

Mapping Green Competencies in the Academic Community in Bulgaria and Romania through a Pilot Survey

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Abstract. *This study provides a snapshot of the competencies and expectations of academic staff in two higher education institutions in Bulgaria and Romania. The aim is to assess to what extent and in what way higher education institutions and their staff are engaged in the green transition. The results of the study show that teachers from Bulgaria and Romania point to difficulties in coordinating actions between different organizational units and the lack of financial resources as the main barriers to the green transition. At the same time, the government entities and higher education institutions, followed by business organizations, are identified as responsible and most appropriate partners in the direction of sustainable development. Citizens and society as a whole are also recognized as accountable for the green transition. At the same time, they are assigned a secondary role as a partner of higher education institutions. The insights will serve as a basis for identifying gaps in teaching competencies and the implemented green transition strategies.*

Keywords: green competencies, green economy, sustainability.

Introduction

Developing sustainability as a key competence in education requires more than political declarations. Active participants in the educational process are needed – teachers and trainers who can turn theory into practice. To fulfil this role, they need new opportunities for their learning and development so that they can transfer their knowledge and skills to students. In other words, to have sustainable education, we need to invest in the sustainable development of the teachers themselves.

It is not enough for sustainability to be included in the curriculum to make it a core pillar of education. Real change will happen when teachers become active drivers of this process. To achieve this, they must be provided with the necessary tools and knowledge base to inspire and educate their students on sustainability issues. In other words, investments in teachers’ professional development are investments in the future of the planet (Bürgener & Barth, 2018).

Why are efforts and investments needed? Kirova and Yordanova (2024) argued that the transition to a sustainable economy would change the labor market. New professions will emerge, and others will disappear. Therefore, educational institutions must be flexible and prepare young people for future jobs. However, these jobs are difficult to predict, and lifelong learning must also be ensured. At the same time, sustainable development also requires a change in thinking. The educational mission should be to form environmental awareness and skills for sustainable living through the knowledge it disseminates.

In this sense, the presented pilot study aims to analyze the level of knowledge among teachers regarding the successful integration of sustainable practices and overcoming the challenges of the green transition. The study was implemented within the framework of the international project Educate4Green, whose primary goal is to accelerate the development of green knowledge and skills of students, teachers and practitioners. This is achieved by designing, implementing and scaling an innovative educational model. The latter is framed by multinational, transdisciplinary and visionary approaches in business and engineering towards greening workplaces and enterprises and sustainable growth. The project involves four partner countries – Bulgaria, Romania, Poland and Italy (Educate4Green, n.d.).

The current study examines the level of awareness among the academic staff of two project partner universities: *University of Ruse “Angel Kanchev”* (Bulgaria) and *National University of Science and Technology Politehnica Bucharest* (Romania). It also examines the theoretical foundations of the green transformation and the role of higher education. The methods of data collection and analysis and the results of the comparison were studied. Based on the results obtained, conclusions and recommendations for future research are formulated.

Literature review

The idea of a sustainable world that ensures the well-being of present and future generations has developed into a global model and is gaining increasing importance over time. Part of this model is the expectation of a successful and effective green transition in all anthropogenic activities. Furthermore, it led to a social obligation that requires cooperation between various stakeholders (Scherak & Rieckmann, 2020; Pavlov & Ruskova, 2023).

Education is a proven mechanism for achieving progress and overcoming social, ecological, and economic challenges. It is an investment in the future and a guarantee of development (Matei *et al.*, 2023). Insufficient knowledge of the origins, functions, and characteristics of sustainable development is a decisive factor in the success or failure of the green transition. That includes the adoption of greener practices in different industries, the application of renewable resources and technologies, the adaptation of existing legislation, *etc.* (Botea-Muntean & Constantinescu, 2023). For this reason, educational institutions are assigned a key role in embedding the principle of sustainability in society (European Commission: European Education and Culture Executive Agency, 2024).

At the same time, sustainable development requires education in all areas: from preschool to higher education to non-formal education and lifelong learning. The introduced educational programs should promote awareness and change attitudes and perspectives, as well as enable students to participate responsibly in building a sustainable world (Scherak & Rieckmann, 2020). Without developing specific competencies and promoting the necessary learning processes, it will be almost impossible to achieve sustainable development (European Commission: European Executive Agency for Education and Culture, 2024).

The view of education's meaningful role in achieving green transformation is not new. In 2014, Murga-Menoyo viewed universities as a key element in preparing future specialists for a sustainable economy. Her study provides a proposal for innovative training focused on the development of four critical competencies related to sustainability. The aim is to prepare not only specialists for "green" jobs but also all graduates who will work in different sectors of the economy to possess knowledge and skills related to sustainable development.

A few years later, Bürgener and Barth (2018) emphasize that in order to achieve real change, it is necessary to turn teachers into drivers of this change. Programs such as the Sustainable Development Goals also underscore the importance of education and promote the development of teachers' skills. On the other hand, to be effective, teachers need to be equipped with the knowledge and skills to work on real-world projects related to sustainability. One way to achieve this is by creating learning environments that allow teachers and students to work on practical projects alongside experts from different fields. This not only develops students' skills but also creates innovative educational practices that can be applied on a broader scale.

Scherak and Rieckmann (2020) also observe that in recent years, higher education has undergone significant changes, with an increasing emphasis on sustainable development. The authors believe that in order to prepare students for the future, universities need to develop new approaches to teaching and learning. This also includes developing specific competencies in teachers. The results of their study show that the development of competencies for sustainable development is a complex process that requires both individual efforts and systemic support. At the same time, according to Rögele *et al.* (2022), when teaching green competencies, educators focus on systems thinking and strategic and normative competencies. Scholars believe that student-centred strategies are particularly suitable for teaching systems thinking and interpersonal competencies.

In summary, the role of higher education is key. However, the implementation of the correct approach in education and tracking the actual transformation in the academic staff is no less critical. In other words, who teaches the principles of sustainability and green transformation and how is essential. This motivates the participants in the Educate4Green project to join forces in creating new academic programs and innovative teaching methods based on both theoretical knowledge and practical competencies. The first phase of the project, the subject of this analysis, includes mapping and assessing the current state of the green transition in the context of higher education. It pays special attention not only to the environmental responsibility of universities but also to the expectations and competencies of academic staff.

Methodology

The research methodology was developed within the Educate4Green project, co-financed by Erasmus+. Parties in the project are: *National University of Science and Technology Politehnica Bucharest* – Bucharest, Romania; *Eurotraining Solution SRL* – Bucharest, Romania; *S.C. INFORELEA* – San Secondo di Pinerolo, Italy; *Lodz University of Technology (POLITECHNIKA LODZKA)* – Lodz, Poland; *University of Ruse “Angel Kanchev”* – Ruse, Bulgaria. The project participants were selected based on their long-standing cooperation, as well as according to the eligibility criteria of the Erasmus+ programs.

The main project's goal is to take stock of current development towards the green transition in terms of environmental responsibility, impact, and opportunities for business and employment. It also aims to provoke discussion about the urgent need to develop ecological skills for students and practitioners in higher education (Educate4Green, n.d.). The study was conducted through an

electronic survey using a Google Forms questionnaire distributed through each organization and university's email network. Microsoft Excel was used to process the primary data.

The research aims to provide an up-to-date and timely analysis of locally rooted training needs, green knowledge, green jobs and enterprises, expectations and skills across the range of pre-defined target groups: students, teachers and practitioners. The pilot study was conducted between October and December 2023.

Structure of the questionnaire

The questionnaire developed for the project covers four thematic sections: 1) Demographic profile; 2) Measuring the knowledge of green concepts/awareness of green transformation; 3) Measuring the level of green skills (intellectual & digital)/teachers' view on student's green skills – green knowledge concept, green skills with non-digital components (intellectual and social), digital components (creatively using digital technologies); 4) Identification of learning needs & expectations for greening jobs & enterprises/learning expectations.

Scope of the study

The comparative analysis between the teachers from Bulgaria and Romania is motivated by the proximity of the two countries, including the passage through similar processes of economic transformation after 1989. To date, Bulgaria and Romania share common challenges but differ in the pace of economic and social development. What further brings the two Balkan countries closer together is their aspiration to improve their social and economic growth within the framework of the European Union.

That study covers a target group of teachers from the *National University of Science and Technology Politehnica Bucharest* (UPB) and the *University of Ruse "Angel Kanchev"* (URAK). It discusses Section 1 – demographic indicators, and partially the questions of Section 2 (Measurement of knowledge about the green concepts) of the survey form developed by the Educate4Green's parties. The project set the minimum number of respondents for the UPB and URAK at 30 and 20 teachers, respectively. These values are consistent with the current academic personnel in the project partner faculties from both universities.

Results and discussions

The total number of lecturers from the two teaching institutions who responded was 54 (N=54), of which 31 (57%) were representatives of UPB (N_{UPB}=31), and 23 (43%) were representatives of URAK (N_{URAK}=23). In UPB, 7 (23%) are males, and 24 (77%) are females (Figure 1). Most of the respondents – 20 (65%) – are over 40 years of age, the rest of them being either between 30-39 years old – 7 (22%) or counted in the first group that is 20-29 years old – 4 (13%). Given these data, we may suppose that most of the questioned teachers are at the maturity level of their career. As a result, a high awareness of their views on the surveyed topics is expected.

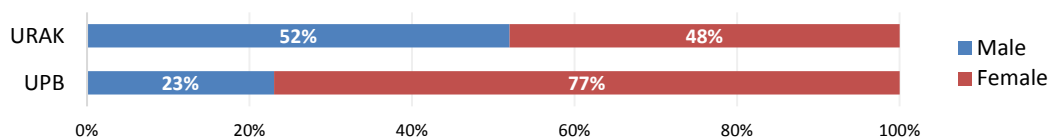


Figure 1. Gender distribution of UPB (N_{UPB}=31) and URAK (N_{URAK}=23)

Source: Educate4Green Project Data'2023.

Twenty-three teachers from Bulgaria took part in the survey. Regarding the gender distribution, we have a reasonably even result: 12 (52%) of the respondents are from the masculine gender, and 11 (48%) of respondents are from the feminine gender (Figure 1). The respondents have indicated their age range within the following numbers: 15 (65%) of the teachers are in the age range 40-49 years old; 5 (22%) of the teachers are in the age range 50-59 years old, and the other three groups – 20-29, 30-39, 60+, are represented by 1 (4%) academic staff. This information leads us to the conclusion that the teachers have enough experience in the professional field.

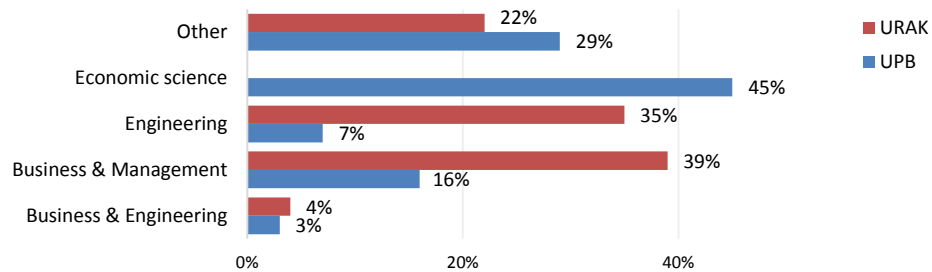


Figure 2. Specialization area of UPB ($N_{UPB}=31$) and URAK ($N_{URAK}=23$) respondents

Source: Educate4Green Project Data'2023.

In UPB (Figure 2), the highest weight is represented by teachers of Economics 14 (45%), followed by those specialized in Business and Management 5 (16%), Engineering 2 (7%), and Business and Engineering 1 (3%). Judging by the respondent's answers to the URAK (Figure 2) on their specialization area, we could state that we have a good balance of teachers – Business and Management 9 (39%), and Engineering backgrounds 8 (35%), and Business and Engineering 1 (4%).

Table 1 provides a list of *Green Actions* – activities that the participants in the Educate4Green project have defined as *significant for reducing the human footprint on the environment*. The most recognizable (*rather known*) UPB variables are the promoting the use of renewable electricity and heat generation sources (74%), followed by being aware of environmental legislation, policies, and principles and also educating organizations and individuals on the correct procedures and legislation concerning the recycling of different types of waste (71%). The variables equally positioned, with 68%, are the promotion of environmentally friendly behaviours in social media and at work, as well as education programmes that encourage healthy lifestyles that lead to changes in consumers' attitudes.

The most *rather known* variables for URAK are the using of ICT systems in an environmentally responsible and sustainable manner and the promotion of the use of renewable electricity and heat generation sources to organizations and individuals – both with 91%, closely followed by the promoting of environmentally friendly behaviours in social networks and at work and the promoting policies, actions and education programmes that encourage healthy lifestyles – with 87%. The variables equally positioned with 83% are educating organizations and individuals on the correct procedures and legislation concerning the recycling and applying principles, policies and regulations aimed at environmental sustainability, including the reduction of waste, energy and water consumption, the reuse and recycling of products, and the engagement in the sharing economy.

On the other hand, the *rather unknown* behaviours and attitudes towards Green Actions in UPB are represented by maintained records and processed facts and figures about the type and

volume of different recycling operations and investigating and designing an artificial lighting system based on daylight – both presenting with 61% of the total sample. These variables are followed by maintaining stable ecosystems and combatting mass extinction by 58%. In third place with 42% are the use of ICT systems in an environmentally responsible and sustainable manner, reduction of resources and correct disposal of e-waste, the educate travellers about making a positive impact and raising awareness of environmental issues, as well as the proactive participation in sustainable consumption. The least known green behaviour, with 61% in URAK, is represented by investigating and designing an artificial lighting system and energy efficiency. That variable is followed by maintaining records and processed facts and figures about the type and volume of different recycling operations – 39%, and the variables with equal values – 35%, being familiar with European and National legislation regarding the risk of pollution and educating travellers about making a positive impact and raising awareness of environmental issues.

**Table 1. Awareness in UPB and URAK related to the use of environmental
2437 behavior to transform the way the respective university operates**

Variables of Green Actions <i>Are you aware of the use of green 2437 behavior in transforming how your university is operating about Green Actions?</i>	UPB (N _{UPB} =31)		URAK (N _{URAK} =23)	
	Rather known	Rather unknown	Rather known	Rather unknown
<i>1.1.1</i> Maintaining stable ecosystems and combatting mass extinction, for example by making conscious dietary choices that support organic food production and animal welfare	13 (42%)	18 (58%)	17 (74%)	6 (26%)
<i>1.1.2</i> Use of ICT systems in an environmentally responsible and sustainable manner, such as the implementation of energy-efficient servers and central processing units (CPUs), reduction of resources and correct disposal of e-waste.	18 (58%)	13 (42%)	21 (91%)	2 (9%)
<i>1.1.3</i> Promote the use of renewable electricity and heat generation sources to organizations and individuals, to work to encourage sales of renewable energy equipment, such as solar power equipment.	23 (74%)	8 (26%)	21 (91%)	2 (9%)
<i>1.1.4</i> Educate organizations and individuals on the correct procedures and legislation concerning the recycling of different types of waste in different types of containers, waste collection procedures, and the sanctions following non-compliance to legislation.	21 (68%)	10 (32%)	19 (83%)	4 (17%)
<i>1.1.5</i> Being aware of environmental legislation, policies, and principles.	22 (71%)	9 (29%)	16 (70%)	7 (30%)
<i>1.1.6</i> Maintained records and processed facts and figures about the type and volume of different recycling operations.	12 (39%)	19 (61%)	14 (61%)	9 (39%)
<i>1.1.7</i> Apply principles, policies and regulations aimed at environmental sustainability, including the reduction of waste, energy and water consumption, the reuse and recycling of products, and the engagement in the sharing economy.	19 (61%)	12 (39%)	19 (83%)	4 (17%)
<i>1.1.8</i> Being familiar with European and National legislation regarding the risk of pollution.	19 (61%)	12 (39%)	15 (65%)	8 (35%)
<i>1.1.9</i> Promotion of environmentally friendly behaviours in social networks and at work.	21 (68%)	10 (32%)	20 (87%)	3 (13%)
<i>1.1.10</i> Educate travelers about making a positive impact and raising awareness of environmental issues	18 (58%)	13 (42%)	15 (65%)	8 (35%)
<i>1.1.11</i> Promote policies, actions and education programmes that encourage healthy lifestyles that lead to changes in consumers' attitudes,	21 (68%)	10 (32%)	20 (87%)	3 (13%)
<i>1.1.12</i> Proactive participation in sustainable consumption leads to changes in consumers' shopping habits and expectations.	18 (58%)	13 (42%)	17 (74%)	6 (26%)
<i>1.1.13</i> Investigate and design an artificial lighting system based on daylight, timer, or occupation of spaces, taking into account any technical specifications and restrictions, such as power quality and energy efficiency and the influence of used materials in light bulbs or LEDs on the environment.	12 (39%)	19 (61%)	9 (39%)	14 (61%)

Source: Educate4Green Project Data'2023.

About the following question: *Do you consider your university well prepared for adopting green transformation?* UPB respondents who believe their university is well prepared for adopting the green transformation are rather pessimistic at 55%, as opposed to the 39% of positive responses.

Only 18% of the respondents in URAK gave a negative answer. In parallel, 74% of teachers' responses indicate that the university is well prepared to adopt a green transformation. This suggests that the university's management is actively pursuing a green transformation.

On the question of *Who is responsible for the implementation of green transformation actions in your country?* (Figure 3), 26 (84%) of UPB respondents transferred this responsibility to government entities. What is interesting to note is that civil society is also marked as an essential responsible party in this process, 22 (71%), and so are the individual citizens, 21 (68%). This recognition of the green implementation of almost equally weighted responsibility is encouraging for the common goal of a clean transformation. Similarly, the majority – 21 (91%) of the URAK teachers – answered that government entities are responsible for the implementation of green transformation actions in Bulgaria. Equal respondents – 12 (52%) consider higher education institutions and civil society to be responsible.

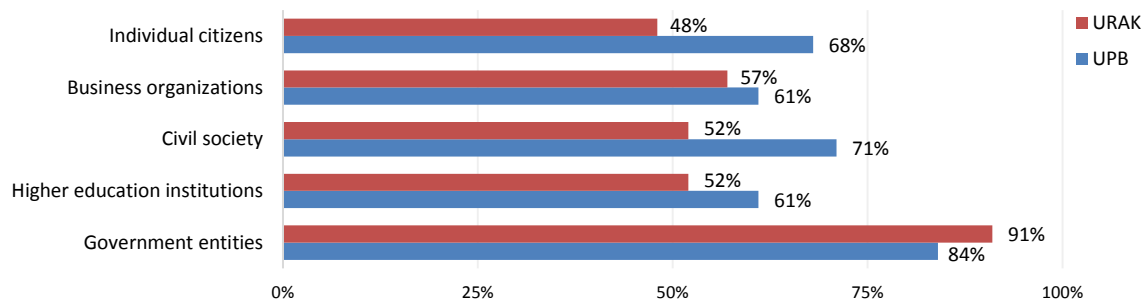


Figure 3. Responsibility for the implementation of green transformation actions according to UPB (N_{UPB}=31) and URAK (N_{URAK}=23)

Source: Educate4Green Project Data'2023.

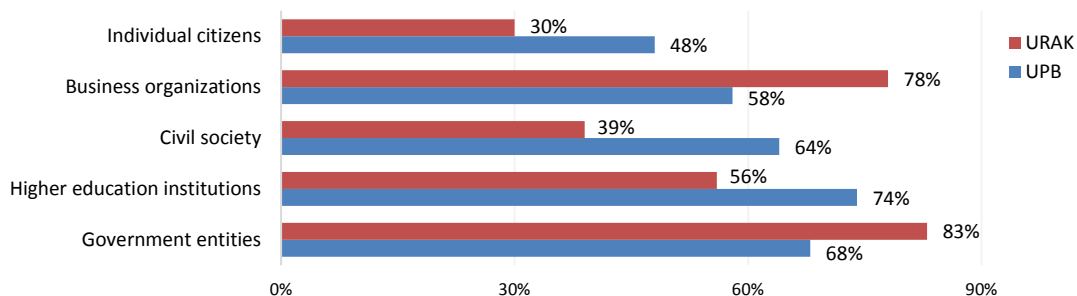


Figure 4. Relevant partners for green practices/transformation according to UPB (N_{UPB}=31) and URAK (N_{URAK}=23)

Source: Educate4Green Project Data'2023.

The next question is *Which of the following would be the most suitable partners for green practices/transformation in your country?* (Figure 4). Interestingly, the UPB team is much more likely to identify other higher education institutions as a suitable partner – 23 (74%), as well as state institutions – 21 (68%) and civil society – 20 (64%). Business is only listed in fourth place as a significant partner. In comparison, URAK listed state institutions – 19 (83%) and businesses – 18 (78%) as the most essential partner. Their own role as a partner is ranked third in importance by 13 (56%) respondents, and citizens and society are perceived as minor partners compared to the other options.

In answering both interrelated questions – *who is responsible* and *who is the most suitable partner* for implementing the green transformation – the academic staff of the two higher education institutions demonstrate similarity and consistency. First of all, state authorities and institutions are indicated as responsible and relevant partners, and secondly, the lecturers recognize the role of higher education institutions and business organizations. It is commendable that the efforts of civil society organizations and the actions of individual citizens receive significant support. This shows the importance of not only the systematic process but also the joint efforts of all stakeholders.

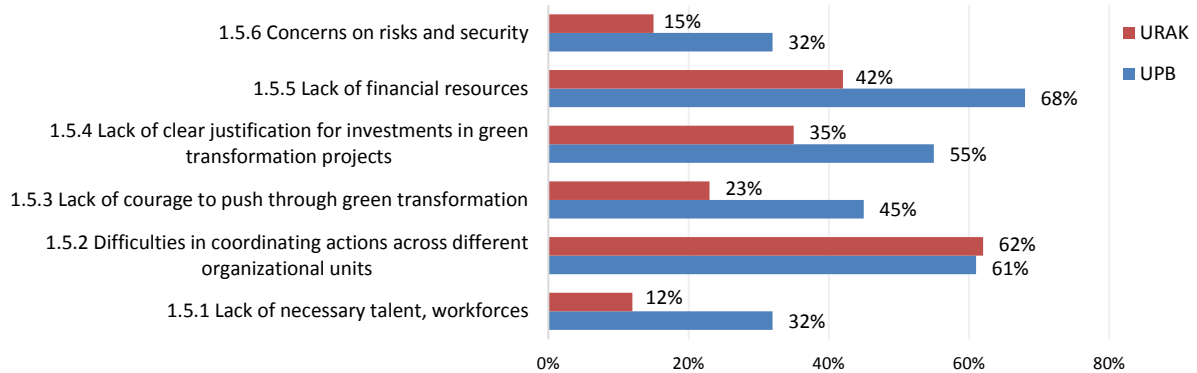


Figure 5. Awareness related to the most relevant barriers to implementing green practices/transformation in UPB ($N_{UPB}=31$) and URAK ($N_{URAK}=23$)

Source: Educate4Green Project Data'2023.

With the possibility of providing more than one answer, the last question is analyzed: *Which are the most relevant barriers to implementing green practices/transformation?* (Figure 5). The lack of financial resources (68%) and the difficulties in coordinating actions across different organizational units (61%) are, by far, the most challenging barriers to green transformation for UPB teachers. The lack of clear justification for investments in green transformation projects is the next recognized obstacle (55% of the total poll), and the lack of courage to push through green transformation is the fourth one (45%). The question that arises is if the concerns on risks and security and the lack of necessary talent and workforces that were least listed (with only 32%) are perceived as such or are just not so well known. The latter variable – lack of necessary talent and workforce – is also marked only by 12% of URAK respondents, who consider it a barrier to implementing green practices/transformation. With 62%, the difficulties in coordinating actions across different organizational units and the lack of financial resources (42%) are also essential problems for URAK.

In summary, the survey conducted among lecturers from the National University of Science and Technology Polytechnic Bucharest and the University of Ruse “Angel Kanchev” shows more commonalities than differences in the competencies and expectations of the respondents. This fact demonstrates the shared point of view and the shared direction of development in the higher education sector in the two neighboring Balkan countries. The common perspective is probably due to the shared belonging of Romania and Bulgaria to the European Union family or the identified expectations towards higher education institutions as carriers of green change and a sustainable future.

Neither university recognizes its own institution as a leader in terms of responsibility for achieving green transformation. The same is true about the responsibility of business organizations. State authorities are attributed a much more significant role, which is understandable given that all leading policies are first adopted by agencies, commissions, or other formations at the state or local

level. This means that a top-to-bottom approach is followed, which is associated with more follow-up and less proactivity.

Accordingly, state institutions are also recognized as a leading partner in achieving the transition. The second most important partner, according to URAK representatives, are business organizations, while for UPB, these are higher education institutions. Here, there is a significant discrepancy in the positions of the two universities. Hypothetically, this may be due to the fact that in Bulgaria, higher education institutions are losing their authority. The emphasis in the country as a whole is on the role of the state and business in achieving social, environmental and economic sustainability. The role of education in forming the necessary knowledge, skills, and competencies to achieve a green transition is underestimated. More worryingly, those employed in the higher education sector in Bulgaria underestimate their role. Instead, they define the business sector as a valuable partner.

A significant polarization between the two universities is also found in the perception of individual citizens and society as a partner. At URAK, these two options are relatively poorly represented. In contrast, UPB not only identifies civil responsibility but also emphasizes civil society's role as a significant partner. The likely reason behind the position of UPB teachers can be found in the growing *strength* of an active civil society in Romania (Romania Insider, 2024). In Bulgaria, on the other hand, manifestations of civic participation are defined as somewhat *sporadic* (Stavrev, 2024).

As can be seen from the results, the two educational institutions indicate that the most significant barriers to the green transition are the difficulties in coordinating actions and the lack of financial resources. These challenges can be overcome by developing strategies to attract expertise and investments from the private sector. Coordination actions can also be improved by forming working groups composed of representatives of different universities, faculties, and departments to coordinate and monitor the green transformation process. It is recommended that the active participation of students in the formed groups be encouraged in order to increase their competencies in the direction of green transformation and effective coordination. Another possible solution is the creation of special funds to support green initiatives and projects created by students and teachers. That will provide the necessary funds and enhance the coordination and management skills of all stakeholders.

The ongoing collaborative activities of the Educate4Green project aim to overcome the identified barriers. The primary strategy includes promoting collaboration between all stakeholders. The approach applied applies the principles of lifelong learning, including for academic staff. The project implements a number of green schools for students and teachers, which are conducted in close cooperation with training organizations outside higher education and with business organizations of various sizes and development. The results are yet to be monitored, and their effectiveness evaluated.

Limitations of the study and applicability of the results

As the present study is a pilot study with a small sample, the results should be interpreted with caution. The limited sample size and potential lack of representativeness may affect the generalizability of the results. Furthermore, the questionnaire used may not have captured all the nuances of teachers' awareness.

Despite these limitations, the study's results provide valuable information about teachers' attitudes regarding green transformation. They can be used to improve the design of future research, adapt curricula and project activities, and formulate new research questions.

Conclusion

This pilot study reveals that serious challenges accompany the growing awareness of the importance of green transformation. The surveyed groups of respondents from Bulgaria and Romania indicate coordination problems, insufficient funding and the lack of clear strategies. The results also show that the surveyed higher education institutions attach different importance to their potential partners in achieving a green transition. For URAK representatives, these are the state authorities, while UPB assesses the collaboration with other higher education institutions as the most significant. To a much higher extent, the Romanian representatives evaluate the role of citizens and civil society organizations. In Bulgaria, such a role is assigned to business organizations.

In addition, the results of this study can be valuable in the development of supranational policies and strategies for green transformation and sustainable development in higher education. This includes the creation of networks for the exchange of knowledge and experience and the promotion of cooperation between universities, businesses and non-governmental organizations. On the one hand, the development and implementation of joint educational and practical-applied programs, stimulating lifelong learning for all stakeholders, will further encourage innovation and support. On the other hand, attracting experts from the business and non-governmental sectors to teach and participate in research projects, applying the perspective of the sector they represent, also emerges as an effective solution.

In conclusion, partnership at all levels and recognition of the responsibility and role of every citizen and organization can be defined as the most essential condition for achieving a green transition. The development of innovative methods to be applied in the educational process and to prepare competitive and competent employees and entrepreneurs of the future is not possible without seeking and achieving effective cooperation.

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Acknowledgments

This study is financed by the European Union-NextGenerationEU through the National Recovery and Resilience Plan of the Republic of Bulgaria, project №BG-RRP-2.013-0001-C01.