

Vanessa Marcella

A Corpus-based Approach to Language Learning

A Case Study in Higher Education at the University of Calabria

Abstract

The use of corpus linguistics (CL) tools and methods has been shown to be of great help in fostering language learning. As argued by Aston (2000), language pedagogy has started to plan and create corpora to fit its own principles and address its own needs. Most studies focus on classroom activities based on concordances and lexical/grammatical analyses carried out on corpora (McEnery et al. 2006). To date, CL has often been combined with teaching specific topics to carry out text and discourse analyses, and data-driven learning (Friginal 2018). Therefore, it is important to further investigate the use of corpora as a valuable resource for language education.

This work is testimony to the usefulness of corpus linguistics and corpus-based analyses for pedagogical purposes, while encouraging students to explore language autonomously and draw their own conclusions and considerations. Indeed, this paper outlines how CL can help learners, with different levels of language proficiency, approach English for Specific Purposes using authentic and concrete examples, and simultaneously lead them to develop new skills which may be integrated within their field of study.

The case study occurred in a distance learning context with first-year students majoring in Data Science and Business Analytics at the University of Calabria. The main objective was to enhance students' motivation while improving their English competences using statistical analyses and corpus tools to investigate data retrieved from the social network Instagram and related to the topic of climate change. In particular, hands-on activities allowed students to create their own corpora, analyze language use through the corpus analysis toolkit AntConc (3.5.8), and carry out topic framing. Students' final projects were then discussed at the oral exam.

Keywords: *corpus linguistics, environmental studies, framing theory, social media communication studies, data-driven approach*

Climate change is a current and much debated issue (Hulme 2009; Halliday 2001), thus, the introduction of this topic in university curricula is of paramount importance. Based on the

assumption that language plays a crucial role in higher education, Language Centers may offer interdisciplinary approaches for the analysis of linguistic and discursive features while encouraging the establishment of climate-related issues as topics to deal with (Fløttum 2014). Indeed, considering the growing eco-anxiety among young people, the introduction of this topic in universities in a positive way may enable students to learn how to become more active and proactive for a sustainable future through an ecological behavioral participation. To date, environmental education has shifted from the study of natural science to a more social and political focus (Johnson and Mappin 2005; Dada et al. 2017). Already in the 1960s, its objective was outlined as the education of “a citizenry that is knowledgeable concerning the biophysical environment and its associated problems, aware of how to help solve these problems, and motivated to work toward their solution” (Stapp 1969, 34).

There are two benefits to the current digital scenario of many social movements founded by young people, who have mobilized the masses all over the world with social media messages (Lee et al. 2021; Yuen and Tang 2021): (1) data on current topics are easily retrievable, (2) the use of social media further encourages students’ participation.

This work outlines the experience of a case study in an English for Specific Purposes (ESP) course in an Italian university context, where the combination of data-driven learning approach and corpus linguistics, based on authentic materials, fostered content and language learning. Indeed, the use of corpus linguistics techniques, framing theory, as well as English language learning objectives, were all functional to train “ecologically minded students” (Kopnina 2012, 1), specifically Data Science and Business Analytics students from the University of Calabria. In addition, the promotion of students’ autonomy in language learning, data collection and analysis were fundamental in deepening their knowledge of such a crucial topic. In fact, students were asked to retrieve and analyze the messages contained in the posts on the social network Instagram according to their perception by means of corpus techniques and frame analysis.

1. Theoretical background

According to Gavioli and Aston (2001), corpora can be considered as resources from which learners can learn directly, where corpus is intended as “a collection of *machine-readable authentic texts*” as defined by McEnery et al. (2006, 5). As Biber et al. (1998) pointed out, corpus linguistics has four main characteristics, namely:

1. it is an empirical (experiment-based) approach that allows for the observation and

- analysis of patterns of language in real language texts;
2. it is based on a representative sample of the target language stored electronically (a corpus);
3. it uses a computer software to carry out the analysis;
4. the interpretation of findings is both quantitative and qualitative.

The data-driven learning (DDL) approach is a language teaching and learning strategy which implies the use of corpora to foster language learning and improve learners' understanding and use of a language. Indeed, authentic language use is the basis for DDL, which aims to make language learning more effective, rather than the adoption of materials retrieved in a dictionary, grammar, or course book as language-learning material (Chambers 2010). In addition, DDL can be used for several language learning objectives, such as improving vocabulary, grammar, or writing skills. It can be applied to different levels and types of learners who are enabled to analyze and work with real-world language data, such as newspaper articles, social media posts, or spoken conversations. As highlighted by Johns (1997, 101), through the DDL approach, students are directly challenged with the data which make "the learner a linguistic researcher" and "every student is Sherlock Holmes." In fact, along with the use of various tools and techniques, learners can identify patterns, structures, and vocabulary in the data, and then apply this knowledge to their own language use (Johns 1991, 2). The objective is to develop learners' awareness of language structure and use, and thanks to the combination of DDL with technology, such as concordance software or online corpora, the exploration and analysis of language data in a meaningful way are facilitated. In particular, as argued by Aston (1997), the use of small and specialized corpora is more suitable and useful in a DDL approach. Indeed, small corpora are easier to analyze and to become familiar with. Moreover, the interpretation of results, such as the identification of collocations, is facilitated thanks to the contextualization of fewer texts. This inductive and explanatory approach is based on what Johns (1991) defined as the principles of DDL: observation (concordance lines), classification (of main features) and generalization (of rules). These phases were also elaborated by Carter and McCarthy (1995), who defined them as the "three Is" (Illustration, Interaction and Induction). Illustration refers to the observation of real data, interaction to the discussion of observations made, and induction to the formulation of one's own rule. In addition, DDL, as any other approach, is inevitably "dependent not only on the social, cultural and political setting of a particular society at a particular point in time and the development of education within that setting but also on the technology available in the classroom" (Johns 1988, 13).

Learning how to deal with data and with corpus linguistics techniques fosters a student-based learning process. Indeed, as argued by Boulton (2011), the hands-on use of authentic corpus data promotes self-directed language learning of advanced usage and students take on more responsibility for their learning, which allows them to become autonomous learners (see also Holec 1981; Little 1991). An autonomous learning process “gives the student the realistic expectation of breaking new ground as a ‘researcher,’ doing something which is a unique and individual contribution” (Leech 1997, 10).

Generally, digital media give movements, opinion leaders and politicians as well, the opportunity to share information, discuss strategies and goals, and build discourses around current issues (Lee et al. 2021). Instagram was chosen since it was the second social network with the highest penetration rate in 2021, as it counted 28.8 million users in Italy (AGCOM 2021), with over sixty per cent of these users aged between 18 and 34. In addition to textual contents, it offers other types of communication, such as videos and images, which provide further knowledge. Indeed, a study conducted by Niepold et al. (2008) shows how narrative techniques and different kinds of visual data posted on Instagram may influence people’s behavior, attitudes and knowledge toward climate change (see also Borchers 2019; Feldman and Hart 2018).

In light of the above, the DDL approach was adopted during the lessons of an ESP course and students were asked to carry out a research project focusing on concordances and collocations through corpus evidence. Moreover, the use of authentic materials, in this case posts from the social networking platform Instagram, further motivated learners with different levels of language proficiency to deal with specific topics using spontaneous and concrete language samples with the help of visual data. As pointed out by Halliday (2001, 199), “we cannot transform language; it is people’s acts of meaning that do that. But we can observe these acts of meaning as they happen around us, and try to chart the currents and patterns of change.” In this case, the “acts of meaning” were extrapolated from Instagram focusing on the communicative functions of the messages, that is on the meanings and strategies of the communicators. In addition, the use of the corpus linguistics software provided useful insight into the detection of frames, as highlighted by Touri and Koteyko (2014). This means “to select some aspects of a perceived reality and make them more salient in a communicating text” (Entman, 1993, 52). Framing helps to define an issue and provide an interpretation of the message that is being conveyed. Several theories in climate change communication have been elaborated with different approaches and backgrounds (Schäfer and O’Neill 2017; Metag 2016; Jang and Hart 2015; Hulme 2009; Benford and Snow 2000; Taylor 2000). In this case study,

starting from a set of defined frames used as guidance, and through the analysis of the concordances of the most frequent words in their corpora, the students were inductively able to identify more specific ones.

2. University context

This case study was carried out with first-year students majoring in Data Science and Business Analytics at the University of Calabria. There were 21 students enrolled during the first semester of the 2020-2021 academic year. However, the results reported in this paper take into account the outcomes of the 10 students who sat the exam in the first winter session.

When enrolling in a master's degree course in this university context, students are expected to have at least a B1 level (Common European Framework of Reference, Council of Europe [2001; 2018], henceforth CEFR). Undergraduates attend mandatory courses of *English for Basic Academic Skills* provided by the University Language Center (CLA Unical) during their bachelor's degree course. In addition, the graduate students of this case study subsequently attended a mandatory 42-hour ESP course of English for Data Science, which aimed to the development of academic skills with reference to the field of Statistics and Economics. Concurrently, the students were also encouraged to improve reading skills necessary for understanding academic and statistics texts, listening skills, and oral production and interaction skills through group work and oral presentations on academic topics. By the end of the course, students were expected to reach at least a B2 level of language competence according to the CEFR.

3. The project

Students were required to individually work on a project as part of their oral exam of the ESP course in Data Science and Business Analytics. Indeed, the final assignment included a written report about their project, and the oral presentation and discussion of their findings. In line with the approaches described above, students were trained to design and encode a corpus of Instagram posts.

The research questions proposed by the teacher were:

- What collocations are used to highlight climate change issues?
- How is climate change framed by activists, opinion leaders and/or organizations?

These questions were addressed by analyzing the most frequent patterns of language use and

frames. The main focus was on the investigation of concordances and collocations related to climate change. The results from the two Instagram accounts were then compared one with the other by the students. Additionally, together with a more general B2 written exam based on topics dealt with in class, within the expected results, the oral presentation fostered a productive use and recognition of new words and collocates, as well as the acquisition of new concepts.

3.1 Aims

The objective of the course, and in particular of the final project, was to combine students' language learning needs and objectives, i.e., B2 level, with the analysis of climate change discourses, taking into account their field of study, namely Statistics, by including statistical analyses through corpus tools. Indeed, the ultimate goal of this research project was to raise environmental awareness among university students, while encouraging them to deepen their English language knowledge in a more autonomous way using a familiar social network, which led to a more intense involvement. They were also encouraged to draw their own conclusions on a crucial topic looking ahead to a more sustainable future. Indeed, by conducting climate change communication research, not only were they motivated to learn more, share findings with peers, and engage in oral presentation and writing skills, but they also became, to a certain extent, linguistic researchers, and thus better data analysts. In fact, through hands-on activities students were enabled to learn how to create their own corpora, analyze language use and patterns through the corpus analysis toolkit *AntConc* (3.5.8), and apply topic framing.

3.2 Tasks

Students were asked to freely select two Instagram accounts that dealt with climate change. The first step was to choose twenty-four posts for each profile, on average two posts per month over one year, 2020. Each post had to be saved separately in a .txt file named after the account owner and publishing date. Secondly, with the forty-eight posts, students created their small corpora which were processed and analyzed with *AntConc* (3.5.8). The first analysis to carry out with this software was to count Word Types and Word Tokens, then carefully analyze concordances and collocates. On average, every single corpus had 5,000-word tokens approximately, and 500-word types. Considering both accounts they had chosen, they carried out a qualitative-contrastive analysis. Following the corpus analysis, students had to frame the posts by identifying the most salient aspect highlighted. In preparation for this, the frames had been identified in class with a preliminary study of the content of the posts. As described in

section 3.4, the students agreed on the choice of the following five frames: information, opinion, call to action, solution, blame.

3.3 Profiles

For the collection and investigation of posts, the selection of two climate change-related accounts per student was freely chosen by them, as can be seen in Table 1:

Number of students	Accounts	User type
1	@algore	Public figure
1	@janefonda	Public figure
1	@leonardodicaprio	Public figure
2	@everydayclimatechange	Photographers
1	@kidsforclimateaction	Young activists
1	@unclimatechange	United Nations Climate Change Secretariat
4	@cnnclimate	CNN
2	@unep	UN Environment Programme
1	@nasaclimatechange	Nasa Climate Change
1	@climate_science	Climate Science
1	@fridaysforfuture	Social movement
1	@giuliaegeordie	British family
1	@lauradove	British family
1	@virimodo	carbon reduction intelligence company
1	@globalgreen	NGO

Tab. 1: Accounts selected by students

Within the analysis of the collected posts, the students were asked to highlight what, in their opinion, were the most interesting collocations encountered without considering the frequency of each collocation. As illustrated in Table 2, they were particularly concerned about the meaning of “climate depression” and “eco-anxiety,” which refer to a psychological state related to climate change. Besides, they were unfamiliar with the concepts of “climate justice” and “environmental racism,” and how climate change is related to racism and social justice. Consequently, these issues were further studied and analyzed in class. Moreover, they argued that collocations with a positive connotation were represented by “climate model” and “climate plan,” identified as ways out to solve climate issues. As for “beat climate change,” a student

highlighted the relation and parallelism between climate change and COVID-19 in one of DiCaprio's posts.

<u>Climate</u>	action		
	activists		
	Change		
	beat climate change	<u>Eco-</u>	anxiety
	chaos		
	crisis	<u>Environmental</u>	racism
	denial		
	depression	<u>Regenerative</u>	agriculture
	disasters		
	hypocrisy	<u>Soil</u>	erosion
	justice		
	model	<u>Water</u>	shortage
	plan		
	resilient		
strike			

Tab. 2: Selection of collocations detected in Instagram posts (in alphabetical order) according to students' perception

3.4 Frames

Within the students' research project, the framing analysis aimed at identifying through corpus linguistics methods (Schäfer and O'Neill 2017) what aspects of climate change the posts were meant to highlight. All students carried out their research matching the Instagram posts to thematic frames of climate change communications identified beforehand. The frames of reference were based on the literature review of two major studies (Painter et al. 2018; Jang and Hart 2015), which had been analyzed before. Specifically, the study carried out by Painter et al. (2018) investigated climate change coverage by digital-born media (e.g., Huffington Post, Vice and BuzzFeed) as compared to legacy media (e.g., *The Guardian*, *New York Times*, *Le Monde*, *El Mundo*) with reference to the COP21 summit in Paris in 2015 across France, Germany, Spain, the UK and the USA, and identified twelve main topics. The most frequent frames were related to negotiations, scientific background, uncertainty/skepticism, disasters or catastrophes, economics and business, renewable energy, opportunities, climate justice, civil society protests, health impacts, food security and migration. The study conducted by Jang and Hart (2015) focused on polarized frames on climate change and global warming in the US and

other countries based on Twitter big data. The frames they identified in public discourse were *real frames*, *hoax frames*, *cause frames*, *impact frames*, and *action frames* (Jang and Hart 2015, 14). Consequently, these frames were adapted by the students and the final frames they identified and selected, based on a preliminary content analysis of a sample of their corpora, were *information*, *opinion*, *call to action*, *blame* and *solution*. Information frames were related to factual information, including scientific descriptions, causes and effects of climate change. The opinion frame referred to personal thoughts expressed by the stakeholders. Call to action frames included daily advice addressed to anyone, taking part in protests, and discussing responsibilities for countries, governments, or companies to take action. Blame frames encompassed declarations about someone who was held responsible for a particular event or situation. Solution frames included opportunities offered by new energy sectors, green jobs, disinvestment from fossil fuel, and net-zero carbon emissions.

As shown in figure 1, the students concluded that information and call to action were the most frequent frames among the selected accounts. These were equally followed by opinion and solution frames, while only one case was related to blame. According to the students, these results helped them to critically consider potential positive ways to tackle climate change. Indeed, information and call to action posts provided useful information and advice about what can be done, e.g., how to reduce and reuse plastics, and increased awareness of actual risks, e.g., rising temperatures and global impacts.

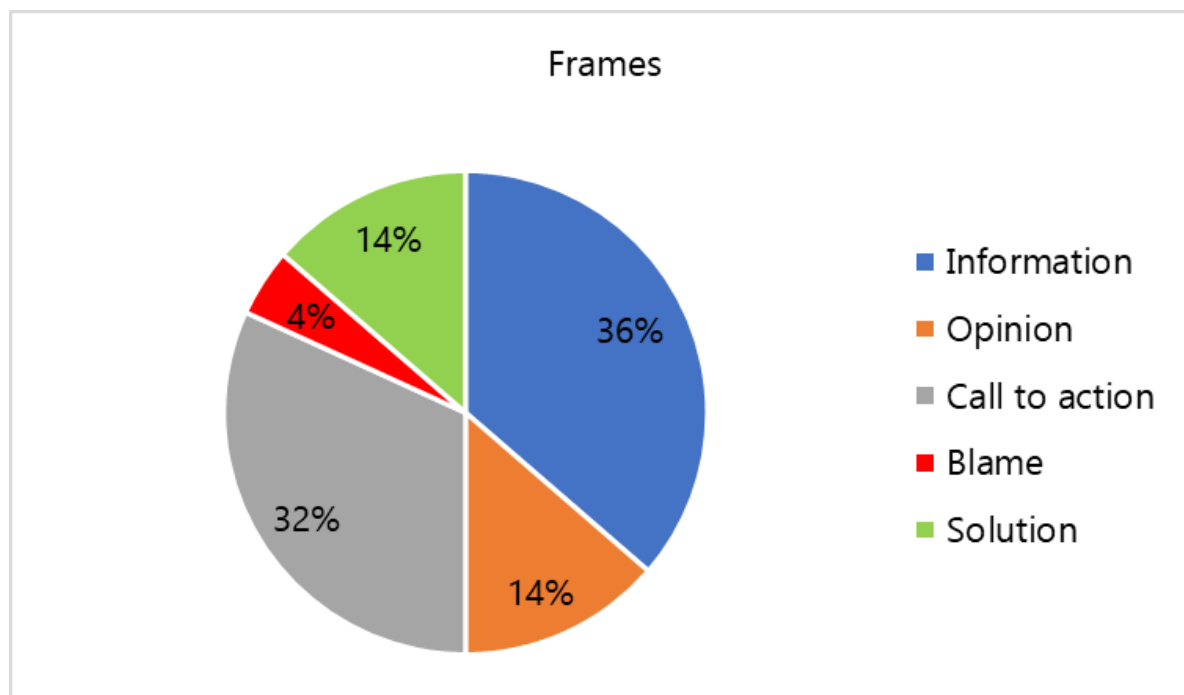


Fig. 1: Frames detected (in percentages)

3.5 Feedback form

At the end of the exam, which included a B2 written exam of *English for Specific Purposes* and the oral presentation of their project, the students were asked to fill in a feedback form based on a set of statements related to the course evaluation, the software used, the topic of climate change, and the social network Instagram. Overall, only ten students completed the form anonymously based on a Likert scale – strongly agree, agree, undecided, disagree, strongly disagree (Batterton and Hale 2017).

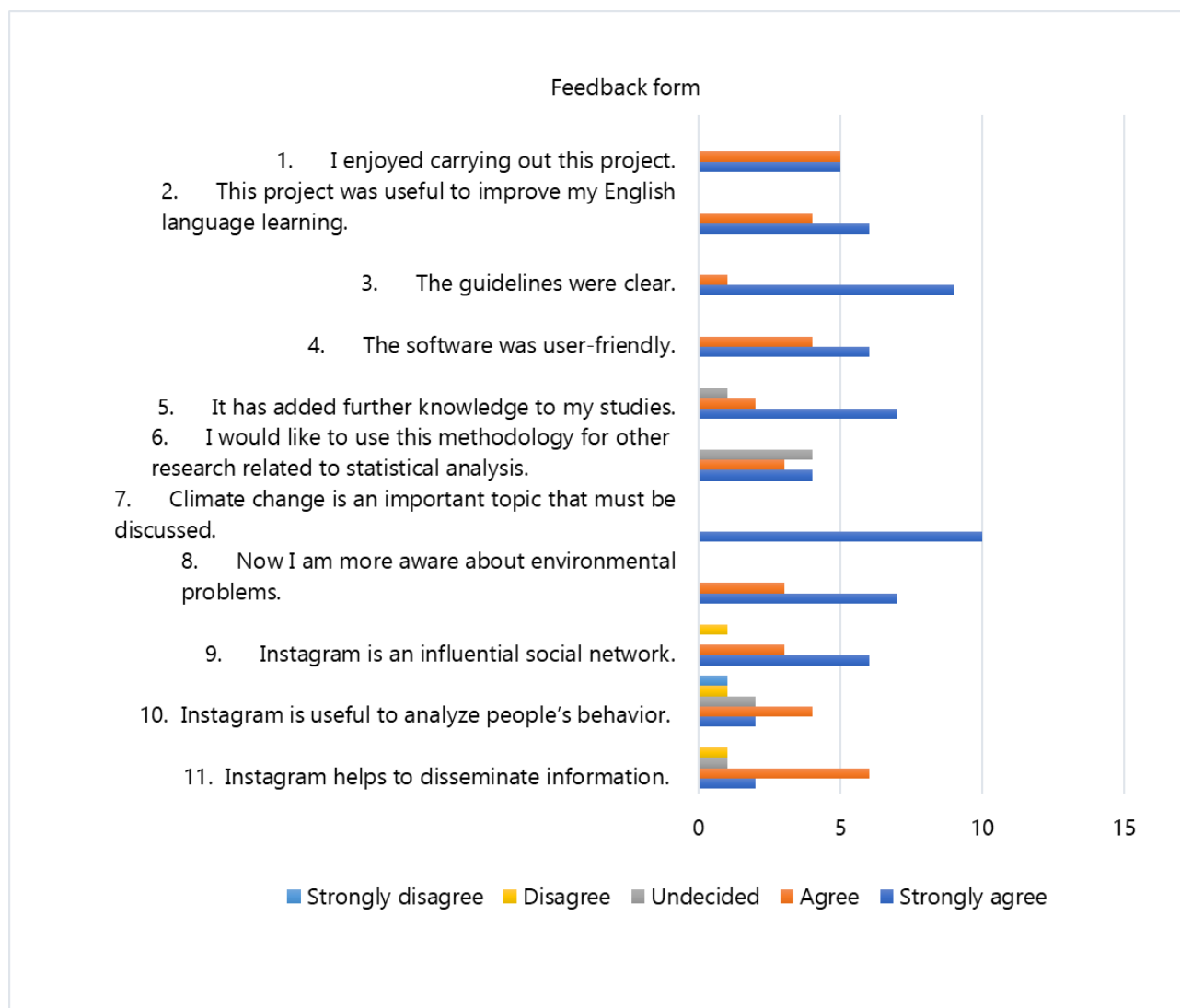


Fig. 2: Feedback form outcomes (raw figures)

With reference to the course evaluation, the first statement was meant to establish whether the students enjoyed carrying the project: 50 per cent strongly agreed and the other half agreed. The second statement aimed to find out whether the students thought that carrying out the

project was useful to improve their English language competence. In this case, 60 per cent of the students strongly agreed and 40 per cent agreed. Concerning the clarity of instructions and guidelines, 90 per cent strongly agreed and only 10 per cent agreed.

As for the second set of statements, 60 per cent of students strongly agreed that the software was user-friendly and 40 per cent agreed. Moreover, 70 per cent of students strongly agreed on the fact that carrying out this project added further knowledge to their studies in the field of Statistics, 20 per cent agreed and 10 per cent were undecided. As for the possibility of using the same methodological approach in combination to their studies, 30 per cent strongly agreed, 30 per cent agreed, and 40 per cent was undecided.

For questions dedicated to the topic of climate change, 100 per cent of the students believed climate change was an important topic that had to be discussed. In addition, 70 per cent of them strongly agreed their awareness of environmental problems had increased during the course and thanks to the project, and 30 per cent agreed.

In the last section related to the social media network Instagram, 60 per cent strongly agreed that Instagram is an influential social network, 30 per cent agreed and 10 per cent disagreed. A completely different scenario is presented when evaluating the usefulness of Instagram to analyze people's behavior. Indeed, 20 per cent strongly agreed, 40 per cent agreed, 20 per cent was undecided, 10 per cent disagreed and 10 per cent strongly disagreed. Similarly, only 20 per cent of the students strongly agreed that Instagram was a way to disseminate information, 60 per cent agreed, 10 per cent was undecided and another 10 per cent disagreed.

4. Discussion

To summarize the results, positive feedback was provided with reference to the course evaluation. Students had no difficulty in carrying out the project with the concordancing software *AntConc*. Indeed, some students were particularly inclined to put into practice their previous knowledge in Statistics when carrying out this research project and many of them integrated the analysis of their results with the use of other software tools such as *R*, which is a free software for statistical computing and graphics. The feedback form included a section for further comments where some students stated that the information they had retrieved was food for thought that could inform every day actions and that the smallest change could make the biggest difference. They also expressed some concern about the worsening of climate change impacts and stressed the importance of taking better care of the planet and making people more actively aware of the topic. Some appreciated the variety of contents posted and how politics engage with climate change. However, this study is limited by its setting and small number of

participants. Another limitation of the study is that it focuses on small corpora, thus, it would be beneficial to explore bigger corpora and involve a higher number of students.

As a project work, most of the activities and tasks were carried out individually and autonomously. It would be advisable for future research to focus on an in-depth sentiment analysis, including a prior annotation scheme and an agreement study based on the measurement of the reliability of the polarity annotation scheme (Wilson et al. 2005). Sentiment analysis is a natural language processing technique which focuses on the determination of people's opinions, sentiments, emotions, and attitudes towards products, services, organizations, individuals, issues, and topics (Zhang et al. 2018). Thanks to the vast amount of opinion data on the Web, such as on blogs and social networks, the interest in sentiment analysis has lately been rapidly increasing. This could spark students' interest in several issues and create more cooperation among them, and, as in this specific case, promote better understanding of climate change narratives.

5. Conclusions

Climate change is a fast-moving concept strictly related to time. The combination of these two words expresses a state of evolution. Since nothing related to the past can be changed, what really matters is the present situation and even more the future perspective.

European higher institutions have started moving forward including environmental education, sustainable development and climate change literacies as corroborated goals (Molthan-Hill et al. 2019). This article showed a possible way of introducing such an important topic in a university context involving a multidisciplinary approach. The teaching and learning approaches adopted in this case study may be taken into consideration and spread through Language Centers in order to develop further activities which may combine communicative language teaching and environmental education. As pointed out by Kopnina (2014; 2012), encouraging a positive change has become essential and it is doable by educating ecologically minded future generations in order to enable them to find a solution. The aim of environmental education in contributing to the development of a citizen who is “aware of, and concerned about, the environment and its associated problems, and who has the knowledge, skills, attitudes, motivations and commitment to work individually and collectively toward solutions of current problems and the prevention of new ones,” as defined by the Belgrade Charter (UNESCO–UNEP, 1976), is being complemented with the goals of education for sustainable development. Indeed, the United Nations Framework Convention on Climate Change (UNFCCC) introduced seventeen sustainable development goals (SDG) (IPCC 2018), and Target 13.3 specifically aims

at improving education while making students aware of climate change mitigation, adaptation, impact reduction and early warning (UNESCO 2021, 8).

Acknowledgements: I gratefully acknowledge funding from Regione Calabria for the doctoral scholarship.

Vanessa Marcella is Adjunct Professor at the University of Calabria, Italy. She has a Bachelor's degree in Linguistic Mediation, a Master's degree in Information Technology for Humanities, and is currently pursuing a PhD in Language Analysis and Interdisciplinary studies. Her research focuses on language variation in discourse use in relation to climate change in social-networking-based communications.

Works cited

- AGCOM. "Osservatorio sulle comunicazioni n. 2/2021." *Agcom.it* (2021).
<https://www.agcom.it/documents/10179/23499052/Documento+generico+12-07-2021/573032b9-d1c1-4aec-a316-1ab0e1844e47?version=1.0>. Last visited 23/06/2023.
- Anthony, Laurence. AntConc (Version 3.5.8) [Computer Software]. Tokyo: Waseda University, 2019. www.laurenceanthony.net/software. Last visited 20/01/2022.
- Aston, Guy. "Corpora and Language Teaching." *Rethinking Language Pedagogy from a Corpus Perspective: Papers from the Third International Conference on Teaching and Language Corpora*. Edited by Lou Burnard and Tony McEnery. Bern: Peter Lang, 2000. 7-17.
- . "Small and Large Corpora in Language Learning." *Practical Applications in Language Corpora* (1997): 51-62.
- Batterton, Katherine A. and Kimberly N. Hale. "The Likert Scale: What It Is and How to Use It." *Phalanx* 50.2 (2017): 32-39.
- Benford, Robert D. and David A. Snow. "Framing Processes and Social Movements: An Overview and Assessment." *Annual Review of Sociology* 26.1 (2000): 611-639.
- Biber, Douglas, Susan Conrad and Randi Reppen. *Corpus linguistics: Investigating Language Structure and Use*. New York: Cambridge University Press, 1998.
- Boulton, Alex. "Data-Driven Learning: The Perpetual Enigma." *Explorations across Languages and Corpora*. Edited by Stanislaw Gozdz-Roszkowski. Bern: Peter Lang, 2011. 563-580.
- . "Data-Driven Learning for Younger Learners: Obstacles and Optimism." *Data-Driven Learning for the Next Generation: Corpora and DDL for Pre-Tertiary Learners*. Edited by Peter Crosthwaite. New York: Routledge, 2019. 14-20.

- Borchers, Nils S. "Social Media Influencers in Strategic Communication." *International Journal of Strategic Communication* 13.4 (2019): 255-260.
- Chambers, Angela. "What is Data-Driven Learning?" *The Routledge Handbook of Corpus Linguistics*. Edited by Anne O'Keeffe and Michael McCarthy. Abingdon: Routledge, 2010. 345-358.
- Council of Europe. *Common European Framework of Reference for Languages: Learning, Teaching, Assessment*. Companion Volume with New Descriptors. Strasbourg: Council of Europe Publishing, 2018.
- Council of Europe, Council for Cultural Co-operation, Education Committee, Modern Languages Division, and Council of Europe. *Common European framework of Reference for Languages: Learning, Teaching, Assessment*. Cambridge: Press Syndicate of the University of Cambridge, 2001. http://www.coe.int/t/dg4/linguistic/CADRE_EN.asp. Last visited 10/03/2022.
- Dada, Deborah O., Chris Eames and Nigel Calder. "Impact of Environmental Education on Beginning Preservice Teachers' Environmental Literacy." *Australian Journal of Environmental Education* 33.3 (2017): 201-222.
- Entman, Robert M. "Framing: Toward Clarification of a Fractured Paradigm." *Journal of Communication* 43.4 (1993): 51-58.
- Feldman, Lauren and P. Sol Hart. "Is There any Hope? How Climate Change News Imagery and Text Influence Audience Emotions and Support for Climate Mitigation Policies." *Risk Analysis* 38.3 (2018): 585-602.
- Fløttum, Kjersti. "Linguistic Mediation of Climate Change Discourse." *ASp. La Revue du GERAS* 65 (2014): 7-20.
- Fløttum, Kjersti and Øyvind Gjerstad. "Narratives in Climate Change Discourse." *Wiley Interdisciplinary Reviews: Climate Change* 8.1 (2017): e429.
- Friginal, Eric. *Corpus Linguistics for English Teachers: Tools, Online Resources, and Classroom Activities*. New York: Routledge, 2018.
- Gavioli, Laura and Guy Aston. "Enriching Reality: Language Corpora in Language Pedagogy." *ELT journal* 55.3 (2001): 238-246.
- Halliday, Michael AK. "New Ways of Meaning: The Challenge to Applied Linguistics." *The Ecolinguistics Reader: Language, Ecology, and Environment*. Edited by Alwin Fill and Peter Mühlhäusler. London: Continuum, 2001. 175-202.
- Holec, Henri. *Autonomy and Foreign Language Learning*. Oxford: Pergamon Press, 1981.

- Hulme, Mike. *Why We Disagree about Climate Change: Understanding Controversy, Inaction and Opportunity*. New York: Cambridge University Press, 2009.
- Jang, S. Mo and P. Sol Hart. "Polarized Frames on 'Climate Change' and 'Global Warming' Across Countries and States: Evidence from Twitter Big Data." *Global Environmental Change* 32 (2015): 11-17.
- Jickling, Bob and Arjen EJ Wals. "Globalization and Environmental Education: Looking Beyond Sustainable Development." *Journal of Curriculum Studies* 40.1 (2008): 1-21.
- Johns, Tim. "Contexts: The Background, Development and Trialling of a Concordance-Based CALL Program." *Teaching and Language Corpora*. Edited by Anne Wichmann, et al. Harlow: Addison Wesley Longman, 1997. 100-115.
- . "Data-driven Learning: The Perpetual Challenge." *Teaching and Learning by Doing Corpus Analysis*. Edited by Bernhard Kettmann and Georg Marko. Leiden: Brill, 2002. 105-117.
- . "Should You Be Persuaded: Two Samples of Data-Driven Learning Materials." *ELR Journal* 4 (1991): 1-16.
- . "Whence and Whither Classroom Concordancing." *Computer Applications in Language Learning* (1988): 9-27.
- Johnson, Edward Arnold and Michael Mappin. *Environmental Education and Advocacy: Changing Perspectives of Ecology and Education*. Cambridge: Cambridge University Press, 2005.
- Kopnina, Helen. "Education for Sustainable Development (ESD): The Turn Away from 'Environment' in Environmental Education?" *Environmental Education Research* 18.5 (2012): 699-717.
- . "Revisiting Education for Sustainable Development (ESD): Examining Anthropocentric Bias Through the Transition of Environmental Education to ESD." *Sustainable Development* 22.2 (2014): 73-83.
- Lee, Francis LF, et al. "Affordances, Movement Dynamics, and a Centralized Digital Communication Platform in a Networked Movement." *Information, Communication & Society* 25.12 (2021): 1-18.
- Leech, Geoffrey N. "Introducing Corpus Annotation." *Corpus Annotation: Linguistic Information from Computer Text Corpora*. Edited by Roger Garside, Geoffrey N. Leech and Tony McEnery. London: Longman, 1997. 1-18.
- Little, David. *Learner Autonomy 1: Definitions, Issues, Problems*. Dublin: Authentik, 1991.

- Lovari, Alessandro and Chiara Valentini. "Public Sector Communication and Social Media: Opportunities and Limits of Current Policies, Activities, and Practices." *The Handbook of Public Sector Communication* (2020): 315-328.
- McCarthy, Michael and Ronald Carter. "Spoken Grammar: What is It and How Can We Teach It?" *ELT Journal* 49.3 (1995): 207-218.
- McEney, Tony, Richard Xiao and Yukio Tono. *Corpus-Based Language Studies: An Advanced Resource Book*. London: Routledge, 2006.
- Metag, Julia, et al. "Perceptions of Climate Change Imagery: Evoked Salience and Self-Efficacy in Germany, Switzerland, and Austria." *Science Communication* 38.2 (2016): 197-227.
- Molthan-Hill, Petra, et al. "Climate Change Education for Universities: A Conceptual Framework from an International Study." *Journal of Cleaner Production* 226 (2019): 1092-1101.
- Niepold, Frank, David Herring and David McConville. "The Role of Narrative and Geospatial Visualization in Fostering Climate Literate Citizens." *Physical Geography* 29.6 (2008): 529-544.
- Painter, James, Silje Kristiansen and Mike S. Schäfer. "How 'Digital-Born' Media Cover Climate Change in Comparison to Legacy Media: A Case Study of the COP 21 Summit in Paris." *Global Environmental Change* 48 (2018): 1-10.
- Schäfer, Mike S. and Saffron O'Neill. "Frame Analysis in Climate Change Communication: Approaches for Assessing Journalists' Minds, Online Communication and Media Portrayals." *Oxford Encyclopedia of Climate Change Communication*. Edited by Matthew Nisbet, et al. New York: Oxford University Press, 2017. n/a.
- Stapp, William B. "The Concept of Environmental Education." *Journal of Environmental Education* 2.1 (1969): 33-36.
- Taylor, Dorceta E. "The Rise of the Environmental Justice Paradigm: Injustice Framing and the Social Construction of Environmental Discourses." *American Behavioral Scientist* 43.4 (2000): 508-580.
- Touri, Maria and Koteyko, Nelya. "Using Corpus Linguistic Software in the Extraction of News Frames: Towards a Dynamic Process of Frame Analysis in Journalistic Texts." *International Journal of Social Research Methodology* 18.6 (2014): 601-616.
- UNESCO-UNEP. *The Belgrade Charter: A Global Framework for Environmental Education*. Belgrade: International Environmental Education Workshop, 1976.
- UNESCO. *Education for Sustainable Development: A Roadmap*. Paris, 2021. <https://unesdoc.unesco.org/ark:/48223/pf0000374802>. Last visited 09/02/2022.

Wilson, Theresa, Janyce Wiebe and Paul Hoffmann. "Recognizing Contextual Polarity in Phrase-Level Sentiment Analysis." *Proceedings of Human Language Technology Conference and Conference on Empirical Methods in Natural Language Processing* (2005): 347-354.

Yuen, Samson and Gary Tang. "Instagram and Social Capital: Youth Activism in a Networked Movement." *Social Movement Studies* (2021): 1-22.

Zhang, Lei, Wang Shuai and Liu Bing. "Deep Learning for Sentiment Analysis: A Survey." *Wiley Interdisciplinary Reviews: Data Mining and Knowledge Discovery* 8.4 (2018): e1253.