

Written argumentation practices in two Argentinian undergraduate courses: multidimensionality and epistemic potentials

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This paper states that the epistemic potentialities of writing and arguing are largely derived from the interweaving of four dimensions. Three of them are constitutive (the logical, rhetorical, and dialectical dimensions), and one is integrative (the epistemic dimension). Thus, we characterize how these four distinct dimensions operate in texts produced by first-year university students in two disciplines (Linguistics and Biology) and how those students reflect on their processes of writing and arguing. The results belong to qualitative research designed as a multiple case study, which focused on teaching practices that intertwine disciplinary contents, writing, and argumentation in Argentinian university classrooms. These results deepen the academic literacies 'lines of research regarding the role that argumentation plays in academic writing. We analyze texts produced by students and interviews with them to characterize the dimensions that such students deploy when writing and arguing to learn in their disciplines.

Keywords: Academic writing. Written argumentation practices. Linguistics. Biology.

Prácticas de argumentación escrita en dos cursos universitarios argentinos: multidimensionalidad y potencialidades epistémicas

Este artículo plantea que las potencialidades epistémicas de la escritura y la argumentación derivan en gran medida del entrelazamiento de cuatro dimensiones. Tres de ellas son constitutivas (dimensiones lógica, retórica y dialéctica) y una es integradora (dimensión epistémica). Caracterizamos cómo operan estas cuatro dimensiones distintas en textos producidos por estudiantes universitarios de primer año de dos disciplinas (Lingüística y Biología) y cómo dichos estudiantes reflexionan sobre sus procesos de escritura y argumentación. Los resultados pertenecen a una investigación cualitativa diseñada como un estudio de casos múltiples y centrada en las prácticas de enseñanza que entrelazan contenidos disciplinares, escritura y argumentación en aulas universitarias argentinas. Estos resultados profundizan las investigaciones sobre alfabetizaciones académicas acerca del papel de la argumentación en la escritura académica. Así, analizamos textos producidos por los estudiantes y entrevistas con ellos para caracterizar las dimensiones que estos despliegan cuando escriben y argumentan para aprender en sus disciplinas.

Palabras clave: Escritura académica. Prácticas de argumentación escrita. Letras. Biología.

Práticas de argumentação escrita em dois cursos universitários argentinos: multidimensionalidade e potencialidades epistêmicas

Este artigo argumenta que as potencialidades epistêmicas da escrita e da argumentação derivam, em grande medida, do entrelaçamento de quatro dimensões. Três destas são constitutivas (dimensões lógica, retórica e dialética) e uma é integrativa (dimensão epistêmica). Caracterizamos como estas quatro diferentes dimensões funcionam em textos produzidos por estudantes universitários do primeiro ano em duas disciplinas (Letras e Biologia) e como estes estudantes refletem sobre os seus processos de escrita e argumentação. Os resultados pertencem a uma investigação qualitativa concebida como um estudo de caso múltiplo e centrada em práticas de ensino que entrelaçam conteúdo disciplinar, escrita e argumentação em salas de aula universitárias argentinas. Estes resultados aprofundam a investigação sobre o papel da argumentação na escrita acadêmica. Assim, analisamos textos produzidos por estudantes e entrevistas com eles, a fim de caracterizar as dimensões que utilizam quando escrevem e discutem para aprender nas suas disciplinas.

Palavras-chave: Escrita acadêmica. Práticas de argumentação escrita. Letras. Biologia.



Introduction

Argumentation plays a central role in academic writing (ANDREWS, 2009; WOLFE, 2011). In this paper, we aim to characterize how academic writing functions, preeminently, as an *argumentative construction* (PADILLA, 2012). In academic discourse, this process of argumentative construction assumes certain particularities regarding three fundamental issues: (a) the rigorous use of others' knowledge (BOLÍVAR, 2004, 2005; KAISER, 2005), which implies the adequate handling of bibliographic sources, regulated by formal and highly conventionalized restrictions; (b) the articulation between others' knowledge and one's knowledge; and (c) the articulation between theory and data (PADILLA, 2012). Thus, when we refer to academic writing as an argumentative construction, we stress that, following Toulmin's model, arguments are claims supported by data. However, from a pragma-dialectical perspective, we also emphasize that argumentation consists of a communicative and interactional act complex (VAN EEMEREN, 2018).

In this vein, our work considers two fundamental claims. On the one hand, we support the idea that, under certain teaching conditions, writing and arguing could become teaching objects and epistemic tools for learning contents and disciplinary logics in university classrooms. On the other hand, we claim that the epistemic potentialities of written argumentation practices, to a large extent, consist of the imbrication of four dimensions. Three of them are *constitutive* (the *logical*, *rhetorical*, and *dialectical* dimensions) and one is integrative (the *epistemic* dimension). Therefore, this paper seeks to characterize these four dimensions and to illustrate how they function in texts produced by first-year Argentinian undergraduate students in two disciplines (Linguistics and Biology). Additionally, through interviews, we explore students' standpoints about their writing processes. These texts and interviews are part of a larger *corpus* where the focus was, precisely, on the teaching interventions that allowed such students to work with writing and arguing to learn.

The literature shows that a key concept to understand the potentialities for learning that writing and arguing entail is that of *epistemic practices* (JIMENEZ-ALEIXANDRE; DÍAZ DE BUSTAMANTE, 2008; KELLY; DUSCHL, 2002). These epistemic practices refer to the set of activities associated with the production, communication, and evaluation of knowledge that favor the processes of appropriation of scientific culture (KELLY; DUSCHL, 2002). In the production, one articulates one's knowledge by making sense of the regularities of the data; in the communication, one has to contact and persuade other members of the community; and, in the evaluation, one needs to coordinate theory with empirical data and confront one's conclusions or those of others with that evidence (JIMENEZ-ALEIXANDRE; DÍAZ DE BUSTAMANTE, 2008).

In congruence with these contributions, some researchers in Psychology and Pedagogy have been stressing the epistemic potentialities of argumentation (LEITÃO, 2007; MULLER-MIRZA, 2008; MULLER-MIRZA; PERRET-CLERMONT, 2009). Leitão (2007) considers that, if argumentation is conceived from a dialogical and dialectical perspective, it is possible to postulate its epistemic dimension, since this perspective confers to this discursive activity “an inherent learning mechanism that turns it into a privileged resource of mediation in the processes of knowledge construction” (LEITÃO, 2007, p. 3). This mediating role can be observed in two levels, according to the author: in the unleashing of revision processes of the own perspectives that lead to cognitive transformations, and in the emergence of self-regulating forms of thought that allow the individual to reflect on the limits of the knowledge he generates about the world. Linking writing and argumentation, Castelló (2006) also emphasizes how epistemic writing, which considers the communicative situation and the intended readers, helps to manage and regulate the written composition process in academic settings.

This goes in line with other researchers who explicitly state that a central problem to solve regarding academic writing is its argumentative dimension (ANDREWS, 2009; CAMPS, 1995; MOLINA, 2017, 2018; MOLINA Y PADILLA, 2018; PADILLA, 2012). Without focusing particularly on argumentation, there is a long tradition of studies that point out the essential role of writing in learning (CARLINO, 2005, 2013; MIRAS, 2000). For these lines of research, the epistemic function of writing refers to the use of writing as an instrument of awareness and intellectual self-regulation and, ultimately, as an instrument for the development and construction of one’s thought (APPLEBEE, 1984; EMIG, 1977; OLSON, 1977). In this way, it is understood that written productions, and especially the processes that the writer uses when composing a text, make possible or facilitate learning (CARTER, 2007; CARTER; FERZLI; WIEBE, 2007; RUSSELL, 2013).

The rest of this paper is organised into five sections. Firstly, we present a literature review of the multidimensional nature of writing and arguing and how they could promote learning. Secondly, we describe the method of our study. Thirdly, we move on to the results presented in two interdependent sections: (a) we present illustrative data of how those dimensions function in two texts produced by students of Linguistics and Biology; (b) we discuss students’ standpoints about their argumentative writing practices, with particular emphasis on the epistemic dimension. Finally, in the conclusions, we sum up key aspects from our analysis.

1 Literature Review: Dimensions and Epistemic Potentialities of Arguing and Writing

Understanding writing and arguing as social practices imply not only doing and thinking, but also “talking about” them (LERNER, 2001). It requires teachers to formulate

authentic questions (DYSTHE, 1996, 2012) and to propose writing projects in which students could write with clear purposes and frequently. In higher education, the importance of conceiving writing and arguing as social practices rely on the fact that students are not only trying to learn disciplinary contents but also, simultaneously, their discipline's vocabulary and expressions (RUSSELL; CORTES, 2012; CARLINO, 2013). In the first year of higher education, students need to participate in practices of writing and arguing and to think of themselves as legitimate interlocutors in their communities. These experiences provide meaning to the challenges of using writing and arguing as social practices in the classrooms. Practices that cannot be performed by means of fragmentary, isolated, disconnected writing activities, but through projects sustained in time, oriented to specific goals, guided by teachers' interventions.

In this regard, we suggest that, in higher education, professors, with more or less emphasis, seek to teach students how to participate in the discursive and textual practices of their disciplines. It is expected that students understand *academic writing*, the way of conveying science, as an argumentative construction (PADILLA, 2012). This argumentative writing in academia, which differs from one discipline to another, implies integrating four dimensions. Three are *constitutive*, and one is *integrative*. Within the constitutive dimensions, the *logical* dimension demands the articulation between ideas and concepts and their logical relations; that is, it has to do with the logical configuration and organization of the argument itself (TOULMIN, 2001, 2003; TOULMIN; RIEKE; JANIK, 1984). The *rhetorical* dimension demands the best way of communicating an argument efficiently, paying attention to the virtual interlocutors, the disciplinary context, and the type of dialogue where such argument is taking place (TOULMIN, 2003; VAN EEMEREN, 2010; WALTON, 2008; WALTON; KRABBE, 1995). The *dialectical* dimension aims to considering other standpoints, conceiving scientific knowledge as provisional and perfective (KELLY; BAZERMAN, 2003; KELLY; DUSCHL, 2002; KUHN, 1991; KUHN; IORDAU; PEASE; WIRKALA, 2008; LEITÃO, 2000; VAN EEMEREN, 2018).

These three dimensions, which we pointed out as *constitutive*, are crossed and encompassed by a fourth *integrative* dimension: the *epistemic* one. This epistemic dimension allows to benefit from the enunciation circumstances and to focus on the cognitive transformations promoted by arguing as a way of learning. In the end, this dimension makes it possible to elaborate and construct knowledge drawn from the communicative situation in which the utterance takes place. The epistemic dimension enables, in the light of a certain communicative situation, to evaluate the results of the articulation among concepts, ideas, and its logical relations (*logical dimension*), to establish the most effective ways of conveying an argument according to its disciplinary and academic context of production and circulation (*rhetorical dimension*), and to link and discuss that new and (re)constructed knowledge with other produced in a given

disciplinary area (*dialectical dimension*). In other words, the epistemic dimension enables students to articulate the utterance with the context it was produced (BAJTÍN, 2011) and to judge and monitor such articulation. These four dimensions are, to a different extent and level of need, interdependent. The *constitutive* dimensions are mandatory because a sound argumentation in academia has to take into account the logical organization of the argument presented, the disciplinary and contextual circumstances in which this argument is introduced, and its theoretical and empirical connections with the field where it is displayed. The epistemic dimension, on the contrary, has to do with the review and evaluation of the argumentation we produce (LEITÃO, 2000; VAN EEMEREN, 2018; WALTON, 2008) and concerns the links we can establish between the utterance (product) and enunciation (process) (BENVENISTE, 2004). In this vein, it is aligned with the notion of *epistemic practices*. Jiménez-Aleixandre and Díaz de Bustamante (2008) understand epistemic practices as a set of activities associated with knowledge production, communication, and evaluation. This evaluation, the result of the argumentative exchange, is the backbone of the epistemic dimension, as the dimension in charge of monitoring and establishing how the communicative situation influences the process of knowledge-making triggered by the articulation of the logical, rhetorical and dialectical dimensions.

2 Method

The data presented are part of a *multiple case study* (CRESWELL, 2007) focused on the practices of argumentation and writing in two university disciplines (Biology and Linguistics). In this paper, we advance results of how these practices, characterized by their multidimensionality, could promote learning. We chose our cases because the professors responsible for these undergraduate courses have incorporated writing practices in their daily classroom activities following the academic literacy approach (CARLINO, 2013). Therefore, we have what Patton (2002) calls *purposeful sampling*.

From a qualitative and interactive approach (MAXWELL, 2005), the fieldwork techniques were: a collection of classroom documents (exams, written assignments, and students' notes), semi-structured interviews with students, and class records¹. In this paper, we primarily return to interviews with students and texts produced by them. Below, we provide the first description of each case.

¹ This research was conducted under the ethical requirements proposed by the National Scientific and Technical Research Council (CONICET, Argentina). We have worked with students of legal age. Both the students and the teachers in charge of the courses gave their consent to participate in the research. With them, we thoroughly discussed our objectives, the scope of our research and its results. When we mention students and professors, we use pseudonyms to keep their privacy.

2.1 Linguistics Class

The Linguistics class corresponds to a seminar on text production, a course that takes place in one of the main public universities in Argentina, as an introduction to discourse studies for students of Linguistics and Literature. It is an annual course, with 4 hours of classes per week (divided into two sessions of two hours each). Teachers have an academic background in Linguistics, Writing, and Rhetoric, whereas they are also interested in Pedagogy.

During the first semester, students learn about discursive genres, scientific discourse, academic writing, and argumentation. They have theoretical and practical classes, with 200 students per classroom in the former, and 30 to 50 students per classroom in the latter. During the second semester of the year, practical classes are transformed into weekly tutorial meetings. Helped by a teacher who behaves as an advisor, students work alone or in small groups (maximum four students) to write a conference paper for the first time in their academic lives. Having studied discursive genres in the first semester, students are asked to choose a genre and to conduct a research project about it. The instructional approach of the Linguistics class is based on the legitimate participation of students in the Discourse Studies community. Research and writing were essential elements of the interaction between teachers and students. Table 1 shows the writing assignment. Here writing is presented to students as a contextualized activity, not as a generalizable elementary skill (RUSSELL, 1990). The students have to deliver a conference paper, with all its specificities (i.e., formulating a research problem, conducting research, writing an abstract, fulfilling stipulated deadlines and conditions, presenting in front of a real audience).

Table 1 – Writing assignment in the Linguistics class: a call for papers

<p><i>VIII Students' Conference Seminar of Text Production</i> <i>Linguistics and Literature Major, Department, University</i> <i>Place, Date</i> <i>Department of Philosophy and Languages, Address</i></p>
<p>The Seminar of Text Production of the Department of Philosophy and Languages invites you to participate in the VIII Students' Conference, which will take place on Date XX, in the aforementioned faculty facilities.</p> <p>As every year, it invites students enrolled in the seminar to submit individual or group proposals to establish a discussion in the Linguistic and Literary fields. The axis is given by the choice of a discursive genre of social circulation in any of its forms (written, oral, or audiovisual) in order to study how these genres are understood and produced by different social actors.</p> <p>1. Participation guidelines</p> <p>Students of this seminar will be exclusively in charge of the expositions. There will not be simultaneous tables. The students themselves will, in turn, participate equally as listening to the presentations made by their peers.</p>

2. Registration and guidelines for authors

The presentations can be both individual and in small groups. The papers will be organized into sessions, according to thematic affiliations. Presentation time will be 20 minutes maximum (equivalent to 8 pages, in Arial 12, spacing 1.5). Advisors will act as moderators of each session.

All authors must send an abstract of their papers (300 words) in Word format, Arial 12, simple spacing (prior correction of each advisor) before Date XX, to teacher Carla XXX (carlaxxx@hotmail.com), with a copy to the respective advisor. The file should contain the following information: surname of the authors followed by the word "abstract".

The file must specified:

- Title of the conference paper (centered with bold and capital letters).
- Authors' full names (right margin; one below the other).
- E-mail address of each author.
- In the body of the text, it should be mentioned: research topic/problem, objectives, questions or hypotheses, theoretical framework, method (study population, data collection techniques, *corpus*) and results.
- Five keywords.

Complete papers must be sent one week before the Conference to professor Adela, Conference Chair, to the following address: xxx@yahoo.com.ar. Authors are reminded that sending the conference paper until Date XX at this address is a condition to participate in the Conference and to pass the seminar.

3. Attendance to the Conference is free. Certificates of attendance and/or exposition will be extended.

Organization committee:

Seminar of Text Production, Department of Philosophy and Languages, University.

2.2 Biology Class

The Biology class corresponds to "Biology 08", a course that takes place in one of the main public universities in Argentina. This class is an introduction to Biology for students of Veterinary Medicine, Psychology, Environmental Sciences, among others. The course is a semester-long one, with six hours of classes per week (divided into two sessions of three hours each). There are 80 to 100 students per classroom, with two teachers in charge. The teachers have an academic background in Biology, but they are also interested in writing and reading to learn.

Contrary to other traditional biology classes in Argentina, where the teacher's voice is predominant, the instructional approach of this Biology class is based on reading and writing to learn tasks. Writing serves as a learning tool for linking and understanding biological concepts. In a discipline such as Biology, paying explicit attention to writing can at first be seen as something odd and foreign. That is why teachers in this class repeatedly insist on writing as a way of understanding and using biology concepts in meaningful ways. The course proposes problem-based writing assignments, i.e., assignments that

contextualize the questions asked and provide a scenario for understanding how biology works in everyday life. Students read and write at home and bring those writings to the classroom for a shared discussion during the first hour and a half of each session. Table 2 delivers a systematic description of Biology classes' structure.

Table 2 – Description of Biology classes' structure

<p>BIOLOGY CLASS Session duration: 3 hours</p>
<p>The teacher resumes the writing assignments carried out by the students at home.</p>
<p>Students discuss in small groups (maximum 10 students) the writing assignments produced at home. Students elaborate on one text taking into account what each of them wrote. Teachers stop by to answer questions.</p>
<p>Teachers and students work together. Each group reads or explains the unified text they have written.</p>
<p>Break time</p>
<p>Teacher's lecture with free interventions made by students. Presentation of the next writing assignment for the following class.</p>

Source: Authors' elaboration

2.3 Data Analysis

We focus particularly on the results obtained from texts and interviews with students, concerning the incidence of writing and argumentation in their learning processes. In each case, texts produced by the students during a whole semester were collected. In the Linguistics class, six papers – written by groups of one to four students – were collected. Each paper involved the writing of 10 to 15 drafts, with the guidance and comments of a teacher/advisor. In the Biology class, a course with 83 students and two teachers in charge, 316 short essays with teachers' comments were collected. In addition, fifteen Biology students and ten Linguistics students were interviewed, until the saturation criterion was reached. These interviews were recorded and transcribed. Before each interview, we notified the students of the purposes of the research and the anonymous nature of their participation. Thus, the students' standpoints were surveyed through 25 semi-structured interviews conducted individually, with an average duration of 15 to 20 minutes each. In Biology, we interviewed students from different majors (Veterinary, Medicine, Psychology, Environmental Sciences, etc.). In Linguistics, we interviewed the students whose papers we have collected. For the analysis of the data described, qualitative *categorizing* and *connecting* strategies were used (MAXWELL; MILLER, 2008).

3 Results and Discussion

3.1 Written Argumentation Practices in Two University Disciplines: A Textual Analysis of Its Constitutive Dimensions

This section aims to show how the logical, rhetorical, and dialectical dimensions operate in two texts produced by students of Linguistics and Biology, under teaching conditions that prompt the epistemic potentialities of writing. Both Linguistics and Biology students write regularly and they receive feedback from their teachers about their writings. These writings are always inserted in assignments that demand to link, justify and construct a personal standpoint about the issues at stake.

3.1.1 Writing and Arguing to Learn Humanities

Writing and arguing in the Humanities has some characteristic traits. One writes and argues articulating sources, linking one's knowledge with that of others, showing erudition and eloquence (SNOW, 1959; TOULMIN, 2001; ANDREWS, 2009). In this abstract, produced by a Linguistics student, these characteristics are very marked.

Table 3 – Abstract produced by a first-year student of Linguistics as part of the task of writing a conference paper

<p>Joy and Sadness in the Literary Geography of Alejandro Nicolau</p> <p>In this work, we propose to carry out a literary analysis of the eight short stories that make up <i>El libro de la Alegría</i> (2011), the debut book by Alejandro Nicolau, a contemporary musician, historian, and writer from Tucumán (Argentina).</p> <p>From the duality “sadness/joy”, we will approach the spatial deployment as the key to reading. We will describe how this emotional duality is represented through the use of different places, milestones, and territories ranging from the daily urban life of a bench in Urquiza square, to the high coldness of the lunar surface, starting from Villa Mariano Moreno, and getting lost in some hidden spot in the Sahara desert.</p> <p>Through an account of the different approaches to space in literature (Bajtín, 1920; Perec, 1974; Certeau, 1990; Bobes, 1993; Augé, 2000; Méndez, 2003; and Ryan, 2012), we will integrate our perspective on the symbolism of the literary geography of <i>El libro de la alegría</i>, with that of the author himself. A literary manifesto that opens this work and an interview with Alejandro Nicolau will serve us as a compass in our journey.</p> <p>It is worth noting that in the field of studies on space in different literary works, we have not found proposals that consider the physically delimited space as a symbolic representation of a clearly emotional duality. This is an exploratory work that opens the doors to future research.</p> <p>To conclude, once described and characterized, we will trace a qualitative pattern between all these spaces. We hope that this map of Alejandro Nicolau's literary geography will allow us to enrich the possible interpretations of the movements that the different characters carry out in that small great cosmos called <i>El libro de la alegría</i>.</p> <p>Keywords: space – joy – sadness – short stories – Alejandro Nicolau</p>

Source: Authors' elaboration

In this abstract, the student/author postulates a thesis (namely, that the spaces delineated in Alejandro Nicolau's work can be read from the duality "sadness/joy") and advances an explanation of the arguments to which he will resort to defending it (analysis of the anthology of short stories *El libro de la alegría* and the manifesto that opens it, different theoretical approaches to the notion of space in literature and an interview with Alejandro Nicolau). Regarding this, the logical dimension of this abstract is materialized in the structure of the argument advanced by the student/writer. In Toulminian terms (TOULMIN, 2003), we have:

- *Claim*: The spaces delineated in Alejandro Nicolau's work can be read from the duality "sadness/joy";
- *Data*: The anthology of short stories *El libro de la alegría*, the manifesto that inaugurates the book, and an interview with Alejandro Nicolau himself;
- *Warrant*: Alejandro Nicolau's work, being fiction, can be analyzed according to categories constructed and managed by literary critics, including the category of space;
- *Backing*: There are different theoretical approaches to the notion of space in the scientific literature and different authors who use this category for analysis;
- *Rebuttals*: Scientific knowledge as provisional, specially in this exploratory study.
- *Modal qualifiers*: Abundant use of metaphors and poetic use of language, which highlights the provisional nature of the statements made.

The fact that this abstract can be schematized in the Toulminian model shows that the student/writer – in this paper, the student worked alone – has built a solid argument (VAN EEMEREN, 2018), which does not mean that he is persuasive or convincing to his audience. The analysis of efficiency must be given as part of the second dimension we have sketched: the *rhetorical dimension*. In this abstract, we find that the student/writer constructs his discursive *ethos* as a *connoisseur* of the field: he knows the literary research that uses space as a category of analysis, he intuits how to articulate that category with that of emotion and how to combine textual analysis, properly immanentist, with the analysis of the personal perspective of Nicolau himself, whom he interviewed. Likewise, the student/writer uses verbal modalizers such as "we propose to carry out" instead of "carry out" or syntactic reformulations – unnecessary from an informative point of view, although semantically significant – as in the case of "it is worth highlighting". Concerning subjectivemes (KERBRAT-ORECCHIONI, 1997), the student/writer does not spare the use of adjectives and nominal phrases loaded with positive value such as "opera prima" and "small great cosmos" to refer to *El libro de la alegría*, for example.

These subjectivemes, modalizers, and the position of the student/writer of the abstract as an expert in the subject at hand shape the rhetorical dimension of this piece of academic writing. In addition, the student knows the abstract genre, its formal features, and characteristics. It is not trivial for the student/writer to point out the research niche and the relevance of his research for the field. These are generic conventions that the student is somehow able to comply with.

The *dialectical dimension*, on the other hand, takes place in the articulation between one's knowledge and that of others. The student/writer proposes a non-integrated quotation when, in brackets, he refers to the writers who will make up his theoretical framework. This is a way of quoting that belongs to the experts, to those who know the field and the subject they are working on. Finally, the *epistemic dimension*, which runs through the writing and argumentation deployed in the abstract, integrates these three constitutive dimensions. It is the epistemic dimension that requires the student/writer to follow the guidelines of the abstract genre, which imposes the need for affirming a thesis and advancing the arguments to defend it, which allows finding the research niche by articulating his knowledge with that of others, and which enables him to construct his academic *ethos* as an expert on the subject to be presented. The epistemic dimension makes it possible for the student/writer to think of the communicative situation and to think of himself as an interlocutor and participant in it. In fact, after presenting his paper in the scientific event organized by the Department, one professor suggests:

[6] Professor Silvana: The only thing I would mention is that you have to attenuate a little this establishment of the niche because I believe that, from the Semiotics field and the semiotic analyses of literature, all the approaches take into account the category "space" and make an analysis that goes beyond the psychological one. For example, I am thinking of stories by Ana María Matute, "*Pecado de omisión*", where the characters are analyzed in relation to the spaces they inhabit. And these are frequent analyses from a semiotic perspective. So, your niche, the way you wrote it, is very strict. I think you should attenuate it because it's not that space has not been studied as a symbolic value. From literary theory, space has been studied as a symbolic value. You, of course, give it an interesting and very significant insight. I even wanted you to show me what Méndez writes, which you quote there.

[7] Student/writer: "Towards a Theory of the Spatial Sign in Contemporary Narrative Fiction". It's a research paper.

[8] Professor Silvana: "Towards a Theory of the Spatial Sign in Contemporary Narrative Fiction".

[9] Student/writer: Yes, yes [looking at his computer and glancing at his notes].

[10] Professor Silvana: Yes, it was just a matter of hedging, nothing more, which I think can be attenuated a little because, maybe from other perspectives, space with a symbolic value has been explored in literary works.

[11] Student/writer: Yes, I mainly wanted to emphasize, let's say, that the symbolic aspect would not be central to my work, but the emotion coming from the symbolic aspect. As I said, it is a kind of summary of several things. But it is true that there are works out there that we haven't taken into account.

Here, the student received critical questions. In turn [6], professor Silvana started to discuss a task related to the academic field: to qualify the statements, to limit their scope and to add some hedging. The professor thought that the student had constructed his "research niche" too categorically and warned him against the risk of doing so when writing scientific-academic texts. To do this, she explained that space as a symbolic value has been studied in the disciplinary field of Semiotics. In turn [11], the student accepted the criticism and thus made a concession, but he also reaffirmed that the original contribution of his paper was not to show space as a symbolic value, but *space and emotion as symbols*.

3.1.2 Writing and Arguing to Learn Sciences

Writing and arguing in Natural Science also have their own traits. The role of evidence and facts is fundamental (TOULMIN; RIEKE; JANIK, 1984). Let us see what happens to the dimensions of academic writing, when a first-year university student writes in Biology.

Table 4 – Texts produced by a Biology student in response to two writing assignments

Writing Assignment

Willows produce a bad-tasting molecule as a defense against herbivorous insects. In the cells of the willow leaves, there is an enzyme called "bitterness" which is responsible for producing this molecule.

(a) Write a text referring to willows linking the following concepts: genetic information, bitterness enzyme, phenotype, bad-tasting molecule.

(b) Write a text referring to the bitterness enzyme that acts on willow leaf cells by linking the following concepts: amino acid sequence, three-dimensional structure, the function of a protein.

Answers

(a) We find in willows a good example to understand how the genetic information of an individual, conditions its phenotype. Their genetic information contains the recipe for making the enzyme bitterness, which in turn is responsible for making the bad-tasting molecule. This molecule is responsible for acting as a defense against herbivorous insects, thus preventing them from being attacked by them, while conditioning their phenotype.

(b) The enzyme bitterness is a protein and, like all proteins, it is formed by a sequence of amino acids. This sequence is the one that determines its three-dimensional structure, being finished this way its active site is the zone of the enzyme that recognizes the substrate. When the enzyme "fits" with its substrate, it can play its role, which in the case of the enzyme bitterness is the production of the bad-tasting molecule. With this example, we see how the function of a protein is determined by its three-dimensional structure. If the three-dimensional structure was different, the structure of its active site would also be different and, therefore, we would be speaking of another enzyme.

About the *logical dimension* of the argumentation deployed by this student, for the two micro-texts presented, we can outline an argumentative schema according to Toulmin's model (2003):

Table 5 – Logical dimension of two texts produced by a Biology student in response to a writing assignment

Components of the Toulmin Model	Answer (a)	Answer (b)
Claim	Willows are a good example to understand how an individual's genetic information conditions his phenotype.	The bitterness enzyme is a protein and is formed by a sequence of amino acids. This sequence is what determines its three-dimensional structure, thus determining its active site, which is the area of the enzyme that recognizes the substrate.
Data	The genetic information of willows contains the recipe for making the bitterness enzyme.	The bitterness enzyme is a protein and has all the characteristics of a protein.
Warrant	The bitterness enzyme is responsible for making the bad-tasting molecule. This molecule is responsible for acting as a defense against herbivorous insects, thus preventing willows from being attacked by insects while conditioning their phenotype.	All proteins are formed by an amino acid sequence and this sequence is what determines their three-dimensional structure which, in turn, determines their function.
Backing	Scientific evidence on enzyme activity and genotype and phenotype.	
Rebuttals	The fallibility of scientific knowledge. New findings that contradict these claims.	
Modal Qualifiers	"We find in willows a good example".	"With this example, we see how the function of a protein is determined by its three-dimensional structure. If the three-dimensional structure was different, the structure of its active site would also be different and, therefore, we would be speaking of another enzyme".

Source: Authors' elaboration

As it can be seen in Table 5, the logical structure of the argument is guaranteed in both texts: the student knew how to connect the concepts proposed by the teacher in his texts, taking into account the case in question, i.e., willows, the production of bitterness enzyme and the relationship between genotype and phenotype. The student knew how to relate the theoretical notions he was learning to a specific case; and was able to appropriate the given knowledge and to establish logical relations of causality, implication, consequence, etc. between them.

The *rhetorical dimension*, in this case, is shown in these texts in the fact that the student has been able to answer the questions with the necessary and correct information. He understood the assignment (“what was asked”) and was able to respond accordingly. For its part, the dialectical dimension, in these texts, concerns the possibility of linking what is known theoretically with a specific case, which refers to the ability to articulate the knowledge learned with reality and natural phenomena. The student was able to link what he knew about genotype, phenotype, proteins, etc., with willows and their enzymes that produce bad-tasting molecules. In other words, he could participate using theoretical concepts and interpret reality accordingly.

The *epistemic dimension*, finally, in these texts has to do with the possibility of integrating all the other constitutive dimensions. The student was capable of adapting to the communicative situation and responding to what the teachers asked him to do. He could link his theoretical knowledge with a real example. He was able to choose the necessary and relevant information according to the communicative situation in which he participated, and he could manage to (re)construct the required biological knowledge.

3.2 An Approach to the Epistemic Dimension: Students’ Standpoints About their Processes of Text Production

Although in the above section we tried to state how the *epistemic dimension* worked in two texts, this dimension cannot be seen in them because it belongs to the metacognitive process involved in writing and arguing. It has to do with the way we reflect upon our writing and arguing processes and how we think about ourselves as writers. The *epistemic dimension* concerns the review and evaluation of the own argumentation (LEITÃO, 2000; VAN EEMEREN, 2018; WALTON, 2008). It is linked with the notion of *epistemic practices*, that is, how we produce, communicate and evaluate knowledge (JIMENEZ ALEIXANDRE; DÍAZ DE BUSTAMANTE, 2008; KELLY; DUSCHL, 2002).

In Table 6, we systematize students’ standpoints about their process of writing and arguing in Linguistics and Biology. We pay attention to what students have to say because the epistemic dimension presents itself in the ways we talk about the ways we write and argue. Ramiro (Linguistics) and Facundo (Biology) are the students/authors of the texts presented in the previous section.

Table 6 – Students’ viewpoints about their writing processes: reflection on the constitutive dimensions

Dimensions	Linguistics	Biology
Logical	<p>Ramiro: We have had to study a topic in-depth, construct a research niche, justify it. It was not like “write freely”, but to do it with a scientific structure in mind.</p> <p>Gabriela: We had to adapt what we found in our research to the conference paper, to construct the argument in this way.</p>	<p>Facundo: In Biology, writing helps you to see what you understand of the subjects and, if you get good feedback from the professors [if the comments are positive], you know that you are following the subject well. [...] The writing of the texts also serves to connect one content with another and not forget what you have already seen.</p> <p>Mariana: The most difficult part of the Biology tasks is to put in text things that happen simultaneously. [...] The processes and the many causes that play a role there [...]. But if you can explain that, then the content at stake is already understood.</p>
Rhetorical	<p>Lucio: Before, I didn’t think too much about what or for whom I was writing. [...] With the conference paper, I realized that one has to know theoretically the genre in which one writes.</p> <p>Blanca: The seminar has made me think a lot about writing, about who is going to read me, and why I have to be clear and relevant for it to be understood. [...] It is very useful to know the genre theory.</p>	<p>Sofia: You have to think very well to write because if you don’t take into account what comes before or after [the processes that take place] you don’t understand anything and what you write doesn’t make sense.</p>
Dialectical	<p>Soledad: The process of thinking about a topic, investigating it theoretically and empirically, was very rewarding. We had to link what we were trying to say and what we found with what other authors said and found to create something new.</p>	<p>Ezequiel: Writing assignments show you how topics are related to each other, [...] they add things up and you understand more when you follow assignments and corrections that are made in class.</p> <p>Mariana: It’s good that they don’t tell you, for example, put “what is protein synthesis” or “what is an enzyme”, but they give you examples and that helps you understand better, it’s less abstract. Otherwise, everything seems so distant from what you see every day.</p>

Source: Authors’ elaboration

For the analysis of the epistemic dimension, it is worth using the general concept of “metacognition” (FLAVELL, 1979). Originated in the field of Cognitive Psychology, we employ this concept to work, particularly, with the notion of “meta-discourse”; that is to say, the reflection on the own discursive practices, obtained from the verbalizations about the difficulties we face in comprehension and production. In Table 6, we can notice how the students of Linguistics and Biology think about the constitutive dimensions they had to take into account in their writings. These students are aware of their processes of text production and of what those processes are involved in their respective disciplines.

When defining metacognition, Flavell (1979, p. 907) stated that “metacognitive knowledge consists primarily of knowledge or beliefs about what factors or variables act and interact in what ways to affect the course and outcome of cognitive enterprises”. These students are thinking about those factors and variables that impact the cognitive enterprise of writing academically. They are thinking about the content of their writings, they are aware of their audience and they are reflecting on the links of their texts with others’ texts and with what the assignment asked. They are, in sum, working autonomously (CAPPELLETTI, 2004).

At this point, we return to the notion of epistemic practices (JIMENEZ ALEIXANDRE; CRUJEIRAS, 2017; KELLY AND DUSCHL, 2002): the epistemic dimension is the integrative one in the sense that it allows, through meta-discourse, to reflect on the production and communication of knowledge while evaluating it. Following Leitão (2007), we also understand that the dialogical properties of argumentation give writing an epistemic dimension. Being aware of this dimension becomes a privileged resource of mediation in the processes of knowledge construction. This mediating role manifests itself on two levels: (1) in the revision of one’s perspectives (as opposed to the different perspectives of others), which allows cognitive transformations; (2) in the reflection on the limits of knowledge (metacognition). In our cases, the work in small and big groups, the defense of the paper in front of a real audience, the biology assignments that contextualized the knowledge at stake, the frequent feedback from professors, etc., favored these processes. This is aligned with the approaches of Maliandi (1997): reasoning implies a critical dialogue. This reasoning through dialogue possesses a double dimensionality: foundation (capacity to give reasons) and criticism (the conscience of the limits of the “own reasons” and the opening towards “other’s reasons”).

From the educational point of view, this *epistemic dimension* of writing, which metacognitively comprehends the logical, rhetorical, and dialectical dimensions, does not occur in a vacuum: it is provided for in the writing assignments proposed by the teachers of our cases (MOLINA; PADILLA, 2018). The writing assignments, both in Linguistics and Biology, asked for argumentative writings. In Linguistics, the students had to investigate and write a conference paper, while in Biology the teachers provided

real-life cases that allowed the students to connect the concepts under study with the surrounding reality. For the students of Linguistics and Biology, writing implied relating and justifying, making use of argumentation understood as “the capacity to relate data and conclusions, to evaluate theoretical statements in the light of empirical data or from other sources” (JIMENEZ-ALEIXANDRE; DÍAZ DE BUSTAMANTE, 2003, p. 361). Writing, worked on in class and used as a mechanism of thought, became a propitious tool for exercising such capacity of relation and epistemic evaluation and students could recognize that.

Conclusions

At the beginning of this paper, we set out to understand in depth the nature of academic writing as an argumentative construction (PADILLA; DOUGLAS; LOPEZ, 2011; PADILLA, 2012). Therefore, we characterized the four dimensions that configured this type of writing: the logical, rhetorical, and dialectic – *constitutive* – dimensions and the epistemic – *integrative* – dimension. We also stressed the need for illustrating how these dimensions operate in texts produced by first-year Argentinian undergraduate students in two disciplines (Linguistics and Biology) and how those students reflect upon their writing and arguing processes.

Concerning the objective of characterizing the constitutive and integrative dimensions of academic writing, we have sketched them out. According to our research, writing academically involves arguing and requires doing so four-dimensionally. It requires constructing an argument that is logically valid or capable of being validated (*logical dimension*), and formulating an argument embedded in a text according to certain rhetorical guidelines (*rhetorical dimension*). It demands writing and arguing by linking one’s knowledge with that of others and with everyday reality, putting into dialogue what one knows with what one expects to know (*dialectical dimension*). If these three dimensions are articulated and, at the same time, the communicative situation is taken into account and the conditions of enunciation in which a text is produced are critically evaluated (*epistemic dimension*), the potentialities of *writing and arguing to learn* would seem to be guaranteed.

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