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A cross-cultural study of
the popularization of environmental issues
for a young audience in digital spaces

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ABSTRACT

Digital spaces are being ever more characterized by an increasing presence of educational videos which aim to inform young people on the importance of understanding the need for environmental sustainability and to instruct them on how they could be dynamically involved to act for their future. Drawing upon the popularization techniques identified in previous literature (Cappelli 2016; Diani 2018; Bruti – Manca 2019; Cappelli – Masi 2019), this study aims to identify the popularizing features of multimodal educational videos focusing on climate change and addressed to young people aged 7-13. This qualitative study aims to contribute to the ongoing research on popularizing and innovation for children and on knowledge dissemination for young people within a cross-cultural perspective.

Keywords: young audience, educational videos, environmental knowledge, contrastive analysis, popularization strategies.

1. Introduction

If it is a truism that climate change issues affect all levels of society including the micro level of individuals (Rossini 2012), it is equally true that we are

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living in the Anthropocene[2] – i.e., the geological era characterized by the human footprint on the global ecosystem. Ecological concerns for the human impact on the environment and the race to control climate change have been brought to even greater prominence by the unprecedented event of Covid-19. The pandemic has given humanity an opportunity to think about innovative recovery pathways able to tackle one of the biggest issues in today's world, climate change. Indeed, despite great hardship, the environmental benefits of a global lockdown have set in motion a record global recovery (see Buckle et al. 2020). This urgent need for positive change is visible at all levels of society and especially in the education of young people. Digital spaces, for example, are increasingly characterized by a growing presence of educational videos aimed at teaching young people the importance of understanding the need for environmental sustainability and conservation and educating them on how they can actively engage to take action for their future. By raising learners' awareness of environmental concerns, education plays an essential catalytic role in counteracting global climate change and, thus, in building a society resilient to climate hazards. As emphasized in the 2030 Agenda for Sustainable Development Neutralizing of the United Nations,[3] education is key to spreading new values and lifestyles that can lead to a more sustainable world. If these values are taught from an early age, people will automatically adopt sustainable attitudes (see Pramling Samuelsson – Kaga 2008).

This research aims to find out how a new ecological onus is popularized among young people. When addressing a lay audience, popularization comprises a wide range of communicative events or genres where specialized knowledge is transformed into everyday knowledge through popularizing strategies; in brief, this process entails "recontextualization of scientific discourse" (Calsamiglia – Van Dijk 2004: 370). Against this backdrop, this paper intends to contribute to contrastive research on forms of popularization of ecological issues, implemented through multimodal videos for children and youngsters. More particularly, we aim, first, to identify the multimodal features of a series of British and Italian videos and, then, to compare these features with the popularization techniques identified by previous studies (Cappelli 2016; Diani 2018; Bruti – Manca 2019; Cappelli – Masi 2019).

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[2]   The word Anthropocene was coined by the Dutch chemist and Nobel Laureate (1995) Paul Crutzen. For further information see Oppermann and Iovino (2017).

[3]   https://sdgs.un.org/2030agenda, accessed October 2021.

This study contributes to ongoing research on popularization and innovation for children and helps identify certain cross-cultural features of knowledge dissemination for young people that are specific to the two groups of "lay readers" (the British and the Italian ones).

2. Popularization discourse

Following Calsamiglia and Van Dijk (2004: 370), popularization can be defined as a variety of communicative events or genres where specialized knowledge is transformed into everyday knowledge and in which scientific discourse is recontextualized to be conveyed through the written media of mass communication. Popularization consists in the "reformulation, reconceptualization, and recontextualization of expert discourse that meet the background encyclopaedia of lay readers" (Cappelli 2016: 71). The tenets of Calsamiglia and Van Dijk's (2004: 371) theory of popularization are reported below and integrated with other scholars' considerations:

1. Popularization can be seen as a social process consisting of a class of discursive-semiotic practices that involve different types of communicative events with the aim of disseminating lay versions of scientific knowledge among the public at large. Science can be, therefore, considered as a discourse and popularization as a genre (see Myers 2003: 266).

2. Popularization is not characterized by specific textual structures but by the properties of the communicative context. These properties are participants and participant roles, their purposes and knowledge, and the relevance of such knowledge in everyday life. In Myers' (2003: 273) words "popularization is a matter of interaction as well as information; it involves persons and identities as well as messages".

3. These context properties are important for the linguistic analysis of the "textual" (verbal) structures of such discourse. Myers (2003: 266), for example, suggests that differences between the discourse of scientific institutions and popular science are to be found in their textual form, sentence subjects, grammatical voice, verb choices, modality and hedging, and rhetorical structure.

4. Popularization consists not only in a reformulation but also in a recontextualization of scientific knowledge and, for this reason, popularization discourse has to adapt to the constraints of the communicative events in which it appears. If the communicative

event is a tourist guidebook for children, the popularization process is partly constrained by the specificities of this genre and partly by the particular nature of the intended audience (Cappelli 2016: 72). This process of recontextualization for a young audience shapes the linguistic code in a more dramatic way as compared to what happens with an adult audience. As it happens for translation, the information process of popularization involves the transformation of an original/ source text into a derived text (Gotti 2013: 13). When a text is redrafted to make it accessible to a lay audience, the disciplinary content is not altered and changes occur only at the level of language which needs to be remodeled to suit a new target audience. Information is transferred linguistically in a way similar to periphrasis or intralinguistic translation.

5. The mass media actively contribute to the production of new, common knowledge and opinions about science and scientists; media managers and journalists are those who ultimately decide what to publish about science and how to publish it.

6. The knowledge produced by mass media should be further interpreted by taking into account their entertainment function.

The process of transformation of specialized knowledge into lay knowledge is based on the discourse activity of "explanation" (Calsamiglia – van Dijk 2004: 372). The following strategies, based on Calsamiglia and van Dijk (2004), Garzone (2006), and Gotti (2013), describe the types of explanation available to allow lay readers to integrate their old knowledge with a new lay version of specialized knowledge. They are discursive practices that work at the syntactic level: denomination, definition/description, reformulation or paraphrase, exemplification, and generalization:

• Denomination refers to the introduction of new terms to explain specific meanings.

• Definition is a strategy used to explain unknown words, while description is used to explain unknown concepts.

• Reformulations and paraphrases are explanatory moves characterized by relative clauses, appositions, parentheses, dashes, quotes and metalinguistic expressions (e.g., 'are called'). They are usually employed when a new notion is introduced and later explained by a reformulation or a paraphrase.

• Exemplification implies the use of specific examples of general phenomena, while generalization draws general conclusions from specific examples or cases.

At the cognitive level, analogies, comparisons, and metaphors are strategically used to organize large parts of a text (see Spinzi 2019). Metaphors, in particular, help establish a link between two domains of experience or knowledge and, for this reason, they play a prominent role in popularization discourse (Calsamiglia – van Dijk 2004: 376).

2.1 Popularizing for a young audience: Previous studies

The popularizing strategies through which children can access specialized knowledge and become engaged by specialized contents have been the object of research by several scholars. Some studies have focused on the dissemination of legal knowledge to a young audience (Engberg – Luttermann 2014; Sorrentino 2014; Diani 2015, 2018; Diani – Sezzi 2019); other studies have investigated the teaching of hard sciences (Myers 1989, 2003) or the dissemination of environmental knowledge in specialized magazines (Bruti – Manca 2019). Finally, some scholars (Cappelli 2016; Cappelli – Masi 2019) have investigated knowledge dissemination for a young audience in the tourism domain. The studies described below are some of the most representative of each knowledge domain and provide interesting insights into the most frequently used popularizing features for a young audience. For this reason, the results illustrated below will provide the basic framework upon which the analyses described in the current paper are based.

Cappelli (2016) analyzes the strategies used in tourist guidebooks for children to make culture-specific or technical terms and concepts accessible to young readers. In particular, the author aims to verify which strategies are used in English tourist guidebooks for children aged 6-12 and which contents have been adapted to make them suitable to their presupposed knowledge and cognitive skills. The most common strategy found in the corpus considered for analysis is explanation, usually consisting of:

- explanatory passages focusing on general concepts;
- definitions instantiated through juxtaposition of specialized terminology and non-specialized vocabulary;
- generalization achieved through paraphrasing or general definitions.

Anchoring to the readers' experience is also pervasive in guidebooks for children and it is instantiated by direct address, wordplay, explicit comparison, and intertextuality. Another very common strategy includes game-like activities which aim to raise children's awareness of the relevant

aspects of the destination described in the guidebook. Conversely, exemplification, analogy, and metaphors are rarely used.

The popularization process in English history information books for children and their translations into Italian is analyzed by Sezzi (2017). As the author points out (Sezzi 2017: 470), when a popularizing text for children is adapted to fit a new social and cultural context, it is further exposed to a re-mediation process and becomes an example of a different idea of popularization and knowledge. Expert discourse has not only to be adapted but also to be re-mediated to arouse readers' curiosity and interest. To achieve this, the strategies used are direct address of the recipient, use of different kinds of images and media, and use of informal language and irony. As for the Italian translations of English history information books, Sezzi (2017: 476) notices that translated versions are characterized more by a sort of "complexification" than by simplification. Notions and historical facts are detailed to be as accurate as possible, and also by adding explanations including more specific terms. The Italian notion of popularization, therefore, seems to tend more towards accuracy rather than "edutainment" (see Scanlon – Buckingham 2002).

Diani and Sezzi (2019) identify the popularization strategies used in two official websites about the EU addressed to children. The results emerging from their study suggest that the strategies used to communicate knowledge to children involve adjusting information through definitions, denominations, similes, and exemplification, and also using some linguistic features typical of dialogic interaction (i.e., the pronoun 'you'). Furthermore, the websites under examination show a highly interactive reader-oriented nature and frequent use of questions as another form of reader engagement. An important role in the communication of EU knowledge to a young audience is also played by images, which are exclusively cartoon-like drawings mirroring the verbal text and thus facilitating its comprehension.

The popularization of scientific discourse in the domain of palaeontology to young children is investigated by Cesiri (2020) by considering a series of episodes from the animated series *Dinosaur Train*. Results from the verbal analysis suggest that the most frequent strategies used in this case of knowledge dissemination are generalization and general terminology, hedging, figurative language, and juxtaposition. Visual elements seem to be exploited to make content clearer and to enhance interaction and comprehension.

An analysis of both verbal and visual popularizing strategies on websites disseminating health concepts for children has been carried out

by Diani (2020). The most frequent strategies are the question-answer mode which suggests the pedagogical function of the website and a game-like structure which acts as an engagement strategy. Furthermore, children are directly addressed using the personal pronoun 'you', to create a feeling of closeness and involvement. Images are meaningfully related to each other and to the verbal content of the websites, thus supporting health popularization for children. For this reason, visual and verbal metaphors are also frequent.

Finally, Bruti and Manca (2019) consider for analysis five online magazines dealing with environmental issues: *the National Geographic*, *Focus*, *the National Geographic Kids* (both the UK version and the US one), and *Focus Junior*. Their aim is to compare popularizing strategies targeting different audiences and in different lingua-cultures. The linguistic popularizing strategies identified in the *National Geographic Kids* magazines tend to involve young readers through a question-and-answer format, through colloquial language including vague terms and informal expressions. Furthermore, there is frequent use of the personal subject pronoun 'you' and of the personal possessive adjective 'our', both contributing to interaction and involvement. The Italian children's magazine also shows a tendency towards the question-and-answer format, but the language used is not more informal and interactive than the language used in the adult version. The adaptation strategies that are most frequently used are explaining, defining, and describing. Language is characterized by highly frequent use of adverbs, conjunctions, and similes. Although both the English and the Italian magazines use the popularizing strategies discussed in the existing literature, the two sets of magazines select these strategies with different frequencies of usage, thus supporting the assumption that requirements of adaptation are culture-dependent.

Based on the results achieved by the studies on popularization for children reported above, to the strategies indicated by Calsamiglia and van Dijk (2004), we can add the following:

- anchoring to the readers' background knowledge and life experience (achieved, for example, through direct address or through expressions that prompt readers to make comparisons with what they know about the world);
- attribution, instantiated by the explicit mention of the source of the information provided;
- use of more than one semiotic code at a time;

- generic hybridization or interdiscursivity (Bhatia 2010: 36), which entails a combination of features typical of different genres;
- reader engagement (Hyland 2005), instantiated by reader pronouns and questions;
- informal and colloquial language;
- irony.

Our aim is to check whether the popularizing strategies discussed in this section are used in the videos selected for analysis and whether they are culture-dependent in their usage. In the following section, a detailed description of the data and methodology adopted is provided.

3. Material and analytical approach

3.1 Data

The empirical data for this study come from a collection of three British and three Italian educational videos for young learners aged 7-13 teaching what climate change is, what its consequences are, and what we can do to stop it and take care of our planet. The compilation of the comparable corpus, which is at a pilot stage, requires a number of criteria to be met to fulfil the objectives of the research, which are described as follows:

- the date of creation of the selected videos is as recent as possible;
- all the video contents pertain to a specialized communicative setting that is about Earth Science, with particular reference to the topical issue of climate change;
- the texts are originally written in one of the two languages (i.e., English or Italian) and belong to the same genre, namely multimodal videos for educational purposes;
- the websites selected for data collection were chosen for their authoritative standing and for their commitment to sensitive issues such as environmental protection.

The first website considered as a source of materials is *National Geographic*, in its education section[4] where a digital library with a collection of

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4   https://www.nationalgeographic.org/topics/resource-library-climate-change/?q= &page= 1&per_page=25, accessed October 2021.

resources about Earth Science is available for all school levels. As we read on the website, teachers are encouraged to use these resources in their classrooms to help young learners (7-13-year-old students in our case) to better understand environmental issues and also to take action on climate change. The video from this website, *Climate Change 101*, relies on the expertise of the scientist Bill Nye, who not only explains the causes and consequences of climate change but also calls for immediate actions to mitigate its effects.

The second video comes from the *BBC* website, where a section entitled *BBC Teach* is devoted to a variety of classroom resources to disseminate specialized knowledge. The video entitled *Climate Change* starts with a young presenter explaining how she learnt about climate change and her feelings about it. Other children are then invited to discuss the questions posed by the narrating voice. Explanations are provided by the original presenter along with suggestions on how young people could make a difference in climate change through simple behaviour in their everyday life.

The third video comes from *Smile and Learn*, a learning platform internationally awarded by the European Union and other institutions, and used by more than one million young learners worldwide. It is also specialized in Content and Language Integrated Learning (CLIL). In brief, this website strengthens curriculum subjects such as Earth Science.

In order to compile a balanced comparable corpus, the Italian videos were downloaded from a range of websites. The first website taken into account is *Focus Junior* website from which the video entitled *Il cambiamento climatico non è una bufala* (Climate change is not a hoax) was selected.

To find a video that could have matched the *BBC* video, the Italian national channel *RaiScuola*[5] was explored. The only videos available on the topic considered in this research were from the late 1990s and were therefore excluded. For this reason, another website was explored, *Ambiente Scuola*, a large, multi-company insurance agency that provides every school with many educational services among which educational videos on environmental issues were found. The video included in the data is entitled *Noi e il Clima* (We and the Climate). The last video considered for the Italian group is from *Zanichelli Scuola*, a popular publishing house known in Italy for its seriousness and rigorous methods, and which provides schools, teachers, and families with numerous digital resources. The video consulted on this

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[5] https://www.raiscuola.rai.it/scienze/articoli/2021/03/Clima-e-cambiamenti-climatici-8e7e0861-ee2b-4db5-8bfe-cd60dbe3af19.html, accessed October 2021.

website is entitled *Quali effetti ha il riscaldamento globale* (What effects global warming has). An overview of the corpora is displayed in Table 1.

Table 1. The multimodal videos on climate change included in the corpus

Italian Videos	Minutes	Source	English Videos	Minutes	Source
1. Il cambiamento climatico non è una bufala	7:07	Focus Junior	1. Climate Change 101 with Bill Nye	4:09	National Geographic
2. Noi e il Clima	7:39	Ambiente Scuola	2. Climate change	4:11	BBC
3. Quali effetti ha il riscaldamento globale	1:37	Zanichelli Scuola	3. Climate change	4:49	Smile and Learn

3.2 Methodology

As anticipated above, the aim of this paper is the identification of the multimodal features of each group of videos. More specifically, the analysis aims to: 1) compare the strategies of popularization for a young audience with the techniques identified by previous studies; 2) compare and contrast the strategies used by the two lingua-cultures to check if the process of adaptation and recontextualization can be defined as culture-dependent.

The analysis of the video transcriptions is qualitative and aims to explore the five forms of "explanation" indicated by Calsamiglia and van Dijk (2004: 372), and the strategies identified by previous studies on the discursive practices for a young audience, as listed below:

- denomination;
- definition;
- reformulation and paraphrase;
- exemplification;
- metaphor, comparison, and simile;
- anchoring to the readers' background knowledge and life experience;
- attribution;
- simultaneous use of more than one semiotic code;
- generic hybridization;

- reader engagement;
- informal and colloquial language;
- irony;
- approximation.

Furthermore, to explore the connections between verbal and visual modes and how they both contribute to the popularization of contents, van Leeuwen's (2005) multimodal model of image-text relations has been adopted (Table 2).

Table 2. van Leeuwen's (2005: 230) overview of visual-verbal linking

Image-text relations	Types	Subtypes
Elaboration	Specification Explanation	The image makes the text more specific The text makes the image more specific The text paraphrases the image (or vice versa)
Extension	Similarity Contrast Complement	The content of the text is similar to that of the image The content of the text contrasts with that of the image The content of the text adds further information to that of the text, and vice versa

The two key concepts selected by van Leeuwen describe two different connections that words and images may have. In the case of "Elaboration", words and text may be connected by two relation types: "Specification" and "Explanation". When the words pick out one of the possible meanings of the image, and vice versa the relation type is "Specification"; when words explain the image (and vice versa), that is the case of "E".

Words and images can also be in a relation of "Extension": two items, one verbal and one visual, provide different but semantically related information. The content of the text may be similar to that of the image ("Similarity" type), it may be in contrast ("Contrast" type) or it may add further information ("Complement" type).

In the following sections, the verbal and visual analysis of the two groups of videos is described and commented. Due to the relevance of questions in educational videos and the persuasive intent to call to action, Bloom's (1956) taxonomy, later revised by Anderson and Krathwohl (2001), and Aristotle's *On Rhetoric* (1959) are considered.

4. Analysis

4.1 Analysis of the Italian videos

The first video considered for this analysis is entitled *Il cambiamento climatico non è una bufala* by *Focus Junior*. It is an actual interview made by the *Focus Junior* reporter, Francesco Barberino, with a meteorologist, Serena Giacomin. For this reason, the presence of the question-and-answer mode cannot be considered an intended popularizing strategy. However, questions and answers contribute to organizing the text linearly and clearly, making it more accessible to a young audience. Furthermore, the reporter asking questions is a young boy with whom the young audience can easily identify. The first two questions are asked to allow viewers to realize that the woman being interviewed is a scientist who starts working very early in the morning: '*Ti vedo spesso in TV ma sei anche una scienziata?*' ('I see you often on TV but are you also a scientist?'), '*Ma come inizia la tua giornata?*' ('How does your day start?'). These questions fulfil the aim of establishing a relationship of trust between the audience and the meteorologist, particularly because the interview aims to show that climate change is not a hoax. The personal pronoun '*noi*' ('we') or verbs conjugated in the 1st person plural are used only three times by the reporter and are never used by the expert. Examples are '*Andiamo a chiederlo a Serena del centro meteo Expert*' ('Let's go and ask Serena from the Expert weather centre'), '*Ma che cosa possiamo fare noi ragazzi di 11 anni per contrastare il riscaldamento globale?*' ('But what can we, 11-year-old children, do to tackle global warming?'), '*E' vero ragazzi, dobbiamo fare qualcosa da oggi, anzi da ieri*' ('It's true, guys, we must do something starting from today or, rather, from yesterday'). Conversely, the expert addresses the audience by saying the name of the reporter as if he represented the whole community of children: '[…] *sono i dati che parlano, Francesco*' ('It's data talking, Francesco'). In only one case, replying to the question asking what 11-year-old children can do, she refers to the audience by saying '*voi ragazzini di 11 anni potete fare davvero tante cose*' ('you, 11-year-old children, can really do a lot of things'). When the expert describes possible everyday actions to counteract the effects of global warming, the impersonal form is mainly preferred (e.g., '*Si possono scegliere le verdure di stagione*' / 'One can choose seasonal vegetables'). The language used is colloquial and the instructive aim is visible in the frequent use of strategies such as definition, reformulation and paraphrase, and exemplification. Examples are expressions and conjunctions such as '*il cosiddetto global warming*'

('the so-called global warming'), '*in pratica*' ('in practice'), '*l'anidride carbonica, che è una piccola molecolina*' ('carbon dioxide which is a very tiny molecule'), '*ovvero*' ('or'), '*cioè*' ('that is'), '*come per esempio*' ('as for example'). The strategy of anchoring to the readers' background knowledge and life experience is also present, particularly when the expert provides some examples of possible actions that can be taken by young people in their everyday lives to reduce pollution and, consequently, global warming. For instance, in the following sentence '[…] *l'acqua è meglio evitare di sprecarla quando ci si lava i denti o quando si fa la doccia meglio non lasciare i rubinetti aperti*' the expert is inviting viewers to avoid wasting water when brushing their teeth or leaving taps running when taking a shower. Another interesting strategy is attribution, which can be observed when the meteorologist makes clear that what she is describing comes from statistical data about weather and climate and from the scientific community, as illustrated by the example: '*la comunità scientifica internazionale dice che questo surriscaldamento, quindi il cosiddetto global warming, riscaldamento globale, è perlopiù causato dall'azione dell'uomo*' ('the international scientific community says that this warming, the so-called global warming, is mainly caused by human activity').

The video under investigation features real-life characters, namely Francesco, the *Focus Junior* reporter, and Serena Giacomin, the meteorologist. The interview is carried out at the weather centre where the meteorologist works, and this is visible from the several screens behind the interviewer and the interviewee. The questions asked by the reporter are always preceded by a video sequence in which the question is reported in white letters against a background featuring clouds, rain, and a white semicircle resembling part of the earth covered with clouds filmed by a satellite or from a space shuttle. This image aims to ensure that the audience clearly understands the questions, and the background to the message seems to emphasize the consequences of climate change (clouds, rain), thus adding further information. For this reason, the word-image relation is of Extension, with the Complement type. When the meteorologist replies to the first question, a map of the world showing the increase in temperatures from 1880 to 2018 is shown. Again, information is added and the word-image relation is Extension of the Complement type. For each answer to the questions by the interviewer, on the left bottom of the screen, a message appears in white letters against some red thick lines and summarizes the most important point made in the answers, such as '*Negli ultimi 10 anni le temperature sono aumentate troppo velocemente*' ('Over the last 10 years, temperatures have increased too quickly') or '*Il riscaldamento globale è causato soprattutto dall'azione dell'uomo*'

('Global warming has been mainly caused by human activity'). In this case, the word-image relation is of Elaboration, because the image makes the text more specific. When the North Pole is mentioned referring to global warming, a map with a simulation of the melting of ice in that area of the earth from 1984 to 2016 is shown, and on the left bottom part of the screen a summarizing message appears again ('*Il Polo Nord risente più di tutto il pianeta del riscaldamento globale*' / 'The North Pole is that area on earth which is mostly affected by global warming'). In this case, two relations appear at the same time, Extension and Elaboration. The same word-image relations are present when the meteorologist explains what 11-year-old children can do to avoid global warming, in that an account of the temperature anomalies by country from 1880 to 2017 is shown on screen and, on the left-bottom part, suggestions about what children can do to tackle this problem are reported. At the end of the interview, Francesco, the reporter, speaks directly to his audience, looking at the camera and emphasizing the need to do something together. Looking directly at viewers generates involvement, as this type of gaze demands action from the audience (Kress – van Leeuwen 2006; Manca 2016; see Halliday – Matthiessen 2004).

The second video entitled *Noi e il clima*, and which is posted by *Ambiente Scuola*, deals with the topic of climate change and with the strategies we can all adopt to limit the increase of global temperature. The pronoun '*noi*' ('we') is strategically inclusive and announces the involvement of both author and audience with the contents described in the video. Verbs conjugated in the 1st person plural of the Present Tense and in the Imperative form are frequent throughout the text, apart from a paragraph where the greenhouse effect is explained. Furthermore, the pronoun '*noi*' is explicitly mentioned in a couple of cases ('*Sono piccole azioni e dipendono da noi*' / 'These are small actions and depend on us'; '*tutti noi siamo in pericolo*' / 'we are all in danger'), along with the object personal pronoun '*ci*' ('us', 'to us') and the possessive adjectives '*nostri*' and '*nostra*' ('our'). This video has only three questions which contribute to organizing content in three phases, i.e., description of climate change and its causes ('*Avete mai sentito parlare di cambiamenti climatici?*' / 'Have you ever heard about climate change?'), actions we can take to counteract its effects ('*Sai quanto costano all'ambiente i cibi?*' / 'Do you know how much food costs to the environment?'), and conclusion with emphasis on the importance of our contribution: ('*E' tutto chiaro quindi?*' / 'Is everything clear then?'). Questions are, therefore, used to organize, define and elucidate contents but also to fulfil a pedagogic aim by involving the addressee and, together with reader pronouns, are an example

of reader engagement strategies (Hyland 2005). The language used is rarely colloquial; there are only two sentences containing exclamatory remarks and having a syntactic organization which suggests a more informal way of addressing the audience: '*Ah, se c'è una cosa che mi piace sono le stagioni!*' ('Ah, if there's something I like, it's seasons!'), '*Ah, che meraviglia le stagioni! Certo, che meraviglia se rimanessero come dovrebbero essere*' ('Ah, how wonderful seasons are! Well, wonderful if they remained as they should be'). Conversely, in many cases, the verbal content of the video is very formal and technical, particularly when phenomena and effects are described (e.g., '*l'incremento dell'effetto serra causa i cambiamenti climatici*' / 'the increase of the greenhouse effect causes climate change'). The main paraphrastic devices used in this video are reformulation and definition, as in the following examples: '*Con la parola clima si intende l'insieme delle condizioni atmosferiche che caratterizzano una certa regione*' ('By using the word climate we refer to the complex of weather conditions that characterize a certain area'), and '*ciò che ci deve preoccupare sono i cambiamenti climatici cioè le variazioni a livello più o meno globale del clima sulla terra*' ('what should worry us is climate change that is to say the variations at a more or less global level of climate on earth'). There are also some instances of exemplification which in four cases are overtly introduced by the expression '*ad esempio*' ('for example') and by the expression '*vediamo qualche esempio*' ('let's have a look at some examples'). The strategy of anchoring to the readers' background knowledge and life experience is also present, for example, in the part of the video focusing on the impact of food production on the environment, where types of food that are part of the young audience's everyday life are mentioned: '*17 kg di CO2 per una bistecca di bovino, 40 litri d'acqua per una fetta di pane, 0,4 kg di CO2 per un kg di patatine fritte, 5000 litri d'acqua per un kg di formaggio*' ('17 kg of CO2 for a beef steak, 40 l of water for a slice of bread, 0.4 kg of CO2 for 1 kg of French fries, 5000 l of water for 1 kg of cheese'). In this video, there is no use of attribution (which was present in the video by *Focus Junior*), irony, verbal metaphor, or simile.

Regarding visual resources, this video shows a cartoon-like visual representation which appeals to very young children because it is relevant to their visual world (Diani 2020: 73). The word-image relation that can be observed in the video is that of Extension, particularly focusing on the type of Similarity where images illustrate exactly what the text says. When terms are explained, a coloured inscription appears in the background, in capital letters, with terms being described, and further details appear, such as the different climate areas of the earth. In this latter case, the type of word-image

relation is Complement. There are also cases of Elaboration with the type of Specification, when, for example, the off-screen voice is defining climate change without referring to its effects and the sequence shows a cartoon character who is being submerged by water and has to wear his mask and snorkel set.

The third video selected for analysis is entitled *Quali effetti ha il riscaldamento globale* and was uploaded by *Zanichelli Scuola*. In this video, there is only one question ('*Ma perché il riscaldamento globale è un problema?*' / 'But why is global warming a problem?') which is asked after the description of the causes of global warming. Contents are objectively described and personal pronouns are never used. Viewers are not involved in the narration and there is no overt invitation to take action. The language used is very formal and some technical terms are used, such as '*combustibili fossili*' ('fossil fuels'), '*emissioni di gas serra*' ('greenhouse gas emissions'), '*allevamento intensivo*' ('intensive farming'), '*le acque degli oceani si espandono*' ('ocean waters are expanding'), '*competono per le stesse risorse*' ('they compete for the same resources'). Some of these terms are explained using exemplification and by anchoring to the readers' background knowledge and life experience, as in the following sentence: '*Tra queste, ci sono l'uso di combustibili fossili usati, per esempio, per riscaldare le case, per i trasporti e l'allevamento intensivo*' ('Among these, there is the use of fossil fuels used, for example, to heat houses, for means of transportation and for intensive farming'). The usage of fossil fuels is, therefore, explained through examples that are familiar to children. Another paraphrastic device is reformulation, used for example when the term '*gas serra*' ('greenhouse gases') is explained by saying '*si chiamano così perché*' ('are called this way because') or when '*cioè*' ('that is') or 'è detto' ('is called') are employed. There is only one case of attribution, in the sentence '*Gli scienziati prevedono*' ('Scientists forecast'). No irony or figurative language was detected in the text.

The video has cartoon-like graphics with drawings that visually illustrate what the off-screen voice is saying. When the rising of sea levels is described, a very stylized cartoon character is depicted while wearing a mask and snorkel set before being submerged by water. This visual metaphor referring to the consequences of rising sea levels was also present in the video *Noi e il clima* by *Ambiente Scuola*. The word-image relation which is more frequently visible in the video is that of Extension and the type is Similarity.

In the last scene of the video, when the off-screen voice explains the consequences of climate change for animals, two species of foxes competing

for the same food resources are illustrated, although they are not explicitly mentioned in the text. In this case, the relation is Extension but the type is Complement. The keywords of the verbal content are written in black or red on the different drawings that constitute the video. Their function is to make sure that children understand the most relevant terms referring to global warming and the relationship between the key concepts verbally described in the video and the effect of global warming visually illustrated.

4.2 Analysis of the English videos

The video entitled *Climate Change 101 with Bill Nye*, published on the National Geographic website, addresses the issue of climate change by focusing on its consequences and concludes with suggestions on how to contribute to its solution. The discussion of these contents is foreshadowed by the three questions posed by the science communicator at the beginning of the video: 'Climate change is a real and serious issue but isn't the climate always changing? What exactly is climate change? Why should we care?'. These questions have the clear function of organizing and structuring the popularization of the phenomenon of climate change and they are followed by progressive answers to each of them based on explanations and definitions. They also trigger the use of deep-thinking tactics to solve the problem, strategies that may not be invoked without those queries. In so doing, questions become relevant in disseminating knowledge, because they engage students' minds more dynamically by rousing their curiosity and inquiry. Furthermore, by stirring the young's emotions, and more precisely by stimulating their "pathos" through the question 'Why should we care?', the topic is introduced as a common concern.

The same engaging purpose is pursued by the use of the pronouns 'we', 'us', 'you' together with possessives (e.g., 'our'), as it was in the Italian video by *Ambiente Scuola*. The high frequency of pronouns, which are purposefully inclusive, aim to involve both the addressees (i.e., young learners) and the addresser (i.e., the science communicator Bill Nye) in a problem that does not pertain only to scientists but is closer to us than one might expect. Therefore, the spectator feels directly involved and thus empowered, as in the following example: 'This new tendency is not caused by the variations of the Earth's orbit but rather very likely caused by human activities, that means you, me'. In addition to this, the same intent of engaging the addressees is pursued through the use of directives which

also perform the persuasive function of inviting the young at a personal level by taking action through the use of material verbs, as illustrated by the following utterance:

> 'Recycle and reuse things, walk or use public transportation to get to work, turn off your electronics when you are not using them, eat less meat while you're at it eat more locally grown vegetables and foods, and last but not least spread your knowledge and concerns about climate change with others'.

Definitions are interspersed in the verbal text and they usually display the form of P is named X or X is P (Gotti 2013: 18). This may be exemplified by 'Climate change is change in our Earth's overall temperature with massive and permanent ramifications', where X is climate change and the rest is its periphrasis. Definitions are followed by reformulations whose purpose is to introduce further explanations through the use of metalanguage (e.g., 'means') as in 'A higher acid content means calcifying species like oysters and clams and shell water corals are at risk putting the entire ocean food web at risk'.

The language used is quite informal and analogies are used to explain more complex ideas. Indeed, in order to elucidate the concept of the rise of sea level and the melting of glaciers, an analogy with an ice cube is constructed. When all that ice melts, it fills the oceans, and this idea is further explained by the use of another analogy: 'just like filling up a bathtub'. Of course, these concrete images are used to locate the abstract concept of rising seas in a real-life context.

Another frequent strategy is that of anchoring to the readers' background knowledge and life experience. Thus, for instance, when explaining the impact that human activities might have on climate, the scientist mentions some examples such as 'like the device you're using to watch this video or the ability to take a plane halfway around the world'. Attribution is also used above all when listing all the necessary activities people are supposed to carry out to save the planet.

As far as the visual components are concerned, this video shows a real-life visual representation where knowledge is disseminated by the science communicator who is visible and speaks in most of the video. The word-image relation is indeed that of Extension, more specifically the type of Similarity where images display the verbal text. Keywords (e.g., 'climate'; 'oceans'; 'acidification') are graphically displayed to connect images and concepts.

In this way, young people organize what has been popularized and what they have to do. Diagrams, figures, and drawings are also shown to facilitate comprehension, and knowledge is then presented like a "scaffolding" work. Extension and Elaboration overlap in most of the cases, as when analogies are introduced. Thus, a cube is graphically represented to convey the idea of the phenomenon of melting. Indeed, the ice inside melts and fills the ocean, which is verbally described as a 'victim'. At the visual level, real-life images of flooded areas are displayed to describe the phenomenon again. In this way, the real image reinforces the emotionality conveyed by the verbal text. At the end of the video, the directives are symbolically represented as a list of circled activities that contain the strategy to follow (e.g., 'walk', 'eat', 'do not eat').

 In the video from the *BBC,* entitled *Climate Change*, a primary school pupil explains what she has learnt about climate change and her shocking reaction to it. The young presenter has set up an emotional tone since the very beginning of the video. After saying that she learnt about climate change at school when she was six, she highlights her active involvement by stating that it is really important to start marches and protests because 'if we ruin this planet there's really nowhere else to go'. She is then joined later by other pupils who, in turn, discuss a range of questions such as 'Do you know what climate change means?', 'Do you know what causes climate change?', 'Is it important to look after the planet?', 'What can you do to help stop climate change?', 'Do grown-ups care enough about protecting the planet?' and provide answers to them. These questions confer a conversation-like quality to the verbal text. Apart from the last two more open questions, the other three are yes/no questions that define what climate change is according to the usual pattern P is X, as in 'Climate change is basically the heating of our planet'; 'Climate change is when the earth is getting too hot' or by the use of 'means' ('Climate change means that all the pollution from cities and cars gets into the atmosphere and it's making the whole planet warmer'). The second question focuses on the consequences of climate change and, apart from the negative answer from the first child, very simple answers are provided by the use of one relevant word such as 'pollution'. In other cases, a more ethical perspective is introduced ('Like disrespect of the earth creates it') through approximation ('mostly like smoke'), which is compatible with the low specialized degree of these digital texts (Gotti 2013: 18).

 The third rhetorical question ('Is it important to look after the planet?') allows the repetition of the question in the answer 'It is definitely important that humans look after the planet because it's the only one we've got'. This

repetition highlights the importance of "taking care" reiterated through a number of reformulations: 'It's our home and if we destroy it then we've lost our home, we're homeless'. In the answers to the fourth question ('Let's say you usually drive to school'; 'maybe try walking to school'; 'reduce the amount of waste and plastic bags'), again approximation ('maybe') and exemplification in a more informal way ('let's say') are visible.

The answers to the last question are formulated as opinions introduced by the hedge 'I think' and contain a call to do much more. When all responses are offered, the original presenter comes back again to give us an explanation of what climate change is and some of its effects. She then provides suggestions by reformulating the previous answers in a more discursive and fluent, but simplified, way. No instantiation of figurative language and attribution were found.

The simplicity of the verbal text, which does not compromise its effectiveness, but rather constitutes its strength, is also reflected at a visual level where only the tactic of Extension through Similarity is used. Indeed, every verbal formulation is also visually denoted; so, for instance, the most common drawings are the thermometer which symbolizes heating and the upward arrow which stands for the rising sea level. Prohibition and concession signs recur frequently to guide young people towards the right behaviour. In this way, the graphic framing may be interpreted as the visual representation of modality which reinforces the verbal text. All the young speakers are shown not as isolated individuals but rather in groups of two or three children at the same time and are foregrounded. In this way, the viewer is asked to enter into a relation of social affinity with them.

The last English video, entitled *Climate Change*, from the website *Smile and Learn*, starts with the interactive and stimulating question 'Have you ever heard of Global warming?' The first question is followed by another query that introduces the topic by presenting a fact: 'Did you know that over the past decades sea level has risen?'. Three questions of this "Did you know" type are present in this video. The other four questions are more knowledge related and the last one, which concludes the video, is an overt invitation to take action. All these questions serve the purpose of organizing knowledge transfer by presenting a fact and then adding further information. The pervasive use of questions along with the inclusive 'we' are forms to engage the spectator. Directives are also employed as in the other videos, above all towards the end of the verbal text, when the message to start action is delivered. The language is colloquial as in the previous videos, but less simple as far as the length of sentences is concerned. Figures are mentioned to support what is said and are introduced by the simple expression 'Here are some facts'.

From a visual standpoint, the resources used are those of cartoons. The strategies adopted are both Extension and Elaboration. Examples of the former are given by representation of the different types of climate which support the definition, while an example of the latter is the representation of a digital tool (e.g., a tablet, see also Figure 1) through which reality is exemplified: every time the finger of an off-screen character slides over the screen, a new bad effect, represented as a real-life image, pops up, such as flooded areas, polluted areas, droughts. In this video, the function of anchoring to the addressees' background knowledge and life experience is performed by visuals. Visuals also complement the verbal text, as in Figure 1 where the word 'help' is written in red in the speech bubble as if the Earth were speaking. In the meantime, the off-screen voice is describing the consequences of climate change. Similarly, while describing the viable solutions, further examples of Complement are visible: when directives are used to invite the young to intervene by making a difference in their everyday life, alternatives to what the speaker says are shown (e.g., paper cutlery instead of plastic cutlery). Interestingly, when the verbal text describes the actions to be taken, the visuals shift to real-life images.
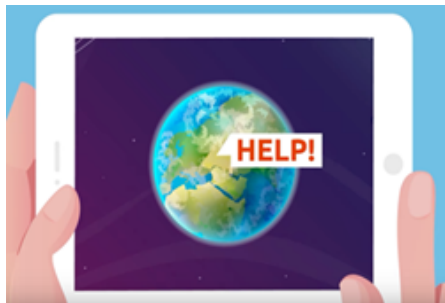
Figure 1. Visual metaphor of the planet asking for help

5. Concluding remarks

The main aim of this research was to identify the most pervasive linguistic and cultural features of popularization of climate change in multimodal videos for young people, aged 7-13, across the English and Italian languages and cultures. To pursue this intent, a corpus of six comparable videos was assembled which was qualitatively investigated in the light of the main popularizing strategies highlighted in the literature.

Results demonstrate that all the videos investigated share some linguistic features even though they differ substantially. In both languages and cultures, the visual/pictorial channel and the auditory/verbal-processing channel have been exploited to facilitate the transfer of information and also to maximize memory capacity (see Mayer 2001). Additionally, for the same reason, all the videos are short and respect the typical average engagement time of less than six minutes (Guo – Kim – Robin 2014).

The popularizing verbal tactics found in the Italian and British videos are seen in the use of questions, definitions, and reformulations, use of attribution, pronouns, and metaphors. The only technique fully shared is Attribution (e.g., 'according to scientists'); this emerged in those videos where scientists are the main narrating voice. This common finding may be explained considering that, when the narrator explains certain events, the expertise of the scientific community he/she belongs to is called upon to ensure credibility. A number of differences were also identified in the corpus. First of all, learners' engagement is maximized in the English data, where a higher degree of interaction is achieved through the pervasive use of inclusive pronouns (e.g., 'we' and 'you') and a conversational style (e.g., 'Let's say you usually drive to school'). Through the use of pronouns, more particularly the second person singular pronoun 'you', authority is given to the audience, a connection with them is favoured and peer-to-peer interactivity is established. In this way, the recipients feel involved in the construction of knowledge. Similarly, the use of colloquial language during multimedia knowledge transfer has been demonstrated to have a large effect on students' learning, because it encourages students to develop a sense of social partnership (Brame 2016). On the contrary, the Italian texts minimize inclusiveness and the sense of social partnership among learners due to the presence of specialized terms (e.g., 'allevamento intensivo'/ 'intensive farming'), impersonal constructions (e.g., 'l'acqua è meglio evitare di sprecarla quando ci si lava i denti'/ 'when brushing teeth, it is better to avoid wasting water'), and less interactional communication.

A further crucial engagement strategy is the use of questions mentioned above. In both the Italian and English videos, questions are used for topic organization; they also have a relevant pedagogical role, even though with a different number of occurrences (in the English data, eleven questions were found against seven questions in the Italian texts). Bearing in mind Bloom's taxonomy (1956), questions may address various levels of reasoning skills, from a mere recall of memorized facts to more complex cognitive processes based on critical thinking (e.g., remember, understand,

apply, analyze, evaluate, and create). In the Italian data, apart from two questions performing a phatic function (i.e., starting a conversation), most of them are mainly of the "knowledge" type, (e.g., '*Ma perchè il riscaldamento globale è un problema?*' / 'But why is global warming a problem?'). A higher cognitive effort is required by the English questions used in the verbal texts, where more analytical skills are required. Application questions (e.g., 'What can you do to help stop climate change?') together with Evaluative questions (e.g., 'Is it important to look after the planet?'; 'Why should we care?') do not only stimulate the recall of important factual and conceptual knowledge but also require the learner to execute a more complex mental process, to analyze, to evaluate and hence, to build up a more exploratory and participatory knowledge.

At a rhetorical level, it is worth mentioning that persuasion in the Italian data is achieved by prompting ethical values ("ethos"). An example may be the question used to start the conversation ('*Ti vedo spesso in TV ma sei anche una scienziata?*'/ 'I see you often on TV but are you also a scientist?'), which sets up a trustful relationship with the audience by highlighting the scientific credibility of the woman being interviewed. Reputation, namely the belief in the speaker's expertise, is then the strategy used in Italian to establish ethos[6]. Unlike Italian texts, in the English data persuasion mainly relies on triggering the young's emotions ("pathos"). As a matter of fact, numerous linguistic patterns seem to be used for this purpose such as the questions 'Do grown-ups care enough about protecting the planet?', 'Why should we care?' or the use of some negatively-connoted words, such as 'victim' to refer to the oceans or highly persuasive conditional formulations through which the narrating voice anticipates the young people's emotions and in so doing encourages their engagement: 'Worse consequences are predicted in the future if we don't take measures urgently'; 'if we destroy the planet that is our home then we will be homeless'; 'if we don't look after it, then one day the world might not be there'.

At the visual level of the analysis, both languages and cultures resort to the techniques of Extension and Elaboration and their types, except for Contrast which is never used. However, some observations are worth making: in the Italian data the discourse of the "planet in danger" is more softened and mainly conveyed through the context rather than the text, namely it is more implicitly than explicitly delivered. An example of this

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6   The other strategies for establishing ethos (credibility) are similarity, authority, and trustworthiness (see Scotto di Carlo 2014).

different type of communication is given by the Italian visual metaphor for natural disaster which transfers the idea of danger through the image of the little man who wears a mask and a snorkel to survive rising sea levels. This visual metaphor is not sustained by verbal text. Similarly, the verbal metaphor '*che è una piccola molecolina ma riesce a fare il suo sporco lavoro*' ('it's a little molecule but it's able to do its dirty work') is not further specified nor visually represented. On the contrary, in the English data, the metaphors encountered verbally are furtherly explained through a drawing and a real-life picture. This brings us to another relevant difference between the two groups of videos: the Italian videos mainly rely on cartoon-like representations whereas the English videos are more hybrid and make recourse to real-life pictures when serious events (e.g., natural disasters) are talked about. Finally, when relevant information has to be highlighted, on-screen texts or symbols are used in both groups.

The implications of this research to educational videos for popularizing environmental knowledge for Translation Studies are manifold. It is fundamental that translation, as a practice of intercultural mediation, is intently concerned with cultural sensitivity. At a time when environmental issues matter, agents working as interpreters and mediators need to be sensitive to the fact that popularization may be misconstrued in its interlingual transmission. Contrastive studies, such as the one in point, enhance intercultural comprehension which relies on in-depth analysis of how language is used; hence, these findings may support translators' acts of negotiating between complex cultural differences when dealing with the popularization of climate change.

To put it in a nutshell, when translating popularized multimodal videos from Italian into English a more informal style should be used, with very simple definitions of the 'P is X' type; less specialized terminology should be favoured for engagement purposes; a higher degree of interaction should be achieved through the use of inclusive pronouns and analytical questions which contribute to constructing an identity of learners as participant personae. Finally, given the low-context profile of English communication (Katan 2004; Manca 2016), explicit information should be preferred; briefly, text should be prioritized over context.

Further avenues for this research may concern the investigation of young people's reception of educational videos. The use of technological devices such as eye-tracking may indeed offer a more objective window into the young audience's perception and comprehension of both verbal and visual texts.

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