Analysing the Functionality of Twitter for Science Dissemination in EFL Teaching and Learning

Análisis de la utilidad de Twitter para la divulgación científica en la enseñanza y aprendizaje del inglés como lengua extranjera

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Communication through social media is a phenomenon whose relevance has involved the consideration of online discourse in the language teaching context. This article explores the functionality of Twitter (now called "X") for science dissemination within the teaching and learning of English as a foreign language. To do this, 100 tweets from the accounts @WWF and @Greenpeace were gathered and analysed from the perspective of digital discourse analysis and communicative language teaching. I argue that using these tweets encourages the development of key competencies, provides room for the practice of integrated skills, and enhances the application of 21st-century skills. Conclusively, science dissemination tweets may be considered adequate for teaching and learning English.

Keywords: English as a foreign language, language teaching, multimodality, online discourse, Twitter

La comunicación en redes sociales es un fenómeno cuya relevancia ha supuesto la irrupción del discurso en línea en la enseñanza de idiomas. Este artículo explora la funcionalidad de Twitter (ahora conocida como "X") como medio de divulgación científica en el contexto de la enseñanza y aprendizaje del inglés como lengua extranjera. Para ello, se seleccionaron y analizaron 100 tuits de las cuentas @WWF y @Greenpeace desde la perspectiva del análisis del discurso digital y del método comunicativo. Así, se argumenta que este tipo de textos puede favorecer el desarrollo de competencias clave del siglo XXI y el trabajo de destrezas lingüísticas. Se concluye que los tuits de divulgación científica pueden constituir una herramienta adecuada para la enseñanza y aprendizaje del inglés.

Palabras clave: enseñanza de idiomas, discurso en línea, inglés como lengua extranjera, multimodalidad, Twitter

Introduction

The English as a foreign language (EFL) teaching and learning scenario has been subject to many changes in the last decades as regards the type of materials, methods, or competencies used and promoted in the classroom. One of the most significant variations in this context has been the establishment of communicative competence as the aim of learning English (Richards, 2006). There have been several attempts to incorporate diverse means and methods that could facilitate the acquisition process (Lightbown, 2003), within which the introduction of digital technologies and the promotion of students' information and communication technology (ICT) competence constitute a perfect example of such an innovative tendency (Dudeney & Hockly, 2007). This tendency to foster technological practices in the EFL context has resulted in an increasing need for further in-depth analyses concerning the educational use of technology, for example, the possible applications of social media as teaching and learning tools. To contribute to this study gap, this paper delves into the potential of Twitter—a microblogging digital platform—as an EFL teaching and learning tool, focusing on the functionality of science dissemination tweets and the applicability of its main affordances (e.g., multimodality and hyperlinking) for this purpose. To carry out this analysis, the present study is framed within the normative context of Spanish secondary education, specifically of the autonomous community of Aragón.[1]

What Characterises EFL Teaching and Learning Today?

The character of English as an indispensable vehicle for global communication has meant the consolidation of this language as a basic learning area in most educational curricula worldwide. Such educational perspective is rooted in the belief that second/foreign language (L2) learners need to develop what Hymes (1972) termed "communicative competence," that is, the ability to use the L2 as it is done in real-life communication. This interest in communication skills led, in the 1970s, to the development of communicative language teaching (CLT), an approach to language teaching aimed at fostering learners' communicative competence, which ousted traditional grammatical approaches (Spada, 2007).

Adopting a communicative approach resulted from the rising importance of communication in second language acquisition (SLA) studies (Dörnyei, 2009; Lightbown, 2003). This explains the alignment of CLT with the eleven principles of instructed SLA proposed by Ellis and Shintani (2014).[2] Out of these principles, scholars have widely considered Principle 6 (the need for input exposure), analysing whether L2 input should come from interaction (Gass, 2013) or authentic materials (Guo, 2012).

With the importance of input, scholars (Kaur, 2019; Luís, 2017) have also considered the digitalisation of teaching materials and its connection with the rapid expansion of technologies in society and education (Hashim, 2018; Selwyn, 2012). In this sense, teenagers' familiarity with Web 2.0 and their tendency to use social media to communicate (Lenhart et al., 2010) suggests that these platforms could be appropriate teaching tools, especially when dealing with secondary school students (Faizi et al., 2013; Greenhow & Lewin,

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1 The legal framework considered in this study is (a) the Spanish national educational law, i.e., the LOMLOE (Ley Orgánica 3, 2020)—which stands for the organic law which modifies previous law, LOE—and (b) its Aragonese adaptation in the autonomic legislation (Orden ECD/1172, 2022) and *Curriculum for English as Foreign Language* (Anexo II, Orden ECD/1172, 2022).

2 These principles state that SLA instruction needs to ensure that learners (1) develop both a rich repertoire of formulaic expressions and a rule-based competence and focus on (2) meaning and (3) form; that it should (4) be predominantly directed at developing implicit knowledge of the L2 while not neglecting explicit knowledge, and (5) take into account the order and sequence of acquisition; that it requires (6) extensive L2 input and (7) opportunities for output; that (8) interaction in the L2 is central to developing L2 proficiency; that instruction needs to take account of (9) individual differences in learners and (10) the fact that there is a subjective aspect to learning a new language; and that (11) in assessing learners' L2 proficiency, it is important to examine both free and controlled production.

2016). In the case of Spanish higher education, such a hypothesis relates to the emphasis of the Spanish curriculum on promoting students' digital competence and ICT literacy (Spante et al., 2018). This emphasis results from global concerns to guide young Internet users in their use of digital platforms, which materialised in the establishment of digital competence as one of the key competencies recognised by the Council of the European Union in May 2018.

The extended digitalisation of society has required schools to develop "strategies to support the digital competences needed for providing high quality teaching and learning" (Pettersson, 2018, p. 1006). In this sense, language teaching seems to be an educational area considerably inclined towards computer-mediated communication or CMC (Ihnatova et al., 2021). Because of this, introducing digital platforms in the EFL classroom would require educators to become digitally competent to choose digital teaching materials appropriately (Johannesen et al., 2014). Therefore, in the understanding of digital competence as "the set of knowledge, skills, attitudes, abilities, strategies and awareness that are required when using ICT . . . and digital media" (Ferrari et al., 2012, p. 84), both teachers and students need to become acquainted with the theoretical perspectives related to CMC, such as digital discourse (Barton & Lee, 2013; Herring, 2019), multimodality (Page, 2009; Jewitt et al., 2016), or hyperlinks (Vaughan, 2016; Wood & Smith, 2004).

Because of students' recurrent use of digital platforms, some studies have examined social media applications within the classroom context (Lambton-Howard et al., 2021; Selwyn & Stirling, 2016). One of the platforms considered in this sense is Twitter,[3] a

microblogging service launched in 2006 in which users interact with each other by posting 280-maximum-character messages called *tweets*. Apart from its educational potential (Denker et al., 2018), Twitter "has integrated itself into [other] important domains of social life such as journalism, public communication, politics and activism" (Zappavigna, 2017, p. 206). One of these specific domains is that of science dissemination: the process of distributing scientific specialised knowledge within a non-specialised context, for which Twitter has recently functioned as a means for the global transfer of information and the sharing of academic publications and papers via hyperlinks (Ortega, 2017; Paradis et al., 2020). Within science dissemination, there exists a plethora of research concerned with the diffusion of findings related to biological and environmental issues (Giannarakis et al., 2016; Scott, 2000), a field in which social media play a crucial role in "alerting people about environmental damages, corporate failure to meet its legal obligations, truthful analysis of new legislations and steps for protection and preservation of environments" (Kushwaha, 2015, p. 1). Such awareness constitutes a crucial element in present-day educational policies, given their alignment with the Sustainable Development Goals of the Agenda 2030 (2015) proposed in the UN 2015 New York Summit in which a world of equality, justice, and non-discrimination was envisaged (Agirreazkuenaga, 2020).

Within this scenario of teaching and learning English, two research questions guide this inquiry:

- RQ1: How do Twitter features and affordances in the context of science dissemination relate to curricular requirements regarding EFL teaching?
- RQ2: How could the Twitter features used for science dissemination be applied in an EFL context to promote students' communicative competence and L2 acquisition while

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3   In October 2022, the microblogging platform was purchased by the South African entrepreneur Elon Musk, under whose ownership the platform has been subject to several functional and layout changes. One of the most significant modifications is renaming the platform into "X"; thus, tweets are now called "posts". However, I decided to keep the terms "Twitter" and "tweet(s)" in this paper, considering that both the corpus gathered and analyses carried out date back to the first semester

of 2022, that is, before any relevant change in the platform had been implemented.

responding to curricular demands on integral development?

To answer these research questions, this paper first explores the connection between using science dissemination tweets for EFL teaching and learning and fostering students' integral development. After this, it examines the potential the tweets have to foster reading and writing skills, specifically focusing on vocabulary and grammar. Finally, it studies their functionality to foster students' multimodal awareness and the integrated practice of linguistic skills.

Method

This paper is the second part of a two-fold analysis. In the first part of such analysis, a closed number of science dissemination tweets was set as the object of a generic analysis identifying the characteristics of science dissemination tweets. In the second part, which is the object of the present study, an analysis of the potential of tweets from a pedagogical point of view is undertaken following two criteria. First, I analysed the connection between the content in the tweets and the key competencies for lifelong learning established by the European Council and adopted in the Aragonese curriculum. It was considered whether the topics addressed and the (verbal or visual) form in which they were presented could be used to practice any key competencies. Second, the hyperlinks and linguistic and multimodal features identified in the generic analysis contrasted with the compulsory content items that, according to the Aragonese curriculum, must be taught each academic year to develop each language skill (listening, reading, speaking, and writing). Thus, I manually checked whether each generic feature identified fell into one or many curricular content items for the four secondary school years.

The choice of tweets as the object of analysis was motivated by the fact that, nowadays, younger generations are often qualified as digital natives (Palfrey & Gasser, 2011). The focus on science dissemination

within Twitter was due to the primal importance given in the European educational field to scientific topics, in general, and environmental issues, in particular, given the connection of educational plans with Sustainable Development Goals 11, 13, 14, 15, and 17 of the Agenda 2030 promoted by the United Nations. In this line, to explore the use of Twitter in the EFL classroom, I selected two international accounts that address environmental issues and use English as the primary language for their international publications: the accounts of the international non-governmental organisation World Wildlife Fund (@WWF) and the global campaigning corporation network Greenpeace (@Greenpeace). Despite their thematic similarities, these organisations implement considerably different tactics to address environmental issues. While Greenpeace—founded in 1971—primarily operates as a denouncing campaigner independent from companies' actions, WWF—founded in 1961—tends to work alongside companies to fight the environmental crisis.

Selection of the Corpus

Regarding selection methodology, 100 tweets were manually gathered by taking screenshots from a computer. As my interest was to focus on two specific Twitter accounts in a certain period, I manually selected 50 tweets per account following numerical and chronological criteria. The compilation of tweets started on February 16th, 2022, and the tweets were collected, going backwards in time until the set number was reached. The combination of chronological and numerical criteria catered for the significant difference in publication frequency between both accounts: While the timespan of WWF's selected tweets goes from January 1st to February 16th, Greenpeace's only covers from February 11th to February 16th. All tweets were extracted from the section "Tweets and replies," excluding retweets to focus on Twitter content specifically produced by the accounts.

Results and Discussion

The findings gathered in the previous generic analysis of tweets for science dissemination led to insights regarding the exploitation of the corpus for EFL teaching and learning in the context of Spanish secondary education. Such insights and their implications conform to this section, divided into four subsections that present four possible ways of exploiting the corpus: (a) to foster students' integral development, (b) to teach written comprehension and production, (c) to teach vocabulary and grammar, and (d) to practice integrated skills using multimodality.

Fostering Students' Integral Development

The generic analysis of the corpus (Sancho-Ortiz, 2022) resulted in this paper by opening up the possibility of exploring the potential applications of science dissemination tweets in EFL teaching and learning. One of the critical aspects identified in that generic analysis is the constant address of environmental and social issues. This somehow relates to a growing interest in the European context in renovating environmental policies and the resulting effort in the educational community to make students aware of the importance of their role in the environmental crisis (Bayrhuber & Mayer, 2000). The promotion of students' awareness as regards globally relevant issues can also be linked with another policy change experienced in the educational field: the formulation of the key competencies recognised by the European Council in May 2018 and the 21st-century skills established in the KSAVE (Knowledge, Skills, Attitudes, Values, and Ethics) model (Binkley et al., 2012). The key competencies and students' awareness of global responsibility are fundamental to their development as competent human beings. Under this premise, and considering the topics addressed in the tweets gathered, the first insight in this paper shows that EFL teachers can take the corpus as a productive source of material through which to promote students' development of

21st-century skills and key competencies advocated for in new European educational policies—also considered as crucial educational requirements in the Aragonese curriculum within the Spanish framework.

Among the different competencies to foster, the most apparent connection in content comes with developing mathematical and scientific competence, as students may need to interpret scientific data and terminology from environmental issues. For such interpretation, students must uphold a critical analytical position, believed to be the essence of critical thinking, one of the skills included in the KSAVE model. See, for instance, Figure 1. Based on this image, students could be asked to reflect on the tweet's statistical data (percentages) and hypothesise the reasons behind the amount of plastic reaching the ocean through rivers.

Figure 1. WWF's Tweet about Plastic Pollution

Apart from the mathematical competence, reflecting on the origin of a specific environmental problem—such as plastic pollution in Figure 1—could enhance students' entrepreneurship competence, as they could be asked to devise solutions for such issues. This would require them to be creative and innovative, two skills of the KSAVE model that constitute entrepreneurship competence. Another connection is that to achieve their science dissemination purposes and promote active participation in their causes; the two accounts emphasise the sense of belonging to a global community, which establishes links with socio-civic competence and the sense of citizenship and social responsibility of the KSAVE model. Moreover, all these reflective tasks would become efficient means to both promote the linguistic communication competence—inherent in any English course—and introduce a communicative approach to English teaching, as students would be focusing on negotiating meaning rather than on merely learning grammatical aspects (Ellis & Shintani, 2014). Similarly, using authentic data in a digital format (tweets) in a classroom context entails that students would work on their digital competence and the use of ICTs by learning to find, critically analyse, and process information through a digital platform such as Twitter—all of which is given considerable relevance within the KSAVE model (Binkley et al., 2012).

In addition to connecting with key curricular competencies and 21st-century skills, science dissemination tweets may have further applications, such as addressing identity issues related to the social and personal development of the learner. The generic analysis of the corpus (Sancho-Ortiz, 2022) demonstrates that, despite their scientific and, therefore, theoretically neutral nature, the WWF and Greenpeace accounts sacrifice scientific objectivity in their tweets to embody their corporative principles and raise environmental issues to public knowledge. In this way, they gain support and active participation from their audience. By pointing to these objectivity alterations in the classroom, teachers could make students face biased or intentionally charged texts so that they understand, first, that not everything they read online is necessarily true and, second, how the stance of the author determines the way readers perceive information, that is, understand the pragmatic dimension of the communicative competence (Canale & Swain, 1980). Similarly, science dissemination tweets could promote students' reflection on their use of social media, including creating an online identity and the reliability of information. This would entail designing teacher-guided activities considering the age limitation of the platform—above 13 years old—to gradually introduce students to the dynamics of online communication while highlighting the risks of consuming biased content, contacting malicious users, or posting personal content to an audience of millions. The issue of beyond-the-text meaning found in online discourse relates to this paper's second insight: the potential of science dissemination tweets to teach written comprehension and production.

Teaching Written Comprehension and Production

The second insight derives from the connection between the processes undergone by EFL students and Twitter users when consuming and producing texts. Concerning text consumption, a similarity has been found regarding the pre-reading requirements faced by students and Twitter users and the resulting impact that these have in choosing specific reading skills to decode texts. In the same way that Twitter users have a clear purpose before they choose a tweet to read—seeking specific information, acquiring general knowledge, or being entertained (Zhang & Duke, 2008)—EFL learners need a clearly stated purpose to succeed in reading tasks (Knutson, 1997). Having been shown that "purpose affects the reader's motivation, interest, and manner of reading" (Knutson, 1997, p. 49), bringing Twitter into the classroom context could make students realise that the goal-oriented selecting process they go through as

social media users is precisely the same procedure they need to follow as L2 learners in their reading tasks. Another aspect in which Twitter users and L2 students coincide is their need to identify the author's stance to avoid biased content—in the case of Twitter users—and successfully understand a text—as for L2 learners. In this context, science dissemination tweets could be handy tools to evidence the importance of an authorial stance. This results from the fact that taking advantage of the semiotic nature of Twitter (Zappavigna, 2017), the WWF and Greenpeace accounts consciously exploit multimodality to engage the intended audience in their denouncing and informative messages and reach their disseminating purposes more easily (Sancho-Ortiz, 2022). For example, Figures 2 and 3 could be shown to students to demonstrate that both the WWF and the Greenpeace accounts resort to the first-person plural ("our" or "we") and emoticons (sad face and clapping hands) to stress the need for urgent global cooperation, and thus, make their audience feel directly involved in the issues addressed.

Figure 2. WWF's Tweet on Deforestation

Considering the similarities concerning written comprehension, it could be argued that bringing into the classroom those reading practices that EFL students typically carry out outside—such as consuming tweets—

Figure 3. Greenpeace's Tweet About Ocean Protection

could teach them how to read more comprehensively and become competent internet users. This latter idea of educating competent users relates to the curricular requirement of fostering students' digital competence by teaching them how to filter information in the digital net. This translates into making students aware, first, of their exploitation of digital affordances such as hashtags as information sources and, second, of the risks of not using these digital means critically, thus contributing to developing critical thinking skills.

Apart from the similarities regarding reading, a parallelism has been found in the steps followed by Twitter users and EFL learners to produce texts.

Within the last decades, the context of EFL teaching has experienced significant changes as regards the conception of writing proficiency (Hasan & Akhand, 2010). These changes primarily derive from a shift from evaluating writing as a product to conceiving it as a process (Brown & Lee, 2015) subdivided into five phases—pre-writing, drafting, revising, editing, and publishing (McKensie & Tomkins, 1984)—which, to a certain extent, coincide with the steps official accounts in Twitter are expected to follow when posting a tweet. In this sense, both L2 students who are instructed in the process-writing approach and the users of official Twitter accounts have a pre-writing stage in which they plan the topic they will address in their writing and consider the resources available to do so. Similarly, Twitter could enhance the importance of the drafting, revising, and editing stages, as the platform allows users to save their messages as drafts and edit them as many times as needed before sharing them. Therefore, students could replicate these steps when composing a text in the L2 and posting a tweet. Such imitation practice would also prove the significance of publishing as a necessary stage by demonstrating to students that, in essence, every text is written to be published—either through a social networking site where it is shared with an audience of millions or in an English classroom, where the teachers and classmates become the audience.

Adding up to their potential to enhance the importance of conceiving writing as a process, science dissemination tweets could be used to provide students with guided opportunities for output production—one of the core principles of SLA (Ellis & Shintani, 2014) and CLT (Brown & Lee, 2015; Lightbown, 2003). In this context, the tweets could function as a model or WAGOLL (What a Good One Looks Like) for scaffolding to facilitate students' task of crafting their tweets. By doing this, students would understand that regardless of the apparent informality of a text and as claimed in genre theory (Bhatia, 1993), every text belongs to a specific genre and, as such, presents a series of generic features that define it. Moreover, by analysing and producing tweets, students would practice their multimodal competence and become aware of mode convergence's implications when making meaning, an aspect of digital literacy essential for present-day communication (Kalantzis & Cope, 2015).

Teaching Vocabulary and Grammar

The connection between the real-life content of the tweets and the topics addressed in an EFL classroom not only allows teachers to foster key competencies and 21st-century skills but also makes the tweets an enriching source of authentic L2 materials to teach vocabulary and grammar. Exposure to authentic L2 input constitutes one of the core principles of CLT and SLA, for it adds to the establishment of meaning and real-life communication aims as the basis of the learning process (Richards, 2006). Knowing this, Twitter could be considered a specifically productive source of vocabulary items because its constantly updated content presents unlimited examples of useful vocabulary (Sancho-Ortiz, 2022). In the case of science dissemination tweets, these texts' scientific and specialised nature endows their vocabulary with a certain degree of complexity that might be difficult to handle at certain educational stages. However, as tweets primarily aim to disseminate knowledge, it is taken for granted that their authors will try to adapt the register and complexity of their explanations to the knowledge of their non-specialised audience, facilitating the decoding and inferring processes students undergo to understand the L2 message. Apart from this, the generic analysis of the corpus shows that most tweets are examples of multimodal ensembles that include images and emojis whose function is to rephrase textual meaning. Such a multimodal nature might also simplify the decoding process as learners could rely on the visual mode to understand the meaning of specific words. This is only plausible when vocabulary appears in a specific context, a highly recommendable strategy when teaching vocabulary (Brown & Lee, 2015). For

example, in Figure 4, the photo of a person in a location full of plastic waste is included to ensure the reader understands the meaning of the sentence "Turkey is not a plastic dump!"

Figure 4. Greenpeace's Tweet About Plastic Dumpsites
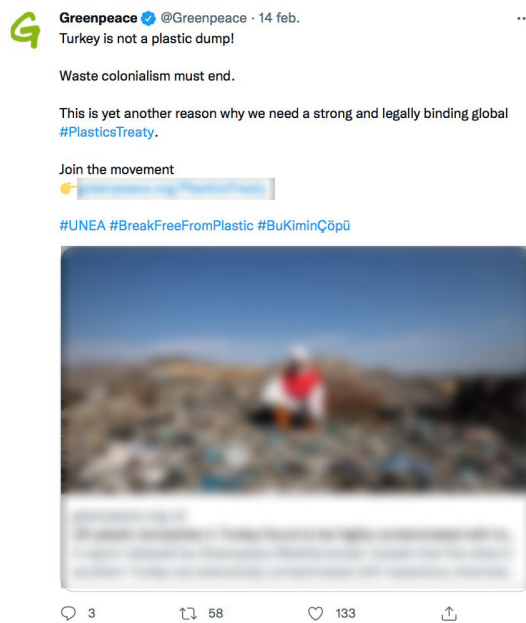
By relying on images to infer meaning, students would be working on their visual literacy while practising pre-reading strategies and complying with the requirements of CLT: They will be both focusing on meaning negotiation (Ellis & Shintani, 2014) and avoiding literal translation, a learning practise generally used in traditional methodologies which at times is believed to hinder students' reasoning process (Ellis & Shintani, 2014). In the same way that seeing lexical items in an authentic context of use can facilitate learning for L2 students, exposure to various actual grammar forms can allow them to understand the abstract theoretical notions explained in the classroom regarding the function and formation of verbal tenses. In the case of the scientific dissemination tweets, the generic analysis demonstrated a predominance of verbs

in the indicative mood, mainly present and past tense. Thus, this type of tweet could explain the differences between and functions of such verbal forms. Thereby, students could be asked to reason why these scientific texts use present tenses and the implications this has as regards objectivity. This reasoning process would relate to the development of scientific competence.

Teaching Multimodal Awareness: A Means to Practice Integrated Skills

The presentation of grammar and vocabulary in context is not the only issue related to analysing English teaching and learning materials. Indeed, many studies (Hanifa, 2018; Rodrigues, 2015) have examined the role of textbooks in teaching and learning dynamics and the possible risks of using them ineffectively. In this sense, the last insight in the present paper shows the resemblance between the design of textbooks as inherently multimodal teaching tools and science dissemination tweets as texts with conscious exploitation of multimodality to make meaning (Sancho-Ortiz, 2022). In the last decades, there has been an increase in the use of visual images in English textbooks (Kress & van Leeuwen, 2021) and a change in the conception of written pages as visual rather than verbal units (Bezemer & Kress, 2010), which have allowed for the potential of textbooks' multimodal nature to be considered within the teaching context (Mushtaq et al., 2022). Despite this preference for multimodal designs and the belief of some that textbooks are fundamental elements in language teaching (e.g., Cunningsworth, 1995), textbooks might be perceived as inefficient material sources that fail to consider the complexity of language learning and the heterogeneity of students' individual needs (Allwright, 1981). Hence, introducing innovative materials extracted from multimodal digital platforms and designing tasks oriented to enhance students' multimodal awareness and literacies (Kalantzis & Cope, 2015) seem to be effective solutions to the inconveniences of textbooks. This would entail taking students' self-taught ICT competencies,

which derive from their knowledge of social media and networking sites, as the initial step to developing linguistic competence.

Concerning the functionality of the science dissemination tweets to teach multimodal awareness, the corpus analysis (Sancho-Ortiz, 2022) proves that the WWF and Greenpeace accounts conveniently use mode convergence to reach their disseminating purposes. Accordingly, to practice multimodal awareness, students could be required to identify the reason why each tweet introduces specific visual elements (e.g., emojis), specialised scientific terms (e.g., "plastic pollution"), or a precise organisation of content in different paragraphs. Asking students to analyse aspects such as the choice of vocabulary (verbal mode), images (visual mode), or a specific layout (spatial mode) would allow them to reflect on the purpose behind mode convergence and become aware of the importance of identifying multimodal patterns when consuming online content.

When approached from the perspective of multiliteracies, the examples of multimodality found in science dissemination tweets can also serve to practise integrated skills in the EFL classroom. Understanding that learners make and process meaning in different modes, languages, and discourses (Kalantzis & Cope, 2015) entails that they should be confronted with a wider variety of communication forms than those offered in traditional textbooks. This will allow lessons to comply more easily with the CLT tenet of integrated skills since, through digital multimodal texts, students would be exposed to varied meaning-making modes. For example, the previous generic analysis of the corpus shows that many tweets contain images or emojis that reinforce the verbal message and, thus, can be used to teach vocabulary. These same visual elements can also promote discussion activities about the design of such images or the topics addressed, fostering both speaking and the development of students' visual literacy.

Similarly, given the interactive nature of the platform, students could simultaneously practice reading and writing by being asked to craft their responses to the tweets as if they were Twitter users. For such writing, they would have to consider the platform's affordances (e.g., character constraint or the use of hashtags), so they would work on their digital competence while exploring generic conventions. Figure 5 is an example of a tweet that may be used for a reading-writing activity: Students would have to first read the tweet's content and the video and then write their own tweet about their city, arguing whether it is plastic smart or not.

Figure 5. WWF's Tweet on Plastic Smart Cities

In the case of Figure 5, the video included has no sound and, therefore, could not be specifically used to practice listening skills. However, many other tweets containing videos with music and oral explanations could become the object of listening activities. Students could be asked to watch the video and orally comment on it to practise listening and speaking or to answer a series of written questions about the clip to practice writing. Apart from this, as multimodal ensembles themselves, some videos also contain examples of the gestural mode, which express significant paralinguistic meanings that students need to be aware of according to curricular demands. Similarly, these videos make very innovative use of spacing and visual elements such as colours, as in Figure 5, in which WWF probably avoids

placing the message in the middle of the image to give prominence to the picture of the earth. In the case of this tweet, to work on their visual and digital literacies, students would have to reflect on the choice of yellow as the colour for input enhancement, the realism of the earth image, and the way light and shade are used to direct the viewer's attention to the verbal and visual elements.

Not only is the multimodal format of science dissemination tweets advantageous for students in their practice of integrated skills but also for teachers in their need to adapt to students' individual needs. In this sense, there exists a parallel between the way science dissemination Twitter accounts (@WWF and @Greenpeace) use mode convergence to reach a heterogenous audience as broad as possible and the way teachers resort to varied materials containing different semiotic modes to respond to their students' learning styles and needs. Although, as has been previously said, textbooks do rely on mode convergence to facilitate learning, one single tweet can contain the same information expressed—and sometimes extended—in (multimodal) ways that students are more accustomed to consuming. This can be seen in Figure 5, where the information in the hashtag #StopPlasticPollution is rephrased through the stop sign and water glass emoji. Tweets seem likely to provide teachers with diverse ideas to address specific topics according to major learning styles. These include designing tasks based on producing tweets for kinaesthetic learners, listening activities with videos for auditory learners, and analysing visual elements for visual learners.

The visual layout of tweets can also serve to design activities for students with specific educational needs (SEN). For instance, the paraphrasing function of emoji (Figure 5) might allow students with autism spectrum disorder to learn the meaning of certain words more easily, given their enhanced visual processing abilities (Alnemr, 2022). Similarly, by presenting input in different formats (e.g., visually synthesising images as

the plastic dump in Figure 4) and using short-length tweets, students with language-related disabilities, such as developmental language disorder and dyslexia, would better understand complex abstract notions (e.g., plastic pollution). The multimodal dynamism characterising tweets can thus be a productive means to enhance students' multimodal awareness and visual literacy, facilitate integrated skills practice, and adapt materials to students' needs.

Overall, science dissemination tweets seem to be highly productive in EFL teaching and learning as they provide students with authentic and updated materials to enhance their communicative competence. Not only does the content and digital format of the tweets allow for students' personal development—which includes the acquisition of key competencies and 21st-century skills—but it also facilitates the understanding of formal linguistic aspects (vocabulary and grammar) and the practice of communicative skills (either relying on multimodal elements or focusing on individual skills such as reading or writing).

Conclusions

The English teaching and learning scenario has experienced several changes in the last decades, favouring innovative sources for teaching materials, such as social networking platforms. Bearing this in mind, this study has analysed whether science dissemination Twitter accounts could be used as English teaching and learning tools in the present-day EFL context. One specific aspect observed in this analysis is the utility of these accounts as a means for students to explore the pragmatic and sociolinguistic dimensions of online communication and fully develop their communicative competence. This paper has proved that not only does this type of text facilitate the acquisition of students' communicative competence by providing them with opportunities to practice varied linguistic skills using authentic materials, but it also enhances their personal development given the digital format of the tweets and

the global and transversal nature of the environmental topics addressed in them. The introduction of these tweets in the EFL classroom, thus, contributes to the overall purpose of education, that is, to make students competent and civic citizens of the world, as working with these posts requires them first to learn how to be critical users of a digital platform, and second, become aware of their role in hindering the consequences of climate change.

This paper has also shown that the multimodal nature of science dissemination tweets plays a fundamental role in promoting students' communicative competence as it allows them to practice communicative skills in an integrated manner. Similarly, the consideration of digital multimodal texts (tweets) from a pedagogical perspective shows how working on mode convergence in the EFL classroom could entail the dismantlement of the assumption that teaching a language is a purely linguistic phenomenon. This involves considering and making students reflect on how different modes (namely the verbal and visual) are used in this—and other—digital platforms to compensate for the limitations of online communication (e.g., character constraints or the absence of instant feedback). Fostering multimodal awareness would also entail addressing students' multiliteracies, as this awareness serves as a means to introduce students to the multiplicity of communication channels found in present-day communication and the integration of diverse cultural perspectives seen in the broad scope of social media audiences. Apart from this, despite some slight considerations introduced in this paper, it is yet to be further explored in greater detail how the multimodal nature of Twitter might or might not be adequately effective for EFL teaching to students with SEN.

In all, this study has proved that science dissemination tweets can be productively exploited to teach and learn English as they open up the possibility to work on crucial 21st-century skills such as digital literacy and multimodal competence, in which students will need to be fully competent by the end of their learning process to face their professional future. Thus, it contributes to making students understand that mastering a language requires dealing not only with textual information but also with the contextual and paralinguistic aspects that interrelate in any communicative situation. For further research, it would be interesting to consider how Twitter (or other social media) users exploit online discourse and digital media to deal with other topics outside the context of science dissemination. Moreover, whether these topics should or should not be brought into the EFL classroom to facilitate students' acquisition process will also need to be discussed.

References

Agirreazkuenaga, L. (2020). Education for Agenda 2030: What direction do we want to take going forward? *Sustainability*, *12*(5), 2035. https://doi.org/10.3390/su12052035

Allwright, R. L. (1981). What do we want teaching materials for? *ELT Journal*, *36*(1), 5–18. https://doi.org/10.1093/elt/36.1.5

Alnemr, M. (2022). Academic learning strategies for students with autism. *International Journal of Novel Research in Education and Learning*, *9*(6), 10–13. https://doi.org/10.5281/zenodo.7335425

Barton, D., & Lee, C. (2013). *Language online: Investigating digital texts and practices*. Routledge. https://doi.org/10.4324/9780203552308

Bayrhuber, H., & Mayer, J. (Eds.). (2000). *Empirical research on environmental education in Europe*. Waxmann.

Bezemer, J., & Kress, G. (2010). Changing text: A social semiotic analysis of textbooks. *Designs for Learning*, *3*(1–2), 10–29. https://doi.org/10.16993/dfl.26

Bhatia, V. K. (1993). *Analysing genre: Language use in professional settings*. Routledge. https://doi.org/10.4324/9781315844992

Binkley, M., Erstad, O., Herman, J., Raizen, S., Ripley, M., Miller-Ricci, M., & Rumble, M. (2012). Defining twenty-first century skills. In P. Griffin, B. McGaw, &

E. Care (Eds.), *Assessment and teaching of 21st century skills* (1st ed., pp. 17–66). Springer. https://doi.org/10.1007/978-94-007-2324-5_2

Brown, H. D., & Lee, H. (2015). *Teaching by principles: An interactive approach to language pedagogy* (4th ed). Pearson.

Canale, M., & Swain, M. (1980). Theoretical bases of communicative approaches to second language teaching and testing. *Applied Linguistics*, *1*(1), 1–47. https://doi.org/10.1093/applin/I.1.1

Cunningsworth, A. (1995). *Choosing your coursebook*. Macmillan Education.

Denker, K. J., Manning, J., Heuett, K. B., & Summers, M. E. (2018). Twitter in the classroom: Modeling online communication attitudes and student motivations to connect. *Computers in Human Behavior*, *79*, 1–8. https://doi.org/10.1016/j.chb.2017.09.037

Dörnyei, Z. (2009). Communicative language teaching in the 21st century: The "principled communicative approach." *Perspectives*, *36*(2), 33–43.

Dudeney, G., & Hockly, N. (2007). *How to teach English with technology*. Longman.

Ellis, R., & Shintani, N. (2014). *Exploring language pedagogy through second language acquisition research*. Routledge. https://doi.org/10.4324/9780203796580

Faizi, R., El Afia, A., & Chiheb, R. (2013). Exploring the potential benefits of using social media in education. *International Journal of Engineering Pedagogy*, *3*(4), 50–53. https://doi.org/10.3991/ijep.v3i4.2836

Ferrari, A., Punie, Y., & Redecker, C. (2012). Understanding digital competence in the 21st century: An analysis of current frameworks. In A. Ravenscroft, S. Lindstaedt, C. D. Kloos, & D. Hernández-Leo (Eds.), *21st century learning for 21st century skills* (EC-TEL 2012. Lecture Notes in Computer Science, vol. 7563, pp. 79–92). https://doi.org/10.1007/978-3-642-33263-0_7

Gass, S. M. (2013). *Input, interaction, and the second language learner*. Routledge. https://doi.org/10.4324/9780203053560

Giannarakis, G., Zafeiriou, E., Sariannidis, N., & Efthalitsidou, K. (2016). Determinants of dissemination of environmental information: An empirical survey. *Journal of Business Economics and Management*, *17*(5), 749–764. https://doi.org/10.3846/16111699.2016.1195771

Greenhow, C., & Lewin, C. (2016). Social media and education: Reconceptualizing the boundaries of formal and informal learning. *Learning, Media and Technology*, *41*(1), 6–30. https://doi.org/10.1080/17439884.2015.1064954

Guo, S.-C. (2012). Using authentic materials for extensive reading to promote English proficiency. *English Language Teaching*, *5*(8), 196–206. https://doi.org/10.5539/elt.v5n8p196

Hanifa, R. (2018). EFL published materials: An evaluation of English textbooks for junior high school in Indonesia. *Advances in Language and Literary Studies*, *9*(2), 166–174. https://doi.org/10.7575/aiac.alls.v.9n.2p.166

Hasan, M. K., & Akhand, M. M. (2010). Approaches to writing in EFL/ESL context: Balancing product and process in writing class at tertiary level. *Journal of NELTA*, *15*(1–2), 77–88. https://doi.org/10.3126/nelta.v15i1-2.4612

Hashim, H. (2018). Application of technology in the digital era education. *International Journal of Research in Counseling and Education*, *2*(1), 1–5. https://doi.org/10.24036/002za0002

Herring, S. C. (2019). The coevolution of computer-mediated communication and computer-mediated discourse analysis. In P. Bou-Franch & P. Garcés-Conejos Blitvich (Eds.), *Analyzing digital discourse: New insights and future directions* (pp. 25–67). Palgrave Macmillan. https://doi.org/10.1007/978-3-319-92663-6_2

Hymes, D. (1972). On communicative competence. In J. B. Pride & J. Holmes (Eds.), *Sociolinguistics: Selected readings* (pp. 269–285). Penguin Books.

Ihnatova, O., Poseletska, K., Matiiuk, D., Hapchuk, Y., & Borovska, O. (2021). The application of digital technologies in teaching a foreign language in a blended learning environment. *Linguistics and Culture Review*, *5*(S4), 114–127. https://doi.org/10.21744/lingcure.v5nS4.1571

Jewitt, C., Bezemer, J., & O'Halloran, K. (2016). *Introducing multimodality*. Routledge. https://doi.org/10.4324/9781315638027

Johannesen, M., Øgrim, L., & Giæver, T. H. (2014). Notion in motion: Teachers' digital competence. *Nordic Journal of Digital Literacy*, *9*(4), 300–312. https://doi.org/10.18261/ISSN1891-943X-2014-04-05

Kalantzis, M., & Cope, B. (2015). Learning and new media. In D. Scott & E. Hargreaves (Eds.), *The SAGE handbook of learning* (pp. 373–387). Sage. https://doi.org/10.4135/9781473915213.n35

Kaur, H. (2019). Digitalization of education: Advantages and disadvantages. *International Journal of Applied Research*, (3), 286–288.

Knutson, E. M. (1997). Reading with a purpose: Communicative reading tasks for the foreign language classroom. *Foreign Language Annals*, *30*(1), 49–57. https://doi.org/10.1111/j.1944-9720.1997.tb01316.x

Kress, G., & van Leeuwen, T. (2021). *Reading images: The grammar of visual design* (3rd ed.). Routledge. https://doi.org/10.4324/9781003099857

Kushwaha, V. S. (2015). Mass media in disseminating environmental awareness. *Social Issues and Environmental Problems*, *3*(9), 1–4. https://doi.org/10.29121/granthaalayah.v3.i9SE.2015.3185

Lambton-Howard, D., Kiaer, J., & Kharrufa, A. (2021). "Social media is their space": Student and teacher use and perception of features of social media in language education. *Behaviour & Information Technology*, *40*(16), 1700–1715. https://doi.org/10.1080/0144929X.2020.1774653

Lenhart, A., Purcell, K., Smith, A., & Zickuhr, K. (2010). *Social media & mobile internet use among teens and young adults* (ED525056). ERIC. https://files.eric.ed.gov/fulltext/ED525056.pdf

Ley Orgánica 3 del 29 de diciembre de 2020, Jefatura del Estado (2020). *Boletín Oficial del Estado*, *340*. https://www.boe.es/boe/dias/2020/12/30/pdfs/BOE-A-2020-17264.pdf

Lightbown, P. M. (2003). SLA research in the classroom/SLA research for the classroom. *The Language Learning Journal*, *28*(1), 4–13. https://doi.org/10.1080/09571730385200151

Luís, A. R. (2017). Exploring technologically enhanced reading materials in L2 learning contexts. In IEEE (Ed.), *2017 12th Iberian Conference on Information Systems and Technologies* (pp. 1–3). https://doi.org/10.23919/CISTI.2017.7975796

McKensie, L., & Tomkins, G. E. (1984). Evaluating students' writing: A process approach. *Journal of Teaching Writing*, *3*(2), 201–212.

Mushtaq, M., Shah, S. K., & Akram, R. (2022). Analyzing visual images of English language textbook: A multimodal discourse analysis of textbooks in Pakistan. *Webology*, *19*(3), 3151–3169.

Orden ECD/1172 del 2 de agosto de 2022, Departamento de Educación, Cultura y Deporte (2022). *Boletín Oficial de Aragón*, *156*. https://bit.ly/3Ezbkgz

Ortega, J. L. (2017). The presence of academic journals on Twitter and its relationship with dissemination (tweets) and research impact (citations). *Aslib Journal of Information Management*, *69*(6), 674–687. https://doi.org/10.1108/AJIM-02-2017-0055

Page, R. (Ed.). (2009). *New perspectives on narrative and multimodality* (1st ed.). Routledge. https://doi.org/10.4324/9780203869437

Palfrey, J. G., & Gasser, U. (2011). *Born digital: Understanding the first generation of digital natives.* Basic Books.

Paradis, N., Knoll, M. A., Shah, C., Lambert, C., Delouya, G., Bahig, H., & Taussky, D. (2020). Twitter: A platform for dissemination and discussion of scientific papers in radiation oncology. *American Journal of Clinical Oncology*, *43*(6), 442–445. https://doi.org/10.1097/coc.0000000000000685

Pettersson, F. (2018). On the issues of digital competence in educational contexts: A review of literature. *Education and Information Technologies*, *23*, 1005–1021. https://doi.org/10.1007/s10639-017-9649-3

Richards, J. C. (2006). *Communicative language teaching today*. Cambridge University Press.

Rodrigues, E. N. (2015). *Curriculum design and language learning: An analysis of English textbooks in Brazil* [Doctoral dissertation, Andrews University]. James White Library. https://digitalcommons.andrews.edu/dissertations/1

Sancho-Ortiz, A. E. (2022). *Science dissemination and social media in the educational context: Analysis of the microblogging platform Twitter as an EFL teaching and learning tool* [Unpublished master's thesis]. Universidad de Zaragoza.

Scott, A. (2000). *The dissemination of the results of environmental research* (Environmental issues series No. 15). European Environment Agency.

Selwyn, N. (2012). *Education in a digital world: Global perspectives on technology and education.* Routledge. https://doi.org/10.4324/9780203108178

Selwyn, N., & Stirling, E. (2016). Social media and education… now the dust has settled. *Learning, Media and Technology*, *41*(1), 1–5. https://doi.org/10.1080/17439884.2015.1115769

Spada, N. (2007). Communicative language teaching. In J. Cummins & C. Davison (Eds.), *International handbook of English language teaching* (pp. 271–288). Springer. https://doi.org/10.1007/978-0-387-46301-8_20

Spante, M., Hashemi, S. S., Lundin, M., & Algers, A. (2018). Digital competence and digital literacy in higher education research: Systematic review of concept use. *Cogent Education*, *5*(1), 1519143. https://doi.org/10.1080/2331186X.2018.1519143

United Nations. (2015). *Transforming our world: The 2030 agenda for sustainable development.* https://bit.ly/3EzYi2y

Vaughan, L. (2016). Uncovering information from social media hyperlinks: An investigation of Twitter. *Journal of the Association for Information Science and Technology*, *67*(5), 1105–1120. https://doi.org/10.1002/asi.23486

Wood, A. F., & Smith, M. J. (2004). *Online communication: Linking technology, identity, & culture.* Routledge.

Zappavigna, M. (2017). Twitter. In C. Hoffmann & W. Bublitz (Eds.), *Pragmatics of social media* (pp. 201–224). De Gruyter Mouton. https://doi.org/10.1515/9783110431070-008

Zhang, S., & Duke, N. K. (2008). Strategies for Internet reading with different reading purposes: A descriptive study of twelve good Internet readers. *Journal of literacy research*, *40*(1), 128–162. https://doi.org/10.1080/10862960802070491

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