Co-funded by the European Union

Go4VocationalSkills

Dobre Kadry
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Go4VocationalSkills

This project has been founded with support from the European Commission under the Erasmus+ Programme
Strategic Partnerships for higher education
PROJECT NUMBER - 2021-1-PL01-KA220-VET-000034866

Summary of quantitative research conducted within the project

Advanced analyses

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1 Introduction

The main aim of the *Go4VocationalSkills* project is to improve the quality of education in technical schools in Europe by implementing a tool for analyzing the competency gap of students studying in the following professions: construction technician, logistics technician, renewable energy technician. The main methodological assumptions of the project were based on the solutions developed in the international project entitled *Go4FutureSkills* [1], as part of which a prototype of an IT system for a comprehensive assessment of students' competencies was created (Kwiatkowska-Ciotucha, D., and Załuska, U., 2020). The system uses the elements of a multidimensional comparative analysis to comprehensively assess an individual's competencies and compare the results with a benchmark assessment performed by experts for specific occupations/positions (Panek T. and Zwierzchowski J., 2013; Walesiak M. and Gatnar E., 2013; Walesiak M. 2011)..

In order to implement the objectives of the *Go4VocationalSkills* project, it was necessary to conduct an extensive international comparative study among students and graduates of the indicated fields of study. In this paper, we present the results of the study in the area of awareness of competencies sought-after by employers and self-assessment of the level of these competencies, as well as the assessment of various aspects related to entering the labour market. In order to structure the analyses, we posed the following research questions:

1) Do the respondents' metric characteristics differentiate their assessments in the indicated areas? In other words, do characteristics such as gender, status on the labour market, the country of study or the field of study have a differentiating effect on the formulation of these assessments?
2) How big, if any, is the difference (gap) in the group of respondents between the perception of importance of different types of competencies and the self-assessment of their level? In other words, can the respondents notice their competency gaps in relation to the expectations of the labour market?
3) Are there any patterns or similarities in the respondents' assessments of the different types of competencies? In other words, is it possible to distinguish certain groups of competencies which are assessed by the respondents in a similar way?

The answers to the questions posed in this way will be used in the next stages of the project to develop dedicated solutions to increase the knowledge and skills of graduates of secondary technical schools that are useful on the labour market.

[1] The Go4FutureSkills project (No. POWR.04.03.00-00-0031/18) is the outcome of international cooperation aimed at developing effective solutions adjusting the education and training system to the needs of the labour market. It is financed by the European Social Fund and implemented as part of the Polish-Finnish partnership. On the part of Poland, the institution leading the project is the training company Dobre Kadry Research-Training Centre Sp. z o. o., which has been operating on the Lower Silesian market for 14 years. On the side of Finland, the entity participating in the project is the Taitaja Adult Education Centre in Kouvola, highly valued by employers from the Kymenlaakso region and active on the market for over 40 years.

2 Research sample and methods of analyses

Table 1 shows the research sample in terms of metric characteristics highlighted in the study: gender, status on the labour market (a student/ graduate), field of study, country of study and age. The study involved 428 respondents – final or penultimate-year students of technical schools, as well as young graduates of this type of school. In order to maintain the clarity of analyses, we did the following in the case of specific characteristics:

- status – we combined the group of final and penultimate-year students and distinguished two sub-groups: students and graduates;
- gender – we decided to eliminate a group of respondents who marked "other" from subsequent analyses because its size is too small;
- the country of study – we created an Erasmus+ subgroup that included students who participated in the survey in Spain during the international internship as part of Erasmus+ programme (they completed the questionnaire in English; students from Croatia and Poland).

Due to the strong inequalities in the size of the individual subgroups for the "age" characteristic, we did not take it into account in the subsequent analyses.

Table 1. A research sample – a structure according to selected characteristics (N = 428)

Characteristic	Characteristic categories	Frequency	Percentage of respondents
Status	Student	312	72.9
	Graduate	116	27.1
Gender	Female	193	45.1
	Male	226	52.8
	Other	9	2.1
Field of study	Construction technician	165	38.6
	Logistics technician	194	45.3
	Renewable energy technician	69	16.1
Country of study	Poland	171	39.9
	Bulgaria	67	15.7
	Greece	109	25.5
	Spain	33	7.7
	Erasmus+	48	11.2
Age	16-18 years old	159	37.2
	19-20 years old	116	27.1
	21-25 years old	123	28.7
	26-30 years old	13	3.0
	over 30 years old	17	4.0

Source: own elaboration

Data analysis methods

In order to find answers to the research questions we used diverse methods of data analysis. In the case of the first research question, we relied on tests of the equality of two means to check differences in assessments in relation to respondents' metric characteristics. Depending on the number of categories for the specific metric characteristics, we used one of the following methods:

- Independent two-sample t test. Tests of the equality of two means were preceded by Levene's test for homogenity of variances. When heterogeneity of variance was found, an alternative to the classical approach, the Welch t-test statistic, was applied. This method was used for characteristics with two categories, such as gender and status – student / graduate.

- One-way analysis of variance. When ANOVA results showed significant differences, post hoc Tukey's HSD tests for multiple comparisons were carried out to identify the pairs characterised by different means. This method was used for characteristics with more than two categories-the field of study and the country of study. The results of the post hoc tests are illustrated in the figures. Statistically significant differences between pairs of metric characteristic categories (nodes as rectangles) are shown with the use of arrows. The beginning of the arrow means a category of a given characteristic with a statistically lower value of the test variable, whereas the arrowhead – a correspondingly statistically higher value of the mean score.

The above-mentioned methods were used to assess the significance of differences for questions with answers on a Likert scale (a five-point scale where 1 meant the lowest, whereas 5 – the highest assessment). In the case of questions whose answers contained two categories (e.g. "yes" and "no"), inferences were made on the basis of the results of the Chi-square test. A threshold p-value of 0.05 was assumed in the analyses, below which it was concluded that there were significant differences in the assessments of respondents characterised by different categories of metric characteristics. In the tables presented in the section dedicated to the study results, p-values are indicated for three levels of significance: below 0.05, below 0.01 and below 0.001.

In order to answer the second research question, we compared respondents' mean scores in terms of the significance of specific competencies and the self-assessment of their level (the results are presented in the main part of the research report), and applied the Spearman's rank correlation coefficient. This measure was used to evaluate the convergence of rankings of importance of specific competencies and the self-assessment of their level. It made it possible to determine the extent to which the formation of competencies in students of secondary technical schools is consistent with their importance on the labour market according to the respondents.

In the case of the third research question, we relied on the factor analysis (Watkins, M. W., 2021; Pett, M. A., Lackey, N. R., & Sullivan, J. J., 2003; Finch, W. H., 2019; Robins, R. W., Fraley, R. C., & Krueger, R. F. (Eds.), 2009; Gorsuch, R. L., 1983). This method was used to reduce the dimensions when assessing the importance of the 12 competencies and their level by the students and graduates taking part in the survey. In order to check the validity of the factor analysis, we carried out the Kaiser-Meyer-Olkin test of sampling adequacy. We also used the Bartlett's test of sphericity to check whether the variables are orthogonal or not. For the

singled out factors, we checked for the diversity of answers in relation to the respondents' metric characteristics with the help of the tests of the equality of two means.

Calculations were performed using SPSS software and MS Excel.

3 Equality of means

The aim of the study was to determine the presence/absence of statistically significant differences between the assessments given by the subgroups of respondents characterised by different categories of specific metric attributes: gender (female / male), status (student / graduate), the field of study and the country of study. Depending on the nature of the answers to each question and the number of subgroups of respondents compared, different methods of data analysis were used. In the case of questions with answers on a five-point Likert scale and two distinguished subgroups of respondents, an independence two-sample t test was used to assess the differentiation of opinions. For the same 5-point Likert scale and more than two subgroups of respondents compared to each other, we relied on the one-way analysis of variance and post hoc tests for multiple comparisons. For one of the research questions the answers were of binary nature ("yes" / "no") – in this case, the occurrence of differences in relation to the selected categories of metric characteristics were assessed on the basis of Chi-square test. The results of the research allow us to give recommendations on a number of issues important from the perspective of project objectives, namely: how to formulate messages for specific groups of students encouraging them to improve their competencies, how to select the scope of development activities and the subject matter of additional educational activities, or how to verify/update the current educational programmes for the analysed field of study.

3.1 Gender (female / male)

While assessing the importance of the different types of competencies, we obtained interesting results for the "gender" characteristic (see Table 2). Positive values of t-statistic indicate that female respondents attributed greater importance to all the listed types of competencies. Moreover, for 6 out of 12 types of competencies those differences proved to be statistically significant. The greatest differences (p-value <0.01) were obtained for IT competencies - software literacy and analytical competency - problem-solving skills. This means that the importance of these competencies is significantly more often appreciated by women than by men.

Table 2. Results of t-tests for importance of competencies (Q1)

Competency	**Gender**	
	t statistic	p-value
vocational – theoretical knowledge	0.944	0.346
vocational – practical skills	0.829	0.408
IT – software literacy	2.771	0.006**
language – knowledge of foreign languages	2.058	0.040*
analytical – problem-solving skills	2.784	0.006**
interpersonal – communication, teamwork	0.978	0.329

interpersonal – work in diverse teams (e.g. multicultural, multigenerational)	1.274	0.204
organisation and self-organisation – time management, self-reliance	1.495	0.136
creativity – generating new ideas, creative style of work	2.184	0.030*
learning – openness to lifelong development	1.510	0.132
personal – loyalty, involvement, responsibility	2.364	0.019*
personal – capacity of resilience (e.g. for stress, time pressure)	1.964	0.050*

* p-value < 0,05; ** p-value < 0,01; *** p-value < 0,001

Source: own elaboration

Table 3 shows the results obtained for the respondents' answers concerning their self-assessment of the specific competencies. For most of those competencies (8 out of 12), women assessed their level in a more positive way than men did. Men, on the other hand, assessed the level of their vocational competencies (both theoretical knowledge and practical skills), language competency and creativity higher than female respondents did. However, it is worth emphasising that for this question no significant differences were obtained between the answers of women and men for any of the types of competencies.

Table 3. Results of t-tests for assessment of the level of competencies (Q2)

Competency	**Gender**	
	t statistic	p-value
vocational – theoretical knowledge	-0.634	0.526
vocational – practical skills	-0.415	0.678
IT – software literacy	0.123	0.902
language – knowledge of foreign languages	-0.453	0.651
analytical – problem-solving skills	0.479	0.632
interpersonal – communication, teamwork	1.030	0.303
interpersonal – work in diverse teams (e.g. multicultural, multigenerational)	0.147	0.884
organisation and self-organisation – time management, self-reliance	0.784	0.433
creativity – generating new ideas, creative style of work	-0.344	0.731
learning – openness to lifelong development	0.715	0.475
personal – loyalty, involvement, responsibility	1.287	0.199
personal – capacity of resilience (e.g. for stress, time pressure)	0.338	0.736

* p-value < 0,05; ** p-value < 0,01; *** p-value < 0,001

Source: own elaboration

Table 4 shows the results of the Chi-square test for the question concerning further education to improve qualifications. The value of the Chi-square statistic of 6.675 indicates that statistically women participate in additional educational activities more often than men.

Table 4. Results of Chi-square test for Q3

Additional activities to raise qualifications		Yes	No	Total	Chi-square	
Gender	female	47%	53%	100%	statistic	p-value
	male	35%	65%	100%	6,675	0,010**

* p-value < 0,05; ** p-value < 0,01; *** p-value < 0,001

Source: own elaboration

Subsequent questions in the survey concerned the evaluation of labour market opportunities and the consequences of changes in the future resulting from the development of modern technologies. A summary of the test results for questions Q4 - Q7 is presented in Table 5. For all the questions, the mean scores of women were higher than those of men (a positive t-statistic value), and in the case of assessment of difficulties in finding suitable work and changes in the scope of necessary competencies to work in the professions related to the current field of study, the differences appeared to be statistically significant.

Table 5. Results of t-tests for Q4 – Q7

Question	Gender	
	t statistic	p-value
How do you assess your current preparation for work after graduation?	0.177	0.860
How do you assess the difficulty in finding a job in line with your expectations?	2.273	0.024*
In your opinion, how will the scope of necessary competencies to work in the professions related to the current field of study change in the next 10 years?	2.662	0.008**
In your opinion, to what extent will future work in professions related to your field of study depend on acquiring new competencies and developing the existing ones?	1.680	0.094

* p-value < 0,05; ** p-value < 0,01; *** p-value < 0,001

Source: own elaboration

3.2 Status (student / graduate)

In the case of "status", we did not find any one-sided correlations for students and graduates' answers concerning the importance of competencies or the self-assessment of their level. 8 out of 12 competencies were assessed as more important by students, but only in the case of "organisation" and "self-organisation" did the differences appear to be statistically significant (see Table 6). It is worth taking a look at the types of competencies that graduates assessed higher – these are mainly those whose importance might be assessed through practical need or use in the workplace, that is, practical skills, IT competency, openness to lifelong development and capacity of resilience.

Table 6. Results of t-tests for importance of competencies (Q1)

Competency	Status	
	t statistic	p-value
vocational – theoretical knowledge	0.893	0.372
vocational – practical skills	-0.365	0.715
IT – software literacy	-1.782	0.075
language – knowledge of foreign languages	0.692	0.489
analytical – problem-solving skills	0.708	0.479
interpersonal – communication, teamwork	0.636	0.525
interpersonal – work in diverse teams (e.g. multicultural, multigenerational)	1.930	0.054
organisation and self-organisation – time management, self-reliance	2.313	0.021*
creativity – generating new ideas, creative style of work	0.567	0.571
learning – openness to lifelong development	-0.072	0.942
personal – loyalty, involvement, responsibility	1.811	0.071
personal – capacity of resilience (e.g. for stress, time pressure)	-0.670	0.503

* p-value < 0,05; ** p-value < 0,01; *** p-value < 0,001

Source: own elaboration

In the self-assessment of the level of 7 out of 12 competencies, the mean scores of students were higher than those of graduates (see Table 7). Interestingly, in the case of vocational competencies - practical skills and personal competency - capacity of resilience, these differences proved to be statistically significant. Graduates evaluated their competencies in the field of IT, analytical, interpersonal and openness to lifelong development in a more positive manner.

Table 7. Results of t-tests for assessment for level of competencies (Q2)

Competency	Status	
	t statistic	p-value
vocational – theoretical knowledge	0.035	0.972
vocational – practical skills	2.198	0.028*
IT – software literacy	-0.687	0.493
language – knowledge of foreign languages	0.316	0.752
analytical – problem-solving skills	-0.238	0.812
interpersonal – communication, teamwork	-1.305	0.193
interpersonal – work in diverse teams (e.g. multicultural, multigenerational)	-0.353	0.724
organisation and self-organisation – time management, self-reliance	0.053	0.958
creativity – generating new ideas, creative style of work	0.270	0.787
learning – openness to lifelong development	-0.372	0.710

personal – loyalty, involvement, responsibility	0.629	0.530
personal – capacity of resilience (e.g. for stress, time pressure)	2.531	0.012*

* p-value < 0,05; ** p-value < 0,01; *** p-value < 0,001

Source: own elaboration

As far as the question on further education is concerned, no statistically significant differences were found, although the answers show that graduates follow additional educational courses more frequently (see Table 8).

Table 8. Results of Chi-square test for Q3

Additional activities to raise qualifications		**Yes**	**No**	**Total**	**Chi-square**	
Gender	student	39%	61%	100%	statistic	p-value
	graduate	45%	55%	100%	1,283	0,257

* p-value < 0,05; ** p-value < 0,01; *** p-value < 0,001

Source: own elaboration

A comparison of students and graduates' answers to the questions about the labour market provided interesting insights (see Table 9). Students evaluated their preparation for entering the labour market in a more positive way, whereas in the question about difficulties in finding a job relevant to one's education there was a statistically significant difference in the assessment given by the two groups – in this case, graduates appeared to be much more critical. Graduates also perceive to a greater extent the importance of changes in competencies and the need for continuous development, although no statistically significant differences were found in the answers to these questions.

Table 9. Results of t-tests for Q4 – Q7

Question	**Status**	
	t statistic	p-value
How do you assess your current preparation for work after graduation?	1.276	0.203
How do you assess the difficulty in finding a job in line with your expectations?	-2.457	0.014*
In your opinion, how will the scope of necessary competencies to work in the professions related to the current field of study change in the next 10 years?	-1.103	0.271
In your opinion, to what extent will future work in professions related to your field of study depend on acquiring new competencies and developing the existing ones?	-0.294	0.769

* p-value < 0,05; ** p-value < 0,01; *** p-value < 0,001

Source: own elaboration

3.3 Field of study

When comparing the respondents' answers in relation to the "field of study", due to the comparison of more than two subgroups it is not possible to unambiguously indicate the direction of differences between individual subgroups based only on the results of ANOVA. On the basis of the results presented in Table 10 in relation to the importance of competencies, we can conclude that statistically significant differences between the fields of study are found only in the case of vocational competencies - theoretical knowledge and practical skills, as well as a personal competency - capacity of resilience. We obtained information about the direction of the observed differences only after performing post hoc tests appropriate for the sample analysed.

Table 10. Results of ANOVA for importance of competencies (Q1)

Competency	Field of study	
	F statistic	p-value
vocational – theoretical knowledge	3.115	0.045*
vocational – practical skills	3.654	0.027*
IT – software literacy	0.398	0.672
language – knowledge of foreign languages	2.255	0.106
analytical – problem-solving skills	1.299	0.274
interpersonal – communication, teamwork	2.682	0.070
interpersonal – work in diverse teams (e.g. multicultural, multigenerational)	0.072	0.931
organisation and self-organisation – time management, self-reliance	1.562	0.211
creativity – generating new ideas, creative style of work	1.336	0.264
learning – openness to lifelong development	2.082	0.126
personal – loyalty, involvement, responsibility	2.922	0.055
personal – capacity of resilience (e.g. for stress, time pressure)	3.223	0.041*

* p-value < 0,05; ** p-value < 0,01; *** p-value < 0,001

Source: own elaboration

The results of the post hoc tests for the assessment of importance of specific competencies are presented in Figure 1 (only for those types of competencies for which significant differences were found on the basis of ANOVA). Students and graduates of the renewable energy field pay more attention to theoretical knowledge in vocational subjects than respondents who chose logistics. As far as vocational practical skills are concerned, statistically significantly higher assessments were indicated by students and graduates of the field of construction compared to the representatives of the other two fields. The respondents who chose the field of construction also evaluated their personal competencies in the case of capacity of resilience in a significantly better way than those who went for the field of renewable energy.

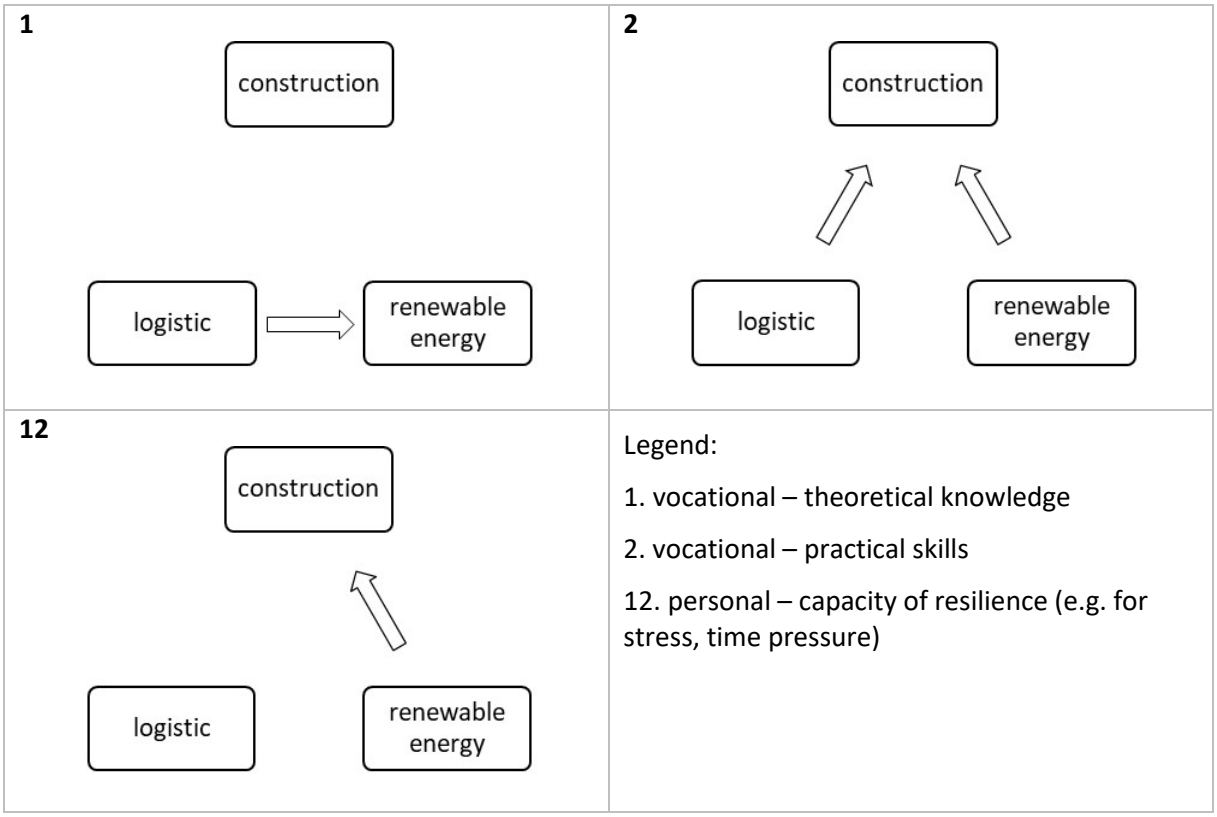


Figure 1. Results of post hoc tests for importance of competencies (Q1)
Source: own elaboration

Significantly greater differences between respondents who chose different fields of study are observed in the question concerning the self-assessment of competency levels (see Table 11). For 7 out of 12 types of competencies, the differences in the answers are statistically significant. It is worth emphasising that for 6 types of competencies the p-value is below 0.01, and for IT – even below 0.001.

Table 11. Results of ANOVA for assessment for level of competencies (Q2)

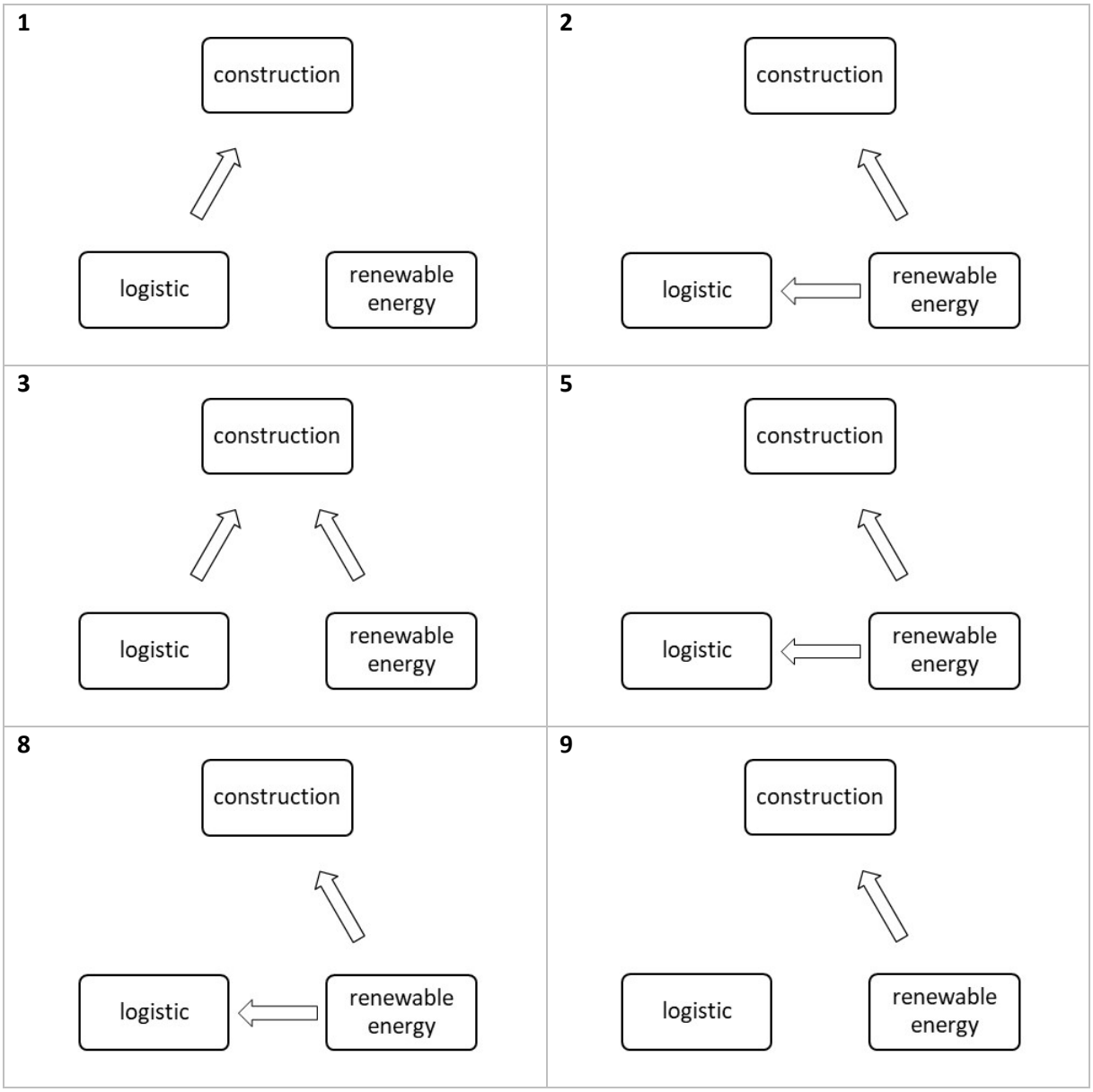
Competency	**Field of study**	
	F statistic	p-value
vocational – theoretical knowledge	5.610	0.004**
vocational – practical skills	5.820	0.003**
IT – software literacy	8.237	0.000***
language – knowledge of foreign languages	2.586	0.076
analytical – problem-solving skills	6.021	0.003**
interpersonal – communication, teamwork	2.280	0.104
interpersonal – work in diverse teams (e.g. multicultural, multigenerational)	1.107	0.332
organisation and self-organisation – time management, self-reliance	5.059	0.007**
creativity – generating new ideas, creative style of work	3.299	0.038*
learning – openness to lifelong development	2.354	0.096
personal – loyalty, involvement, responsibility	4.879	0.008**

personal – capacity of resilience (e.g. for stress, time pressure)	1.671	0.189

* p-value < 0,05; ** p-value < 0,01; *** p-value < 0,001

Source: own elaboration

Figure 2 shows the results of the post hoc tests for the question concerning the self-assessment of the level of specific competencies. In the case of 6 types of competencies for which significant differences were found on the basis of ANOVA, the scores given by the students and graduates of the field of renewable energy were lower than the scores given by the respondents who chose the field of construction. The same applies to 4 competencies whose assessments were lower than those given by the representatives of the field of logistics. The last group of respondents, however, assessed their vocational theoretical knowledge and IT skills in a less positive way than the representatives of the field of construction.



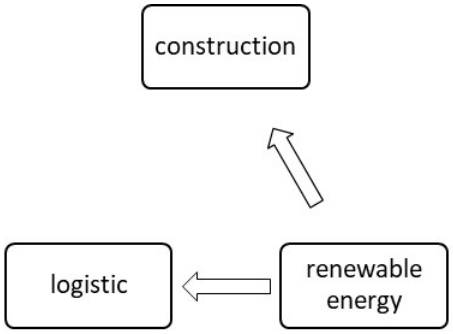
11 	Legend: 1. vocational – theoretical knowledge 2. vocational – practical skills 3. IT – software literacy 5. analytical – problem-solving skills 8. organisation and self-organisation 9. creativity 11. personal

Figure 2. Results of post hoc tests for assessment for level of competencies (Q2)
Source: own elaboration

As far as the question concerning further education and training is concerned, no statistically significant differences were found. On the basis of the results obtained, it is possible to state that the respondents who chose the field of construction are more likely to participate in various forms of additional educational activities than those who decided to study other majors (see Table 12).

Table 12. Results of Chi-square test for Q3

Additional activities to raise qualifications		**Yes**	**No**	**Total**	**Chi-square**	
Field of study	construction technician	45%	55%	100%	statistic	p-value
	logistics technician	37%	63%	100%	2.832	0.243
	renewable energy technician	38%	62%	100%		

* p-value < 0,05; ** p-value < 0,01; *** p-value < 0,001
Source: own elaboration

When it comes to the questions concerning the assessment of the situation on the labour market, only in the case of the assessment of the need for further education and training were significant differences noticed in the respondents' answers (see Table 13). The results of the post hoc test for this question are shown in Figure 3. The need to acquire new competencies and develop existing ones in the context of future work is noticed mainly by the students and graduates of the field of construction. Their assessments are significantly higher in this respect than the assessments of respondents who chose the field of logistics, and slightly higher than the assessments given by the representatives of the renewable energy field.

Table 13. Results of ANOVA for Q4 – Q7

Question	Field of study	
	F statistic	p-value
How do you assess your current preparation for work after graduation?	1.957	0.143
How do you assess the difficulty in finding a job in line with your expectations?	0.220	0.803
In your opinion, how will the scope of necessary competencies to work in the professions related to the current field of study change in the next 10 years?	1.740	0.177
In your opinion, to what extent will future work in professions related to your field of study depend on acquiring new competencies and developing the existing ones?	3.645	0.027*

* p-value < 0,05; ** p-value < 0,01; *** p-value < 0,001

Source: own elaboration

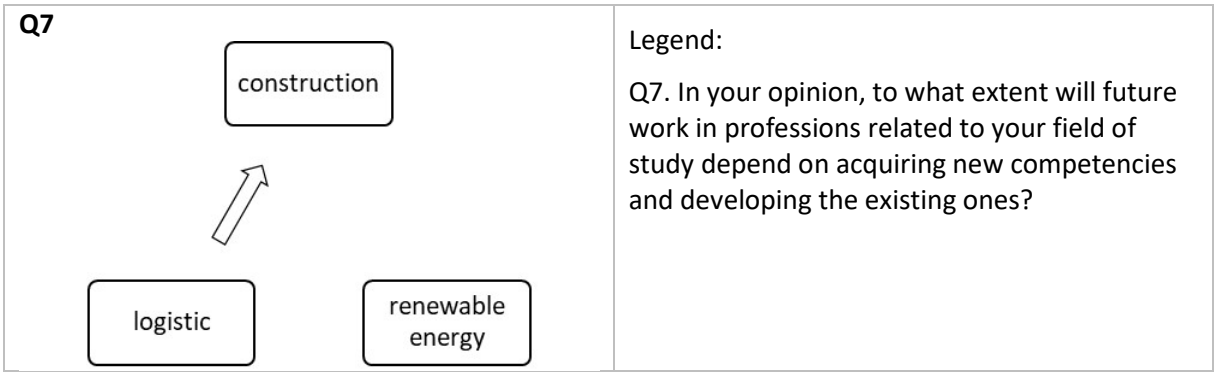


Figure 3. Results of post hoc test for the assessment of the need for further education and training (Q7)

Source: own elaboration

3.4 Country of study

For the "country of study" characteristic, as in the case of the comparison of respondents' answers for the "field of study" attribute, due to the comparison of more than two subgroups, it is not possible to clearly indicate the direction of differences between the specific subgroups based only on the results of ANOVA. The analysis of the comparison of answers for the importance of competencies (see Table 14) shows that statistically significant differences exist in 10 out of 12 types of competencies. Only for analytical and learning competencies no significant differences were found. The strongest differentiation was noticed for vocational competency, IT, creativity, loyalty, involvement and responsibility.

Table 14. Results of ANOVA for importance of competencies (Q1)

Competency	Country of study	
	F statistic	p-value
vocational – theoretical knowledge	10.093	0.000***
vocational – practical skills	5.744	0.000***
IT – software literacy	7.855	0.000***
language – knowledge of foreign languages	3.616	0.007**
analytical – problem-solving skills	2.309	0.057
interpersonal – communication, teamwork	4.469	0.002**
interpersonal – work in diverse teams (e.g. multicultural, multigenerational)	3.627	0.006**
organisation and self-organisation – time management, self-reliance	3.280	0.012*
creativity – generating new ideas, creative style of work	5.069	0.001***
learning – openness to lifelong development	2.275	0.061
personal – loyalty, involvement, responsibility	5.525	0.000***
personal – capacity of resilience (e.g. for stress, time pressure)	2.564	0.038*

* p-value < 0,05; ** p-value < 0,01; *** p-value < 0,001

Source: own elaboration

The results of the post hoc tests for the assessment of the importance of specific competencies are shown in Figure 4 (only for those types of competencies for which significant differences were found on the basis of ANOVA). When analysing pair-wise comparisons between countries, the most significant differences were found for the vocational competency - theoretical knowledge, for which the assessment of importance given by the respondents from Bulgaria was significantly higher the assessment given by people from Poland and Greece, and students taking part in Erasmus+ mobility projects. On the other hand, assessments given by the Polish respondents were much higher than those given by people from Bulgaria, Spain and Greece. For all the competencies for which significant differences were found on the basis of ANOVA, the assessments given by Bulgarian students and graduates were higher than the results for at least one of the remaining categories. As far as Polish respondents are concerned, it is possible to notice that they attach greater importance to practical skills rather than theoretical knowledge, especially in comparison with respondents from other countries or Erasmus+ project participants. In 7 out of 10 competencies with significant differences, Greek respondents assessed the importance of competencies significantly lower than the representatives of at least one of the other categories. We did not notice any particular situation in the assessments given by mobility project participants, and statistically significant differences did not occur for the respondents from Spain very often either.

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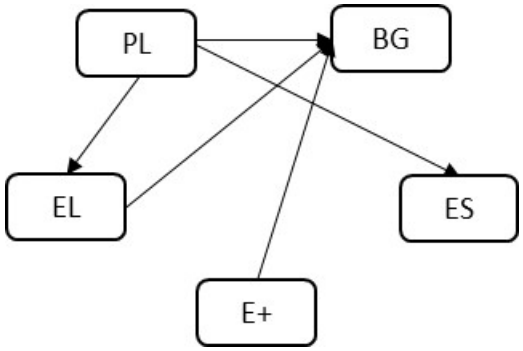
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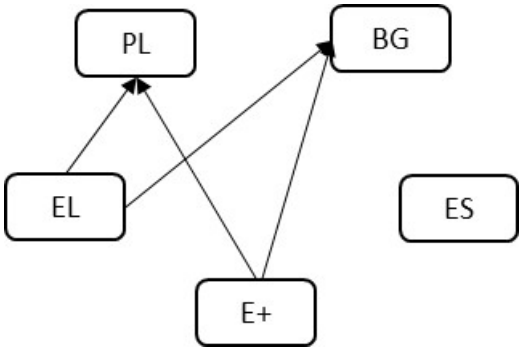
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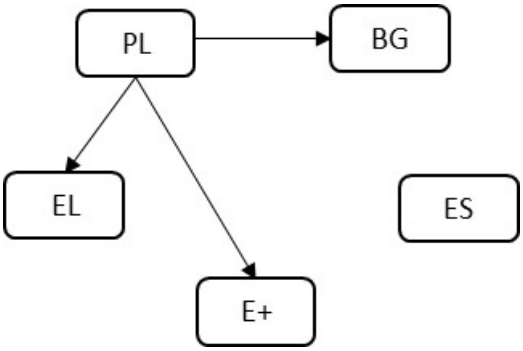
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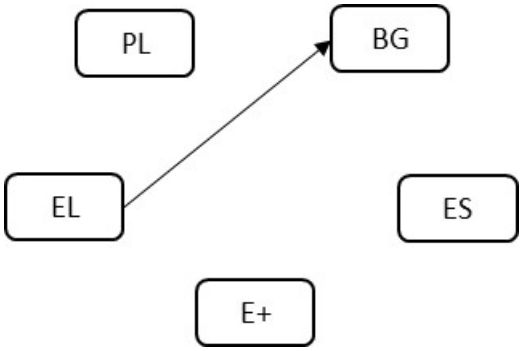
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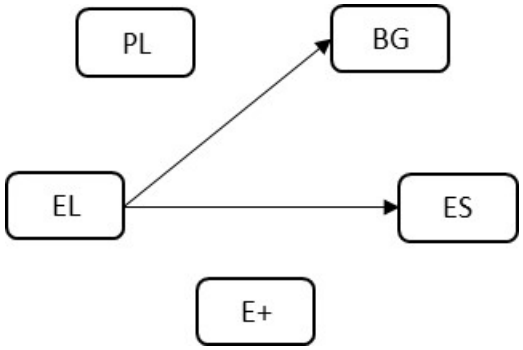
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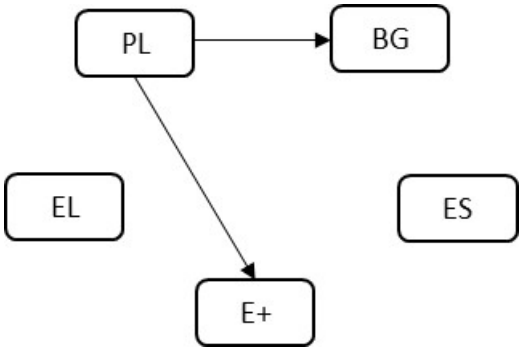
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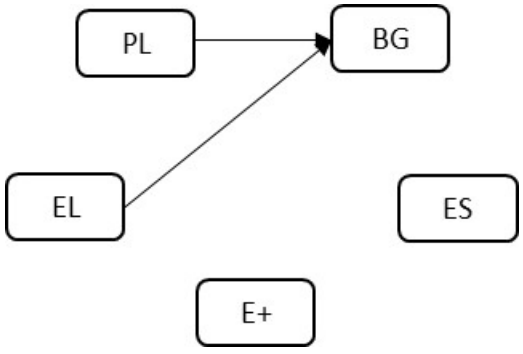
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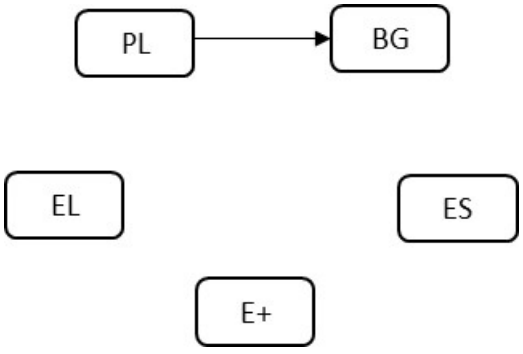
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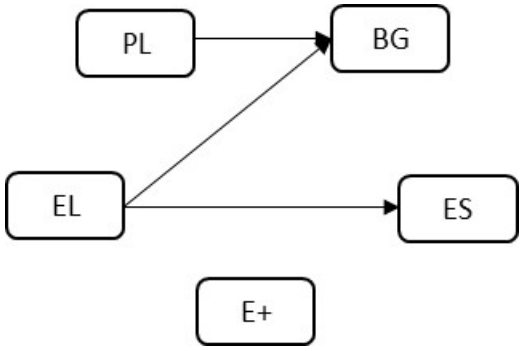
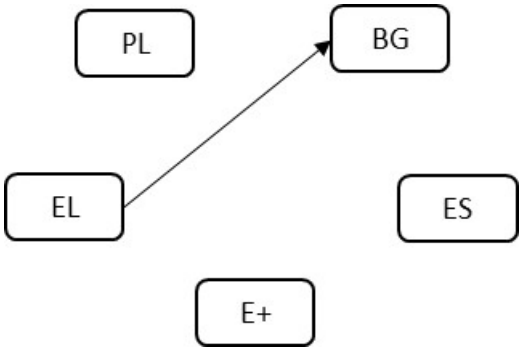
	
Legend: 1. vocational – theoretical knowledge 2. vocational – practical skills 3. IT – software literacy 4. language – knowledge of foreign languages 6. interpersonal – communication, teamwork	7. interpersonal – work in diverse teams 8. organisation and self-organisation 9. creativity 11. personal 12. personal – capacity of resilience (e.g. for stress, time pressure)

Figure 4. Results of post hoc tests for importance of competencies (Q1)
Source: own elaboration

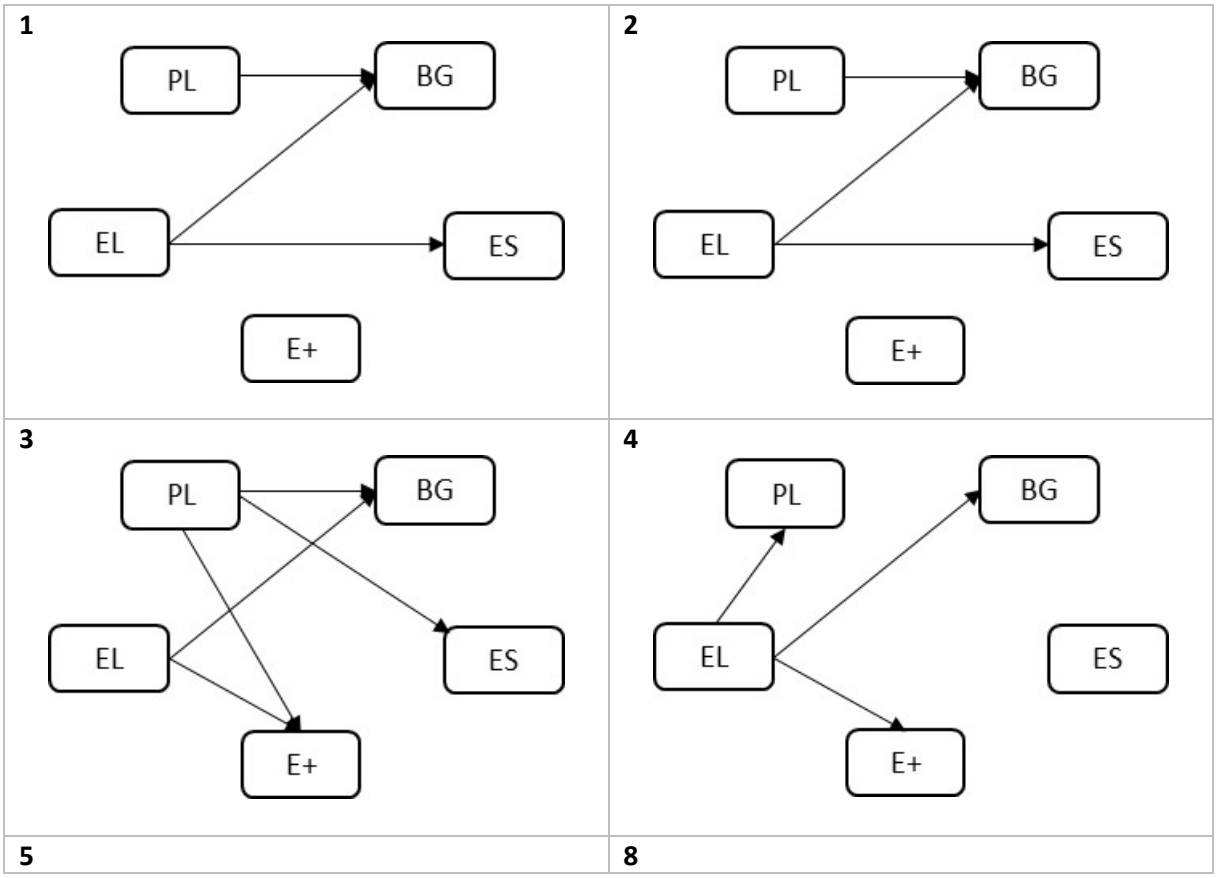
Even greater differences were noticed in the self-assessment of competency level (see Table 15). Statistically significant differences were also found in 10 out of 12 competencies, but for 8 of them the p-value was lower than 0.001, indicating very strong differentiation. The competencies for which no significant differences in the answers were observed were the interpersonal ones.

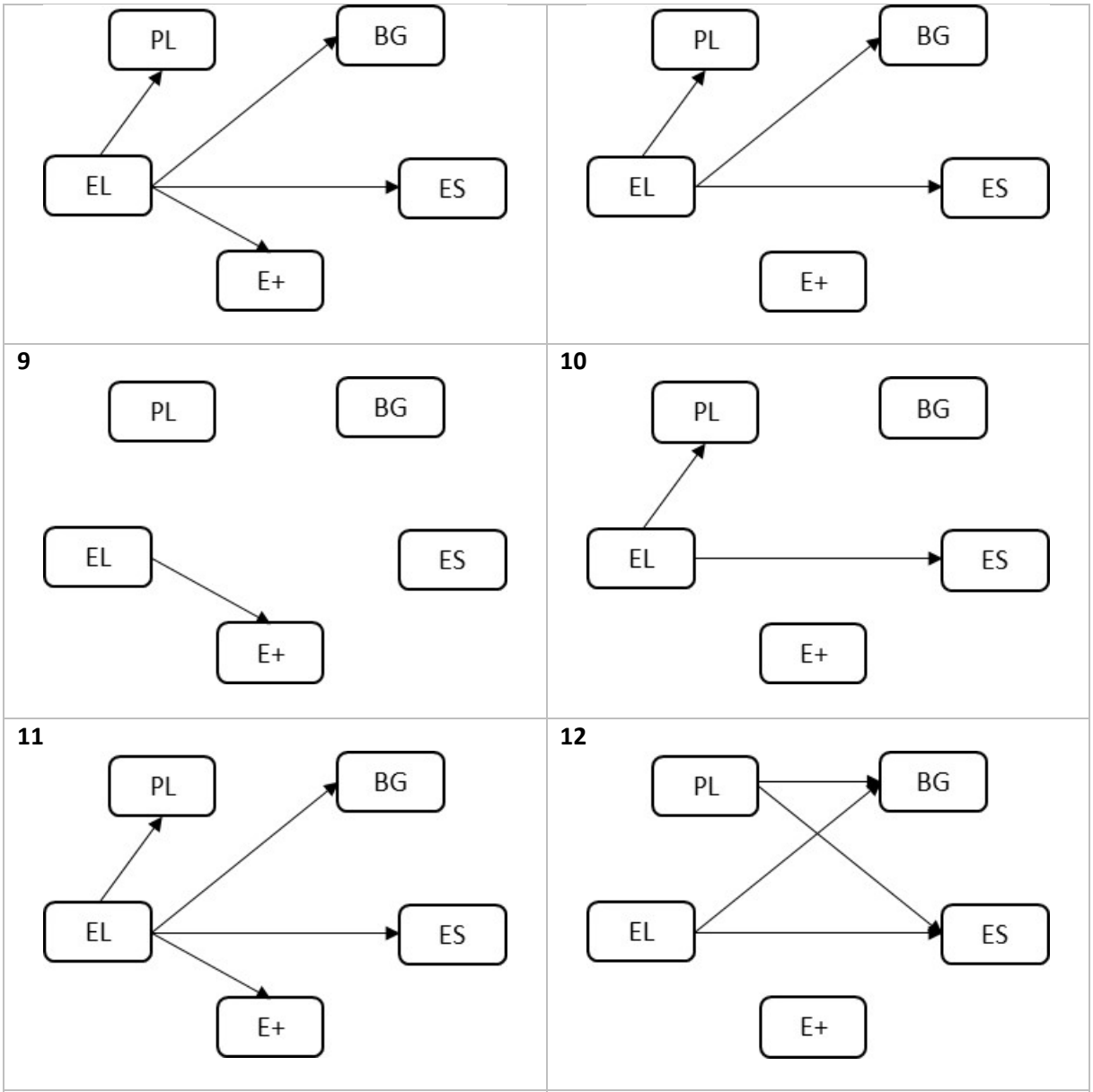
Table 15. Results of ANOVA for assessment for level of competencies (Q2)

Competency	Country of study	
	F statistic	p-value
vocational – theoretical knowledge	4.756	0.001***
vocational – practical skills	6.127	0.000***
IT – software literacy	9.427	0.000***
language – knowledge of foreign languages	8.331	0.000***
analytical – problem-solving skills	6.963	0.000***
interpersonal – communication, teamwork	2.052	0.086
interpersonal – work in diverse teams (e.g. multicultural, multigenerational)	1.826	0.123
organisation and self-organisation – time management, self-reliance	6.218	0.000***
creativity – generating new ideas, creative style of work	2.433	0.047*
learning – openness to lifelong development	3.482	0.008**
personal – loyalty, involvement, responsibility	5.175	0.000***
personal – capacity of resilience (e.g. for stress, time pressure)	6.719	0.000***

* p-value < 0,05; ** p-value < 0,01; *** p-value < 0,001
Source: own elaboration

Figure 5 presents the results of the post hoc tests for the question concerning the self-assessment of the level of particular competencies. When analysing pair-wise comparisons between countries, the most significant differences occurred for the IT competency - software literacy, for which the assessments given by the Polish respondents differed significantly in minus in comparison with the assessments given by the respondents from Bulgaria and Spain, and students taking part in Erasmus+ mobility projects. In comparison with the scores given by Bulgarian respondents and participants of mobility projects, those noted in Greece were lower. It is worth paying attention to the fact that scores given by Greek students and graduates, in relation to all other categories, for two competencies, namely analytical (problem-solving skills) and personal (loyalty, involvement, responsibility), were significantly lower. Unlike the evaluation of the importance of competencies, in this case we did not find any differentiated assessments in relation to vocational competencies - theoretical knowledge and practical skills. In both cases, the level of respondents' competencies was evaluated in a more positive way by the Bulgarian respondents compared to Polish and Greek ones, and by the Spanish respondents compared to Greek ones. There was nothing unusual about the assessments made by mobility project participants – if there were any significant differences, they were in favour of this subgroup in relation to comparative subgroups (5 out of 10 analysed cases with significant differences).





Legend:	8. organisation and self-organisation
1. vocational – theoretical knowledge	9. creativity
2. vocational – practical skills	10. learning – openness to lifelong development
3. IT – software literacy	11. personal
4. language – knowledge of foreign languages	12. personal – capacity of resilience (e.g. for stress, time pressure)
5. analytical – problem-solving skills	

Figure 5. Results of post hoc tests for assessment for level of competencies (Q2)
Source: own elaboration

Statistically significant differences were also noted for the question on further education and training. A simple analysis of the results in Table 16 shows that the respondents from Poland and participants of Erasmus+ mobility projects are significantly more likely to participate in various forms of additional educational activities than people from Bulgaria, Greece or Spain.

Table 16. Results of Chi-square test for Q3

Additional activities to raise qualifications		Yes	No	Total	Chi-square	
Country of study	Poland	47%	53%	100%	statistic	p-value
	Bulgaria	34%	66%	100%	11.147	0.025*
	Greece	32%	68%	100%		
	Spain	30%	70%	100%		
	Erasmus+	52%	48%	100%		

* p-value < 0,05; ** p-value < 0,01; *** p-value < 0,001

Source: own elaboration

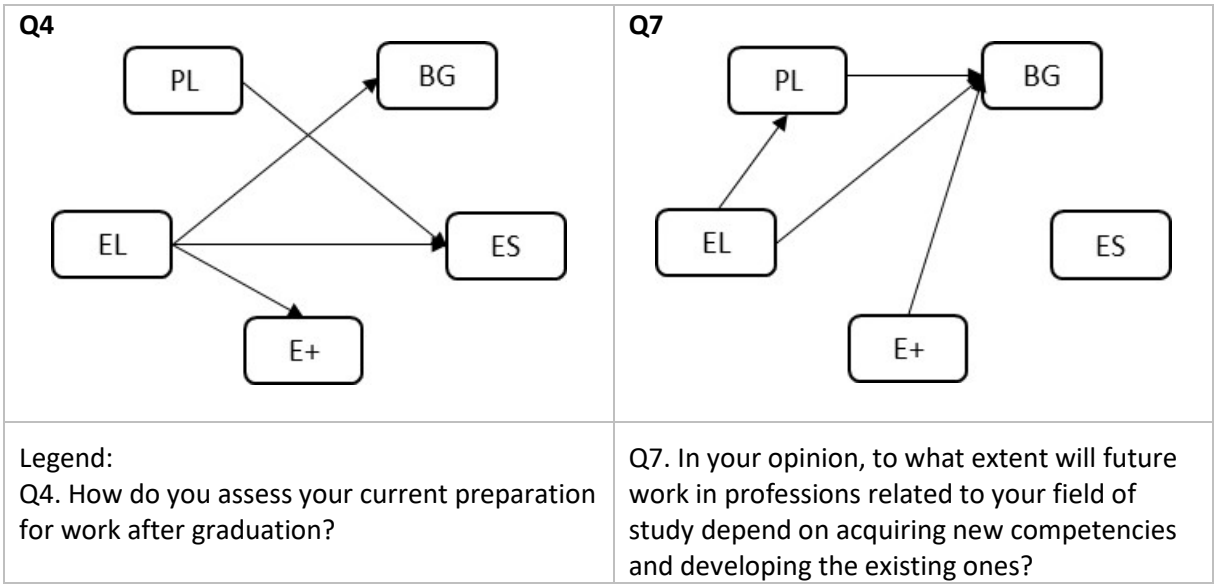
Statistically significant differences, also for p-value < 0.001, were noted for the two questions assessing the situation on the labour market (see Table 17). The respondents expressed different opinions and gave different scores when answering the question about their preparation for entering the labour market and the necessity of participating in educational activities in the future. The results of the post hoc tests for these questions are shown in Figure 6. When looking at the whole research group, the respondents from Spain assess their preparation for entering the labour market in a more positive way than those from Poland or Greece. The respondents from Bulgaria and those who take part in Erasmus+ mobility projects also expressed more positive opinions than students and graduates from Greece. The need for further education and training is noticed primarily by the respondents from Bulgaria, with significant differences in plus for respondents from Poland, Greece and participants of mobility projects. Additionally, there was a significant difference in mean scores between Greece and Poland. In this case, the assessments given by Polish respondents were significantly higher than those of Greeks.

Table 17. Results of ANOVA for Q4 – Q7

Question	Country of study	
	F statistic	p-value
How do you assess your current preparation for work after graduation?	7.062	0.000***
How do you assess the difficulty in finding a job in line with your expectations?	1.299	0.269
In your opinion, how will the scope of necessary competencies to work in the professions related to the current field of study change in the next 10 years?	1.579	0.179
In your opinion, to what extent will future work in professions related to your field of study depend on acquiring new competencies and developing the existing ones?	9.700	0.000***

* p-value < 0,05; ** p-value < 0,01; *** p-value < 0,001

Source: own elaboration



Legend: Q4. How do you assess your current preparation for work after graduation?	Q7. In your opinion, to what extent will future work in professions related to your field of study depend on acquiring new competencies and developing the existing ones?

Figure 6. Results of post hoc tests for questions about preparation for work after graduation and the need for further education and training (Q4 and Q7)
Source: own elaboration

4 Assessment of the importance of competencies and self-assessment of the level of competencies

In order to obtain an answer to the research question about the possible difference between the perception of the importance of different types of competencies and the self-assessment of the level of these competencies, we used a measurement of the convergence of the rankings obtained by ranking the answers given to the first and second questions in the survey. The rankings were created separately for the question on the importance of competencies and the self-assessment of their level based on the average values assigned to the subsequent types of competencies.

The creation of rankings involves arranging the observations in special order according to a highlighted variable and giving them new values in the form of ranks. A rank is a consecutive number of an observation after they are ranked according to the value of the variable. When assigning ranks, we discard information about differences between specific observations – the only thing we are interested in is their order. According to the theory of measurement scales, the assignment of ranks usually results in a shift from a higher-order scale (interval or ratio scale), in which the specific values assigned to specific observations are important, to an ordinal scale, where we are only interested in the ordering of the observations analysed. The rank is given after sorting due to the variable that put records in order in the analysed set. Usually, ascending order and numbering from the value of 1 is used. Usually, ascending order and numbering from the value of 1 are used. When for one or more observations the same value of distinguished variable is recorded, which is the basis for ranking, we use the so-called tied ranks. The most common method of creating tied ranks involves calculating the mean of the repeated ranks and assigning it to an observation with the same value of the distinguished variable.

In order to evaluate the consistency of the ordering of the rankings created for the assessment of the importance of competencies and the self-assessment of their level, we relied on the Spearman's rank correlation coefficient. This measure was used to assess the convergence of the two rankings and to identify gaps between the two assessments. The rankings were created first for the entire group of respondents (that is, 428 participants), and then for the answers given by the respondents representing specific fields of study. The results obtained for the comparison of rankings created on the basis of answers given by all the respondents are shown in Table 18. The value of the Spearman's rank correlation coefficient was r = 0.5318, which was slightly lower than the critical value for p-value = 0.05. The two orderings are not statistically similar, which means that the respondents perceive the importance of competencies and assess their level in different ways. The biggest difference – 8 positions – as observed for personal competencies (capacity of resilience), which took the 2nd position in the ranking of importance and only 10th position in the ranking of self-assessment. The second significant difference was noted for vocational competencies (practical skills), which took the 1st position in the ranking of importance and only 5th in the ranking of self-assessment. We did not notice any significant differences when the situation was the other way around, that is, when the importance of competencies was much lower than the self-assessment of their level.

Table 18. Average value and rank for the assessment of importance and level of competencies – the whole research sample

Competency	average value		rank	
	importance	level	importance	level
vocational – theoretical knowledge	3.64	3.56	8	7
vocational – practical skills	4.13	3.58	1	5
IT – software literacy	3.41	3.15	12	12
language – knowledge of foreign languages	3.56	3.36	11	11
analytical – problem-solving skills	3.77	3.57	7	6
interpersonal – communication, teamwork	3.82	3.71	3.5	2
interpersonal – work in diverse teams (e.g. multicultural, multigenerational)	3.58	3.54	10	8
organisation and self-organisation – time management, self-reliance	3.81	3.67	5.5	3
creativity – generating new ideas, creative style of work	3.61	3.5	9	9
learning – openness to lifelong development	3.81	3.65	5.5	4
personal – loyalty, involvement, responsibility	3.82	3.79	3.5	1
personal – capacity of resilience (e.g. for stress, time pressure)	3.90	3.48	2	10

Source: own elaboration

r* = 0.5874 (12 values, p-value = 0.05)
r = 0.5318

The results of the comparison of the rankings created for the field of construction are presented in Table 19. In this case, the Spearman's rank correlation coefficient was lower than

the critical value for p-value = 0.05, which means that the orderings are not statistically similar. As for the sample as a whole, the greatest differences were noted for personal competencies (capacity of resilience) which took the 2nd position in the ranking of importance and only 10th position in the ranking of self-assessment, and vocational competencies (practical skills), which took the 1st and 5th position respectively.

Table 19. Average value and rank for the assessment of importance and level of competencies – construction technician

Competency	average value		rank	
	importance	level	importance	level
vocational – theoretical knowledge	3.70	3.74	9	5
vocational – practical skills	4.28	3.69	1	6
IT – software literacy	3.44	3.44	12	12
language – knowledge of foreign languages	3.47	3.49	11	11
analytical – problem-solving skills	3.71	3.66	8	7
interpersonal – communication, teamwork	3.93	3.75	5	4
interpersonal – work in diverse teams (e.g. multicultural, multigenerational)	3.61	3.62	10	9
organisation and self-organisation – time management, self-reliance	3.85	3.79	6	2
creativity – generating new ideas, creative style of work	3.72	3.63	7	8
learning – openness to lifelong development	3.94	3.78	4	3
personal – loyalty, involvement, responsibility	3.94	3.88	3	1
personal – capacity of resilience (e.g. for stress, time pressure)	3.99	3.56	2	10

Source: own elaboration

r* = 0.5874 (12 values, p-value = 0.05)
r = 0.4091

The comparison of rankings created for the fields of logistics looks similar (see Table 20). Also, in this case, we did not find any similarities between the two orderings. The biggest differences were noted for the same types of competencies as before (personal - capacity of resilience and for vocational - practical skills), with personal competencies (capacity of resilience) taking the 8th in the ranking of self-assessment, and not 10th as before. Interestingly, significant differences were found when the situation was the other way round – when the self-assessment of the level of a given competency was much higher in the ranking than its importance. This was the case for interpersonal competencies - communication, teamwork (importance – rank 6, self-assessment – rank 2) and personal competencies - loyalty, involvement, responsibility (importance – rank 5, self-assessment – rank 1).

Table 20. Average value and rank for the assessment of importance and level of competencies – logistics technician

Competency	average value		rank	
	importance	level	importance	level
vocational – theoretical knowledge	3.51	3.4	11	10
vocational – practical skills	4.05	3.63	1	5
IT – software literacy	3.35	2.98	12	12
language – knowledge of foreign languages	3.69	3.34	8	11
analytical – problem-solving skills	3.86	3.64	3	4
interpersonal – communication, teamwork	3.79	3.76	6	2
interpersonal – work in diverse teams (e.g. multicultural, multigenerational)	3.56	3.52	9.5	7
organisation and self-organisation – time management, self-reliance	3.84	3.69	4	3
creativity – generating new ideas, creative style of work	3.56	3.48	9.5	9
learning – openness to lifelong development	3.74	3.61	7	6
personal – loyalty, involvement, responsibility	3.81	3.84	5	1
personal – capacity of resilience (e.g. for stress, time pressure)	3.92	3.49	2	8

Source: own elaboration

r* = 0.5874 (12 values, p-value = 0.05)
r = 0.5295

The comparison of the convergence of the rankings created for the field of renewable energy is shown in Table 21. Again, no similarities between the two rankings were found. The biggest differences were observed for vocational competencies - practical skills (importance – rank 1, self-assessment – rank 9.5) and analytical competencies - problem-solving skills (importance – rank 4, self-assessment – rank 9.5). Interestingly, there was no clear difference observed for the earlier orderings in the case of personal competencies - capacity of resilience (ranks 5 and 7 respectively). When the situation was the other way round, we noticed significant differences for both types of interpersonal competencies (ranks 5.5 and 2.5 for interpersonal competencies – communication and teamwork – and 8.5 and 5 for working in diverse teams) and also for personal competencies – loyalty, involvement, responsibility (ranks 8.5 and 4 respectively).

Table 21. Average value and rank for the assessment of importance and level of competencies – renewable energy technician

Competency	average value		rank	
	importance	level	importance	level
vocational – theoretical knowledge	3.84	3.61	2	1
vocational – practical skills	3.96	3.17	1	9.5
IT – software literacy	3.48	2.96	11	12

language – knowledge of foreign languages	3.42	3.13	12	11
analytical – problem-solving skills	3.68	3.17	4	9.5
interpersonal – communication, teamwork	3.61	3.46	6.5	2.5
interpersonal – work in diverse teams (e.g. multicultural, multigenerational)	3.58	3.39	8.5	5
organisation and self-organisation – time management, self-reliance	3.61	3.32	6.5	6
creativity – generating new ideas, creative style of work	3.49	3.23	10	8
learning – openness to lifelong development	3.71	3.46	3	2.5
personal – loyalty, involvement, responsibility	3.58	3.45	8.5	4
personal – capacity of resilience (e.g. for stress, time pressure)	3.62	3.26	5	7

Source: own elaboration

r* = 0.5874 (12 values, p-value = 0.05)
r = 0.2614

5 Factor analysis

Factor analysis was used in order to check whether respondents' answers revealed any similarities in their attitudes towards different types of competencies. Discovering such similarities would allow us to use a summative scale and replace questions concerning 12 types of competencies with 2-3 questions about the distinguished groups of competencies that received similar assessments. This situation would be extremely beneficial for further research as it would significantly reduce both the size of the questionnaires and analyses conducted on the basis of their results.

In order to check the validity of using factor analysis to assess the importance of competencies and their level, we carried out the Kaiser-Meyer-Olkin test of sampling adequacy and also Bartlett's test of sphericity. In both cases, the KMO close to 1 (KMO = 0.915 and KMO = 0.949, respectively) indicates the adequacy of sample selection. Bartlett's test of sphericity (in both cases: df = 66, p = 0.000) confirms that the variables are not orthogonal. Hence, the use of dimensionality reduction is justified and can lead to meaningful results. The factors were isolated using the principal components analysis.

5.1 Importance of competencies

The explanation of the total variance through specific components is shown in Table 22.

Table 22. Factor analysis results – explained total variance

Component number	Initial eigenvalues		
	Total	% of variance	% cumulative
1	6.385	53.208	53.208
2	1.102	9.180	62.389
3	0.788	6.567	68.956
4	0.647	5.391	74.346
5	0.626	5.216	79.562
6	0.516	4.296	83.859
7	0.439	3.658	87.517
8	0.406	3.381	90.898
9	0.326	2.715	93.613
10	0.290	2.419	96.032
11	0.258	2.153	98.185
12	0.218	1.815	100.000

Source: own elaboration

The first factor explains 53.208% of variance and the second one - 9.180%, which gives a total of 62.389%. The subsequent increments of explanation are insignificant, which can also be observed in the scree plot (Figure 7).

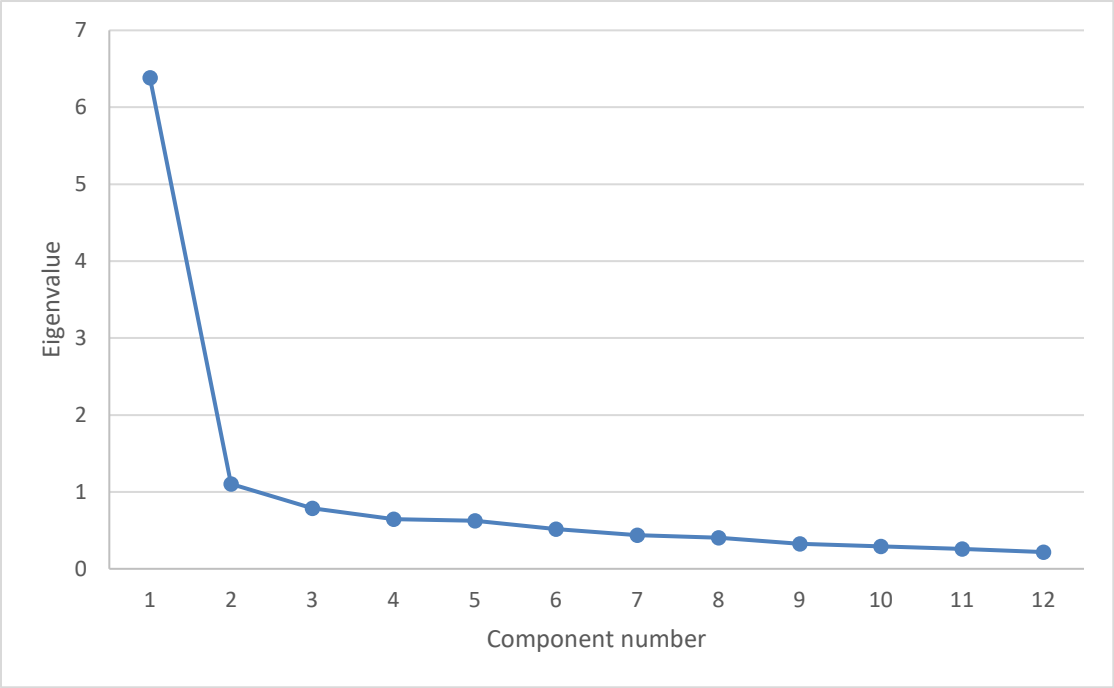


Figure 7. Scree plot – assessment of the importance of competencies
Source: own elaboration

The scree plot and the degree of explanation of the variance prompt us to analyse two factors. The solution was subjected to varimax rotation with Kaiser normalisation, and the results obtained are shown in Table 23.

Table 23. Factor analysis results – factor loadings after varimax rotation with Kaiser normalization

Variable (competency)	Loadings	
	Factor 1	Factor 2
vocational – theoretical knowledge	0.224	**0.782**
vocational – practical skills	0.319	**0.637**
IT – software literacy	0.152	**0.842**
language – knowledge of foreign languages	**0.485**	0.454
analytical – problem-solving skills	**0.664**	0.423
interpersonal – communication, teamwork	**0.809**	0.154
interpersonal – work in diverse teams (e.g. multicultural, multigenerational)	**0.810**	0.089
organisation and self-organisation – time management, self-reliance	**0.748**	0.324
creativity – generating new ideas, creative style of work	**0.690**	0.436
learning – openness to lifelong development	**0.657**	0.458
personal – loyalty, involvement, responsibility	**0.734**	0.287
personal – capacity of resilience (e.g. for stress, time pressure)	**0.700**	0.311

Source: own elaboration

The pattern of the loadings after rotation indicates that variables can be linked to factors. The variables related to vocational and IT competencies are connected with the second factor,

while the other variables are mainly determined by the first factor. Hence, the second factor may be labelled as “hard skills”, whereas the first one – “universal skills”.

Using the results of the factor analysis, we applied a summative scale for the variables represented in specific factors (a mean value for these variables) and, on that basis, we made an assessment of differentiation of scores in relation to gender, the status of the respondent, the field of study and the country of study. As in the previous analyses, in the case of gender and status, a t-test of the equality of two means was used, and for the remaining variables - a one-way analysis of variance. The results of the tests and characteristics in relation to the categories of independent variables are presented in Table 24 and 25.

Table 24. Differences in summative scale with respect to gender, status, field of study, country of study – Factor 1

Independent variable	Dependent variable – summative scale		p-value (source)
	Mean	SD	
	Gender		
female	3.865	0.844	0.022*
male	3.680	0.801	(t – test)
	Status		
student	3.794	0.855	0.252
graduate	3.691	0.754	(t – test)
	Field of study		
construction technician	3.836	0.811	0.164
logistics technician	3.762	0.873	(ANOVA)
renewable energy technician	3.611	0.729	
	Country of study		
Poland	3.675	0.934	0.001**
Bulgaria	4.080	0.703	(ANOVA)
Greece	3.619	0.579	
Spain	3.970	0.814	
Erasmus+	3.844	0.956	

* p-value < 0,05; ** p-value < 0,01; *** p-value < 0,001

Source: own elaboration

In the case of the first factor, the tests showed that for the two categories of analysed independent variables there were significant differences in the mean values for the summative scale ($p < 0.05$). Men (mean = 3.680) obtained a significantly lower score than women (mean = 3.867). As far as countries are concerned, the highest value was noted for Bulgaria (mean = 4.080), whereas the lowest one for Greece (mean = 3.619). Tukey’s HSD post hoc tests (significance level = 0.05) revealed that significant differences occurred between the scores given by the respondents from Bulgaria and those given by Polish and Greek participants. The scores given by students and graduates from Bulgaria were significantly higher than those given by the respondents from the other two above-mentioned countries (see Figure 8 – the left side).

Table 25. Differences in summative scale with respect to gender, status, field of study, country of study – Factor 2

Independent variable	Dependent variable – summative scale		p-value (source)
	Mean	SD	
	Gender		
female	3.818	0.914	0.050*
male	3.650	0.835	(t – test)
	Status		
student	3.707	0.876	0.555
graduate	3.764	0.925	(t – test)
	Field of study		
construction technician	3.810	0.851	0.168
logistics technician	3.636	0.899	(ANOVA)
renewable energy technician	3.758	0.939	
	Country of study		
Poland	3.536	0.970	0.000**
Bulgaria	4.144	0.741	(ANOVA)
Greece	3.746	0.742	
Spain	3.929	0.725	
Erasmus+	3.604	0.974	

* p-value < 0,05; ** p-value < 0,01; *** p-value < 0,001

Source: own elaboration

In the case of the second factor, the significance of the differences in mean scores for the summative scale concerned the same metric categories as in the case of the first factor, namely gender and the country of study. Again, female respondents evaluated the importance of competencies higher (mean = 3.818) than men did (mean = 3.650). On the country level, the highest scores were noted in Bulgaria (mean = 4.144), whereas the lowest - in Poland (mean = 3.536). Significant differences are presented in Figure 8 (the right side).

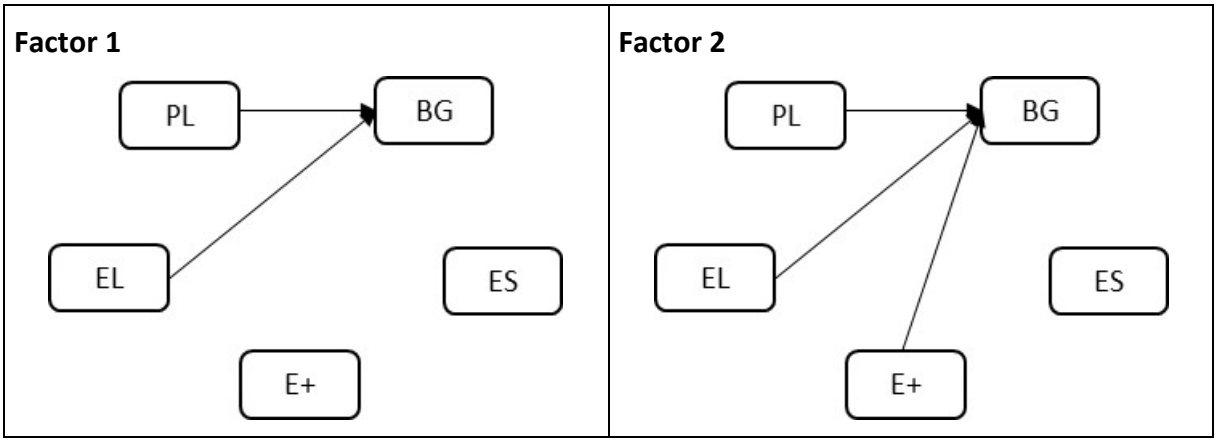


Figure 8. Importance of competencies – significant differences for the summative scale

Source: own elaboration

5.2 Assessment of the level of competencies

The degree of explanation of the total variance through specific components is presented in Table 26.

Table 26. Factor analysis results – explained total variance

Component number	Initial eigenvalues		
	Total	% of variance	% cumulative
1	7.048	58.733	58.733
2	0.917	7.641	66.374
3	0.683	5.688	72.062
4	0.549	4.578	76.640
5	0.502	4.186	80.826
6	0.441	3.671	84.498
7	0.401	3.338	87.836
8	0.356	2.970	90.806
9	0.337	2.809	93.615
10	0.296	2.467	96.082
11	0.254	2.114	98.196
12	0.216	1.804	100.000

Source: own elaboration

The first factor explains 58.733% of variance. The subsequent increments of explanation are insignificant, which can also be observed in the scree plot (Figure 9).

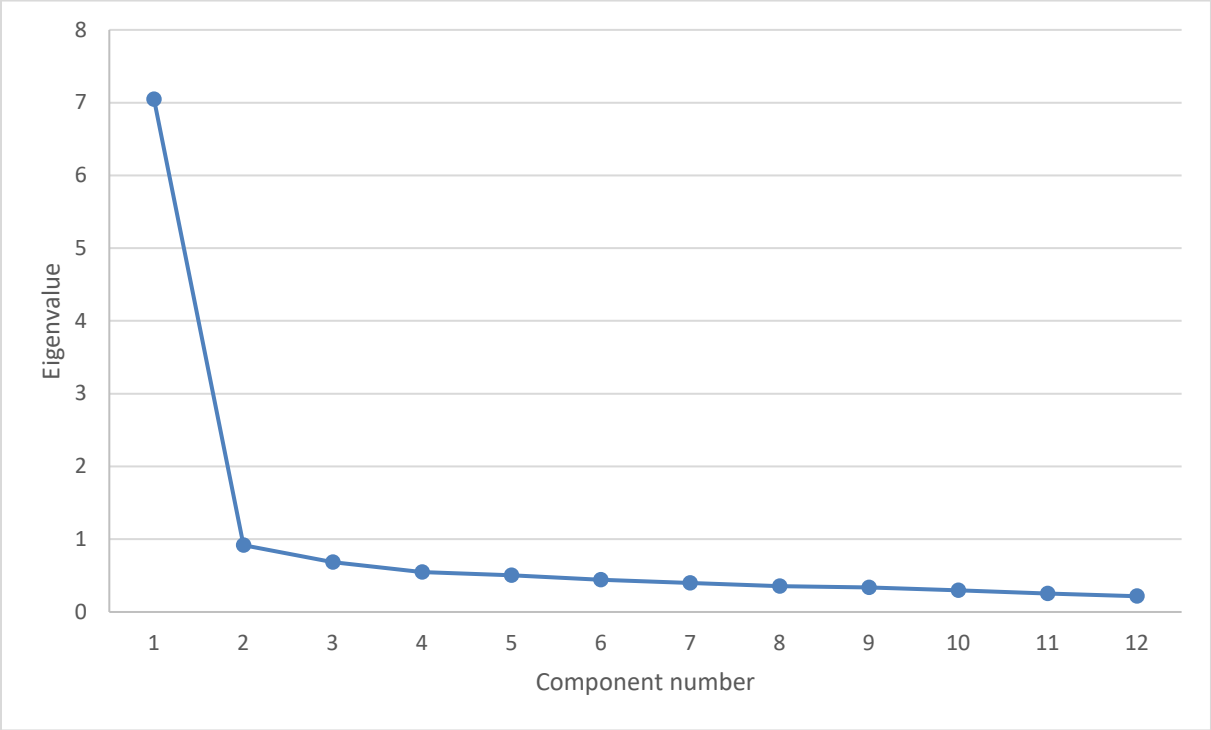


Figure 9. Scree plot – assessment of the level of competencies

Source: own elaboration

The scree plot and the degree of explanation of the variance prompt us to analyse one factor. The results obtained are shown in Table 27.

Table 27. Factor analysis results – factor loadings

Variable (competency)	Loadings
vocational – theoretical knowledge	0.646
vocational – practical skills	0.709
IT – software literacy	0.702
language – knowledge of foreign languages	0.651
analytical – problem-solving skills	0.839
interpersonal – communication, teamwork	0.791
interpersonal – work in diverse teams (e.g. multicultural, multigenerational)	0.772
organisation and self-organisation – time management, self-reliance	0.828
creativity – generating new ideas, creative style of work	0.827
learning – openness to lifelong development	0.828
personal – loyalty, involvement, responsibility	0.829
personal – capacity of resilience (e.g. for stress, time pressure)	0.737

Source: own elaboration

Using the results of the factor analysis, we applied a summative scale (a mean value for all variables) and, based on this, we made an assessment of the differentiation of scores in relation to gender, status, the field of study and the country of study. As in previous analyses, in the case of gender and status, we used a t-test of the equality of two means, and for the remaining variables - a one-way analysis of variance. The results of the tests and characteristics according to the category of independent variables are presented in Table 28.

Table 28. Differences in summative scale with respect to gender, status, field of study, country of study

Independent variable	Dependent variable – summative scale		p-value (source)
	Mean	SD	
	Gender		
female	3.559	0.830	0.746
male	3.533	0.820	(t – test)
	Status		
student	3.556	0.840	0.725
graduate	3.524	0.797	(t – test)
	Field of study		
construction technician	3.670	0.838	0.007**
logistics technician	3.530	0.823	(ANOVA)
renewable energy technician	3.302	0.768	

	Country of study		
Poland	3.522	0.802	0.000***
Bulgaria	3.795	0.925	(ANOVA)
Greece	3.255	0.624	
Spain	3.828	0.827	
Erasmus+	3.766	0.974	

* p-value < 0,05; ** p-value < 0,01; *** p-value < 0,001

Source: own elaboration

In this case, the differentiating factors were the field of study and the country of study. The general level of competencies was evaluated in the most positive way by the representatives of the construction field of study (mean = 3.670), whereas those who chose the field of renewable energy gave the lowest scores (mean = 3.302). As far as countries are concerned, the most positive opinions concerning the general preparation were expressed by students and graduates from Spain (mean = 3.828), whereas the poorest ones – by the respondents from Greece (mean = 3.255). Significant differences are presented in Figure 10.

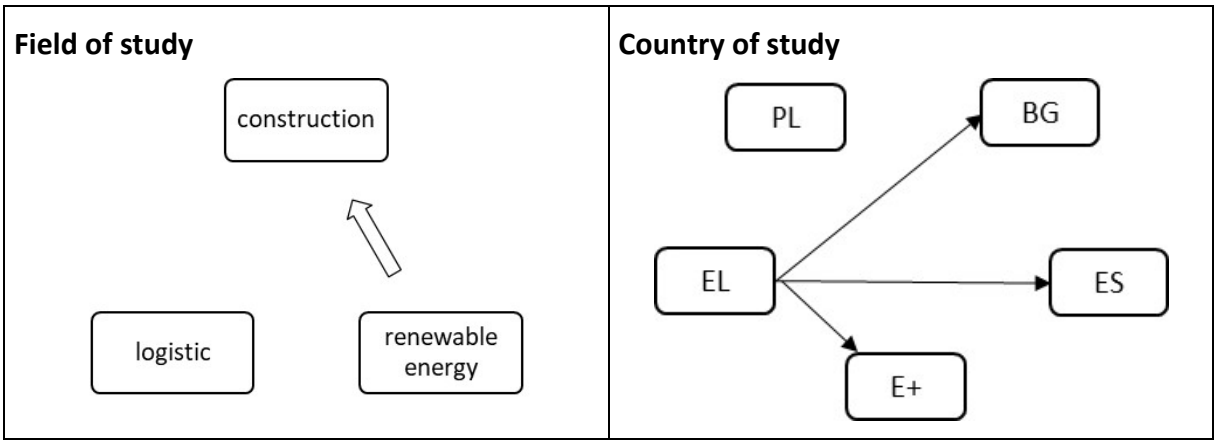


Figure 10. Assessment of the level of competencies – significant differences for the summative scale

Source: own elaboration

6 Conclusion

The survey carried out among secondary technical schools' students and graduates provided interesting insights into respondents' perceptions of different types of competencies as well as their awareness of the current situation on the labour market. The main observations include:

- **A strongly differentiating metric characteristic is gender.** It is possible to conclude that women are more critical about their preparation for entering the labour market and their ability to find and maintain a job that is compatible with their field of study. When it comes to assessing the importance of competencies (in 6 types of competencies out of 12), the differences in the scores given by men and women were statistically significant, with women's mean scores being higher than men's scores for all the competencies. It means that women rate the importance of specific competencies higher than male respondents. Statistically significantly higher mean scores for questions assessing the situation on the labour market further indicate that women notice potential risks in finding a job and the need for further education and training due to inevitability of change more frequently than men. Last but not least, differences in the assessment of the importance of competencies and the situation on the labour market show that women participate in additional educational activities more often than men. **Potential use in the project**: targeting messages about participation in the activities offered in the project mainly at women due to their greater openness to further education and critical judgement. This concerns both the test use of the comprehensive competency assessment tool and proposals for further education and training (result 4). It may be worth considering the preparation of a varied offer adapted to the needs of both genders.

- **Graduates are more critical of their preparation for entering the labour market than students**. Although a comparison of the answers given by students and graduates did not indicate numerous differences to which statistical significance could be attributed, it is possible to draw interesting conclusions from the analysis of the direction of the differences observed. Graduates attributed higher importance to competencies that are used in practice in the workplace, i.e. practical or IT skills, and they also appreciated the importance of openness to lifelong development and capacity of resilience. In the self-assessment of the level of competencies, it is quite surprising to find statistically significant differences in favour of students in the case of vocational competencies (practical skills) and personal competencies (capacity of resilience). If we also add to this a more critical attitude expressed by graduates towards difficulty in finding a job suitable for their education, we can assume that the higher scores given by students when self-assessing their level of competency or the situation on the labour market are probably due to a lack of awareness of the actual needs and expectations of potential employers. **Potential use in the project:** it is worth paying attention to issues related to making students familiar with the current situation on the labour market (e.g. by presenting the results of employer surveys or expert analyses). It is also worth considering the preparation of a training course bringing market realities closer to students as part of further education and training (result 4).

- **The biggest differences in the respondents' answers differing by the "field of study" characteristic was noted for the question concerning the self-assessed level of**

competency. For this question, we found statistically significant differences in 7 out of 12 competencies assessed. Only in one case (vocational - theoretical knowledge) did they not refer to the poorer assessment of their competencies by students and graduates from the field of renewable energy. Two differences were found mainly for competencies such as: analytical – problem-solving skills, organisation and self-organisation – time management, self-reliance and personal – loyalty, involvement, responsibility. **Potential use in the project:** a varied proposal for development activities for students of the different fields of study included in the project. Special attention should be paid to the improvement of the self-assessment of students who chose the field of renewable energy. Preparation of a proposal for changes in the field of renewable energy in the form of additional resources (in addition to the results planned in the project).

- **The characteristic that appeared to be the most differentiating was the country of study.** For this characteristic, we found statistically significant differences in 10 out of 12 types of competencies analysed, both in the question about their importance and self-assessed level. In the case of both questions, we noticed multiple statistically significant differences in pair-wise comparisons of countries in plus for Bulgaria and in minus for Greece. This situation requires a deeper analysis in terms of the rationale behind the answers given by respondents classified in the different categories of the "country" characteristic. It is important to determine the reasons for the statistically significant differences that have occurred - whether they result from different cultural and historical backgrounds, a different approach to the vocational training process, different expectations of employers or, for example, a different perception of reality (realism vs. wishful thinking). Significant differences also occurred in the answers to the question about further education and training, and in 2 out of 4 questions concerning the situation on the labour market. Additional educational activities are mainly undertaken by the participants of mobility projects, followed by students and graduates from Poland. Students and graduates from Spain, followed by the respondents from Bulgaria and those who participate in Erasmus+ projects, evaluate their preparation for entering the labour market in a more positive way than the respondents from Poland and Greece. **Potential use in the project:** in addition to universal solutions at the EU level, developing guidelines/recommendations taking into account the situation in the country (especially in the partner countries), including students' opinions on the importance of competencies and the self-assessment of their level; verification of drivers motivating the respondents to give specific answers - identification of cultural differences and their impact on the perception of importance of competencies and their self-assessment. The last issue may be relevant when formulating assessments and recommendations from the results of a competency test.

- **We found differences in the respondents' assessment in the area of importance of different types of competencies and self-assessment of their level.** The lack of similarities between rankings created for both analysed issues means that the respondents consider other types of competencies as important for their employment after graduation, and point to others as their strengths. The lack of similarities between rankings was noted for the entire sample as well as specific fields of study, which proves that the respondents are aware of their competency gaps in relation to the

expectations on the labour market. This mainly applies to personal competencies – capacity of resilience and vocational ones – practical skills, which took higher positions in the rankings of importance than self-assessment. In comparison with orderings obtained for the entire sample and other fields of study, we noticed relative significant differences for the field of renewable energy. What seems to be worrying is the very low position in all the rankings of competencies such as IT competency, language competency or creativity, that is, competencies considered by practitioners to be particularly important for potential job candidates (they are called "flexible competencies" and they allow of quick adaptation to the requirements of the job or occupation). Another concern is a large difference between the rankings of importance and self-assessment of a personal competency - capacity of resilience. **Potential use in the project:** paying particular attention to flexible competencies when developing proposals for further education and training (it is about pointing to the need for developing such competencies and suggesting realistic ways of improving their level). Developing a solution to improve the capacity for resilience among students, as indicated not only by the differences in rankings, but also by the differences in the perception of this competency by students and graduates.

- **The use of factor analysis confirmed the occurrence of certain patterns in the respondents' assessments concerning the different types of competencies.** The clearly visible two factors created for the answers to the question on the importance of different types of competencies show that the respondents assess the importance of competencies belonging to the group of so-called universal skills (factor 1) and the importance of so-called hard skills (factor 2) in a similar manner. The summative scale used for the two factors instead of the 12 questions concerning the individual types of competencies showed, in the case of universal skills, significant differences in the scores given by men and women, and the respondents studying in different countries. As far as hard skills are concerned, significant differences were noticed for the same subgroups of respondents as for factor 1, namely gender and the country of study. In the case of self-assessment of the level of competencies, only one factor was detected, which may indicate a tendency of respondents to evaluate the level of all the competencies as either "good" or "bad". The summative scale used showed the significance of differences for the field and the country of study. **Potential use in the project**: these insights can be used when planning potential support for the students of secondary technical schools. If we assume, for example, that the majority of students approach flexible competencies or hard skills in a similar way, it is possible to refer to the importance of the entire group of competencies while promoting activities targeted at a specific group. Differentiation due to gender, the field of study and, above all, the country of study, means that we should prepare a dedicated offer for a well-defined target group.

Appendix. Selected questions from the PAPI questionnaire

No	Question / Answers / Categories
Q1	In your opinion, how important are the following competencies for the employment in your field of study? *Please use the 1-5 scale, where 1 means "Not important at all" and 5 – "Very important"* 1. vocational – theoretical knowledge 2. vocational – practical skills 3. IT – software literacy 4. language – knowledge of foreign languages 5. analytical – problem-solving skills 6. interpersonal – communication, teamwork 7. interpersonal – work in diverse teams (e.g. multicultural, multigenerational) 8. organisation and self-organisation – time management, self-reliance 9. creativity – generating new ideas, creative style of work 10. learning – openness to lifelong development 11. personal – loyalty, involvement, responsibility 12. personal – capacity of resilience (e.g. for stress, time pressure)
Q2	How do you assess your level of the following competencies? *Please use the 1-5 scale, where 1 means "Insufficient", and 5 – "Fully sufficient to acquire satisfactory job"* 1. vocational – theoretical knowledge 2. vocational – practical skills 3. IT – software literacy 4. language – knowledge of foreign languages 5. analytical – problem-solving skills 6. interpersonal – communication, teamwork 7. interpersonal – work in diverse teams (e.g. multicultural, multigenerational) 8. organisation and self-organisation – time management, self-reliance 9. creativity – generating new ideas, creative style of work 10. learning – openness to lifelong development 11. personal – loyalty, involvement, responsibility 12. personal – capacity of resilience (e.g. for stress, time pressure)

Q3	In addition to your studies, do you learn anything else/develop in order to obtain additional professional qualifications? □ Yes □ No If yes, in what form/how do you do that? □ working in a student scientific association(s) □ participation in training courses organized at the university □ participation in training courses organized outside the university □ free apprenticeships/internships □ paid apprenticeships/internships □ working in a position related to the field of study □ self-study e.g. reading books, articles, materials on websites devoted to specific sectors, video guides □ other – please specify
Q4	How do you assess your current preparation for work after graduation? *Please use the 1-5 scale, where 1 means "Insufficient" and 5 – "Fully sufficient"*
Q5	How do you assess the difficulty in finding a job in line with your expectations? *Please use the 1-5 scale, where 1 means "Very easy" and 5 – "Very difficult"*
Q6	In your opinion, how will the scope of necessary competencies to work in the professions related to the current field of study change in the next 10 years? *Please use the 1-5 scale, where 1 means "It won't change a lot" and 5 – "It will change a lot"*
Q7	In your opinion, to what extent will future work in professions related to your field of study depend on acquiring new competencies and developing the existing ones? *Please use the 1-5 scale, where 1 means "To a minor extent" and 5 – "To a large extent"*

References

1. Finch, W. H. (2019). Exploratory factor analysis. Sage.
2. Gorsuch, R. L. (1983). Factor analysis. Lawrence Erlbaum Associates. Hillsdale
3. Kwiatkowska-Ciotucha, D., and Załuska, U. (2020). Go4FutureSkills – a comprehensive competency assessment tool. Econometrics. Ekonometria. Advances in Applied Data Analysis, 24(4).
4. Panek T., and Zwierzchowski J. (2013), *Statystyczne metody wielowymiarowej analizy porównawczej. Teoria i zastosowania*, Oficyna Wydawnicza Szkoła Główna Handlowa, Warszawa.
5. Pett, M. A., Lackey, N. R., & Sullivan, J. J. (2003). Making sense of factor analysis: The use of factor analysis for instrument development in health care research. Sage.
6. Robins, R. W., Fraley, R. C., & Krueger, R. F. (Eds.). (2009). Handbook of research methods in personality psychology. Guilford Press.
7. Walesiak M., and Gatnar E. (2013), *Statystyczna analiza wielowymiarowa z wykorzystaniem programu R*, Wydawnictwo Naukowe PWN, Warszawa.
8. Walesiak M., Uogólniona miara odległości GDM w statystycznej analizie wielowymiarowej z wykorzystaniem programu R, Wydawnictwo Uniwersytetu Ekonomicznego, Wrocław 2011.
9. Watkins, M. W. (2021). A step-by-step guide to exploratory factor analysis with SPSS. Routledge.