OmniaScience

Journal of Technology and Science Education

JOTSE, 2025 – 15(2): 602-613 – Online ISSN: 2013-6374 – Print ISSN: 2014-5349

https://doi.org/10.3926/jotse.3388

OPINIONS OF UNIVERSITY EDUCATION STUDENTS ON DEGROWTH TRAINING: A QUANTITATIVE STUDY

Antonio Pérez-Robles[1*], Enrique Javier Díez-Gutiérrez[2], Luisa María García-Salas[3], José Jesús Trujillo Vargas[1]

[1]Universidad Internacional de La Rioja (UNIR) (Spain)

[2]Universidad de León (ULE) (Spain)

[3]Centro Universitario Virgen de Europa (adscrito a la Universidad de Cádiz, UCA) (Spain)

[*]*Corresponding author: antonio.perezrobles@unir.net, ejdieg@unileon.es, lmgsalas@magisteriolalinea.com, jose.trujillo@unir.net*

Received February 2025

Accepted July 2025

Abstract

The ecological crisis and climate change threaten life on the planet. Degrowth is seen as the most effective way to avoid possible eco-technological collapse and to learn to live more simply, so that others can simply live. The training of teachers in degrowth, both initial and permanent, becomes a priority for the Higher Education of future generations. The purpose of this research was to analyse the opinion of 348 students of Education degrees (Bachelor and Master) regarding the ecological crisis and degrowth, and their opinion on the need for training on these issues in Higher Education. The quantitative research methodology was carried out using a Likert-type questionnaire with 10 closed questions, allowing for a descriptive-interpretative and factorial analysis of the data obtained. The results show that the participants perceive the seriousness of the ecological crisis and, although they do not have an in-depth knowledge of the concept of degrowth, they consider that education in and for degrowth should be introduced into the educational system in order to change the paradigm of infinite development of a finite and consumerist planet as a form of social fulfilment and happiness. It is concluded that systematic, permanent and in-depth university teacher training on degrowth is necessary as an effective and necessary alternative to face the current global crisis and that the questionnaire has been an appropriate instrument to find out the students' opinions.

Keywords **–** Degrowth, Sustainability, University teacher training, Environmental education, Questionnaires.

To cite this article:

Pérez-Robles, A., Díez-Gutiérrez, E.J., García-Salas, L.M., & Trujillo-Vargas, J.J. (2025). Opinions of university education students on degrowth training: A quantitative study. *Journal of Technology and Science Education,* 15(2), 602-613. https://doi.org/10.3926/jotse.3388

---

1. Introduction

The climate crisis affects life on the planet in multiple ways as evidenced by numerous research studies (Grubb, Okereke, Arima, Bosetti, Chen, Edmonds et al., 2022; López, 2023; Navarro, 2023; Readfearn,

2020), causing changes in the atmosphere, biosphere and ocean, indicating that the world has warmed due to rising CO2 levels. Among the most worrying changes are significant reductions in arctic ice and glacier thickness, oceans have increased in level, acidification and deoxygenation, land temperatures are increasing in extremes, causing devastating fires and storms and negatively affecting the health and well-being of the planet and its inhabitants. Humans have also been influenced: loss of life, reduced livelihoods (agriculture, fisheries...), high mortality rates, physical and mental health problems, among others, especially in impoverished countries that see the natural resources on which they survive diminishing and lack sufficient infrastructure to cope with more severe climatic conditions, such as earthquakes, fires, floods and so on (Al-Khourdajie, van Diemen, Lamb, Pathak, Reisinger, de la Rue du Can et al., 2022; Grubb et al., 2022; Ripple, Wolf, Gregg, Rockström, Newsome, Law et al.., 2023).

Despite proven scientific evidence that climate change is humanity's most important challenge (Bento, Miller, Mookerjee & Severnini, 2023), there are still some who consider that there is exaggerated alarmism about it, believing that it has no immediate consequences and therefore does not need to be prioritised on the agenda of nations or that it will be solved by some kind of technical solution or breakthrough in the future (González-Gaudiano, 2020).

One of the plausible and most repeated hypotheses is that resistance to change in the face of current environmental problems is due, for the most part, to the fact that people and communities do not have an 'objective' and 'real' knowledge of what global decline means and the consequences it has and can have (González-Gaudiano & Meira-Cartea, 2019). For this reason, they insist that training is key to transmitting scientific knowledge that allows them to act accordingly. However, for González-Gaudiano and Meira-Cartea (2019) the education system seems to have remained oblivious to this serious crisis. This is worrying because it is precisely through education that a critical vision and the possibility of a change in the perception of young people and those who are preparing to teach others can be fostered (Grubb et al., 2022; Mehmood, Tariq, Ul-Haq, Aslam & Imran, 2023).

The current education law (LOMLOE, 2020), insists on sustainability from the preamble, recognizing this approach as one of its main keys. Title IV of the law states that the education system cannot be oblivious to the challenges posed by global climate change and that educational centers must become a place of stewardship and care for our environment (Flores, 2022; Guerrero-Fernández, Rodríguez-Marín, Solís-Ramírez & Rivero-García, 2022; Herrero, Rendueles, Muiño, Valladares & Valero., 2022). It also points out that it is essential for higher education to promote initial and ongoing teacher training that takes these approaches into account (Gómez-Gómez & García-Lázaro, 2023).

In order to introduce this change, several authors propose that a pedagogy of degrowth should be included and mainstreamed in the education system (Díez-Gutiérrez, 2024; Díez-Gutiérrez & Palomo-Cermeño, 2023; García-Díaz, 2004; García-Díaz, Rodríguez-Marín, Fernández-Arroyo & Gutiérrez, 2019; González & Almazán, 2023). A pedagogy that promotes a culture to make humanity aware of the crucial importance of consuming what is necessary and avoiding excessive waste of renewable and non-renewable raw materials found in nature. This alternative emerged at the beginning of the 21st century, when people began to talk about degrowth as a project to reduce industrial production and consumption to what is necessary in order to achieve eco-social and technological sustainability (Demaría, Schneider, Sekulova & Martínez-Alier, 2013; Schneider, 2010). The construction of this society of degrowth implies a whole work of cultural deconstruction of current thinking that establishes a direct relationship between economic growth (more production, more consumption) and development, prosperity; understanding that 'more' (a newer, bigger car, with more cylinder capacity, a bigger house and more comforts) is equal to 'better'. In such a way that competitiveness, higher performance and growth have become mantras that are systematically repeated as a form of development of any society (Calvo, 2024), but also the reconstructions of new cultures to learn to live better with what is necessary. In this cultural reconstruction, educators have a great responsibility in their professional practice (Arnal & Reyes, 2024; Díez-Gutiérrez, 2013), as they can positively intervene in behaviours and perceptions that can help

minimize human actions that have a negative impact on nature, influence a decrease in consumption in the communities where they work and help care for the ecosphere and the planet.

Other research has also explored the beliefs of Education students about what can be done in the face of the climate emergency situation from the University, as professionals and as citizens in the interests of environmental awareness (García-Díaz et al., 2019; López-Lozano & Guerrero-Fernández, 2019), but also from practical proposals in schools (Espinet-Blanch, Hosta-Cuy, del Castillo & Sabater, 2020; Rodríguez-Marín, Fernández-Arroyo & García, 2015; Rodríguez-Marín, Fernández-Arroyo, Puig-Gutíerrez & García-Díaz 2017), or from ecofeminist approaches (Aragón, 2022; Caramés & Mulet, 2018).

In short, the aim of this research has not only been to validate and collect information from a questionnaire on degrowth, but its main contribution is to show whether future teachers perceive the need for training in degrowth during their initial training and whether they are adequately prepared to face the social, technological and educational challenges posed in their future teaching, given the present and future situation of the planet, from this perspective of degrowth.

2. Methodology

This study is part of an open and international project, linked to the improvement of teacher training through the study of the opinions of Education students on teacher training in degrowth, within the framework of a European Jean Monnet project. Over the last two years, this project has implemented various data collection and analysis tools: focus groups; open-ended batteries; classroom observations; recorded interviews; and, among others, the questionnaire on Ecological Education and Degrowth Training (FEED), in its final version, which is presented here.

The quantitative research has been developed following a quasi-experimental, phased, empirical-analytical methodological design, with a descriptive-interpretative and principal components factor analysis (SPSS v27.), and the following research problems were addressed: a) What degree of validity does the FEED instrument have to analyze significant trends in university students' opinions about current degrowth; and b) What opinions do university students have about current degrowth in relation to the categories: economic growth, socio-economic system-production-consumption and educating in degrowth?

For this purpose, the FEED questionnaire was initially designed in beta phase. It was validated through a pilot test with 35 students whose teachers were involved in the project, and simultaneously a Delphi technique was used to validate the questionnaire (Andrés-García, Muñoz-Moreno, Ruiz-López, Gil-Sáez, Andrés-Puertas & Almaraz-Gómez, 2020; López-García, Cisneros-Cohernour & Solís-Cáceres, 2023) through a selection of 7 experts in teacher training for STS (Science, Technology and Society) teachers, who were asked to rate the relevance and clarity of each item and the category system from 1-5, in two rounds of voting on a Likert-type scale (from 1 to 5). Expert ratings were above 3 for all items and suggestions for improvement influenced the accuracy of 5 items. This questionnaire was also used in similar research with a sample of 235 subjects, supporting its validity and reliability. Both validations resulted in the final version (1.1) of the questionnaire.

For its initial construction, other questionnaires describing scientific university education from the students' perspective were taken into account, such as the Student Engagement Questionnaire (SEQ) (Kember & Leung, 2009) and its validation in Spanish university students (Gargallo, Suárez-Rodríguez, Almerich, Verde & Cebrià-i-Iranzo, 2018), the Questionnaire of University Students' Beliefs about Innovations in Higher Education (C-RENOVES) (Pérez-Robles, Delord, Pérez-Rodríguez & Hamed, 2024; Pérez-Robles, Delord & Porlán, 2024) and the Questionnaire on Education for Sustainability in Teacher Education (Solís-Espallargas & Valderrama-Hernández, 2015).

The FEED 1.1. is composed of two parts, one with 10 closed Likert-type items with 4 response values (strongly disagree; somewhat disagree; somewhat agree; strongly agree) and the other with two types of questions or items, not analysed in this research (Shannon-Baker, 2016) due to their open-ended nature: one of multiple response (5 items); on global warming, the concept of degrowth, degrowth education and

teacher training based on degrowth; and another of open questions (5 items), on the present-future vision of the planet, degrowth education and other aspects of the questionnaire that could be improved. The 10 closed items of the quantitative part of the instrument correspond to three categories that cover the different aspects of degrowth: Economic Growth, the Socio-economic System, Production and Consumption, and Educating in Degrowth. In parallel, these three categories are subdivided into 10 subcategories with 1 item for each of them as shown in Table 1. Items 1 and 2 do not appear in the category system as they are demographic descriptors of the subjects.

Categories	Subcategories	Items
Economic Growth (CE)	Social Justice and Happiness (JFS)	3. Do you believe that the current economic growth has brought greater social justice and happiness to the human beings who inhabit it and that the planet is becoming better and with greater possibilities for all? (CE3)
	Inequality (D)	4. Do you believe that current economic growth has enriched the few, but has increased inequality, while the planet has been exploited beyond measure? (CE4)
	Sustainability (S)	5. Do you think it is possible, while maintaining the current level of consumption, to grow economically in a sustainable way? (CE5)
Socio-economic system, Production and Consumption (SSPC)	Destruction of the planet: biodiversity and the environment (DPBM)	6. Do you believe that the current socio-economic system and the consumption it entails is destroying the planet we inhabit? (SSPC6)
	Reduction of production (RP)	8. To what extent do you agree with the statement: "It is essential to reduce production and consumption (especially in rich countries) in order to preserve the environment for future generations"? (SSPC8)
	Consumption of Planetary Resources (CRP)	9. To what extent do you agree with the statement: "We cannot afford to consume beyond the planet's resources"? (SSPC9)
	Readapting the capitalist system (RSC)	10. To what extent do you agree with the statement: "Only the readaptation of the capitalist system, with its consumerism and productivism, can prevent the destruction of the planet"? (SSPC10)
	"5R" principle (P5R)	12. To what extent do you agree with the statement: "We must base economy and life on principles of relocation, reuse, recovery, cooperation, self-production and exchange, durability, sobriety"? (SSPC12)
Educating for Degrowth (ED)	Training in consumption and production (FCP)	7. Do you think we should train ourselves to live with less (especially in the richest countries on the planet), limiting production only to the satisfaction of basic needs? (ED7)
	Consumption of the planet's resources (CRP)	11. ¿En qué medida estás de acuerdo con la afirmación: "Debemos educar en un modelo social de 'sobriedad voluntaria' (consumir en función de las necesidades básicas reales)"? (ED11)

Table 1. Categories, subcategories and items of the FEED questionnaire

In order to facilitate the analysis, each item has been identified with a code containing its position in the questionnaire and the category of origin and, similarly, the subcategories have been identified with a code by acronym; for example: the item "'SSPC12"' is identified with the category socio-economic system, production and consumption (SSPC) and with position 12 in the questionnaire. The order of the questions is randomized, and the administration was done electronically in the presence of the authors. The connection between categories, subcategories and items are shown in Table 1.

2.1. Participants and Context

This research has been carried out within the framework of the international project "'Degrowth and Education"', linked to a research team from the University of León (ULE), the University of Alcalá

(UAH) and the University Centre Virgen de Europa in La Línea (Cádiz), attached to the University of Cádiz (UCA), in relation to the current vision and teacher training in the face of the apparent and inevitable degrowth.

The sample consisted of 348 students of the bachelor's degree in Primary Education at the aforementioned universities during the 2022-2023 academic year. Of these, 283 were female (81.4%) and 65 male (18.6%), with an average age of 21 years.

The sample was selected purposively based on accessibility, following the basic principles for the protection of individuals in research processes, according to the Belmont report. Specifically, the informed consent of the students was requested in coherence with the policy of protection and processing of personal data of the European Union, guaranteeing anonymity and the exclusive use of the answers by the researcher-teachers.

2.2. Procedure

To analyse the students' responses and the coherence of the factors with respect to each item, factor analysis by principal components was used through the SPSS v27 statistical package, establishing the relevance of the study with the Kaiser-Meyer-Olkin (KMO) sample adequacy tests, interpreting as adequate values if KMO $\geq$ 0.75, and with Bartlett's test of sphericity, determining the significant correlation between the chi-square model if p-value (Sig.) < 0.005.

To determine the consistency, stability and reproducibility of the instrument, Cronbach's alpha coefficient (α) and the index for non-parametric intraclass correlation tests (ICC) were used, in line with the statistical recommendations of Taber (2018), with satisfactory levels being those above 0.7 (Frías-Navarro, 2020).

In relation to the descriptive-interpretative analysis, the percentages, averages and standard deviations of the students' ratings of the questionnaire items were calculated. To facilitate the interpretation of these statistics, item response scores were grouped into agreement (scores 3 and 4) and disagreement (1 and 2).

3. Results

In this section, the results obtained in the different analyses are analyzed and, in turn, discussed together with the background information.

3.1. Principal Components and Factor Analysis

The Kaiser-Meyer-Olkin sampling adequacy (KMO) value was 0.759 and Bartlett's test of sphericity rejected the null hypothesis and indicated significant correlation according to the chi-square probability scheme (p-value < 0.001), thus supporting with both results the relevance of the study. On the other hand, Cronbach's alpha coefficient and the intraclass correlation index (ICC) indicated adequate reliability and internal structure, with α=0.774 and ICC=0.754, which reinforces the validity of the FEED questionnaire (Table 2).

	Reliability	**ICC**	**KMO test**	**Bartlett's sphericity test**		
Items	**Cronbach's alpha (α)**	**Average Measurement**	**Sampling adequacy measure**	**Approx. Chi-square**	**gl**	**Sig.**
10	0,774	0,754	0,759	415,900	45	<0,001

Table 2. Analysis of Cronbach's alpha (α), ICC, KMO Index and Bartlett's sphericity

Regarding principal component analysis using Varimax rotation, 4 factors or dimensions were obtained, explaining 59.04% of the total variance explained. The factor loadings are greater than 0.6 (Table 3), indicating the factorial power of the variable-factor relationship.

	Factors (explained variance: 59.04%)			
	1	**2**	**3**	**4**
	Measures to slow down irreversibility	**Effects of the current socioeconomic system**	**Disproportionate economic growth**	**Educating for conscious degrowth**
	22,40%	13,94%	11,82%	10,88%
Item ED11	**,831**	-	-	-
Item SSPC12	**,708**	-	-	-
Item SSPC8	**,677**	-	-	-
Item SSPC10	**,672**	-	-	-
Item CE5	-	**,793**	-	-
Item SSPC6	-	**,687**	-	-
Item CE3	-	**,560**	-	-
Item CE4	-	-	**,787**	-
Item SSPC9	-	-	**,695**	-
Item ED7	-	-	-	**,911**

Table 3. Rotated component matrix based on items and emerging categories

Factor 1, which explains 22.40% of the total variance, includes the items associated with measures to slow down irreversibility and covers two categories from the study: the socioeconomic system, production and consumption (SSPC), and educating for degrowth (ED) (see Table 1). Items 11 and 12 stand out, with factor loadings above 0.7. Regarding education on voluntary simplicity, students show agreement with the need to incorporate an educational model that teaches consumption based on actual basic needs rather than socially imposed external needs (item 11). As for the SSPC category, represented by items 8, 10, and 12, students highlight the importance of basing the economy and life on the "5R" principle (relocalisation, reuse, recovery, self-production, and durability) (item 12), consider reducing production and consumption essential to preserve the environment (item 8), and agree that only the readaptation of the capitalist system would prevent the destruction of the planet (item 10).

Factor 2 (13.94%) and Factor 3 (11.82%) of the sample, which together account for 25.76% of the total variance, are associated with the effects of the current socioeconomic system and disproportionate economic growth, both concepts related to the core categories economic growth (EG) and SSPC (see Table 1). Items 4 and 5 stand out with factor loadings above 0.7. Factor 2, linked to items 3, 5, and 6, expresses, according to the students, that with the current socioeconomic system and the consumption it entails, the planet we inhabit is being destroyed (item 6), greater social injustice and inequality have been generated (item 3), and economic growth in a sustainable way is perceived as impossible (item 5).

Finally, Factor 4 (10.88%), linked to item 7 (with a factor loading of 0.911) and associated with the idea of educating for conscious degrowth, clearly highlights with strong factor loadings that students need updated education on consumption and production (FCP), as their responses reflect that they must be trained to live with less, limiting production solely to the satisfaction of basic needs (item 7).

3.2. Descriptive-Interpretative Statistical Analysis

As outlined in the Methodology section, numerical values were assigned to the responses to the questionnaire items (1 = strongly disagree; 2 = somewhat disagree; 3 = somewhat agree; 4 = strongly agree), and responses with values between 1 and 2 inclusive were grouped as disagree (D), while those with values between 3 and 4 inclusive were grouped as agree (A), facilitating the analysis and interpretation of the statistics (see Table 4).

Regarding the economic growth category, 82.8% of students state that they disagree with the idea that current economic growth has brought greater social justice and happiness to the humans who inhabit the planet and that the planet is improving (item 3). Similarly, 93.6% agree with the idea that excessive

exploitation has led to greater inequality (item 4), and 74.7%, disagreeing, consider sustainable economic growth impossible with the current level of consumption (item 5).

Categories	Subcategories	Items	D/A (%)	$\bar{X}$	σ
Economic Growth (EG)	Social Justice and Happiness (JFS)	3	D: 82,8% A:17,2%	1,2	0,62
	Inequality (D)	4	D: 6,4% A: 93,6%	3,4	0,41
	Sustainability (S)	5	D: 74,7% A: 25,3%	1,6	0,92
Socio-economic System, Production, and Consumption (SSPC)	Destruction of the Planet: Biodiversity and Environment (DPBM)	6	D: 5,0% A: 95,0%	3,6	0,37
	Reduction of Production (RP)	8	D: 8,3% A: 91,7%	3,1	0,64
	Consumption of Planetary Resources (CRP)	9	D: 6,2% A: 93,8%	3,4	0,58
	Readaptation of the Capitalist System (RSC)	10	D: 38,2% A: 61,8%	2,8	1,05
	"5R" Principle (P5R)	12	D: 4,1% A: 95,9%	3,7	0,22
Educating for Degrowth (ED)	Education on Consumption and Production (FCP)	7	D: 19,1% A: 90,9%	3,4	0,37
	Education on Voluntary Simplicity (FSV)	11	D: 7,4% A: 92,6%	3,6	0,41

Table 4. Descriptive statistics by category, subcategory, and items: percentage of Agreement/Disagreement (%), mean ($\bar{X}$), and standard deviation (σ)

In the socioeconomic system, production, and consumption category, the consumerist factors that have generated current growth are highlighted, as well as the difficult task of achieving the readaptation of the capitalist system. 95% of students agree that the current consumption-based socioeconomic system is destroying the planet (item 6), 91.7% agree that it is essential to reduce production to preserve the environment for future generations (item 8), 93.8% agree that we cannot have a consumption vector greater than what the planet can produce (item 9), and 95.9% agree that the economy should be based on the "5R" principle (item 12). On the other hand, only 61.8% agree with the idea that only the readaptation of the capitalist system, with its consumerism and productivity, could prevent the destruction of the planet (item 10), indicating that nearly 40% of the consumerist population, despite even accepting the imminent forced degrowth caused by the planet's own limits, does not believe that capitalism should disappear to promote planetary stability.

Finally, in the educating for degrowth category, 90.9% of students state that they agree that they should receive education focused on living with less (especially in the wealthiest countries on the planet), limiting production solely to the satisfaction of basic needs (item 7). Similarly, 92.6% of students agree with the idea of educating for a social model of voluntary simplicity (consuming, also, based on basic needs) (item 11).

In summary, the factor and descriptive-interpretive statistical analyses reflect that the sample of university students identifies with three main ideas: a) society needs educational improvement in response to the new ways of addressing the current ecosocial crisis of the planet (García-Díaz et al., 2019); b) the idea of moving towards degrowth as an effective and necessary alternative to the current system of production, consumption, and planetary pollution; and c) the essential need for university-level teacher training on the topic to understand it in depth (Díez-Gutiérrez, 2013). In parallel, these aspects refer to the three core categories of the study: economic growth (EG), the socioeconomic system, production and consumption

(SSPC), and educating for degrowth (ED), which also confirms the idea that teacher change is a process filled with gradual and sometimes contradictory transitions. This process is subject to both cultural changes, strategies in initial and ongoing teacher education, resources and means to implement it, as well as educational policies and curricular decisions on which content is relevant and priority in education at all levels (Caballero & Bolívar, 2015; Díaz & Guerra, 2024).

4. Discussion and Conclusions

The main conclusions drawn from the study, along with the discussion of the results, are described below: a) the first conclusion is the validity of the FEED questionnaire, with high and adequate reliability indices that ensure the reproducibility and internal consistency of the construct. This has allowed us to effectively understand students' opinions on their concern about the current ecological crisis and climate change, and whether they consider education on degrowth to be a necessity in the initial and ongoing teacher training to raise awareness among future generations about these issues; b) the second conclusion is that it is confirmed that participants believe training in a lifestyle and coexistence model based on restraint and voluntary simplicity is necessary. Specifically, they consider the need to incorporate a model in the education system that teaches consumption based on real basic needs, not on external social needs set by advertising and marketing, which link happiness to growth and endless consumption, thus addressing current Science, Technology, and Society (STS) issues; and c) the third conclusion is that it is corroborated that students are open to reconfiguring the conception of life and the economy based on the principles of relocalization, reuse, recovery, self-production, and durability —essential elements of the degrowth paradigm— and basic strategies on which education should focus in schools. Furthermore, they agree on the need for education in conscious degrowth through serious and updated training on current consumption and production.

However, the issue is discussed regarding whether students should only be educated for degrowth in schools and how this education is approached, as we consider it insufficient if it does not go beyond the school environment. As the traditional saying goes, it takes the whole tribe to educate one of its members. In this regard, we believe that in order for the culture of degrowth to be effective, these elements must also influence the economy and life in higher education, breaking with the life model of a society that continues to rely on growth as a way out of crises, as reflected by García-Díaz et al. (2019) and Espinet-Blanch et al. (2020). This implies, as almost all respondents (93.8%) value, what we could establish as the fourth conclusion: the essential reduction of production and consumption to preserve the planet (Calvo, 2024). Capitalism has not only failed to bring greater social justice and happiness to humans, but, on the contrary, has generated greater social inequality and unsustainability (Menargues & Luján, 2024; Ramiro, Barranco-Barroso & Lirio-Castro, 2024). On the other hand, although students are aware of the collapse and that much of its root is capitalism, nearly 40% of respondents do not believe that this system should be readapted to promote planetary stability. This aligns with the results of recent research (Bello-Benavides & Cruz-Sánchez, 2020; Espinet-Blanch et al., 2020; Rodríguez-Marín et al., 2017; Velázquez-Labrada, Pérez-Benítez, Pérez-Rodríguez & Domínguez-Hopkins, 2021), regarding the fact that students come from an education system that has not sufficiently addressed the structural causes and global impacts of this issue, without questioning possible courses of action beyond the current growth system.

In summary, the participating students reflect the need for systematic, organized, and in-depth university teacher training on how to address the current ecosocial, economic, and technological crisis of the planet, advancing towards degrowth as an effective and necessary alternative to learn how to live better with less. In agreement with Ruiz-Peñalver, Porcel-Rodríguez and Ruiz-Peñalver (2021), we emphasize the urgent need for teachers to introduce consistent and continuous changes in the education system, in order to fully address Science, Technology, and Society (STS) issues, based on the pedagogical principles of Science Didactics focused on ecosocial and technological sustainability. To achieve this, university teacher training must foster a degrowth-driven and collective shift that adapts to the needs of each classroom and context, with its advantage lying in bidirectional communication between teacher and student and in the problematization of content (Pérez-Robles, Trujillo Vargas & Perlado-Lamo, 2024).

Regarding the aspects that limit the study and its future prospects, it is worth noting that: a) the sample subjects from the previously mentioned universities participate in the project voluntarily, which implies a certain interest in improving their training regarding degrowth. Therefore, the representativeness of these results is conditioned by this fact; and b) the qualitative part of the questionnaire, in addition to being beyond the scope of this article, is underdeveloped, and there is the possibility, based on the most prominent subcategories of the quantitative study, to expand it in a complementary paper and incorporate more focused questions on these subcategories. Concerning the quantitative part, the inclusion of other types of multivariate analyses, such as cluster analysis, is considered to strengthen the grouping and classification (clustering) between variables (items) or individuals (set of responses), thus confirming the factorial structure of the construct.

Declaration of Conflicting Interests

The authors declare no conflict of interest. The funders had no role in the study design; in the collection, analysis, or interpretation of data; in the writing of the manuscript; or in the decision to publish the results.

Funding

We would like to thank the European Union for the financial support in developing this research, and the participating universities for their administrative and technical support, provision of spaces, software, and materials.

This research has been funded by the European Project Erasmus+, Jean Monnet Module, titled *"Building up an Inclusive and Democratic Europe through a Dialogical Co-Creation of Intercultural Solutions to the Rise of Neo-Fascism and Xenophobia."* Call for Proposals 2020 - EAC-A02-2019-JMO. Application No 620320-EPP-1-2020-1-ES-EPPJMO-MODULE. Duration: 3 years (2020-2023).

References

Al-Khourdajie, A., van Diemen, R., Lamb, W.F., Pathak, M., Reisinger, A., de la Rue du Can, S. et al. (2022) Annex II: Definitions, Units and Conventions. In *IPCC, 2022: Climate Change 2022: Mitigation of Climate Change. Contribution of Working Group III to the Sixth Assessment Report of the Intergovernmental Panel on Climate Change*. Cambridge University Press. https://doi.org/10.1017/9781009157926.021

Andrés-García, I., Muñoz-Moreno, M., Ruiz-López, G., Gil-Sáez, B., Andrés-Puertas, M., & Almaraz-Gómez, A. (2020). Validación de un cuestionario sobre actitudes y práctica de actividad física y otros hábitos saludables mediante el método Delphi. *Revista Española de Salud Pública*, 93, e201909081.

Aragón, V. (2022). *Ecofeminismo y decrecimiento: frente a la crisis global*. Los Libros de la Catarata.

Arnal, S.L., & Reyes, L.G. (2024). Construir comunidades, desear ecotopías: entrevista a Luis González Reyes. *El Viejo topo*, 434, 30-35.

Bello-Benavides, L.O., & Cruz-Sánchez, G.E. (2020). Profesorado universitario ante el cambio climático. *RMIE,* 25(87), 1069-1101.

Bento, A.M., Miller, N., Mookerjee, M., & Severnini, E. (2023). A unifying approach to measuring climate change impacts and adaptation. *Journal of Environmental Economics and Management,* 121 102843. https://doi.org/10.1016/j.jeem.2023.102843

Caballero, K., & Bolívar, A. (2015). El profesorado universitario como docente: hacia una identidad profesional que integre docencia e investigación. *Revista de Docencia Universitaria*, 13(1), 57-77. https://doi.org/10.4995/redu.2015.6446

Calvo, G. (2024). Los Objetivos de Desarrollo Sostenible frente a los límites de crecimiento del planeta. *Alambique: Didáctica de las ciencias experimentales*, 116, 45-51.

Caramés, R.E., & Mulet, B. (2018). Extrañamiento ecofeminista a la cibercultura como paradigma para una sociología de la educación del decrecimiento. *Teknokultura: Revista de Cultura Digital y Movimientos Sociales*, 15(1), 69-87. https://doi.org/10.5209/TEKN.57961

Demaría, F., Schneider, F., Sekulova, F., & Martínez-Alier, J. (2013). What is degrowth? From an activist slogan to a social movement. *Environmental Values,* 22(2), 191-215. https://doi.org/10.3197/096327113X13581561725194

Díaz, J., & Guerra, N. (2024). Reconceptualizing teaching education in Higher Education. *El Guiniguada*, 33, 16-27. https://doi.org/10.20420/ElGuiniguada.2024.711

Díez-Gutiérrez, E.J. (2024). *Pedagogía del decrecimiento*. Octaedro.

Díez-Gutiérrez, E.J. (2013). El decrecimiento en la formación del profesorado. *Revista Interuniversitaria de Formación del Profesorado*, 27(3), 207-219.

Díez-Gutiérrez, E.J., & Palomo-Cermeño, E. (2023). Degrowth and Higher Education: The Training of Future Teachers. *Sustainability and Climate Change*, 16(2), 115-129. https://doi.org/10.1089/scc.2023.0003

Espinet-Blanch, M., Hosta-Cuy, J., del Castillo, G.L., & Sabater, M.M. (2020). Educar en el decrecimiento: una perspectiva necesaria en agroecología escolar. In *Educación para el Bien Común: hacia una práctica crítica, inclusiva y comprometida socialmente* (465-479). Octaedro.

Flores, R.C. (2022). La formación de maestros en educación ambiental. Una experiencia con base a la elaboración de situaciones problema y alternativas de solución. *Educar em Revista,* 38, 1-20. https://doi.org/10.1590/0104-4060.80817

Frías-Navarro, D. (2020). *Apuntes de consistencia interna de las puntuaciones de un instrumento de medida*. Universidad de Valencia.

García-Díaz, J.E. (2004). *Educación Ambiental, Constructivismo y Complejidad: una propuesta integradora*. Díada.

García-Díaz, J.E., Rodríguez-Marín, F.R., Fernández-Arroyo, J., & Gutiérrez, M.P. (2019). La educación científica ante el reto del decrecimiento. *Alambique: Didáctica de las Ciencias Experimentales,* 95, 47-52.

Gargallo, B., Suárez-Rodríguez, J.M., Almerich, G., Verde, I., & Cebrià-i-Iranzo, M.À. (2018). The dimensional validation of the Student Engagement Questionnaire (SEQ) with a Spanish university population. Students' capabilities and the teaching-learning environment. *Anales de Psicología*, 34(3), 519-530. https://doi.org/10.6018/analesps.34.3.299041

Gómez-Gómez, M., & García-Lázaro, D. (2023). Concienciación y conocimientos sobre los Objetivos de Desarrollo Sostenible en la formación del profesorado. *Profesorado*, 27(3), 243-264. https://doi.org/10.30827/profesorado.v27i3.27948

González, L., & Almazán, A. (2023). *Decrecimiento: del qué al cómo. Propuestas para el Estado español.* Icaria.

González-Gaudiano, E.J. (2020). La educación frente a la emergencia sanitaria y del cambio climático. Semejanzas de familia. *Perfiles Educativos,* 11(170), 54-62. https://doi.org/10.22201/iisue.24486167e.2020.168.59464

González-Gaudiano, E.J., & Meira-Cartea, P.A. (2019). Educación para el cambio climático. *Perfiles Educativos,* 11(168), 157-174.

Guerrero-Fernández, A., Rodríguez-Marín, F., Solís-Ramírez, E., & Rivero-García, A. (2022). Alfabetización ambiental del profesorado de Educación Infantil y Primaria en formación inicial. *Revista Interuniversitaria de Formación del Profesorado,* 36(97), 75-98. https://doi.org/10.47553/rifop.v97i36.1.92434

Grubb, M., Okereke, C., Arima, J., Bosetti, V., Chen, Y., Edmonds, J. et al. (2022). Introduction and Framing. In *IPCC, 2022: Climate Change 2022: Mitigation of Climate Change. Contribution of Working Group III to the Sixth Assessment Report of the Intergovernmental Panel on Climate Change.* Cambridge University Press. https://doi.org/10.1017/9781009157926.003

Herrero, Y., Rendueles, C., Muiño, E.S., Valladares, F., & Valero, A. (2022). La enseñanza de la crisis ecológica en la educación superior: una propuesta. *Dossieres EsF*, 47, 14-15.

Kember, D., & Leung, D. (2009). Development of a questionnaire for assessing students' perceptions of the teaching and learning environment and its use in quality assurance. *Learning Environments Research,* 12, 15-29. https://doi.org/10.1007/s10984-008-9050-7

LOMLOE (2020). Ley Orgánica 3/2020, de 29 de diciembre, por la que se modifica la Ley Orgánica 2/2006, de 3 de mayo, de Educación. *Boletín Oficial del Estado,* 340, de 30 de diciembre de 2020.

López, G. (2023). Good morning. We're covering extreme weather, cooling inflation and Emmy nominations. *The New York Times*. Available at: http://bit.ly/3Tr2JF2

López-García, Y., Cisneros-Cohernour, E.J., & Solís-Cáceres, R. (2023). Los sistemas de calidad: la validación de un cuestionario mediante la técnica Delphi. In *Investigación e innovación educativa en contextos diferenciados* (279-288). Dykinson.

López-Lozano, L., & Guerrero-Fernández, A. (2019). ¿Qué creen estudiantes de Educación qué se puede hacer ante la situación de emergencia climática desde la Universidad, como profesionales y como ciudadanos? *Investigación en la Escuela*, 99, 46-59. https://doi.org/10.12795/IE.2019.i99.04

Mehmood, U., Tariq, S., Ul-Haq, Z., Aslam, M.U., & Imran, A. (2023). How Economic Growth Contributes to CO2 Emissions in the Presence of Globalization and Eco-Innovations in South Asian Countries? *World,* 4, 202-213. https://doi.org/10.3390/world4010014

Menargues, A., & Luján, I. (2024). Educación para el desarrollo sostenible: ¿qué, para qué y cómo? In *Liderazgo educativo y desarrollo sostenible: un viaje hacia el corazón de las escuelas* (61-73). Graó.

Navarro, J. (2023). Los récords de calor que está batiendo esta década: los días de más de 40 grados ya no son una excepción. *El País*. Available at: https://acortar.link/tpUGYl

Pérez-Robles, A., Delord, G., Pérez-Rodríguez, N., & Hamed, S. (2024). El profesorado universitario de disciplinas CTS: percepciones de los estudiantes sobre su mejora docente. *Práxis Educativa,* 19, 1-19. https://doi.org/10.5212/PraxEduc.v.19.22885.008

Pérez-Robles, A., Delord, G., & Porlán, R. (2024). Opiniones de estudiantes universitarios de ciencias experimentales y tecnología sobre clases innovadoras frente a otras áreas de conocimiento. *Formación Universitaria,* 17(1), 139-154. https://doi.org/10.4067/S0718-50062024000100139

Pérez-Robles, A., Trujillo Vargas, J.J., & Perlado-Lamo, I. (2024). Aportaciones investigativo-formativas sobre el decrecimiento para la formación docente universitaria [Investigative-training contributions on degrowth for university teacher training]. *European Public & Social Innovation Review,* 9, 1-19. https://doi.org/10.31637/epsir-2024-450

Ramiro, B.E., Barranco-Barroso, R., & Lirio-Castro, J. (Eds.). (2024). *Desarrollo sostenible para la reducción de las desigualdades sociales*. Octaedro.

Readfearn, G. (2020). Pangolines, murciélagos y un contagio humano sin descifrar: lo que sabemos sobre el origen tras cinco meses de virus. *eldiario.es.* Available at: https://bit.ly/41sVleb

Ripple, W.J., Wolf, C., Gregg, J.W., Rockström, J., Newsome, T.M., Law, B.E. et al. (2023) The 2023 state of the climate report: Entering uncharted territory. *BioScience*, 0, 1-10 https://doi.org/10.1093/biosci/biad080

Rodríguez-Marín, F., Fernández-Arroyo, J., & García-Díaz, J.E. (2015). El huerto escolar ecológico como herramienta para la educación en y para el decrecimiento. *Revista Investigación en la Escuela,* 86, 35-48.

Rodríguez-Marín, F., Fernández-Arroyo, J. Puig-Gutíerrez, M., & García-Díaz, J.E. (2017). Los huertos escolares ecológicos, un camino decrecentista hacia un mundo más justo. *Enseñanza de las Ciencias*, Extra, 805-810.

Ruiz-Peñalver, S.M., Porcel-Rodríguez, L., & Ruiz-Peñalver, A.I. (2021). La ecopedagogía en cuestión: una revisión bibliográfica. *Contextos educativos: Revista de educación*, 28, 183-201. https://doi.org/10.18172/con.4489

Schneider, F. (2010). Degrowth of production and consumption capacities for social justice, wellbeing, and ecological sustainability. In *Proceedings of the second conference on economic degrowth for ecological sustainability and social equity*. University of Barcelona.

Shannon-Baker, P. (2016). Making paradigms meaningful in mixed methods research. *Journal of Mixed Methods Research*, 10(4), 319-334. https://doi.org/10.1177/1558689815575861

Solís-Espallargas, C., & Valderrama-Hernández, R. (2015). La educación para la sostenibilidad en la formación de profesorado. ¿Qué estamos haciendo? *Foro de Educación*, 13(19), 165-192. https://doi.org/10.14516/fde.2015.013.019.008

Taber, K.S. (2018). The Use of Cronbach's alpha when developing and reporting research instruments in science education. *Research in Science Education*, 48, 1273-1296. https://doi.org/10.1007/s11165-016-9602-2

Velázquez-Labrada, Y.R., Pérez-Benítez, M., Pérez-Rodríguez, G., & Domínguez-Hopkins, R. (2021). La educación ambiental ante el cambio climático en la formación del profesional universitario: experiencias desde la Universidad de Oriente. *Revista Universidad y Sociedad*, 13(1), 331-339.

Published by OmniaScience (www.omniascience.com)

Journal of Technology and Science Education, 2025 (www.jotse.org)