

EXTENDED DATA

Understanding Climate Engagement and Open Recognition in European Higher Education: A Mixed-Methods Study Across Four Countries

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ANNEX I: SURVEY QUESTIONNAIRE

Introduction

Thank you for taking the time to participate in this online survey on climate change. The survey aims to collect information on the nature of students' general views and commitments towards climate change, and their view on receiving training on climate-related topics, either formal or informal, and the recognition of these flexible learning pathways using an open badge system.

Your participation in this survey is entirely voluntary. Your responses will be kept confidential, and your personal information will be kept anonymous. Only the researchers involved in this project will have access to the data collected, and the results will be reported in aggregate form. By taking the survey, you are indicating that you have read and understood this statement and that you consent to participate. If you do not wish to participate, you may decline by closing the survey window.

Information on data protection: As established in the current data protection regulations, you are informed that the [University of Valladolid] will process the personal data provided, in the case of choosing this option, to manage your participation in this research project. If you do not provide your e-mail address, the present data protection clauses do not apply as you are not identifiable. The legitimacy of this treatment is based on your consent and the fulfillment, by the University, of missions carried out in the public interest and the obligations legally assigned to it. Your data will not be disclosed to third parties. We inform you that you can exercise your rights of access, rectification, and deletion, among others, through the e-mail address [delegado.proteccion.datos@uva.es] or the postal address: [Secretaría General de la Universidad de Valladolid. Plaza del Colegio de Santa Cruz, 8. 47002 Valladolid]. Additional and detailed information on data protection can be consulted at [https://uvaes-my.sharepoint.com/:b:/g/personal/pmr_uva_es/EZ9bbrmUdRZlVXOkZI92fwIBLlKvDRSmkiHAPQWd2mpdiw?e=gyzCHz] and on the web [www.uva.es/protecciondedatos].

Demographic questions

Before we begin, please provide us with some basic information about yourself:

What is your age? [Single choice]

- Under 18
- 18-24
- 25-44
- 45-64
- Above 65

How do you identify in terms of gender? [Single choice]

- Male
- Female
- Non-binary
- Prefer not to say
- Other: [Text field]

What is your current level of education? [Single choice]

- Middle School / Junior High (11-14 y.o.)
- High School (14-18 y.o.)
- Bachelor's degree student
- Master's degree student
- Ph.D. student
- Lifelong learner/Other

In which country do you study? [Single choice]

- France
- Italy
- Spain
- Portugal
- Other: [Text field]

Climate change views

1. On a scale of 1-5, how concerned are you about climate change? (1: Very unconcerned, 5: Very concerned) [Likert scale]
2. On a scale of 1-5, how much do you think human activities contribute to climate change? (1: Not at all, 5: A great deal) [Likert scale]
3. On a scale of 1-5, how much do you think individuals can make a difference in addressing climate change? (1: Not at all, 5: A great deal) [Likert scale]
4. On a scale of 1-5, how much do you think governments can make a difference in addressing climate change? (1: Not at all, 5: A great deal) [Likert scale]

Environmental values and identity

5. On a scale of 1-5, how important is it to you to protect the environment? (1: Not at all important, 5: Extremely important) [Likert scale]
6. On a scale of 1-5, how much do you think the environment should be prioritized over economic growth? (1: Not at all, 5: Completely) [Likert scale]
7. On a scale of 1-5, how much do you think your actions align with your environmental values? (i.e., how often do you engage in pro-environmental behaviors, such as recycling, saving energy, or using public transportation?) (1: Not at all, 5: Completely) [Likert scale]

Personal responsibility and emotional responses

8. On a scale of 1-5, how much do you agree or disagree with the following statement: "I feel personally responsible for reducing the negative effects of climate change."? (1: Strongly disagree, 5: Strongly agree) [Likert scale]
9. On a scale of 1-5, how hopeful do you feel about the future of the environment? (1: Not hopeful at all, 5: Extremely hopeful) [Likert scale]

Social norms

10. On a scale of 1-5, how much do you think people in your social circle care about the environment and climate change? (1: Not at all, 5: A great deal) [Likert scale]
11. On a scale of 1-5, how much do you think people in positions of responsibility (national government, regional government) in your country care and take action to protect the environment and climate change? (1: Not at all, 5: A great deal) [Likert scale]

Eco-pedagogical activities

An eco-pedagogical activity is an educational activity that aims to promote environmental awareness and sustainability, educating planetary citizens to adopt life-long caring and appreciation for nature.

12. On a 1-5 scale, what do you consider to be your degree of training on climate change received from formal education (e.g., courses or workshops at your educational institution)? (1: None at all, 5: Extensive) [Likert scale]

13. On a 1-5 scale, what do you consider to be your degree of training on climate change received from informal education (documentaries, podcasts, social media, games, etc.)? (1: None at all, 5: Extensive) [Likert scale]
14. On a scale of 1-5, how frequently have you participated in eco-pedagogical activities in the past year? (1: Never, 5: Very frequently) [Likert scale]

Learning interests and training preferences

15. On a scale of 1-5, how interested are you in learning about climate-related topics? (1: Not at all interested, 5: Extremely interested) [Likert scale]
16. On a scale of 1-5, how much do you think formal education should include climate-related topics? (1: Not at all, 5: Absolutely) [Likert scale]
17. On a scale of 1-5, how much do you think informal learning can be effective in teaching about climate-related topics? (1: Not effective at all, 5: Very effective) [Likert scale]

Open badges system/awareness

Open badges are digital credentials that represent skills or achievements earned by an individual and can be shared on digital platforms. They help showcase skills and knowledge acquired outside of traditional educational institutions.

18. On a scale of 1-5, how much do you value recognition for completing climate-related learning activities? (1: Not at all, 5: Extremely) [Likert scale]
19. On a scale of 1-5, how much do you think open badges can motivate you to learn about climate-related topics? (1: Not at all, 5: Extremely) [Likert scale]
20. On a scale of 1-5, to what extent do you think that open badges related to climate-related training can increase your employability and career opportunities? (1: Not at all, 5: Significantly) [Likert scale]

Follow-up

21. Would you be willing to participate in a follow-up study of this survey, discussing your view on key climate commitments to consider? [Yes/No]
22. Please indicate your email address (permanent one) [Text field]

Conclusion

Thank you for completing this survey. Your responses will help us understand the perceptions and attitudes of students towards climate change, and their willingness to receive training on climate-related topics. Your participation is greatly appreciated.

ANNEX II: SURVEY RESULTS

Climate attitudes and values among survey participants

Table S1. Mean Likert scale scores (range: 1–5) for survey items assessing climate change views, environmental values and identity, personal responsibility and emotional responses, and social norms constructs.

Gender	Q1	Q2	Q3	Q4	Q5	Q6	Q7	Q8	Q9	Q10	Q11
Female	4.11	4.50	3.83	4.45	4.53	3.94	3.66	3.29	2.58	2.93	2.33
Male	3.77	4.24	3.44	4.22	4.37	3.68	3.58	3.03	2.71	2.81	2.40
Total	3.98	4.40	3.68	4.36	4.47	3.84	3.63	3.19	2.63	2.88	2.36
Education Level	Q1	Q2	Q3	Q4	Q5	Q6	Q7	Q8	Q9	Q10	Q11
High School	3.77	4.32	3.57	4.24	4.44	3.78	3.70	3.13	2.72	2.71	2.45
Bachelor's degree	4.00	4.41	3.72	4.41	4.49	3.85	3.67	3.24	2.52	2.86	2.27
Master's degree	4.15	4.49	3.82	4.49	4.45	3.90	3.49	3.15	2.60	3.10	2.28
Total	3.96	4.40	3.69	4.37	4.46	3.84	3.63	3.18	2.61	2.88	2.34
Country	Q1	Q2	Q3	Q4	Q5	Q6	Q7	Q8	Q9	Q10	Q11
France	4.11	4.50	3.79	4.37	4.42	3.91	3.48	3.02	2.50	3.08	2.18
Italy	3.76	4.31	3.57	4.22	4.44	3.78	3.71	3.13	2.72	2.69	2.46
Portugal	4.48	4.80	3.98	4.63	4.75	3.85	3.65	3.52	3.04	3.13	2.56
Spain	3.91	4.29	3.62	4.45	4.44	3.83	3.66	3.26	2.48	2.82	2.33
Total	3.97	4.40	3.68	4.36	4.46	3.84	3.62	3.17	2.62	2.88	2.35

Table S2. Kruskal-Wallis test results (mean of ranks) and multiple pairwise comparisons using the Conover-Iman procedure for survey items assessing climate change views, environmental values and identity, personal responsibility and emotional responses, and social norms constructs.

Gender	Q1	Q2	Q3	Q4	Q5	Q6	Q7	Q8	Q9	Q10	Q11
Female	337.8 a	332.5 a	337.4 a	329.8 a	330.5 a	331.4 a	319.8 a	333.0 a	308.7 a	324.9 a	314.0 a
Male	281.2 b	285.4 b	275.6 b	289.3 b	294.8 b	286.6 b	309.6 a	291.8 b	331.9 a	300.2 a	321.5 a
p-value	<0.0001	0.000	<0.0001	0.003	0.007	0.002	0.466	0.004	0.107	0.084	0.597
Education Level	Q1	Q2	Q3	Q4	Q5	Q6	Q7	Q8	Q9	Q10	Q11
High School	265.5 a	284.3 a	281.8 a	278.5 a	295.5 a	290.9 a	317.4 b	296.5 a	325.8 b	272.9 a	324.8 a
Bachelor's degree	317.0 b	309.3 a	312.1 a	311.6 ab	300.7 a	306.1 a	316.6 b	318.2 a	286.1 a	299.9 a	292.3 a
Master's degree	334.1 b	320.1 a	319.6 a	324.3 b	312.4 a	315.8 a	269.2 a	293.2 a	298.1 ab	346.5 b	291.2 a
p-value	<0.0001	0.063	0.057	0.010	0.529	0.330	0.004	0.255	0.039	<0.0001	0.062
Country	Q1	Q2	Q3	Q4	Q5	Q6	Q7	Q8	Q9	Q10	Q11
France	334.2 b	327.6 b	323.4 ab	310.1 ab	295.3 a	288.3 a	272.9 a	281.3 a	284.1 ab	343.2 b	272.8 a
Italy	260.0 a	282.6 a	280.3 a	275.5 a	299.6 ab	322.5 a	317.7 b	358.1 b	324.8 bc	269.5 a	325.5 b
Portugal	405.6 c	389.6 b	360.2 b	347.2 b	362.9 b	310.8 a	319.6 b	296.5 ab	378.2 c	353.5 b	342.3 b
Spain	296.9 ab	280.3 a	295.6 ab	319.0 b	300.5 ab	300.4 a	313.5 ab	320.2 ab	277.1 a	290.1 a	297.8 ab
p-value	<0.0001	<0.0001	0.007	0.006	0.052	0.237	0.027	0.016	0.000	<0.0001	0.005

p-values shown in bold indicate statistical significance.

Educational engagement and perspectives on climate learning and its recognition

Table S3. Mean Likert scale scores (range: 1–5) for survey items assessing eco-pedagogical activities, learning interest/flexible learning pathways/training preferences, and open badges system/awareness constructs.

Gender	Q12	Q13	Q14	Q15	Q16	Q17	Q18	Q19	Q20
Female	3.27	3.46	2.29	3.90	4.19	4.20	3.60	3.34	3.09
Male	3.09	3.53	2.20	3.65	3.97	3.91	3.42	3.09	2.95
Total	3.20	3.49	2.26	3.81	4.11	4.09	3.53	3.25	3.04
Education Level	Q12	Q13	Q14	Q15	Q16	Q17	Q18	Q19	Q20
High School	3.15	3.50	2.16	3.59	3.99	3.99	3.38	3.28	2.98
Bachelor's degree	3.04	3.39	2.06	3.80	4.05	4.11	3.56	3.27	3.08
Master's degree	3.47	3.61	2.52	4.07	4.32	4.18	3.64	3.17	3.02
Total	3.20	3.49	2.23	3.80	4.10	4.09	3.52	3.24	3.03
Country	Q12	Q13	Q14	Q15	Q16	Q17	Q18	Q19	Q20
France	3.51	3.66	2.55	4.00	4.26	4.16	3.59	3.06	2.95
Italy	3.16	3.52	2.19	3.60	4.00	4.00	3.40	3.29	2.99
Portugal	3.44	3.56	2.83	4.31	4.44	4.23	3.92	3.54	3.46
Spain	2.87	3.25	1.79	3.68	3.98	4.07	3.45	3.26	3.01
Total	3.20	3.49	2.24	3.80	4.10	4.09	3.51	3.23	3.02

Table S4. Kruskal-Wallis test results (mean of ranks) and multiple pairwise comparisons using the Conover-Iman procedure for survey items assessing eco-pedagogical activities, learning interest/flexible learning pathways/training preferences, and open badges system/awareness constructs.

Gender	Q12	Q13	Q14	Q15	Q16	Q17	Q18	Q19	Q20
Female	324.8 a	309.5 a	323.9 a	331.9 a	327.9 a	332.4 a	326.6 a	332.7 a	325.6 a
Male	295.9 b	323.9 a	306.0 a	289.4 b	293.5 b	288.1 b	300.7 a	290.5 a	300.6 a
p-value	0.047	0.314	0.219	0.003	0.015	0.002	0.073	0.004	0.085
Education Level	Q12	Q13	Q14	Q15	Q16	Q17	Q18	Q19	Q20
High School	293.1 a	303.6 a	294.3 a	261.6 a	278.8 a	283.6 a	278.6 a	308.5 a	294.4 a
Bachelor's degree	279.6 a	289.0 a	277.8 a	312.0 b	298.6 a	311.4 a	313.8 ab	309.7 a	314.8 a
Master's degree	347.4 b	322.1 a	348.2 b	345.0 b	340.7 b	318.2 a	321.4 b	289.3 a	300.3 a
p-value	0.000	0.145	0.000	<0.0001	0.001	0.083	0.023	0.426	0.423
Country	Q12	Q13	Q14	Q15	Q16	Q17	Q18	Q19	Q20
France	356.3 c	334.1 b	355.1 c	343.1 b	334.5 b	319.6 a	317.1 ab	278.7 a	296.4 a
Italy	295.4 b	305.7 ab	296.3 b	261.7 a	279.0 a	285.7 a	280.6 a	311.1 a	294.2 a
Portugal	339.8 bc	324.7 ab	387.0 c	397.2 b	364.6 b	322.6 a	378.8 b	349.7 a	383.2 b
Spain	248.5 a	263.1 a	235.7 a	287.9 a	284.6 a	303.3 a	296.7 a	307.3 a	300.4 a
p-value	<0.0001	0.001	<0.0001	<0.0001	0.000	0.188	0.002	0.046	0.009

p-values shown in bold indicate statistical significance.

ANNEX III: ONE-TO-ONE INTERVIEW QUESTIONNAIRE

Background information

- Can you tell me what is your name?
- What are you studying?

Section I: Climate change views

1. What do you think are the most pressing environmental issues facing the world today?
2. What actions do you think individuals can take to address climate change? / In your opinion, what is the most effective way for individuals to make a difference on this issue?
3. How can we encourage more people to take action on climate change? How can we encourage more people to adopt sustainable lifestyles and behaviors?

Section II: Eco-pedagogical activities

4. Have you received any formal or informal training on climate-related topics? If so, could you describe your experience?
5. What types of eco-pedagogical activities have you participated in before?
6. How do you think eco-pedagogical activities can be used to promote sustainable behavior change?

Section III: Learning interests and training preferences

7. What types of climate-related topics are you most interested in learning about?
8. How do you prefer to learn about climate-related topics: online courses, workshops, experiential learning (i.e., learning by doing), action-oriented (i.e., focused on practical solutions and strategies), etc.?
9. Do you believe flexible learning pathways (e.g., self-paced courses) are effective for learning about climate-related topics? Why or why not?

Section IV: Open badges system/awareness

10. Have you ever earned an open badge related to environmental issues? If so, what was your experience like? / Have you ever used open badges as a way to showcase your skills or knowledge related to sustainability or environmental protection? If so, how did it work out for you?
11. How effective do you think open badges are in recognizing and validating skills related to sustainability and environmental protection?
12. Do you believe that open badges could be used as a tool for motivating people to take action on climate change? Why or why not?

ANNEX IV: NATIONAL FOCUS GROUP QUESTIONNAIRE

Section I: Climate change views

1. What are your thoughts on the current state of climate change and its impact on the environment? [*The instructor should encourage the students to agree on 5-10 most relevant issues*]
2. How do you think climate change is affecting current generations? And how will affect future generations? How do you think climate change is affecting and will affect your local community? [*The instructor should encourage the students to reach an agreement on at least the 5 most relevant impacts and then prioritize them*]
3. Do you believe that there is still time to mitigate the effects of climate change? Why or why not? [*The instructor should encourage the students to provide at least 5 reasons to support their opinion*]

Section II: Personal responsibility and emotional responses + Social norms

4. Have you ever changed your behavior or lifestyle in response to concerns about climate change? If so, how? Have you promoted/caused changes in others' behavior? [*The instructor should encourage the students to provide 2-3 actions per student*]
5. What role does personal responsibility play in addressing climate change compared to collective action by governments and institutions? [*The instructor should ask the students to summarize their view in 4-5 main points*]
6. What actions do you think governments should take to address climate change? What steps should governments take to incentivize individuals, businesses, and organizations to reduce their carbon footprint? [*The instructor should encourage the students to provide a list of at least 3 actions (one for individuals, one for businesses, and one for organizations). When translating this question, please take into consideration that 'businesses' refers to companies, whether they are private, public, or a combination of both. On the other hand, 'organization' is used as a broader term to encompass non-profit organizations, non-governmental organizations (NGOs), and other similar entities*].

Section III: Learning interests and training preferences

7. What role do you think education (e.g., eco-pedagogical activities) and awareness-raising campaigns can play in addressing climate change? [*The instructor should gather at least 3-5 points*]
8. How can we ensure that future generations are equipped to address the challenges of climate change? What are the key competencies to be acquired? How can they be acquired? [*The instructor should ensure that they define priorities and that those key competencies are ranked in terms of importance. By 'key competencies', we are referring to a set of essential (soft) skills, knowledge, and attitudes that individuals need to possess (e.g., environmental awareness, understanding of complex, critical thinking and problem-solving, knowledge of sustainable practices, collaboration and communication, empathy and ethical responsibility, etc.). The students should share their perspectives on how to acquire the top three competencies. This can be done through online courses, workshops, experiential learning (learning by doing), action-oriented approaches (focused on practical solutions and strategies), and more. It would be beneficial if students discuss specific examples that can further enhance the learning experience*]
9. How can we measure the impact of eco-pedagogical activities on students' attitudes and behaviors towards the environment? How can we measure the degree of acquisition of the key competencies? [*It is essential that the students provide at least 5 "means of verification" of the impact of the eco-pedagogical activities; the second question may be skipped, as it may be difficult for them to answer it*]

10. How can we ensure that eco-pedagogical activities are accessible to all students, regardless of their background or socioeconomic status? [*The students need to propose at least 5 ideas*]

Section IV: Open badges system/awareness

11. What role do you think open badges can play in promoting lifelong learning about environmental issues? [*The instructor should explain what open badges are, and students should propose at least 3 ideas; as an example, you may use [About Open Badges - Open Badge Factory](#) or [Open badges: new opportunities to recognize and validate achievements digitally – UNESCO IITE](#)]*]
12. How can we ensure that open badges are credible and trustworthy indicators of skills and knowledge related to sustainability? [*The instructor should provide examples of skills related to sustainability (e.g. <https://www.innerdevelopmentgoals.org/framework>), and the students should provide at least 3 approaches*]