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Environmental awareness of the students of technology and engineering

According to the objectives set in the „Strategy for Education for Sustainable Development” education for sustainable development should develop and strengthen the capacity to assess the reality and decision-making for sustainable development of individuals, groups, communities, organizations and countries. Moreover, it should change the way of thinking, allowing people to create a safer, healthier, and more prosperous world. It should develop critical thinking, as well as raise awareness.

Taking into account that this strategy was adopted at a meeting of high level representatives from the Ministry of Environment and Education in Vilnius, 17–18 March 2005, it seems that the demands contained in it should “reach out to the masses” and students should have at least basic information resource concerning environmental and ecological education.

Therefore it was decided to check whether students have high environmental awareness.

The research was conducted over two years (from February 2014 to October 2015). The study involved 243 students of the Pedagogical University of Krakow and was carried out using an on-line questionnaire (it was included in the teaching materials at remote lectures).

The questionnaire contained 18 questions about various aspects of environmental awareness:

- choice of means of communication;
- segregation of garbage;
- consumer preferences;
- pro-ecological behaviour.

The present article provides the results of research on segregation of garbage by the surveyed students.

Hypothesis: The previously acquired knowledge influences pro-ecological behaviour. Students of technical and natural sciences know how to recognize materials the objects of everyday life are made of. They also know (from a great number of leaflets) which items can be thrown into individual garbage containers. Therefore, students of science and technology are better at segregation of garbage than other students.



Fig. 1. A typical leaflet informing how to segregate garbage

Source: <http://mojafirma.infor.pl/nieruchomosci/nieruchomosci/spoldzielnia-mieszaniowa/320712,Jak-segregowac-smieci-Infografika.html> [access 8.12.2015]

The research group

The questionnaire was made available to more than 500 students – participants of lectures at the university. 243 students answered the survey, of which the majority (82.6%) were women and only a small number were men (17.4%). The percentage ratio of women to men in returned questionnaires was similar to the same ratio in the whole population.

The research population comprised the students of all levels – from first year of BA studies, through MA students and finally the PhD students.

The most abundant group were students of first year of BA studies (58.8%). The smallest group (only 3.3% of population) were students of postgraduate studies. Also in this case the distribution of respondents who filled in the survey was similar to the distribution of students in the whole population.

The subjects were of different ages 19 to 36 year-olds. The most numerous group were students aged 21–22.

Due to the fact that the lectures were addressed to the entire academic community, students participating in the survey represented a variety of fields of study and different specializations. For statistical analysis of the results the students were categorized into 3 groups according to their profile of education: studies in natural science, technical studies, and humanities.

Students of technical studies represented about a quarter of the study population.

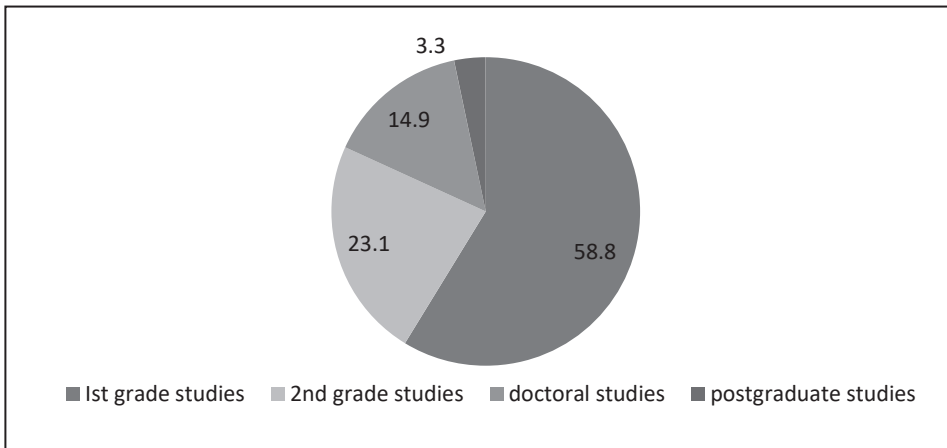


Fig. 2. Percentage distribution of the level of education of respondents

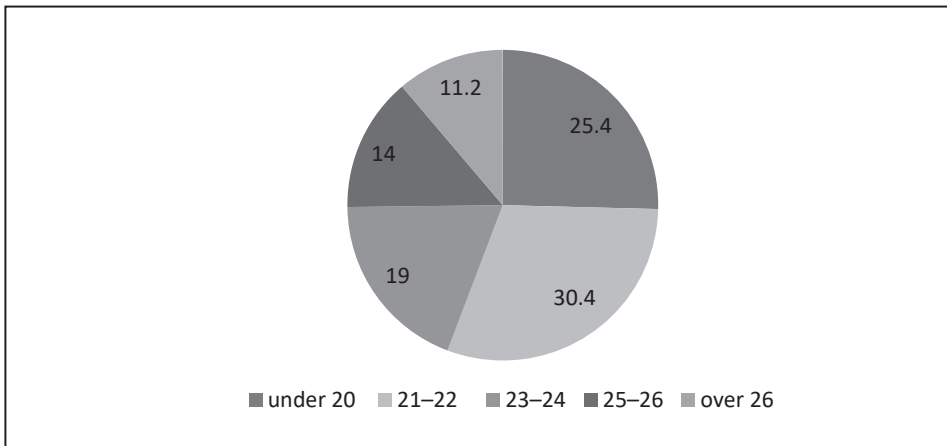


Fig. 3. Percentage distribution of age of students

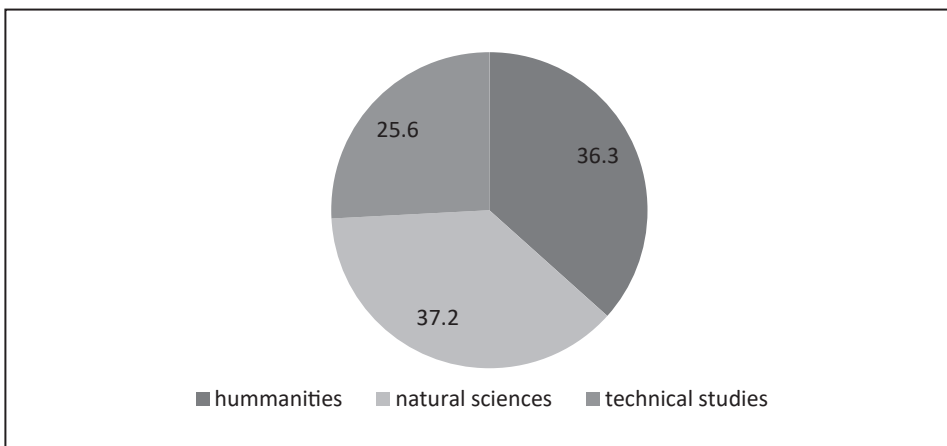


Fig. 4. Percentage distribution of the type of education of respondents

Results

The first analysed question concerned the declared knowledge of students on waste segregation and read as follows: How would you rate your knowledge on waste segregation?

Students had to mark their answers on a five point Lickert scale, where 5 meant *very good* and one meant *I am not familiar with waste segregation at all*. Most of the surveyed students reported average or good level of knowledge about waste segregation (respectively 43% and 35.5%). In contrast, 11.6% of respondents reported very good level of their knowledge, 6.6% poor and finally 3.3% very poor level of knowledge about the segregation of garbage.

In the next step it was examined whether the declared level of knowledge in the field of waste segregation depends on the type of education of the respondents (Fig. 6). Considering the fact that about a quarter of the study population there were students of technical branches it may be noted that in groups where students declared their knowledge at 5, 4, 3 the percent of the students in technical branches is larger than a quarter. Students of natural sciences, who constituted over 36% of the study population more frequently declared knowledge at 5 or 4. Students of humanities accounted for a greater percentage than that resulting from the number of participants in a group, in groups of assessing the declared knowledge at 3, 2 and 1. It can be concluded that students of technical subjects declare their knowledge at a slightly lower level than students of natural sciences but definitely on a higher level than students of humanities. It seems, therefore, that the declared knowledge of students confirms the hypothesis.

It was also examined whether declared knowledge of waste segregation depends on the gender of the surveyed students.

Comparing the percentage of men in the studied population it can be seen that only a group of students declaring an average knowledge concerning the segregation of garbage per cent of men is similar to the males percentage in the population and accounts for about 17%. There are no males who admit the complete lack of knowledge of the tested topic. Moreover, less than 14% of males assess their knowledge at '4'. Overproduction of males can be observed at levels: '2' (25%) and '5' 29%.

In order to verify students' declarations students were asked to select the correct waste bin for each of the five waste items listed below:

- a sardine tin;
- bulb;
- plastic medicine packaging;
- fruit juice package;
- Styrofoam packaging.

There were five waste bins available:

- Metal
- Glass
- Paper
- Plastics
- Other

The correct answer in all cases is a container signed 'Other' but most students did not choose this option. None of the surveyed students have assigned all

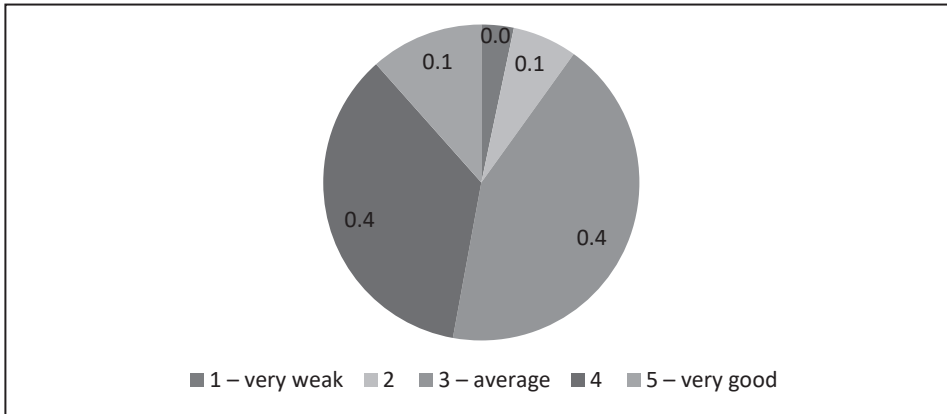


Fig. 5. Declared level of knowledge on segregation of the garbage.

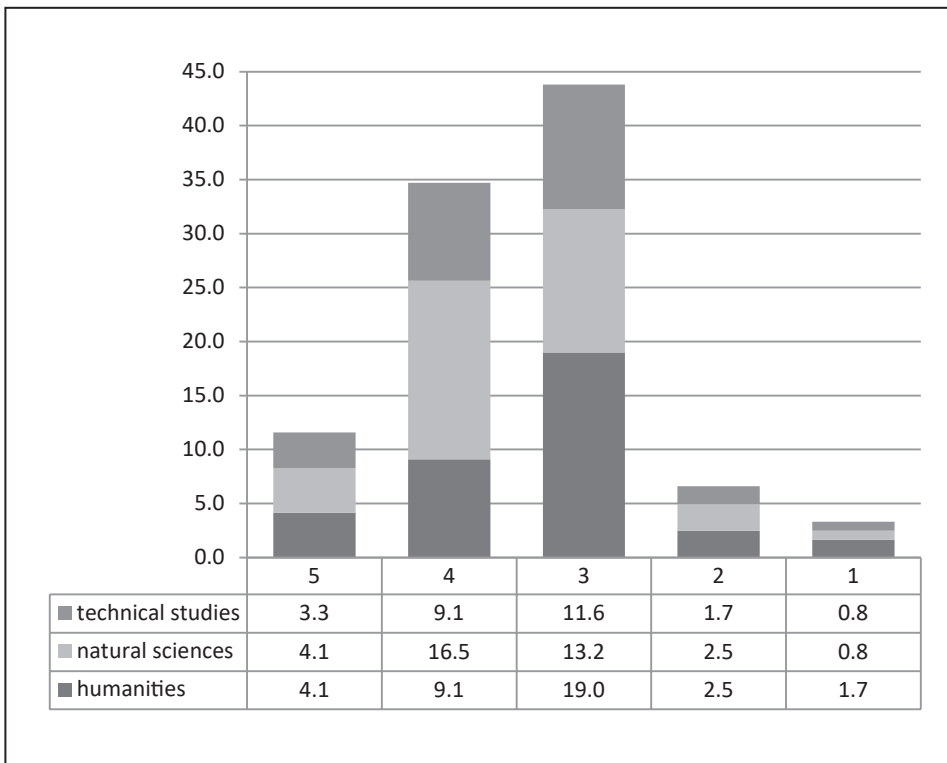


Fig. 6. Declared knowledge of students on the segregation of garbage grouped by the branch of the studies. Likert scale (1 I don't know much, 5 – I am very good at it)

requested items correctly. It can therefore be concluded that none of the students is an expert in segregation of garbage. Only a few students pointed out the individual elements as those that should be thrown to the container 'Other'. The most common element dropped to the container marked 'Other' was polystyrene foam (74.4%) and a sardine tin was the least often thrown element (only 0.8%).

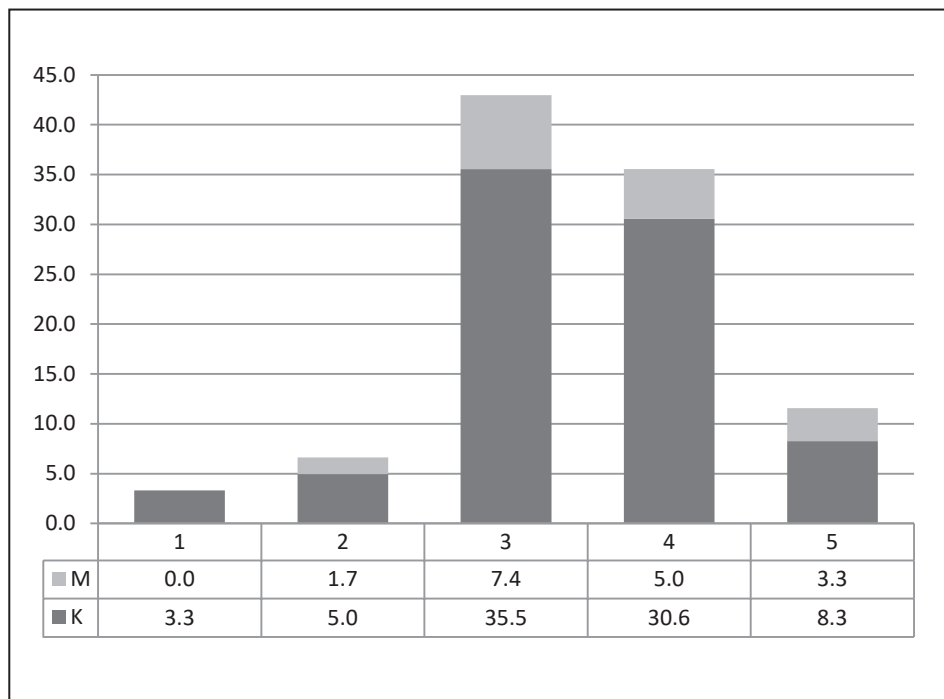


Fig. 7. Declared knowledge of students on the segregation of garbage grouped by the gender. Likert scale (1 – I don't know much, 5 – I am very good at it). Females – dark grey; males – light grey

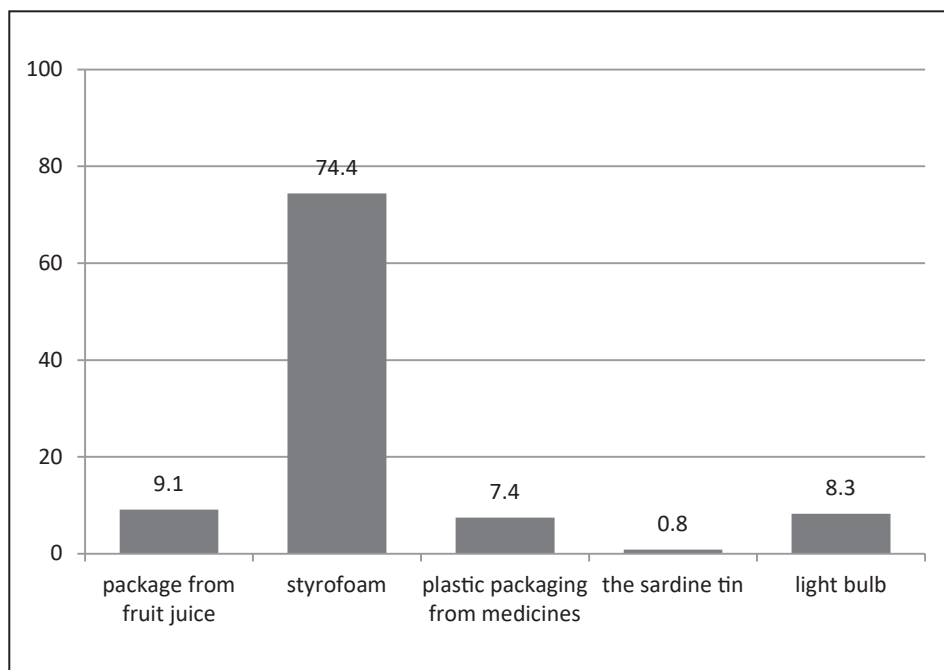


Fig. 8. The percentage of correct choices of the container 'Other' for particular kind of garbage

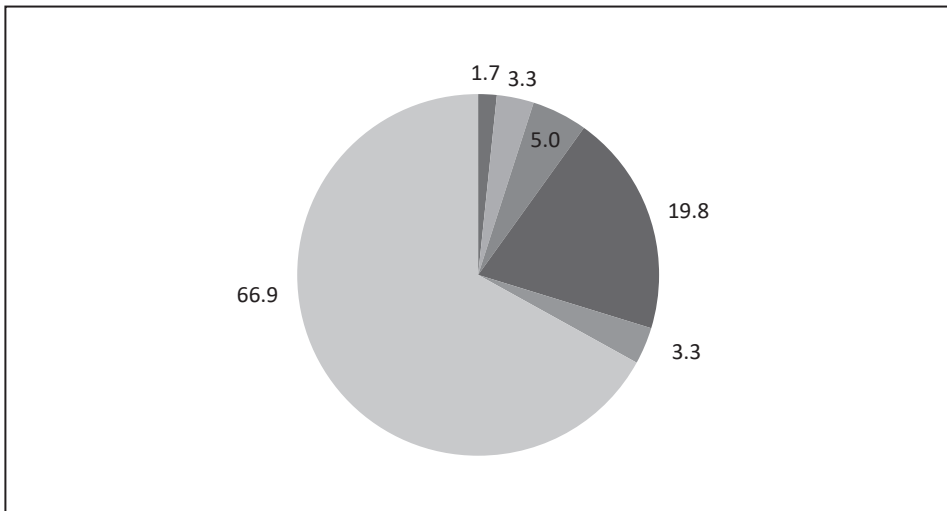


Fig. 9. Percentage distribution of the number of correct answers with the assumption that the garbage are thrown to separate containers

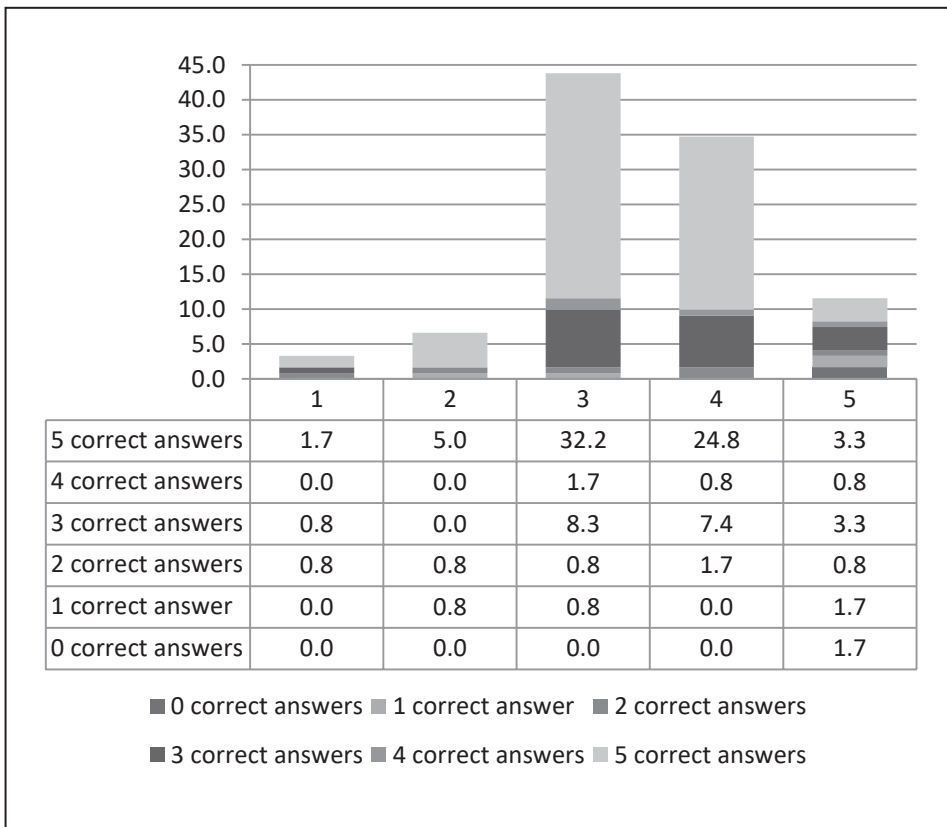


Fig. 10. Declared knowledge about waste segregation (Likert scale 1-5) versus the number of correct answers

Even if we assume a not very correct classification and we will throw away light bulbs to the container with glass, empty can of sardines to the container with metals, juice cartons to the container with paper and finally empty drugs plastic packaging to the waste bin containing plastics the number of correct answers is still relatively small. Only 66.9% of respondents were able to assign all 5 elements.

As shown in a detailed analysis of the results the students are not aware of their knowledge concerning segregation of garbage, eg. among students evaluating their knowledge at 5 (66.9% of such students), only 3.3% of them selected the correct containers for 4 items, but 1.7% of those students have not selected any correct container.

The number of correct answers was grouped into the three categories:

- 0–1–2 correct answers (complete lack of knowledge regarding segregation of garbage);
- 3–4 correct answers (average knowledge);
- 5 correct answers (correct knowledge).

It turned out that the greatest number of correct answers was given by those students who evaluated their competences regarding separation of garbage at 3. In contrast, the worst results were achieved by those students who declared their knowledge at the 5 (up to 4.1% students gave no more than 2 correct answers).

It can therefore be concluded that students are unable to assess properly their knowledge in the field of waste segregation. But the truth is slightly different. The

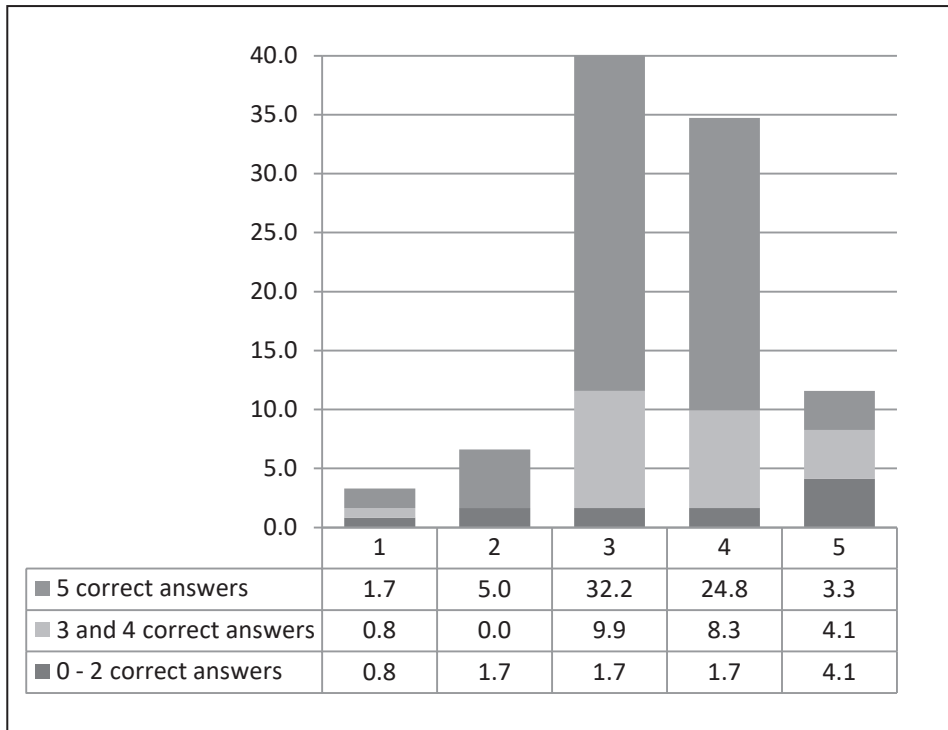


Fig. 11. Declared knowledge about waste segregation (Likert scale 1–5) versus the grouped number of correct answers.

students' declared knowledge was analysed and compared taking into account the division of students in three groups (humanities, natural sciences, technical sciences).

The students were classified by the number of correct answers into three groups:

- 1) number of correct answers less than declared knowledge,
- 2) number of correct answers equal to the declared knowledge,
- 3) number of correct answers greater than declared knowledge.

The way of assignment of respondents to the groups is presented in the table 1.

Tab. 1. The way of assignment of students to the groups

The group	associated variants of the results
declared knowledge > equal number of correct answers	2 > 1 3 > 2; 3 > 1 4 > 3; 4 > 2; 4 > 1 5 > 4; 5 > 3; 5 > 2; 5 > 1
declared knowledge = equal number of correct answers	1 = 1 2 = 2 3 = 3 4 = 4 5 = 5
declared knowledge < equal number of correct answers	1 < 2; 1 < 3; 1 < 4; 1 < 5 2 < 3; 2 < 4; 2 < 5 3 < 4; 3 < 5 4 < 5

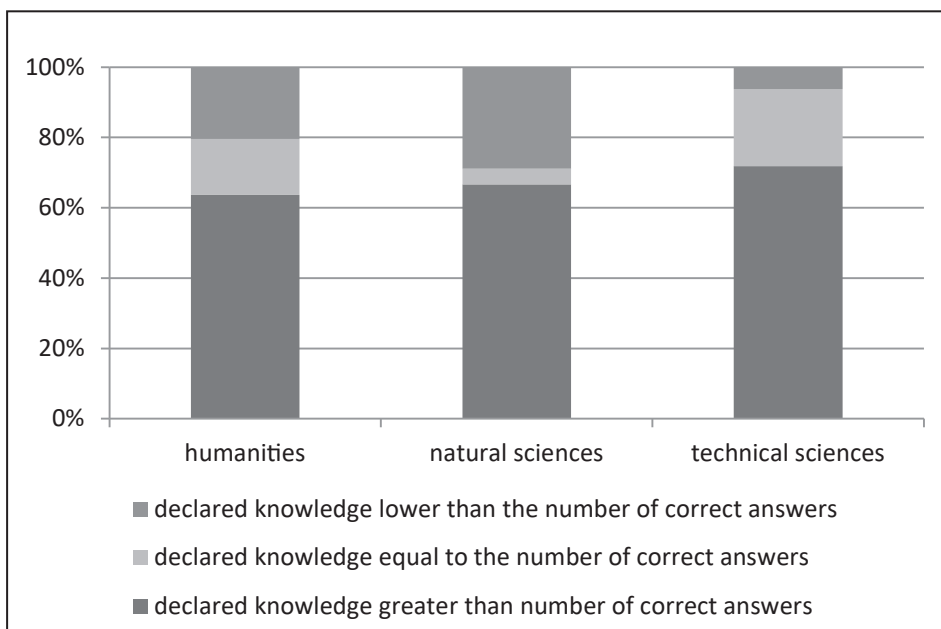


Fig. 12. Comparison of declared knowledge to the number of correct answers according to assignment presented in table 1, divided into particular branches of studies.

Such assignment reveals (Fig. 12), that the students of technical studies most accurately evaluate their knowledge (the largest % of respondents belongs to category “declared knowledge = equal number of correct answers”). They often also underestimate their knowledge (about 70%). In contrast, students of natural sciences most often overestimate their knowledge.

Conclusion

It can be concluded that most students do not have the basic knowledge concerning segregation of garbage.

Despite many years of education for sustainable development in frames of the “Strategy for Education for Sustainable Development” the knowledge of students is still insufficient.

Comparing results of students of science, technology and humanities it can be said that the students of technical branches are not convinced of their knowledge.

Abstract

Segregation of garbage is very important topic and it could be considered as well known. Moreover it is one of the very important factor, which should be taken into account in order to achieve better and healthier world, as it is stated in the Strategy for Education for Sustainable Development. Therefore it was decided to check whether students have high environmental awareness in context of segregation of garbage and also wheather the knowledge aquired has impact on proecological behaviour of students. The research was carried out by the questionnaires which were collected from 243 students of Pedagogical University of Cracow at various levels of education. It can be concluded that most students do not have basic knowledge concerning segregation of garbage and also they cannot properly asses their knowledge in this field.

Key words: ecology, sustainable development, segregation of garbage

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