & Doiz, 2023). For the purposes of this paper, we focused on the teacher-led questions in which a dialogic exchange between the teacher and the student or students took place. The goal of these interactions was to enhance the transmission and appropriation of knowledge, which is why we were only interested in (i) the teacher-led questions which dealt with the subject matter of the lesson, as opposed to procedural questions having to do with the managerial aspects of the class, and (ii) the questions which prompted an answer from the students. Consequently, we only included those questions that were answered by the students. In addition, we excluded self-answered questions (i.e., "those which are immediately answered by the teacher, preventing other participants from providing any response") and rhetorical questions posed by the teachers (i.e., "those to which no answer is expected") (Sánchez-García, 2020, p. 32). Confirmation check questions, that is to say, the questions whose main function is to make sure that the topic has been understood, were also discarded for two reasons. Firstly, most of the time the students did not reply to these questions, and secondly, their linguistic form did not pose any analytical interest in terms of linguistic complexity as can be seen from representative examples of this kind of question such as the expressions "okay?", "umm?", "eh?", "yes or no?", "yes?", "no?", "any question?", "have you followed me?", "have you understood?"...

In the last step of the data-collecting process and with the view of conducting the analysis of the *syntactical* complexity of the questions, the research assistant identified and counted the tokens and types of

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compound and complex sentences, and the types of verb tenses used. He also identified and counted the number of tokens and types of lexical words such as nouns, adjectives, adverbs, and verbs, and categorized them according to the six language proficiency levels of A1, A2, B1, B2, C1 and C2 of the CEFR as stated in the Cambridge Dictionary to gauge the *lexical* complexity of the questions. Occasionally, the dictionary did not provide the proficiency level of the CEFR of a particular word or a particular meaning of a polysemous word. In these particular cases, the research assistant assigned the proficiency level based on the meaning of the word in the context. Furthermore, when a word had two meanings that belonged to two different levels, the tokens for each level were differentiated and the word counted as two different types. For example, the word *system* which is categorized as a B1 word or a C2 word depending on its meaning in the context counted as one token/type in the B1 level and as another one in the C2 level. To guarantee inter-rater reliability, one of the authors of this study analyzed 10% of the words of each of the categories as classified by the research assistant. There were no significant discrepancies. The auxiliary verbs, the verb *go* in the periphrastic future construction, and the verbs *have*, *be*, and *do* were excluded from our corpus of tokens and types, as they did not really contribute to the complexity of the utterance concerned. We present the results next.

Results and Discussion

To check the statistical significance of the distribution of the data in each category, normality tests (Kolgomorov-Smirnov) were performed. Results indicated that data was both normally and not normally distributed, which is why both parametric (ANOVA) and non-parametric (Kruskal-Wallis) tests were conducted. The former included the number of adverbial clauses, relative clauses, non-finite clauses, the total number of clauses (research question 2) and the lexical complexity in levels A, B and C of the CEFR (research question 3). The latter concerned the total number of words per question (research question 1), the number of coordinate clauses, and the type of verb tenses (research question 2).

RQ1: What is the average number of words per teacher-fronted question by discipline?

Table 1 provides the average number of words per teacher-fronted question by discipline. In particular, it shows the total number of words uttered by the lecturers in the second column, the total number of words in the teacher-fronted questions in the third, and the number of questions posed in the fourth. In the rightmost column it shows the average number of words per question, the fact that interests us most here since we want to see how lengthy (and perhaps complex as we will see in research question 2) the questions are.

Table 1. Average number of words per teacher-fronted question by discipline

Discipline	number of words by Ts	number of words in T-fronted questions	number of questions	Average number of words (column. 3) per question (column 4)
Economics	52642	2596	268	9.68
Engineering	60755	3629	453	8.01
History	74475	5327	595	8.95
Total	187872	11552	1316	8.77

Note: T stands for teacher.

In general terms, we observe that a small part of the lecturers' talk in our data was used to ask questions (see columns 2, 3 and 4), with economics in the last place in terms of the number of questions posed (268), followed by engineering (453) and history with 595 questions in the first place. By contrast, the average number of words per question was the highest in economics (9.68 words per question), followed by history (8.95) and engineering in the last place (8.01 words per question). This means that while the history lecturers dedicated a greater part of their speech to asking questions than the other two groups of lecturers, the questions posed by the lecturers in economics were longer than in the other two disciplines. However, the Kruskal-Wallis tests showed no statistically significant difference in the total number of words per question ($\chi 2$ (2, n=9) = 0.356, p = 0.837).

LACLIL e-ISSN: 2322-9721 VOL. 15, No. 2, JULIO-DICIEMBRE 2022 DOI: 10.5294/laclil.2022.15.2.6 e1526

We will present the results of the fine-grained analysis of the categories of syntactical and lexical complexity of the questions next.

RQ2: Are there any differences regarding the syntactic complexity of the questions posed by the teachers by discipline?

The syntactic complexity of the questions was measured in terms of the number of compound sentences (i.e., sentences with two or more main clauses, such as coordinate clauses linked with the conjunctions *and, but, or*) and the number of complex sentences (i.e., sentences with a main clause and one or more subordinate clauses) that made up the questions (Carter & McCarthy, 2013). Table 2 shows the number of tokens in the three disciplines for each sentence type.

Table 2. Syntactical Complexity by Discipline

	Tokens of compound sentences (Coordinate clauses)	**Tokens of complex sentences**		
	and/or/but	**Adv. clauses**	**Relative clauses**	**Non-finite clauses (-ing/-inf/-ed)**
Economics	15	32	4	8
Engineering	18	43	14	9
History	31	51	13	6
Total	64	126	31	23

In general terms, we saw that complex sentences were used more frequently than compound sentences in the three disciplines. However, the lecturers of history produced the highest amount of compound and complex structures with a total of 101 sentences in contrast to 84 sentences in engineering and 59 in economics. It has to be noted that, out of the 126 adverbial clauses, the clauses of purpose (39 tokens), time (30 tokens) and condition (23 tokens) were the most frequently used ones. Adverbial clauses of concession (11), reason (10), result (6), place (5), and contrast (2) were also used but to a lesser extent. Extracts 1 and 2 provided below illustrate the occurrence of adverbial clauses of purpose and of time in teacher-led questions.

Extract 1:

> T3: Once labor services are no longer necessary, is there any incentive **to fix** the peasants to the land **to prevent** the Chinese peasants from the possibility of migrating from their own villages to other villages or to the cities of the southern coast? (History)

Extract 2:

> T1: What happens **when** the angular frequency of the circuit is such that it makes the reactants equal to each other? (Engineering)

The impact of discipline on the categories that were normally distributed was conducted via the one-way between-groups analysis of variance. Post-hoc comparisons using the Tukey HSD test revealed that the EMI lecturers from the three disciplines did not differ significantly from each other. This was the case for the number of adverbial clauses ($F (2, 9) = 0.137$, $p = 0.874$), the number of relative clauses ($F (2, 9) = 0.722$, $p = 0.524$), the number of non-finite clauses ($F (2, 9) = 0.250$, $p = 0.787$), and the total number of clauses ($F (2, 9) = 0.228$, $p = 0.803$). The Kruskal-Wallis tests showed no statistically significant difference in the number of coordinate clauses ($\chi 2 (2, n=9) = 0.067$, $p = 0.967$).

We also analyzed the types of verb tenses used as a sign of syntactic complexity. Our assumption was that the higher the number of different types of verb tenses in the questions used, the greater their linguistic complexity. In other words, the speech of a lecturer whose questions were always formulated in the present simple, for example, could be stated to be more basic than the speech of a lecturer who used several tenses in his or her speech. Following usual practice among English language teachers, we considered three major tenses, namely, the present, the past and the future, in combination with four different aspects, the simple, the progressive, the perfect and the perfect progressive, resulting in 12 tense/aspect combinations (Table 3).

LACLIL e-ISSN: 2322-9721 VOL. 15, No. 2, JULIO-DICIEMBRE 2022 DOI: 10.5294/laclil.2022.15.2.6 e1526

Table 3. Tokens and Percentages of the Verb Tenses by Discipline

		Present Simple		Past Simple		Future		Present Continuous		Past Continuous		Present Perfect	
	Token	#	%	#	%	#	%	#	%	#	%	#	%
Economics	332	247	74.4	45	13.6	26	7.8	10	3.0	3	0.9	1	0.3
Engineering	530	447	84.3	26	4.9	19	3.6	26	4.9	1	0.2	11	2.1
History	626	407	65.0	139	22.2	12	1.9	31	5.0	5	0.8	32	5.1
Total	1488	1101	74.0	210	14.1	57	3.8	67	4.5	9	0.6	44	3.0

Note: # stands for number.

Out of the 12 possible tense/aspect combinations, only six appeared in the lecturers' questions since none of the perfect progressive combinations (e.g., present perfect continuous) were used, for example. The most frequently used tenses were by far the present simple, followed by the past simple at a distance, in the three disciplines. When analyzed by disciplines, engineering stood out for the high frequency of the present simple present (84.3%), and in the case of history, of the past simple (22.2%). The rest of the four tenses appeared in the lecturers' questions but with far fewer cases, and no tendencies were noted. When we looked at the lecturers individually, T3 of economics did not use the past tense, the past continuous or the present perfect, and T2 of engineering did not use the past continuous. All in all, it could be concluded that there were no noticeable differences in the degree of complexity among the three disciplines regarding the types of tenses since we encountered that only six different verb tenses were used in the three disciplines. Furthermore, the Kruskal-Wallis tests showed no statistically significant difference in the type of verb tenses ($\chi 2$ (2, n=9) = 1.167, p = 0.558).

RQ3: Are there any differences concerning the lexical complexity of the questions posed among the teachers by discipline?

To determine the lexical complexity of the questions, we classified the four parts of speech (e.g., the verbs, the nouns, the adjectives, and the adverbs) according to the levels proposed in the CEFR, our assumption being that the higher the number of word types in the B

level (*independent user*) and especially the C level (*proficient user*), the higher the lexical complexity of the questions posed (Council of Europe, 2018). Table 4 shows an overview of the sum of the tokens and the types of the parts of the speech considered by teacher and discipline, that is to say, if two lecturers of the same discipline used the same noun type, for instance, the word *world*, the word counted as two different tokens in the discipline, but one type. The percentages of the number of types for each category were calculated from the total number of types for each category, namely, 280 for economics, 305 for engineering and 516 for history.

Table 4. Overview of the Lexical Complexity by Discipline

	A			B			C		
	Token	**Type**	**% Type/ Total**	**Token**	**Type**	**% Type/ Total**	**Token**	**Type**	**% Type/ Total**
Economics (280)	294	120	42.9	248	130	46.4	77	30	10.7
Engineering (305)	371	134	**43.9**	284	111	36.4	202	60	**19.7**
History (516)	643	209	40.5	635	256	**49.6**	138	51	9.9
Total		463			497			141	

In general terms, the number of different word types was the highest in history with 516, followed by engineering with 305 and economics in the last place (280). Most of these word types belonged in the A and B levels. However, when analyzed by discipline, engineering had the highest percentage of word types at the A and C levels (43.9 % and 19.7%), history had the highest number of words at the B level (49.6%), and economics was in between the other two disciplines. When we added the percentages of the two highest levels, B and C, history had the highest level of complexity with 59.5% of its words at these two levels, followed by economics (57.1%) and engineering in the last place (56.1%).

The statistical analysis, however, revealed that the differences were not significant when the total lexical complexity was considered, that is, the total number of types of verbs, nouns, adjectives, and adverbs for each level of the CEFR. Thus, the total lexical complexity in level A was not significantly different ($F(2, 9) = 1.312$, $p = 0.337$) when the three different disciplines under scrutiny were compared via the

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one-way between-groups analysis of variance, nor was any significant difference found in the case of levels B ($F(2, 9) = 1.596$, $p = 0.278$) and C ($F(2, 9) = 1.173$, $p = 0.371$).

The results were also analyzed by individual word category (verbs, nouns, adjectives, and adverbs) and discipline. The percentages were calculated from the total number of types for each word category, namely, a total of 409 verb types, 274 noun types, 263 adjective types and 155 adverb types. The results were ordered from the highest occurring word types (e.g., verb) to the lowest (e.g., adverb) (Table 5).

Table 5. Lexical Complexity by Word Category and Discipline

		A	B	C
		% Type/Total	**% Type/Total**	**% Type/Total**
Verb (409)	Economics	9.8	12.5	2.0
	Engineering	16.1	13.2	**4.4**
	History	**18.8**	**21.3**	2.0
Noun (274)	Economics	5.5	9.9	3.3
	Engineering	4.7	7.3	**10.2**
	History	**19.3**	**28.8**	10.9
Adjective (263)	Economics	12.9	13.7	**4.2**
	Engineering	8.4	9.1	**4.2**
	History	16.0	**27.8**	3.8
Adverb (155)	Economics	**20.0**	10.3	1.3
	Engineering	**21.3**	8.4	1.9
	History	**23.9**	11.0	1.9

Verb types. Most of the verbs used by the lecturers in the three disciplines belonged in the B level (e.g., *vote, notice, contain, design*) and A level (e.g., *see, think, put*), with history showing the highest percentages of different verb types, indicating a greater variety of lexical resources in terms of verbs. Engineering had the highest number of verb types in the C level (e.g., *apply, decode, verify, relate*), although the percentage was small (4.4%). Economics used the lowest number of different verb types but followed the same tendency as the other two disciplines. Thus, there does not appear to be any remarkable differences among the disciplines in terms of the degree of the complexity of the verb types since most of them belonged to the B level in the three disciplines.

Noun types. While there was a total of 409 different verb types, only 274 different noun types were found in the three disciplines. Once again, the lecturers in history used the highest number of different noun types, most of which belonged in the B level (28.8%) followed by nouns in the A level (19.3%). The same tendency was observed in the case of engineering and economics. However, engineering (10.2%) also used nearly as many different noun types of the C level as history (10.9%), even though the former only had 61 different noun types in comparison with the 162 types used in the latter. Some examples of nouns in the A level in economics are *problem*, *cost*, *result and question.* Words in the B level in history are *energy*, *fuel*, *division*, *growth*, *resource*, and *manufacture*, and words in the C level in the case of engineering are *matrix*, *determinant*, *vector*, and *equation*.

Adjective types. There was only a total of 11 fewer types of adjectives than of nouns (263 vs. 274). As in the case of the verb and the noun types, history lecturers displayed a higher number of different types of adjectives, followed by economics and engineering in the last place. Once again, most of the adjectives used belonged to the B category followed by those in the A level in the three disciplines. However, history (3.8%) contained the lowest number of adjectives in the C level in comparison with the other two disciplines (4.2% in both). Some examples of the adjectives at the C level used are *equivalent*, *parallel*, *constant* (engineering), *inferential*, *variable*, *civil* (economics) and *legendary*, *preventive*, *stagnant* (history). At the B level, we encountered the adjectives *equal*, *passive*, *complex* (engineering), *critical*, *estimated*, *political* (economics), *precise*, *global*, *military* (history). At the A level, we found *black*, *easy*, *same* (engineering), and *important*, *small*, *foreign* (economics), and *big*, *new*, *whole* (history).

Adverb types. The variety of the adverbs was not extensive as we found a total of 155 types of adverbs in the three disciplines, the lowest number in the four categories under scrutiny. Once again, history had the highest number of adverb types with 57 cases, in comparison with the 49 cases of the other two disciplines, but no differences regarding their complexity were observed among the disciplines. However, unlike in the case of the previous word types, the majority of the adverbs belonged to the A level in the three disciplines (e.g., *here*, *now*, *there*) and then to the B level (e.g., *intuitively*, *finally*). There were only a few adverbs in the C level (*specifically*, *algebraically*). Most of the adverbs

ending in –ly in the B and C levels corresponded to an academic and specialized register.

Table 6 presents a summary of the main results organized according to the word category and discipline. 1 stands for the highest number of types for the word category at the specific level, 2 for the second highest place and 3 for the lowest number of types for each word category at that specific level.

Table 6. Lexical Complexity by Word Category and Discipline at a Glance

	Economics	Engineering	History
Verbs	B = 1 A = 2 C = 3	**A = 1** **B = 2** C = 3	B = 1 A = 2 C = 3
Nouns	B = 1 A = 2 C = 3	**C = 1** **B = 2** A = 3	B = 1 A = 2 C = 3
Adjectives	B = 1 A = 2 C = 3	B = 1 A = 2 C = 3	B = 1 A = 2 C = 3
Adverbs	A = 1 B = 2 C = 3	A = 1 B = 2 C = 3	A = 1 B = 2 C = 3

Table 6 reveals that the three disciplines followed the same tendency concerning the complexity of the adjectives, the majority of which fell in the B category, then A, and C in the last place. In the case of the adverbs, the three disciplines followed the same trend, however, the majority of the adverbs used were not complex since they belonged to the A category, followed by those to the B and C levels. Economics and history also follow the same tendency in the case of the nouns and verbs because the majority of the words in these two categories belonged to the B level, then the A level and to the C level in the last place. However, engineering was a little bit different since the majority of its verbs belonged to the A category and its nouns to the C category.

According to the statistical analyses, when verbs, nouns, adjectives, and adverbs were individually scrutinized, the only category in which the three disciplines differed substantially was that of the nouns. In

fact, history (M = 17.67, SD = 3.21) teachers used significantly more A-level nouns than their economics (M = 5.00, SD = 2.00; p = 0.012) and engineering counterparts (M = 4.33, SD = 4.93; p = 0.009). The same trend was observed in the case of nouns at the B level, as history teachers (M = 26.33, SD = 9.01) also used significantly more nouns than economics (M = 9.00, SD = 1.00; p = 0.018) and engineering teachers (M = 6.67, SD = 2.20; p = 0.010). When focusing on nouns at the C level, both history (M = 10.00, SD = 3.60; p = 0.016) and engineering (M = 9.33, SD = 0.57; p = 0.024) teachers used significantly more nouns than their economics pairs (M = 3.00, SD = 0.010). In addition, the effect size of the differences found in noun types at levels A (eta squared = 0.814), B (eta squared = 0.798) and C (eta squared = 0.771) were large, which indicates that the magnitude was meaningful. In sum, history teachers used significantly more nouns at the A and B levels, and both history and engineering teachers used more nouns at the highest level, namely C, than the economics teachers.

In short, our analyses concluded that the data did not reflect any statistically significant results for the most part when the lexical and syntactic layers of language complexity (Bulté & Housen, 2012; 2014) were compared. This result is similar to those found in previous studies (Doiz & Lasagabaster, 2023; Chang, 2012) that have also analyzed EMI teachers' questioning practices, although the latter did not focus on complexity. However, given the limited number of participants in each discipline, the main limitation of the study, our results should be considered with caution. With this limitation in mind, our analysis revealed certain tendencies.

The first observation is that while the history lecturers dedicated a greater part of their speech to asking questions than the economics and engineering lecturers (in accordance with Lo, 2014), the questions posed by the lecturers in economics contained an average of more words than those in the other two disciplines. This difference did not translate into a difference in the syntactic or lexical complexity of the questions, since no statistically significant results were obtained in the overall analyses. The lecturers tended to use more complex sentences than compound sentences in the three disciplines, and, among them, the adverbial clauses of purpose, the clauses of time and condition were the most frequent.

LACLIL e-ISSN: 2322-9721 VOL. 15, No. 2, JULIO-DICIEMBRE 2022 DOI: 10.5294/laclil.2022.15.2.6 e1526

The disciplines did not differ in the number of verb tenses used, six out of 12. The use of the present simple stood out in the case of engineering and the past simple in history, as one might expect. In the case of engineering, procedures that were not anchored in a specific time frame were frequently explained, whereas, in the case of history, past events were retold mainly. These results were in line with Lo (2014) who concluded that science subjects generally use the present tense, while other types of verb tenses may be found in humanities subjects. In any case, these differences did not reflect any disparity in terms of the syntactic complexity of the questions in the three disciplines.

As for the lexical complexity of the word categories (verbs, nouns, adjectives, and adverbs), our study revealed that the majority of the words used in the three disciplines belonged to the B or independent user level, followed by the words in the A or basic user level. There were fewer words of the C or proficient user level. A look at the lexical complexity by word category revealed a clear pattern that should be corroborated with more data in future research. In particular, the three disciplines used the same kinds of adverbs in terms of their complexity (A > B > C), a result that suggests the possibility of working on this word class to expose students to more complex language that may facilitate L2 learning. In the case of the adjectives and their complexity, another pattern was also observed in the three disciplines, namely, B > A > C. However, we found some differences in the case of nouns and verbs. In particular, history teachers used significantly more nouns at the A and B levels than the other disciplines, and, together with the engineering lecturers, they resorted to more nouns at the C level than their economics counterparts. The higher presence of nouns at the C level in engineering could be attributed to the higher number of technical or specialized words, such as *matrix*, *determinant*, *vector*, and *equation* that characterize this discipline. As for the complexity of the verbs used, engineering excelled in the use of A-level verbs, a result that should be researched further.

Conclusions

Our study has shown that, for the most part, it is not possible to claim that the discipline affects the complexity of the questions posed by the lecturers. Although some authors (An & Thomas, 2021) affirm that the language of science shows a higher level of abstraction and technicality than the humanities', our results do not confirm this claim. In fact, no significant differences were found between engineering and history in any of the categories, including nouns at the C level. Since the total number of infrequent words is regarded as proof of lexical complexity (Jarvis, 2013a, 2013b; Kyle & Crossley, 2015), our findings seem to indicate that these inter-disciplinary differences would not take place in EMI contexts, at least as far as the lexical complexity of questions is concerned. No differences in terms of the syntactic complexity of the questions posed were found either.

Future studies should aim at comparing both L1-medium and EMI lecturers' speech to discard or confirm whether the results we obtained in the present study are due to the language used as a means of instruction. If the questions in the L1-medium classes revealed a higher level of complexity, EMI teacher training should focus on how the complexity of questions could be worked on.

Our results would help to understand why studies on the purported positive impact of EMI on English proficiency are far from being definitive (Lasagabaster, 2022). In this vein, Aguilar and Muñoz (2014) observed that only those students with the lowest level of proficiency benefitted from EMI, while no improvement was detected among those with a higher level of proficiency. The authors put it down to the fact that some lecturers could not provide rich input and, therefore, only students below the intermediate level took advantage of EMI courses. Although "language –in our case English as an additional language– is used in different ways and for different purposes depending on the nature and knowledge-making practices of the academic discipline" (Kuteeva & Airey, 2014, p. 546), if students are not widely exposed to language at the C level of the CEFR in all language skills (including the oral mode), it might be the case that EMI would not be providing the best conditions to foster language development and improvement.

LACLIL e-ISSN: 2322-9721 VOL. 15, No. 2, JULIO-DICIEMBRE 2022 DOI: 10.5294/laclil.2022.15.2.6 e1526

And it is in this context where the importance of teacher training comes to the fore, which leads us to two pedagogical implications. First, lecturers (irrespective of their discipline) should be trained to include a higher amount and variety of nouns, verbs, adjectives, and adverbs in the C level of the CEFR, because the percentages of types and tokens at this level were rather small in the three disciplines under scrutiny. Second, since interaction plays such a key role in knowledge building (Mercer et al, 2019; Wells, 1999; Vygotsky, 1978), continuous professional development courses (Lasagabaster & Doiz, 2023) should aim at making EMI lecturers aware of the fact that complex questions trigger higher-order thinking skills and complex answers. Importantly, not only does complexity in questioning practices foster adequately articulated and more developed knowledge and comprehension, but it also helps to underpin the English language development of EMI students.

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