

Designing an English for Academic Purposes Course for Biology Students: A Focus on Argumentative Discourse

Conception d'un cours d'anglais à des fins académiques pour les étudiants en biologie : une focalisation sur le discours argumentatif

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Abstract:

This study investigates the argumentative discourse needs of second-year biology students at the University of Adrar, Algeria, within an English Medium Instruction (EMI) context. With the current English for Academic Purposes (EAP) module largely focused on terminology, the research aims to inform a proposed redesign of the EAP course. Three instruments were used to collect data: an argumentative essay task, a five-minute oral presentation, and a student questionnaire. The results indicate that students face persistent challenges in structuring arguments, supporting claims with evidence, and engaging with counterarguments in both writing and speaking. Students' perceptions further reveal that the current module does not meet their academic communication needs. These findings align with existing research highlighting the underrepresentation of argumentation instruction in EMI settings. The study recommends a shift from terminology-centred instruction to an argumentation-focused EAP module; one that offers pedagogical strategies such as Toulmin's model, peer feedback, and dialogic tasks.

Keywords: Argumentative discourse – English for Academic Purposes (EAP)– English Medium Instruction (EMI) – biology students – course design.

Résumé :

Cette étude examine les besoins en discours argumentatif des étudiants en deuxième année de biologie à l'Université d'Adrar, en Algérie, dans un contexte d'enseignement en anglais (English Medium Instruction - EMI). Le module actuel d'anglais à des fins académiques (English for Academic Purposes - EAP) étant principalement axé sur la terminologie, cette recherche vise à éclairer une refonte proposée du cours d'EAP. Trois instruments ont été utilisés pour recueillir les données : une tâche de rédaction argumentative, une présentation orale de cinq minutes et un questionnaire destiné aux étudiants. Les résultats indiquent que les étudiants rencontrent des difficultés persistantes à structurer leurs arguments, à étayer leurs affirmations par des preuves et à interagir avec des contre-arguments – à l'écrit comme à l'oral. Les perceptions des étudiants révèlent en outre que le module actuel ne répond pas à leurs besoins en communication académique. Ces résultats confirment les recherches existantes qui soulignent la faible présence de l'enseignement de l'argumentation dans les contextes EMI. L'étude recommande de passer d'un enseignement centré sur la terminologie à un module EAP axé sur l'argumentation, en proposant des stratégies pédagogiques telles que le modèle de Toulmin, la rétroaction par les pairs et les tâches dialogiques.

Mots- clés : discours argumentatif - anglais à des fins académiques (EAP) - enseignement en anglais (EMI) - étudiants en biologie - conception pédagogique des cours.

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Introduction

Over the past few years, Algeria has gradually embraced English as the Medium of Instruction (EMI) in scientific disciplines to align higher education with international academic and research standards. This has led to an urgent need for students to develop a strong command of academic English. Accordingly, biology students are increasingly required to master argumentative discourse, which is fundamental for academic success. This skill allows them not only to engage actively in lectures and discussions but also to deliver effective presentations and produce scientific texts such as laboratory reports, research summaries, and dissertations.

However, argumentation is still insufficiently addressed in many Algerian EMI classrooms, where English for Academic Purposes (EAP) courses tend to focus predominantly on terminology and grammar. While such an approach helps students build subject-specific vocabulary, it falls short in preparing them to construct coherent arguments, support their claims with evidence, and respond to opposing views, which are essential skills for scientific reasoning and academic communication. This situation raises an important pedagogical question: should EAP continue to focus primarily on vocabulary acquisition, or should it shift towards developing higher-order skills such as argumentative competence?

Several studies have explored EAP learners' general needs and challenges in Algeria (Merine, 2019; Tourche and Chettibi, 2018), but few have delved into how argumentative discourse might be effectively integrated within EMI science education. Notably, no research has systematically examined biology students' argumentative performance alongside their perspectives to inform curriculum development. This represents a significant gap; it demonstrates the need for research that connects students' real academic practices with purposeful pedagogical interventions.

At the University of Adrar, the EAP course is offered twice a week in ninety-minute sessions. This limited timeframe requires careful prioritization of language skills. Drawing on international research suggesting that terminology is often acquired naturally in EMI contexts (Alhamami, 2024; Pecorari and Malmström, 2018; Sánchez-Pérez, 2023), this study advocates a shift in the EAP curriculum towards explicit instruction in argumentative discourse. In doing so, it investigates the argumentative needs of second-year biology students at Adrar to provide evidence-based grounds for redesigning the module to better respond to the communicative demands faced by students in EMI environments.

1 Literature Review

The implementation of English as a Medium of Instruction (EMI) in higher education has been shown to significantly influence students' acquisition of disciplinary language. Dearden (2014) defines EMI as "the use of the English language to teach academic subjects in countries or jurisdictions where the majority of the population's first language is not English" (p. 2). In such

contexts, students are constantly exposed to discipline-specific terminology in lectures, textbooks, and laboratory work. This exposure provides opportunities for vocabulary acquisition in meaningful contexts (Macaro, 2018). As Hyland (2006) observes, the immersion in authentic disciplinary discourse enables learners to build lexical repertoires that would otherwise remain underdeveloped through traditional language teaching approaches. Thus, EMI plays a vital role in fostering the acquisition of specialized scientific vocabulary.

However, English for Academic Purposes (EAP) courses should not be reduced to teaching terminology alone. Hyland (2006) defines EAP as “the language research and instruction that focuses on the specific communicative needs and practices of particular groups in academic contexts” (p. 2). Simply memorizing scientific terminology does not necessarily equip students with the communicative skills required in their fields. Instead, as Wingate (2012) stresses, EAP should foster argumentative competence, because “argument is the essence of academic writing” (p. 145). Hutchinson and Waters (1987) similarly argue that the focus of ESP and EAP must remain on the skills and strategies students need to function successfully in their academic domains. Therefore, EAP provision within EMI contexts should prioritize argumentative discourse as a core competency.

Argumentation is particularly important in science education, where students are constantly required to justify claims, compare evidence, and communicate reasoning. Erduran and Jiménez-Aleixandre (2007) emphasize that “argumentation is central to science education because it mirrors the ways in which knowledge is constructed in science” (p. 1). Students must move beyond explanation, which Berland and Reiser (2009) define as making sense of phenomena by linking cause and effect, towards argumentation, which involves justifying claims with evidence (Osborne and Patterson, 2011). As Kuhn (1993) argues, argumentation should be seen as the “core of scientific thinking” (p. 320), since it enables learners to engage critically with disciplinary content and articulate claims in both writing and oral presentations.

Importantly, general language proficiency does not necessarily predict students’ ability to engage in effective argumentation. For instance, Lea and Street’s (1998) “academic literacies” framework highlights that students may demonstrate relatively high proficiency in everyday English but still lack competence in advanced academic practices such as constructing structured arguments. Bacha (2010), in her study of Lebanese university students, similarly found that even those with intermediate or advanced English levels struggled to produce well-structured argumentative essays. These findings suggest that A1–C2 proficiency scales alone are insufficient indicators of students’ readiness to handle argumentation in EMI contexts.

Another key reason to foreground argumentation in EAP courses is its value as a tool for formative assessment. Osborne et al. (2004) demonstrate that students’ argumentative discourse makes their reasoning processes visible, thus providing teachers with diagnostic insights into both conceptual understanding and scientific literacy. As Roberts (2007) argues, scientific literacy is not limited to knowledge of concepts but includes the capacity to reason about evidence and construct defensible claims. Therefore, teaching argumentation allows instructors to evaluate not only language proficiency but also disciplinary thinking.

Furthermore, engaging students in argument helps them recognize that scientific knowledge is dynamic rather than fixed. Kuhn (1993) shows that when students construct and critique arguments, they begin to understand science as a process of continual inquiry where claims are open to revision in light of new evidence. Similarly, Sadler (2004) highlights that argumentation

around socio-scientific issues fosters an epistemological shift: students perceive knowledge as tentative and contingent, rather than absolute. Such perspectives are essential for developing a critical and authentic understanding of scientific practice.

Explicit instruction in argumentation is therefore indispensable in EMI-oriented EAP provision. As Toulmin (2003) illustrates in his model of argument, effective reasoning requires students to articulate claims, support them with data, connect them through warrants, and consider counter-arguments through qualifiers and rebuttals. Teaching these structural components helps students move from vague assertions toward disciplined reasoning. Pedagogical interventions that incorporate activities such as debates, role-plays, and structured writing tasks have been shown to scaffold argumentative competence effectively (Erduran and Jiménez-Aleixandre, 2007). Osborne *et al.* (2004) similarly demonstrate that when learners engage in structured argumentation tasks, the quality of their reasoning improves, and teachers are able to identify conceptual gaps more clearly. Furthermore, Bacha (2010) highlights that explicit instruction not only enhances students' argumentative writing but also increases their awareness of academic conventions, which leads to improved overall performance across disciplines. Yet, the design of such instructional interventions must be firmly grounded in empirical needs analysis. Long (2005) emphasizes that needs analysis is not a peripheral step but the foundation of effective ESP and EAP course design. It identifies the actual linguistic, cognitive, and rhetorical challenges students face in their academic environments and ensures that instruction addresses authentic requirements rather than presumed deficits. Without such analysis, courses risk focusing too narrowly on vocabulary lists or grammar drills, while neglecting the communicative practices that are essential for students' academic success. Incorporating needs analysis into the planning process thus ensures that explicit argumentation instruction is both context-sensitive and pedagogically relevant.

2 Methodology

This study adopted a mixed-methods approach that combined quantitative and qualitative techniques in order to provide a comprehensive picture of biology students' argumentative competence. Quantitative data were obtained from students' written essays, oral presentations, and Likert-scale questionnaire items, while qualitative data emerged from the open-ended survey responses. This methodological choice was guided by the belief that argumentative competence is best understood through both observable performance and the subjective perceptions of learners themselves. The mixed-methods orientation, therefore, enabled triangulation between task results and student perspectives, ensuring that the findings reflected both measurable outcomes and lived experiences.

2.1 Setting and Participants

The research was carried out at the University of Adrar in Algeria, where EMI has been recently implemented across scientific disciplines. The target population consisted of second-year BA biology students, who were purposively selected because they were among the first cohorts to receive sustained exposure to EMI in their field. Out of 134 eligible students, a total of 60 participated voluntarily in the study. The participants comprised 43 females and 17 males, with an age range between 21 and 25 years. Their self-reported English proficiency was largely elementary, with 50 students at level A1 and 10 at level A2. At the time of data collection in November 2024, all participants had completed at least six laboratory reports as part of their coursework, which provided them with some prior experience in producing scientific writing.

2.2 Data Collection Instruments

Three instruments were used to assess students' argumentative discourse in writing, oral presentations, and their perceptions of argumentation in EAP.

a) Argumentative Essay Task

The first instrument was a one-hour argumentative essay in English on a biology-related topic. The essay task is widely recognized as an effective tool for assessing students' ability to construct claims, use evidence, and address counterarguments in writing (Weigle, 2002; McNamara, 2000). Essays were evaluated using a rubric adapted from established frameworks in argumentation research (Toulmin, 1958; Osborne *et al.*, 2004). The rubric included nine criteria—claim clarity, use of evidence, counterarguments, organization, content development, cohesion, academic tone, grammar and punctuation, and vocabulary—each scored on a five-point scale ranging from 1 (very weak) to 5 (excellent).

b) Oral Presentation

The second instrument was a five-minute scientific presentation in which students presented and defended an argument related to their field. Oral presentations are considered a valid way to assess academic speaking skills and students' ability to structure and defend arguments in real time (Brown, 2004; Knight, 2002). Presentations were evaluated using a rubric that focused on clarity of argument, effective use of evidence, effective rebuttal strategies, audience engagement, and confidence. Similar performance-based approaches have been recommended in English for Academic Purposes (EAP) contexts because they reflect authentic academic communication tasks (Hamp-Lyons and Heasley, 2006).

c) Questionnaire

The third instrument was a structured questionnaire designed to gather students' perceptions of argumentative discourse and the current EAP module. Questionnaires are widely used in EAP research to explore learners' needs, attitudes, and perceptions (Dörnyei, 2010; Brown, 1995). The first section included Likert-scale items measuring students' views on the importance of argumentation, their confidence in using argumentative discourse, and their evaluation of the current EAP module. The second section consisted of open-ended questions inviting participants to describe their challenges and experiences. This combination of closed and open questions is recommended in needs analysis research because it provides both quantifiable data and richer qualitative insights (Basturkmen, 2010; Hyland, 2006).

2.3 Data Analysis

Data analysis was carried out in two complementary phases. Quantitative data from the essay and presentation rubrics were processed through descriptive statistics, including percentages and mean scores, to identify the most frequent areas of weakness and strength. Responses to Likert-scale items were analysed in terms of the proportion of students who agreed or disagreed with each statement. This, in turn, offers an overview of shared attitudes and perceptions. Qualitative data from the open-ended questionnaire responses were analysed thematically. The analysis followed a straightforward procedure of repeated reading, coding, and grouping responses into emerging themes such as lack of argumentation training, difficulties in performing academic tasks, and the perception that EMI facilitated vocabulary acquisition but not argumentative competence.

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2.4 Ethical Considerations

Ethical considerations were respected throughout the study. Participation was voluntary and based on informed consent, and students were assured that their contributions would remain anonymous and would not influence their academic evaluation. Confidentiality was maintained by avoiding the disclosure of any personal identifiers in the analysis or reporting.

3 Results

The evaluation of students' argumentative writing and oral presentation skills reveals significant weaknesses in argumentation, evidence use, and structure (see Table 1 and Table 2).

Criteria	1/5	2/5	3/5	4/5	5/5
Claim Clarity	27%	60%	11%	2%	0%
Use of Evidence	32%	54%	10%	0%	0%
Counterarguments	56%	29%	15%	4%	0%
Organisation/ Structure	33%	40%	16%	10%	1%
Content Development	52%	35%	13%	0%	0%
Transitions & Connections	31%	42%	18%	6%	2%
Academic Tone	38%	33%	22%	7%	0%
Mechanics (Grammar & Punctuation)	50%	21%	21%	8%	0%
Vocabulary/ Lexical Diversity	31%	38%	14%	12%	5%

Table 1 Argumentative Essay Writing Performance

As shown in Table 1, the majority of participants received low scores (1 or 2 out of 5) in claim clarity (87%), use of evidence (86%), and counter-argumentation (85%). Organization, content development, and academic tone also proved challenging, with fewer than 20% of students reaching level 3 or above.

Criteria	1/5	2/5	3/5	4/5	5/5
Clarity of Argument	65%	20%	12%	3%	0%
Use of Evidence	50%	35%	5%	0%	0%
Rebuttal Strategies	10%	87%	3%	0%	0%
Audience Engagement	83%	16%	1%	0%	0%
Confidence	79%	12%	9%	0%	0%

Table 2 Oral Presentation Performance

Oral presentations showed similar patterns. Table 2 indicates that 65% of students scored at the lowest level in clarity of argument, and half did so in the use of evidence. The weakest areas overall were audience engagement (83% at level 1) and confidence (79% at level 1). These results demonstrate that difficulties in argumentative performance extend beyond writing into spoken academic tasks.

Survey Question	Agree (4&5)	Disagree (4&5)
With the introduction of EMI, mastering English argumentative discourse has become essential for my studies in biology.	85%	10%
The current EAP course helps me develop argumentation skills.	27%	60%
I struggle with constructing arguments in English	73%	15%

Focusing only on biology-related terminology in EAP courses does not fully meet my academic needs.	86%	5%
I am already learning biology-related terminology in the other modules that are taught using EMI.	64%	34%
A focus on biology-related terminology in EAP courses limits my ability to express complex scientific arguments.	71%	24%
The current EAP course does not prepare me to construct and present scientific arguments in English.	62%	28%
The current focus on terminology is sufficient, and I do not see the need for a change.	21%	77%

Table 3 Students' Perceptions of Argumentative Discourse in EAP

Students' perceptions, captured through the questionnaire, reinforced these findings. As shown in Table 3, 85% of participants agreed that mastering argumentative discourse is essential in their biology studies, but only 27% believed the current EAP course supports them in this area. Most respondents (73%) reported struggling to construct arguments in English, while 86% considered a terminology-only focus insufficient for their academic needs.

Theme	Student responses (summarized)
Lack of argumentation training	"We focus more on vocabulary, but we never practice argumentation."
Struggles with academic tasks	"I find it difficult to write structured arguments in lab reports."
	"I find it difficult to deliver presentations in English."
EMI helps with vocabulary, not argumentation	"I know biology terms, but I don't know how to defend my ideas."

Table 4 Thematic Analysis of Open-Ended Responses

Thematic analysis of open-ended responses provided further support for these patterns (Table 4). Students repeatedly mentioned the lack of argumentation practice in the EAP module and linked this gap to difficulties in completing laboratory reports and oral presentations. While many acknowledged that EMI helped them acquire biology-related terminology, they emphasized that it did not equip them with the skills needed to defend ideas or engage in academic debate.

4 Discussion

The main objective of this study was to explore the argumentative discourse abilities of second-year biology students at the University of Adrar within an EMI context, with the ultimate goal of informing the redesign of the existing EAP module. Currently, the module remains heavily focused on terminology acquisition, which, while important, is no longer sufficient in an EMI environment where students are increasingly expected to communicate complex scientific ideas in English. Since core modules are now taught through EMI, students

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are regularly exposed to English terminology through content instruction. However, the ability to construct, present, and defend scientific arguments in English is far less likely to emerge without focused pedagogical support.

To investigate this gap, three data collection instruments were used: an argumentative essay task to assess written performance, a five-minute oral presentation to evaluate spoken argumentation, and a questionnaire to elicit students' perceptions regarding the current EAP course and its potential redesign. The results from all three tools pointed to the same conclusion: students struggle with core elements of argumentation, including claim formulation, evidence integration, counterargument handling, and logical organization. Moreover, their feedback strongly suggests that the current course does not support them in developing these skills.

Several environmental factors contribute to these findings. Firstly, the recent and rapid transition from French to English as the Medium of Instruction imposes a considerable cognitive and linguistic burden. Cummins' (1979) Interdependence Hypothesis suggests that second language proficiency is partially a function of underlying first language cognitive academic language proficiency (CALP). Students who have developed their academic thinking and argumentation skills in French need time and support to transfer these skills effectively to English. The sudden shift to EMI, as highlighted by Coleman (2010), can lead to a situation where students are struggling with both the content and the language of instruction, which hinders their ability to engage in complex academic tasks like argumentation in English. The cognitive overload can impede their capacity to focus on the structural and logical demands of constructing arguments as they simultaneously process information in a less familiar language (Swain, 1985, on comprehensible output).

Secondly, the educational background primarily within an FMI system might not have prioritized explicit instruction in argumentation in the same way as some English-dominant systems. Research by Wingate (2012) emphasizes the importance of disciplinary literacy, which includes understanding the specific ways knowledge is constructed and argued within a discipline. If the FMI educational system did not explicitly teach these argumentative conventions, students would lack foundational skills transferable to English. Studies comparing educational systems, such as Biggs (1999) on teaching for quality learning, often reveal variations in pedagogical approaches and emphasis on critical thinking and argumentation skills.

Thirdly, the availability of resources and support for EMI implementation in Algerian higher education is crucial. Kirkpatrick (2011) argues that successful EMI requires substantial investment in teacher training, curriculum adaptation, and appropriate learning materials. If the University of Adrar has recently transitioned to EMI without adequate resources dedicated to supporting both faculty and students in this shift, academic discourse skills like argumentation are likely compromised. The lack of specialized EAP support tailored to biology students' needs further exacerbates this challenge.

Fourthly, cultural and linguistic norms can influence students' approaches to argumentation. Connor (1996) and Kaplan (1966), in their work on contrastive rhetoric, highlight how rhetorical patterns vary across languages and cultures. Students accustomed to French academic discourse might employ organizational structures or persuasive strategies that do not align with English academic expectations prevalent in scientific writing.

Finally, exposure intensity and duration significantly impact language skill development. Krashen's (1985) Input Hypothesis suggests acquisition occurs through comprehensible input; however, limited exposure due to a "quick transition" may hinder internalization of linguistic features essential for sophisticated arguments.

The results of this study, therefore, call for a reconsideration of the current EAP module. There is a clear need for a redesign that moves beyond terminology-focused instruction to incorporate explicit training in argumentative discourse. As Hyland (2006) and Basturkmen (2006) have argued, EAP courses must reflect the communicative practices of the disciplines they serve. In the context of biology, this means equipping students with the ability to construct, present, and defend scientific arguments. Approaches such as Toulmin's model of argumentation, structured peer-feedback, and dialogic instructional strategies offer practical ways to support this transition.

Despite these promising insights, several limitations must be acknowledged. First, the study was conducted with a sample of 60 biology students from a single institution, which may limit the generalizability of our findings. Second, although a detailed rubric was used to evaluate both writing and presentation performances, some subjectivity in scoring could influence the outcomes. We addressed these issues by triangulating quantitative scores with qualitative survey and thematic data. These steps helped to mitigate the impact of these limitations, and we believe they do not detract from the overall validity of our results.

This research also has notable strengths. To our knowledge, it is the first study to focus specifically on the development of argumentative discourse skills within an EAP course for biology students in an Algerian EMI context. Our targeted approach narrows the broad traditional focus on vocabulary and terminology to address the immediate need to develop Algerian biology students' argumentative competence, which we believe is a critical aspect for success in academic tasks such as lab reports, presentations, and research writing. This study reinforces that terminology acquisition alone is insufficient within a rapid EMI transition context.

5 Conclusion

This study analysed the argumentative discourse needs of second-year biology students at the University within an EMI context. Findings from essays, presentations, and questionnaires clearly indicate that students face significant challenges in constructing structured arguments and supporting claims with evidence, both in writing and speaking. These difficulties confirm that the current EAP module in the Biological Sciences program, which mainly emphasizes terminology, does not adequately prepare students for the demands of academic argumentation.

The study highlights a neglected aspect of EAP instruction in Algeria: the necessity to shift from terminology-focused teaching to an argumentation-centred approach. To our knowledge, this is the first research combining performance-based assessment with students' perceptions to examine argumentative competence in an EMI biology program in Algeria. The results strongly justify redesigning the EAP course to better equip students to meet the argumentative demands of academic writing and speaking in scientific contexts.

Although limited to a single institution and discipline, this research opens several avenues for future inquiry. Studies in other scientific fields could explore whether similar challenges

exist across disciplines, while comparative research might investigate differences in argumentative performance between levels of study. Longitudinal studies would be valuable for assessing the long-term impact of redesigned EAP modules focused on argumentation. Finally, incorporating teachers' perspectives and classroom practices could provide a more comprehensive understanding of how argumentation is - or is not - addressed in EMI contexts.

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