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Early adolescents' visions of the future: towards hopeful and sustainable futures?

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Education for Sustainable Development (ESD) particularly emphasises developing future-thinking competencies. Nevertheless, this line of thinking still represents a challenge for younger students, who tend to be left behind when deciding and visualising the future within educational spaces. Through a qualitative approach, our research attempts to explore early adolescents' views concerning probable and preferable futures and how they are related to sustainable development dimensions. For this purpose, we asked 352 students in the fifth and sixth grades of primary schools in the province of Tarragona (Spain) to explain their visions regarding the probable and preferable futures of their city or town. We analysed the data through an inductive-deductive approach. Our findings indicate that the students' pessimistic visions of the future require a special effort from an ESD viewpoint to educate them towards hopeful futures. Different degrees of complexity in their views of the futures were identified in relation to sustainability, denoting the need to design diagnostic tools that properly guide pedagogical approaches and interventions towards developing sustainability competencies.

KEYWORDS

Education for Sustainable Development, future-thinking competence, early adolescents, qualitative research, SDG 4: quality education

1 Introduction

Enabling learners to think about the future in any topics or disciplines they study is one of the roles of education, especially because education has its roots in some social idea of anticipated futures (Gidley and Inayatullah, 2002; Vidergor, 2023). This is more evident within the context of Environmental Education (EE) and Education for Sustainable Development (ESD), where learning about and for the future is key to empower individuals to become active change agents in their societies (De Haan, 2006; Millican, 2022; Ojala, 2017; Rieckmann, 2018; Wheeler and Bijur, 2000; Wiek et al., 2011). Some authors indicate that EE envisions a future that entails an economic transformation, while an ESD conceptualisation of the future makes an allowance for the economic growth that has contributed to the current environmental crisis (Girault and Sauve, 2008). Nevertheless, beyond these reductionist and never-ending theoretical debates (Vilches et al., 2010), and following the more recent post-sustainability debates (Le Grange, 2017), any form of sustainability education could be an opportunity to educate learners to envision alternative and sustainable futures considering the environmental, social, and economic dimensions. Additionally, since Sustainable Development (SD) was defined as "(...) the development that satisfies the needs of the present generation without compromising the future generations' capacity to satisfy their own needs" (Brundtland, 1986, p. section 49), there has been an opportunity to thoughtfully consider sustainability for future

generations. Thus, the aims and means of ESD include the idea of anticipated justice by considering those “other” individuals’ needs in the future (UNESCO, 2017).

Furthermore more, in the context of ESD, there have been different attempts to establish framestudys and models of key sustainability competencies, including in all of them *future-thinking competence* or *anticipatory competency*. For instance, in the key sustainability competencies model, which has been considered the most influential study in terms of conceptualising sustainability competencies (Bianchi, 2020; Brundiens et al., 2021; Wiek et al., 2011) define anticipatory competence as:

(...) the ability to collectively analyse, evaluate, and craft rich “pictures” of the future related to sustainability issues and sustainability problem-solving framestudys (...) including concepts such as time and uncertainty (...); as well as methods and methodologies such as simulation and scenario analysis. Overall, these skills are tailored to address key sustainability issues, including unintended harmful consequences and intergenerational equity (Wiek et al., 2011, p. 207–209).

The most recent and relevant effort regarding the conceptualisation of sustainability competencies is the *European sustainability competence framestudy “GreenComp”* (Bianchi et al., 2022). Notably, the GreenComp framestudy sets a specific competence area on *Envisioning sustainable futures*, which includes three competencies related to the ability to envision futures. The *Futures literacy competency* focuses on envisioning alternative sustainable futures through visualising and creating alternative scenarios and identifying the actions needed to achieve the preferred futures. The *Adaptability competency* embraces managing sustainability transitions and the challenges of complex sustainability problems to enable making future-related decisions while encountering uncertainty and risk. The *Exploratory thinking competency* outlines seeking and making connections with different disciplines by being creative, experimentative, and employing new methods (Bianchi et al., 2022). Across the competency framestudys, those focused on future thinking are critical since they are related to other competencies and are multi-referential:

(...) as it looks for connections between different perspectives and allows for debates about environmental, economic and social changes on a local scale. Therefore, the state of envisioning and projecting oneself into the future is connected with the ability to make sound choices between these different perspectives (Julien et al., 2018, p. 33).

Hence, future-thinking competencies are also important for the development of other skills that facilitate participation, decision-making and, ultimately, transformation towards a more just and sustainable society (Paige and Lloyd, 2016). This is particularly relevant in the current context of climate emergency, as the lack of ability to have a sense of direction through time could generate more vacillation, uncertain action, and, ultimately, fewer chances of survival (Boulding, 1956; Lowe, 2009; Paige and Lloyd, 2016). Nevertheless, it is not an easy task, having in mind that learning for and by the future could be particularly challenging, since in the foundations of the most dominant pedagogic approaches there is the notion that education

focuses on transmitting knowledge mainly approximately the past and the present (Julien et al., 2018). For this reason, ESD becomes important in challenging old pedagogic paradigms that allow envisioning not only the future but a better future by building bridges between long-term objectives and current behaviour, and especially by motivating students towards action (Adomssent et al., 2007).

It is also essential to consider that it is different to educate young adults for the future, the target of our research, rather than educating children and early adolescents for it (Kopnina, 2014). There is a dominant adult-centred view in education and society, in which children tend to have a secondary role when participating in different democratic tasks and their inherent abilities including envisioning expected, preferred, and alternative futures (Chang and Henriquez, 2013). Existing research has explored the visions of futures among young adults and secondary students, while limited studies exist on the views and visions of young children on expected and preferable futures (Angheloiu et al., 2020; Henriksson, 2023). As pointed out by previous studies, children live surrounded by negative images of the future, feeling that their future has been taken away from them (Santisteban and Anguera, 2013). The proliferation of dystopic images charged with ideologies and agendas that tend to promote demobilisation, catastrophism, or defensive activisms and focus on complaint leads to a continuation of the status quo (Martorell-Campos, 2021). Such catastrophism is linked to eco-anxiety, a more recent phenomenon- studied and described as “*anxiety and distress about the ecological crisis*,” causing feelings of helplessness, confusion, shock, and trauma among students (Pihkala, 2020). To alleviate climate or eco-anxiety, it is essential for students to not only acquire knowledge and skills but also to cultivate a wisdom of hope for the future and focus on solutions to develop hope among young generations (Henriksson, 2023; Li and Monroe, 2019; Ojala, 2017). Hope is perceived as a critical factor in engaging individuals in problem-solving and is based on the idea that individuals are goal-oriented and therefore are the driving force (Li and Monroe, 2019). To cultivate constructive hope, it is fundamental to contrast probable with preferable futures and create realistic possible futures, avoiding unrealistic hope perspectives and thus disengagement (Hicks, 2014). The future dimension needs to be embedded in school curriculum and teachers have to develop critical and creative thinking and future perspectives among students, creating opportunities for hope (Bianchi et al., 2022; Hicks, 2007; Ojala, 2017).

For this reason, it is particularly relevant to explore the visions of self-perceived probable and preferable futures by children and identify whether children are visualizing catastrophic futures or more sustainable and hopeful ones. In this exercise, evidence can be gathered to inform educational practices and curriculums and to better encourage and develop constructive hope among students by promoting climate literacy (Oziewicz, 2023). This entails the use of practical pedagogies that provide an opportunity to express emotions and build a sense of community within classrooms (Vandaele and Stålhammar, 2022).

Previous studies have described stereotyped images of the future by young people across age strata. The most common scenarios imagined by young people are ‘*business as usual*’, in which the future has similar elements and problems as in the present, ‘*technological fix*’, in which all problems will be solved with technology; ‘*edge of disaster*’ in which even more difficulties and catastrophes will take place, and less commonly found ‘*sustainable development*’ in which essential

transformations focused on ecology and more holistic views are needed (Béneker and Wevers, 2013; Hicks, 2001; Hutchinson, 1996). Other studies reported and classified future visions as (a) possible, (b) probable, and (c) preferable futures (Bell, 2009; Slaughter, 1988). In this sense, according to Hicks (2007), education should focus on the (b) probable futures, which give orientation to actions in the present, and the (c) preferable futures, which help students be more conscious of the different and complex elements surrounding future visions.

Therefore, understanding the visions of the future among early adolescents may represent a first step to finding creative and more suitable ways of promoting the probable and preferable visions of the future towards hopeful ones; keeping this in mind is the most fundamental step for building alternative and sustainable futures (Lowe, 2009). Also, imagining possible and hopeful futures becomes a political and justice-oriented action, especially necessary in educational spaces (Casadellà et al., 2022). For these reasons, the present study sought to explore early adolescents' visions of the future in the area of Tarragona (Spain). The research aim of this qualitative study was to identify early adolescents' views concerning probable and preferable futures and how these relate to sustainable development dimensions.

The research questions guiding this study are the following:

1. What are the views of early adolescents concerning probable and preferable futures?
2. How are the views and patterns of probable and preferable futures of early adolescents related to sustainable development dimensions?

2 Methods

This study is part of the EDUCLIMAD¹ project, a Spanish national research project that aims to develop, test, and implement climate assemblies in primary education schools in the region of Tarragona towards the co-creation of climate change mitigation and adaptation strategies and the development of sustainability competencies. The city of Tarragona and its surroundings are considered a unique location in terms of air quality as it is a dynamic region. It is the second largest agglomeration of inhabitants in Catalonia (482,000 inhabitants), having the largest petrochemical industry in southern Europe and coexisting with an important tourist and agricultural activity (Rovira et al., 2021). Its geographical location, on the Mediterranean coast, implies the region is subject to the recurring and increasingly frequent extreme weather phenomena, such as heat waves, droughts, and torrential rains, in some cases related to storms such as Gloria (Sanuy et al., 2021).

An assessment instrument was designed and distributed before starting the climate assemblies among all participating students with the aim of gathering information on their previous knowledge and attitudes related to sustainability. In this article, we present the findings gathered from responses to the open-ended questions as part of the sustainability

competency assessment instrument for primary education students, designed and implemented within the framework of the EDUCLIMAD research project. A qualitative research approach, which seeks to gain a deep understanding of social contexts and circumstances, is adopted and data relate to participants' views, experiences, and meanings (Creswell, 2007; Denzin and Lincoln, 2011; Silverman, 2006).

Data were collected between May and June 2023 using convenience sampling from the schools participating in the EDUCLIMAD project. A total of 352 early adolescents (188 self-identified as boys and 164 as girls) participated in this study. During data collection, they were studying in the fifth and sixth grades in six primary education schools located in the region of Camp de Tarragona (Spain). The participants' ages ranged between 10 and 13 years. Furthermore more, the average age (M) was 10.95 years with a standard deviation (SD) of 0.70 (10 years, 93 participants; 11 years, 183 participants; 12 years, 73 participants; 13 years, three participants). The participants of this age, who were part of the EDUCLIMAD project, were included considering the existing research gap in relation to climate change perceptions, as most existing research had focused on adults and young adults rather than children and adolescents (Corner et al., 2015; Weber, 2010). Additionally, their ages were considered appropriate for participation in this study as in these grades, students have already studied climate change and sustainability topics as part of the school curriculum, thus having a more accurate scientific knowledge regarding these topics than in the previous grades (European Commission, 2024; Lee et al., 2020).

The legal guardians of the participating schoolchildren gave informed consent and students were also given total freedom to participate, resulting in the voluntary participation of all subjects, respecting the ethical principles regarding scientific research, as espoused in the Declaration of Helsinki. This research (Ref. Num. CEIPSA-2023-PR-0008) obtained approval from the Research Ethics Committee on People, Society and Environment (CEIPSA) of Universitat Rovira i Virgili on the May 2, 2023.

The students were asked to complete an assessment tool before starting the process of climate assemblies. The administered instrument consisted of three sociodemographic questions (gender, age, and grade); three open-ended questions regarding their views of the future; a scale with 36 items on the Likert scale including knowledge, attitudes, and skills related to sustainability competencies; and four contextualised scenarios with 15 vignette questions with multiple choices. In this article, we present the findings of the first part of the instrument, corresponding to the qualitative section. We decided to conduct qualitative research using open-ended questions to deeply explore participants' visualisations of the future (Creswell, 2007; Kvale and Brinkmann, 2009). We did this by asking the following three open-ended questions:

1. Write how you imagine your own town or city within 10 years.
2. How is what you have imagined of your town or city similar to how you would like it to be?
3. How is what you have imagined of your town or city different from how you would like it to be?

We did not directly ask students about what their ideas of a preferable or probable future were. The questions were adapted to participants' age, in which the language comprehension was considered and to provide space for an open type of answers. In

¹ <https://educlimad.com/en>

framing the questions in this way, we explored their perceptions and discourses by interpreting their responses, which is one of the benefits of conducting qualitative research (Corbin and Strauss, 2015).

The instrument was anonymous and administered in paper, and the researchers explained each question to the students before they started their responses. In some cases, when students asked for clarifications, the researchers supported them and gave examples to help early adolescents write their visions of the future. Students were asked to write their thoughts without consulting their peers' opinions or answers, so that their personal views and visions of the future are captured. All students answered all the questions. Answers were, in most cases, short in length, but as will be described in the results, some participants provided more details than others. The answers were then transcribed and coded using Atlas.ti qualitative data analysis software. We conducted a thematic analysis to organise and understand the data obtained (Braun and Clarke, 2006). During the analysis process, an inductive-deductive approach was used, employing a combination of deductive and inductive codes to find patterns that can be derived from both data and previous literature and theoretical revisions around future visions and sustainability. We coded parts of the answers thematically following the inductive-inductive analysis process. For this reason, the number of quotations reported in the results is higher than the number of participants and questions/answers. In Figure 1, we present a synthesis of the analysis process and its three stages, outlining and specifying the codes generated at each stage. At each stage of the analysis, reliability was ensured by making a first codification carried by the first and second authors; then codes were compared and contrasted by the third author, and, finally, all authors chose the final codes that best suited our research aim.

First, four main groups of codes were constructed through a deductive process inspired by previous categorisations of future visions in young audiences (Bell, 2009; Slaughter, 1988):

Code 1. Probable vision of an optimistic future: optimistic ideas of how students imagine the future of their town or city.

Code 2. Probable vision of a pessimistic future: pessimistic ideas (including continuity ideas) of how students imagine the future of their town or city.

Code 3. Preferable vision of an optimistic future: optimistic ideas of how students would like their town or city to be in the future.

Code 4. Continuity visions of the future: continuity ideas understood as an expressed preference for the future of their city or town to be the same as the past or the present.

It is important to clarify that the answers of the participants to the three questions were coded according to whether they referred to the future they prefer (preferable vision), the future they imagined it could happen (probable vision) or whether they referred to a continuity vision of the future (continuity vision). Most of the "Preferable visions" answers were found in question 2, while most of the "Probable visions" were found in questions 1 and 3. It turned out evident that all the preferable visions were thus optimistic as none preferred a future that was worse. In change, there were both optimistic and pessimistic answers within the probable visions. We decided to code the

continuity visions separately since these did not provide further details on whether such continuity was worse (pessimistic) or better (optimistic) than in the present. It is important to note that one single participant could describe answers that corresponded both to pessimistic and optimistic views since this was tightly associated with the question, but the details described varied among participants. In this sense, the questions were designed in a way that students could openly describe how they imagined the future as well as how they preferred it in order to respond to our research questions.

Second, following an inductive process, the early adolescents' views were analysed and classified into main themes regarding future visions in emerging codes. These are the different aspects that probable and preferable visions of the future refer to. A total of 16 themes of the future emerged (see Table 1), including aspects such as Environmental, Technology, Urbanization, Tourism, and Health, among others. The definition of each emergent theme of the future is listed in Table 1.

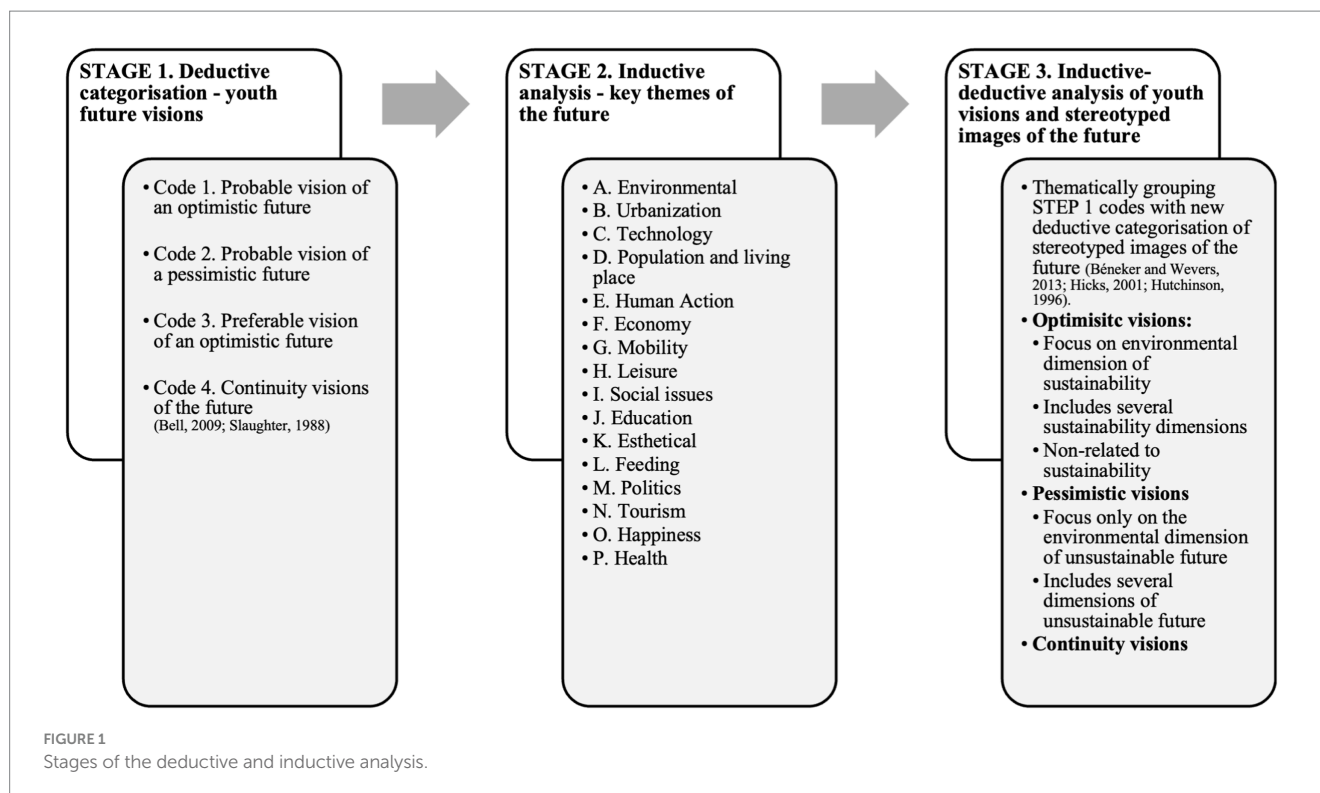
The codification process always involved a codification regarding the probable vision of an optimistic or pessimistic future (Codes 1 and 2) or a preferable vision of an optimistic or continuity future (Codes 3 and 4). At the same time, we also codified the same extract concerning the themes of the future, such description matched (themes of the future A-P), coding one or multiple themes depending on the topics or aspects commented in early adolescents' answers.

Third, once this first codification process was carried out, we thematically grouped them to understand our findings better. We did so by first grouping them into three major themes: optimistic, pessimistic, and continuity visions of the future. Then, we analysed whether such descriptions included one or several sustainability dimensions, as well as their theoretical correspondence with the previous categorisation of stereotyped images of the future across young people reported in the previous studies (Béneker and Wevers, 2013; Hicks, 2001; Hutchinson, 1996). As a result, we thematically grouped them into six themes: *Visions focusing only on the environmental dimension of sustainability*, *Visions including several sustainability dimensions*, *Visions non-related to sustainability*, *Visions focusing only on the environmental dimension of an unsustainable future*, *Visions including several dimensions of an unsustainable future*, and *Visions of continuity*. The definitions of the themes and their adaptation from the previous literature are described in Table 2.

Finally, as a complementary way to analyse the data, we use the co-occurrence analysis tool of Atlas.ti to look for more or less predominance of probable and preferable views and their themes. This quantification of the codes is often used in mixed-methods to enrich the analysis (Anderson, 2016).

3 Results

This section presents the findings of early adolescents' views concerning probable and preferable futures and the way in which those views relate to sustainable development dimensions. We do so through a qualitative analysis in which a total of 1,200 quotations were generated from the answers of study participants. From the Atlas.ti co-occurrence analysis tool (see Figures 2, 3), we were able to observe that early adolescents' views of a probable future were mainly optimistic (437 quotations), compared with the pessimistic (318 quotations). Meanwhile, within their visions of a preferable vision were all optimistic (439 quotations), and a few were continuity visions



(22 quotations). Thus, across all answers and considering both probable and preferable visions of the future, there were more optimistic (876 q.), than pessimistic (318 q.) and continuity visions (22 q.).

Regarding themes of the future, we found the predominance of A. *Environmental* (537 quotations), followed by B. *Urbanization* (224 quotations), C. *Technology* (210 quotations), and D. *Population and Living Place* (165 quotations) themes.

In the following subsections, we describe our findings thematically as previously explained in the methods section (see Table 2).

3.1 Optimistic visions of the future (preferred and probable)

Both probable and preferred visions of the future were predominantly optimistic. Regarding the probable visions, when asked how they imagined their city or town within 10 years, the answers were predominantly optimistic in their thinking of the future (437 quotations). Evidently, concerning the preferred future visions, most of the answers of early adolescents were optimistic (439 quotations). As both probable and preferred optimistic visions had similar patterns, to make a deeper content analysis, these were grouped according to the following themes: *Visions focusing only on the environmental dimension of sustainability*, *Visions including several sustainability dimensions*, and *Visions non-related to sustainability*. We present the content of these themes in the following sections.

3.1.1 Visions focusing only on the environmental dimension of sustainability

In most cases, students described answers associated only with the environmental sphere of sustainability, both within the descriptions

of the probable and preferable future. In their own words: “more parks,” “more plants, flowers, animals, vegetation and trees,” “less air and water pollution,” “clear water and beach,” “less drought,” “less global warming,” “no use of plastic,” “comfortable and arable weather” (Environmental).

3.1.2 Visions including several sustainability dimensions

There were optimistic visions of the future that included several dimensions of sustainability. In these descriptions, students mentioned more elements or topics together with the environmental sphere of sustainability. For instance, some added how these positive changes in the environment would have aesthetical importance within the city: “more beautiful, with more garbage containers around the whole town” (Environment + Urbanization + Esthetical) or concerning other social issues: “there will not be animal abuse nor bullying” (Environment + Human Action + Social issues), “less poverty and pollution, with more green zones and more diversity” (Environmental + Social issues), “with less pollution and more peace” (Environmental + Social issues). Interestingly, some described these environmental improvements as directly related to their leisure: “more places to play in the park” (Environment + Urbanization + Leisure), “I would like the town would not be contaminated, that the people could be happy, without any pollution in the sky, that we could swim in the sea without seeing plastics” (Environmental + Leisure + Happiness). Although some wished for more places to spend their free time, they also demanded that such spaces would need to be sustainable and sustained by human action: “I would like that the new restaurants close to the seashore would not contaminate and that the people that go could be aware [of the environmental issue]” (Environmental + Human Action + Leisure).

TABLE 1 Themes of the future emerged in the coding process.

Themes of the future	Definition
A. Environmental	Future descriptions of effects on different elements of the natural environment (air, water, animals, etc.)
B. Urbanization	Future description around the way cities and/or towns would look like, in terms of built elements such as buildings, schools, parks, streets, etc.
C. Technology	Future descriptions around the use or invention of technologies such as flying cars, robots, computers, etc.
D. Population and living place	Future descriptions around population decrease or increase together with the living place.
E. Human Action	Future descriptions that consider the human action (i.e., “people will recycle” entitles someone is changing the reality directly)
F. Economy	Future descriptions around the way places where people will work are going to change.
G. Mobility	Future descriptions considering the way humans move from one place to the other.
H. Leisure	Future descriptions around the way people would spend their free time.
I. Social issues	Future descriptions around various social issues such as gender, racism, poverty, bullying, violence, wars, etc.
J. Education	Future descriptions around the way and places in which people would learn.
K. Esthetical	Future descriptions around how cities and/or towns would look, regarding beauty standards.
L. Feeding	Future description around the way humans will be fed. (i.e., “people will eat proximity veggies”)
M. Politics	Future descriptions around the way political actors would be involved.
N. Tourism	Future descriptions around how cities and/or towns would be touristic destinations.
O. Happiness	Future descriptions around the state of happiness or well-being in people.
P. Health	Future descriptions around the implications of people’s health.

Similarly, there were several narrations in which such pro-environmental future envisioned will need human action. For instance, “the human race will change their mindset around the use of plastic,” “there will be more activists that will improve climate change and pollution,” “we need to reduce the use of plastic,” “I would like that we recycle” (Environment + Human Action), and “we will not eat that much meat” (Environment + Human Action + Feeding). On other occasions, this human action was also endorsed by institutions: “The school and the city hall will help us to recycle and clean” (Environment + Human Action+ Education + Politics) or with the support of social norms, “people will not be able to use their cars because they contaminate,” “we will have to walk or use the bike” (Environment +Human Action +Mobility), “there will be days in which we will only be able to eat plants” (Environmental + Human Action + Feeding). Additionally, some of the responses desired that the human action needed urbanistic infrastructure: “there will be more garbage containers to be able to recycle” (Environment + Urbanization + Human Action). Alternatively, there were critical voices explaining how urbanised spaces and the increase in factories were linked to environmental degradation, thus wishing that they decreased. For instance, less urbanistic expansion and an increase in natural spaces were envisioned, with or without mentioning the role of human action: “much smaller but clean, with big trees and beautiful green zones, flowers...” (Environment + Urbanization + Human Action), “I would like more ground that is pure soil without asphalt to play football” (Environmental + Leisure +Urbanization), “I would like this town to be less polluted, and using less light over the nights,” “I would like that it could be more rural, that we do not use much electricity” (Environmental + Urbanization), “if we have more businesses and factories, there will be more contamination, even though we could have some solutions it will not be enough” (Environmental + Economy).

There were various answers regarding technology fix for environmental issues. Some detailed how these human actions, in order to be oriented to take care of the environment, will be mediated by the technology: “It will be more sustainable because we will use more solar panels and will be aware of the problem we have” (Environment + Human Action + Technology). On the contrary, most of them did not call for human action in solving environmental issues, but relied on technological improvements: “robots will pick up the garbage,” “we will have houses that will function with the pollution and all the energy they do not use will be returned to plants” (Environment + Urbanization +Technology + Population and Living Place), “it will be more advanced in technology as well as sustainable” (Environment + Technology), “there will be electric cars using solar energy” (Environmental + Technology + Mobility). Interestingly, only a few voices were critical of technological improvements: “I should hope for a better world, I know a flying car is very cool, but instead, we could focus on making cars that do not contaminate” (Environmental + Technology + Mobility).

3.1.3 Non-related to sustainability

Most of the descriptions described their town as more urbanised: “with more buildings and highways,” “bigger streets,” “renewed,” and “with higher buildings” (Urbanization). Also, many answers referred to this together with an increase in the population and houses built, hospitals, workplaces, schools, leisure places, or including technology features: “it will be bigger, with more people” (Urbanization + Population and Living Places), “it will be bigger, with a shopping mall, another primary school and high school, more futuristic and with many places to work” (Urbanization + Technology + Economy + Education), “with an aquatic park” “with more swimming pools and theme parks” (Urbanization + Leisure).

Despite its relationship with the Environmental and Urbanization topic, students described in a general way how technology applies to

TABLE 2 Definitions of the thematic group of codes adapted from previous studies' categorisation (based on Béneker and Wevers, 2013; Hicks, 2001; Hutchinson, 1996).

Thematic group adapted from the previous categorisation		Description	Previous categorisation correspondence	Previous categorisation' definition
Optimistic visions of the future	Visions focusing only on the environmental dimension of sustainability	Refers to preferred and probable optimistic answers that considered whether only environmental dimension of sustainability.	<i>Did not correspond to any</i>	<i>Did not correspond to any</i>
	Visions including several sustainability dimensions	Refers to preferred and probable optimistic descriptions that, besides describing environmental dimension of sustainability, considered more complex elements when visualising a more sustainable future (such as social issues, urbanisation, technology, etc.).	<i>Sustainable development</i>	Important transformations need to take place towards ecology and holistic views.
			<i>Corresponds partially to: Technology fix</i>	All problems will be solved with technology
Visions non-related to sustainability	Refers to preferred and probable optimistic visualisations of the future that did not conceive the environment nor other dimensions of sustainability in their future visions. Here we also included answers that incorporated contradictory elements that is, answers that did not match with a more sustainable future.	<i>Did not correspond to any</i>	<i>Did not correspond to any</i>	
Pessimistic visions of the future	Visions focusing only on the environmental dimension of an unsustainable future	Refers to pessimistic visions that conceived only elements of environmental degradation without integrating other sustainability-related elements.	<i>Edge of Disaster</i>	A future in which even more difficulties and catastrophes will take place
	Visions including several dimensions of an unsustainable future	Refers to pessimistic visions which integrated other sustainability-related dimensions besides describing elements of environmental degradation.	<i>Corresponds partially to: Edge of Disaster</i>	A future in which even more difficulties and catastrophes will take place
Continuity visions	Visions of continuity	Refers to those visions that perceived a future in continuity with the present and/or the past.	<i>Business as usual</i>	The future has similar elements and problems as in the present.

	1.ProbableVision.Optimistic 437	2.ProbableVision.Pessimistic 318	3.PreferableVision.Optimistic 439	4.PreferableVision.Continuity 22
A.Environmental 537	130	188	236	2
B.Urbanization 224	125	31	83	5
C.Technology 210	121	35	62	2
D.Population&LivingPlace 165	91	35	44	2
E.Human Action 127	44	35	50	2
F.Economy 103	47	23	39	
G.Mobility 98	55	19	32	
H.Leisure 73	32	4	41	
I.Social Issues 64	18	15	31	1
J.Education 44	29	1	19	
K.Esthetic 41	22	3	20	
L.Feeding 17	7	5	5	
M.Politics 14	10	1	6	
N.Tourism 12	6	1	5	
O.Happiness 12	5	2	6	
P.Health 8	6	2	4	

FIGURE 2
Co-occurrence table generated by Atlas.ti.

or is related to different topics like education, their leisure, or work positions: “more technology and big screens to play” (Technology + Leisure) “robots will be waiters” “robots will build the structures we are now doing” (Technology + Economy). Many answers explained how technology will be related to mobility: “cars will be able to fly,” “we will use submarine cars.”

Furthermore, other answers, even though they added more elements in addition to the environmental sphere of sustainability, they incorporated elements that could be less compatible with a sustainable future. For instance, they referred to the willingness to have more natural spaces and parks, at the same time having more shopping malls, bigger urbanised spaces, more population, cars, and tourism. In the same lines, some did not see a connection between technology or urbanisation improvements based on pavement and a possible environmental hazard: “I would like less contamination and that the city would be bigger and modern” (Environmental + Technology + Population and Living Place), “[the town] would have renewed avenues, and there will be a lot of green spaces” (Environmental + Urbanization).

3.2 Pessimistic visions of the future (all probable)

As expected, the pessimistic visions only emerged when they described probable future visions (318 q.). We thematically grouped all the pessimistic visions of the future as follows: *Visions focusing only on the environmental dimension of an unsustainable future* and *Visions including several dimensions of an unsustainable future*.

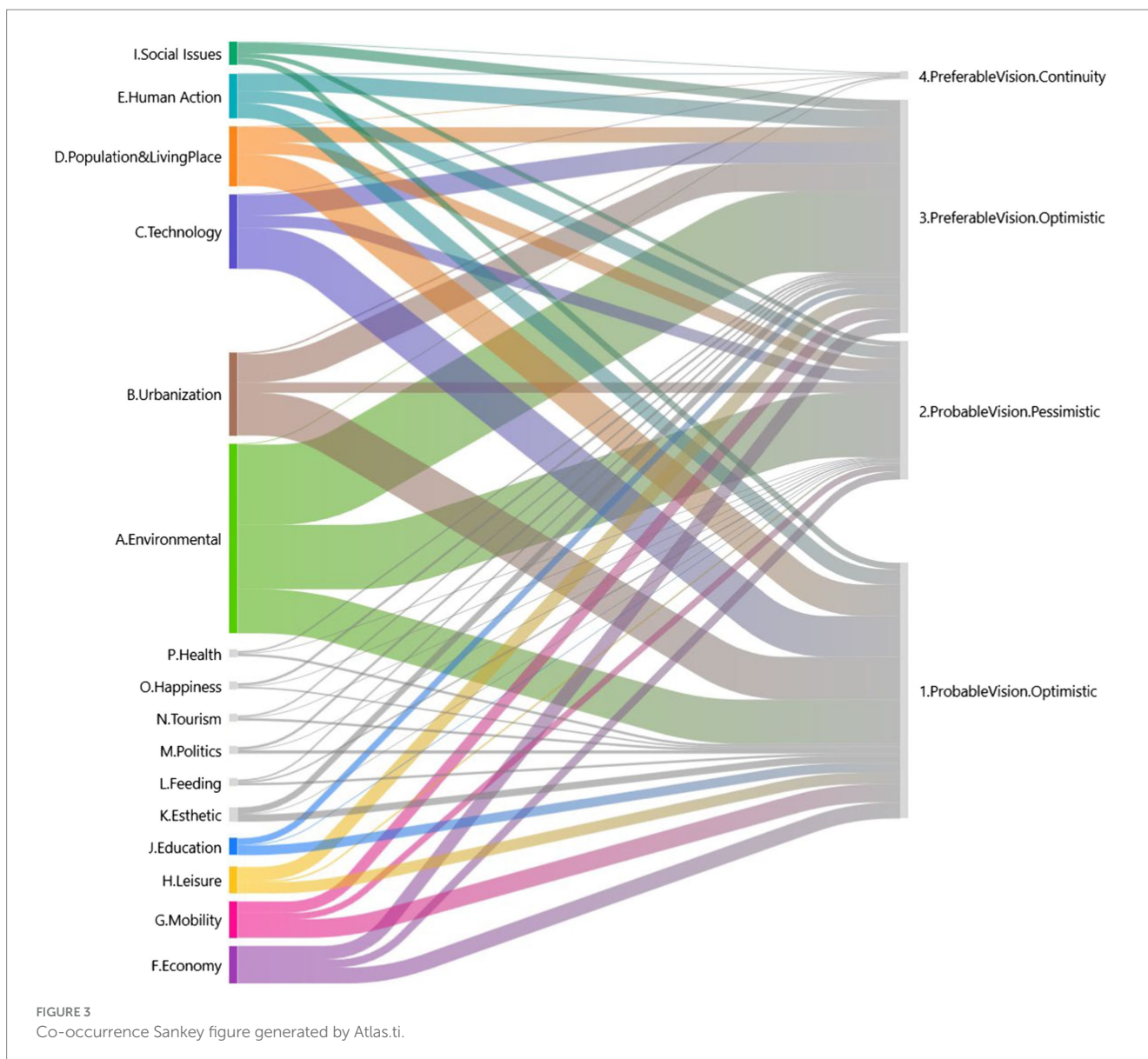
3.2.1 Visions focusing only on the environmental dimension of an unsustainable future

Within these narrations, participants described only environmental elements of sustainable development that would get worse in the future, such as “more pollution,” “deforestation,” “more hot weather because of climate change,” “lack of water,” “droughts,” “fires,” “fewer animals,” and “a lot of plastics.”

3.2.2 Visions including several dimensions of an unsustainable future

Alternatively, some narrations described more sustainability dimensions. For example, some were related to the city’s livelihood patterns: “the town will be smaller because the sea level will rise” (Environmental + Urbanization). Similarly, other answers described how their own town will be less inhabited because of pollution: “the town will be abandoned because of the garbage” (Environmental + Population and Living Place). Other descriptions linked the environmental crisis with social and humanitarian issues: “I imagine my town with more immigrant people because of climate change, with less nature and fewer animals” (Environmental + Social issues).

In the same way, as in the visions including several sustainability dimensions, there were visualisations considering human action or only the mere population increase being related to further environmental degradation: “there will be more climate change unless we act quickly” (Environmental + Human Action), “there will not be that many trees because these would be cut down to make more houses” (Environmental + Population and Living Place), “homes and buildings will be bigger, with more population buying food and throwing away their garbage, going directly to the Mediterranean sea” (Environmental + Population and Living Place + Human Action + Feeding).



Also, the environmentally pessimistic visions were described concerning businesses or places that generate economic growth: “there will be more business, factories and entrepreneurs and therefore more pollution,” “there will not be green fields because these will be shopping malls” (Environmental + Economy). Participants sometimes linked environmental degradation to using polluting mobility options: “there will be more contamination, more cars, trucks, etc.” (Environmental + Mobility). Even technological advancements were associated with the environment: “flying cars that I think will be even more pollutant” (Environmental + Technology + Mobility).

Related to technology specifically, a few answers described how technological progress could lead to positive change, but it will happen at the cost of environmental deterioration: “I imagine we will use virtual reality headsets and everything will be really polluted and technologic” (Environmental + Technology + Leisure); “everything will be more modern and advanced in technology for our health but the environment will be left behind” (Environment + Technology +

Health); “I imagine the town covered by a gigantic dome with black and contaminated air, but more technologic” (Environmental + Technology).

3.3 Continuity visions

Even though continuity visions were not as observed among the answers as the rest (22 q.), it is relevant to differentiate them. Some participants envisioned that further change in the status quo was needed. To illustrate this in early adolescents’ own words: “I imagine it being the same,” “more or less the same,” “the people will be the same,” “I would like that my town would be the same forever,” “I would like that it continues just like now” (Continuity). On occasions, they added other topics: “the cars will be the same” (Continuity + Mobility), “For me, everything would be the same, the homes, the neighbourhoods” (Continuity + Urbanization + Population and Living Place). Interestingly, some of them also added that it should

be like it used to be in the past: “there will be bars like in the past” (Continuity + Leisure).

4 Discussion

In this section, we outline the implication of the main findings related to our research questions regarding the views of early adolescents concerning probable and preferable futures and how they are related to sustainable development dimensions. Through this research, we arrived at four main findings: (1) the presence of pessimistic and continuity visions of the future, (2) the inclusion of one or more dimensions of sustainability, (3) the role of technology, and (4) the non-sustainable visions. At the end of this section, we also discuss some methodological limitations of our study.

First, even though there were more optimistic than pessimistic visions, the mere observation of pessimistic views in the responses among the participants may indicate that there is an awareness of the climatic crisis we are facing at present and, as a consequence, the urgent necessity to collectively act to solve it (European Commission, 2022). Nevertheless, it also reflects how children live in a society surrounded by a proliferation of dystopic images (Martorell-Campos, 2021). This is in line with previous studies indicating that young people, despite their interest in the global future, experience emotions of helplessness and hopelessness (Connell et al., 1999; Nordensvaard, 2014; Strife, 2012; Threadgold, 2012; Tucci et al., 2007). In the same vein, other previous studies found that future visions among young people corresponded to the so-called “Edge of Disaster,” in which more difficulties and catastrophes will take place. Such complex responses and emotions may also be tightly related to the eco-anxiety phenomenon associated with distress around the ecological crisis (Pihkala, 2020). Thus, considering our findings, ESD needs to place more emphasis on developing critical emotional awareness among early adolescents, especially towards hope (Ojala, 2017). Since hope is also linked with agency and action (Snyder et al., 2002), one way to do so is through the usage of student-centred pedagogies such as active and participatory, multiple-stakeholder collaborative and transformative learning approaches (Tilbury, 2011). By promoting these pedagogies, ESD also contributes to the active participation of students and a transformation of society and unjust structures (Rieckmann, 2020) and breaking with the dominant adult-centred view in education (Chang and Henriquez, 2013). Indeed, a specific way to do so is by developing sustainability competencies among students. Further research should focus on studying and finding different ways to operationalise, develop, and assess competencies among early adolescents, such as those from the GreenComp framework’s area of “Acting for sustainability,” which describes three specific competencies: political agency, collective action, and individual initiative (Bianchi et al., 2022).

In relation to the continuity visions of the future that a few students foresaw, it may indicate that students wish for the permanence of the current status quo (Martorell-Campos, 2021). These visions relate to the “business as usual” future visions found in previous studies, in which the future has similar elements and problems as in the present (Béneker and Wevers, 2013; Hicks, 2001; Hutchinson, 1996). Therefore, such continuity visions do not show visions of disruption towards sustainability. Instead, this points out how the notion that education focuses on transmitting knowledge

mainly around the past and the present, which is also an issue in our findings (Julien et al., 2018). Thus, these showcase a poor development of sustainability competencies, especially future literacy, adaptability, and exploratory thinking (Bianchi et al., 2022; UNESCO, 2017). This is especially relevant in the context of ESD in which learning around the future is central (Cebrián et al., 2020; De Haan, 2006; Millican, 2022; Ojala, 2017; Rieckmann, 2018; Wheeler and Bijur, 2000; Wiek et al., 2011). Furthermore, as the future competency has also been linked to other competencies (Julien et al., 2018), another way to overcome this challenge is by motivating students towards action (Adomssent et al., 2007), in other words, emphasising as well action-oriented competencies.

Second, the way students referred to one or more sustainability dimensions among their visions indicates the understanding of the environmental crisis and the level of complexity, which varied among participating early adolescents. Some visions of sustainability reported by the participants only mentioned the environmental dimension of sustainability, and by doing this, they are not aware of the variety of elements and interconnections that need to take place to achieve a deep transformation towards sustainability. According to Wals and Jickling (2002), discussing issues of sustainability entails too ethical inquiries around seeking justice in using the planet’s resources, critically addressing development issues such as justice peace, conflict resolution, human rights, as well as the dignity and intrinsic value of the others throughout the ecosystems. Thus, among the participants of this study, this may indicate the need to develop sustainability competencies in early adolescents, those related to systems thinking, critical thinking, and problem framing (Bianchi et al., 2022; Brundiers et al., 2021). Such competencies must be developed considering the cognitive and moral development stage of students in primary education since these stages vary significantly across this fundamental human development period (Kopnina, 2014). Also, it should be noted that the instrument used can present some limitations in terms of gathering the extent to which their visions are complex or not. In future studies, other strategies could be considered, as further suggested in the last paragraph of this discussion.

Furthermore, among our study participants (fifth and sixth graders), we found answers that added more sustainability dimensions, which may correspond to more complex and holistic visions of sustainable futures. For instance, various answers also considered the role of human action when reducing pollution, consuming more environmentally friendly food and products, or changing their mobility to less carbon-based options. Such descriptions corresponded with visions of the future less commonly described among young participants in previous studies (Béneker and Wevers, 2013; Hicks, 2001; Hutchinson, 1996). Such visions were named as “sustainability development” visions of the future, in which participants described significant transformations needed considering more ecological and holistic visions. Thus, the presence of both visions with one or more sustainability dimensions denotes the importance of developing key sustainability competencies, such as systems thinking, in a non-homogenous fashion (Cebrián et al., 2020). Not all students demonstrate the same level of acquisition of sustainability competencies. As previous studies concerning ESD competencies of educators have found (Corres et al., 2020), further research should continue developing diagnostic tools to better perform more tailored

oriented pedagogic interventions that pretend to enhance sustainability competencies, not only among educators but also among early adolescents.

Third, concerning the role of technology as gleaned from students' visions, various sustainability solutions or optimistic descriptions implicated the use of technology. This corresponds to what previous studies identified as a vision of the future called "technological fix," which conceives that all environmental problems will be solved with the use of technology (Béneker and Wevers, 2013; Hicks, 2001; Hutchinson, 1996). Nonetheless, in our findings, we found more variety of answers related to technology. For instance, some described the intervention of human action that chooses to use solar panels, being technology-mediated, and controlled by human behaviour. Interestingly, to a lower extent, another type of responses emerged in which participants were critical of the use of technology in relation to the preservation of the environment, perceiving the technology developments as contaminating.

This variety of answers linking technology as a solution provider or worsening element to the environmental crisis may show the existence of such tensions among early adolescents. It has to be considered how technology in the form of video games, smartphones, televisions, tablets, etc., is present in their daily lives, not only for entertainment purposes but also in their educative spaces, in which they are learning for and from the future, having an effect on participants' answers (Greenwood and Hougham, 2015). In this sense, computer-mediated technologies may distort human relationships with their environments (Bowers, 2006). Thus, if current primary education students are having a mediated experience of the environment through the technologies, how could they imagine the future without using these tools? This does not mean that technologies are negative or positive *per se*. For instance, these have been especially important in developing ESD competencies during the pandemic (Corres and Ruiz-Mallén, 2023) and highly crucial before the pandemic in environmental education (Hills and Thomas, 2019). However, these should be critically used considering their appropriateness to the pedagogic objectives (Corres and Ruiz-Mallén, 2023) as well as seriously debated among students, even if they are early adolescents. In other words, it is necessary to pose the following question: "(...) how do we embrace learning technologies on the one hand, while remaining critically awake to the reality that these same technologies are being used as ubiquitous shaping instruments of people and the planet?" (Greenwood and Hougham, 2015, p. 102).

Fourth, other types of answers among the participants did not refer to the environmental topic when visualising their preferred and probable future. These descriptions were mainly centred around urban developments: more schools, bigger streets, more shopping malls, theme parks, etc. As we did not specifically ask about the environmental future, we were expecting these kinds of answers. These descriptions could be related to the immediate needs corresponding to their age, that is, the need for more leisure spaces or the likeliness of images of a "cool city" represented in the media as part of what these students may consume for entertaining purposes. Interestingly, this type of vision of the future was not reported in previous research studies on the future visions of young audiences (Béneker and Wevers, 2013; Hicks, 2001; Hutchinson, 1996). Therefore, ESD efforts with early adolescents should carefully problematise such visions, having in mind students' needs and wishes without imposing the environmental importance, since this could

generate feelings of rejection towards this topic, as previous studies have found in relation to eco-anxiety (Pihkala, 2020).

In relation to the limitations of our study regarding the design and method, even though we gathered children's views of the future through writing on how they imagine their own town or city in the future (10 years), future studies could consider a more comprehensive exploration of children's future visions through gathering other forms of expression such as drawings (Julien et al., 2018) and more participatory inquiry approaches, such as child-led research, children as co-researchers, and youth participatory action research (Bakhtiar et al., 2023). This could provide a more comprehensive overview of early adolescents' future visions, a triangulation of results, and interpretations of the answers being enriched by the participants themselves. In addition, future research could also explore the differences by using more direct questions and non-interpretative approaches such as close-ended questions (Yilmaz, 2019; Murphy et al., 2021). Furthermore, the thematic categories that emerged in the present research could be helpful in the development of a future questionnaire that could deeply explore such topics using a variety of methods. Finally, regarding limitations, it is relevant to note how the study context might have influenced the findings in relation to pessimistic views of the future, especially considering that the largest petrochemical industry of the south of Europe is located within the Tarragona province, where a high level of risk awareness has been reported among the population (Bustamante Picón et al., 2023).

5 Conclusion

This qualitative research contributes to the discussion around the views and visions of early adolescents in relation to probable and preferable futures and how these are related to sustainable development dimensions. Regarding our first research question, our study showed how students described optimistic and pessimistic visualisations of what they think is a more probable future of their town or city and the ways they preferred this future to look like. Our findings have similarities and differences with what previous research categorised regarding future visions of young audiences. In this sense, and in relation to our second research question, we found a wider variety of answers thematically grouped, ranging from future visions describing one or more sustainability dimensions to optimistic, continuity, and pessimistic visions. From this categorisation, we especially picked up the pessimistic visions of the future. Even though they were not as big a surprise given the climatic crisis we are currently experiencing, ESD needs to incorporate creative and innovative ways to develop hopeful visions of the future by, for instance, emphasising the usage of ESD pedagogical approaches and operationalising sustainability competencies of envisioning sustainable futures and acting for sustainability.

Also, these different visions that included one or more sustainability dimensions suggest the need to develop sustainability competencies such as systematic thinking, critical thinking, and problem-solving. In this sense, further studies should develop diagnostic tools to determine early adolescents' level of acquisition of sustainability competencies, especially those that promote complexity, action, systems, and future thinking to implement appropriate pedagogic strategies that are properly integrated into the school curricula. Additionally, special attention should be given to

problematising the role of technology as a “fixer” of sustainability issues among children of these ages. Furthermore, the non-sustainable visions analysed indicate that this should also be critically problematised in this age group, considering the emotional implications of such visions on students’ psychology and derived eco-anxiety or distress related to the ecological crisis and climate emergency situation. Education has to focus on cultivating constructive hope for creating sustainable societies among future generations. Thus the future dimension has to be embedded into the school curriculum.

All in all, further research should consider the limitations of the present research, considering, for instance, the usage of more direct questions or participatory-led methodologies that could deeply explore how the pessimistic visions of the future are related to early adolescents’ hopeless feelings. Besides, further developments in ESD need to consider the high-risk perception regarding the petrochemical industry in the Tarragona province, where the study participants live and visualise their future. This is particularly relevant since ESD plays a critical role in building awareness, promoting future-oriented and anticipatory competencies, and mindset-change towards the transformation of unjust structures, fostering constructive hope among students and promoting positive and empowered change agents among them who visualise alternative futures.

Data availability statement

The original contributions presented in the study are included in the article/supplementary material, further inquiries can be directed to the corresponding author.

Ethics statement

The studies involving humans were approved by the Research Ethics Committee on People, Society and Environment (CEIPSA) of Universitat Rovira i Virgili. The studies were conducted in accordance with the local legislation and institutional requirements. Written informed consent for participation in this study was provided by the participants’ legal guardians/next of kin. Written informed consent was obtained from the individual(s), and minor(s)’ legal guardian/

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AC: Conceptualization, Data curation, Formal analysis, Investigation, Methodology, Supervision, Validation, Visualization, Writing – original draft, Writing – review & editing. GC: Conceptualization, Data curation, Formal analysis, Funding acquisition, Investigation, Methodology, Project administration, Resources, Supervision, Validation, Visualization, Writing – original draft, Writing – review & editing. MJ: Conceptualization, Formal analysis, Investigation, Project administration, Supervision, Validation, Visualization, Writing – original draft, Writing – review & editing.

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Conflict of interest

The authors declare that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

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