PERCEPTION OF APPLIED ECOLOGY BY UNIVERSITY STUDENTS

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Abstract

Applied ecology concentrates on the ecosystems and their manageability. It is also connected to environmental awareness as judgement of the results of deterioration of the environment. For this reason, it is important to make research on students at different levels, especially young adults – university students. The study concentrates on the Košice Region, in the eastern part of Slovakia. Using Google Forms a questionnaire was delivered to 558 secondary school students from the mentioned region. From the participants 74.9% were female and 25.1% were male students. The most numerous age category was 18-21, the least one was 28 and above. 39.4% were students of medical or pharmaceutical focus, 24.7% were students of technical focus, 16.5 % were students of natural sciences focus, 14.0% were students of humanities focus, 4,7 % were students of economic focus and only 0.7% were students of art focus. All the students are interested in the quality of the environment regardless of the focus of their study. Most students are aware of the state of the environment and consider the quality of the environment in the place of their residence average, good or high. Most students use energy-efficient appliances only a small percentage not, regardless of the focus of their study. About a half of the students are satisfied and a half are dissatisfied with the activities of the local authority in the field of the environment, regardless of the focus of their study. The same applies for the voluntary activities to improve the environment in the place of residence. Most students are aware of the impacts of climate change on the environment.

Keywords: *environmental knowledge, applied ecology, university students, questionnaire survey*

1. INTRODUCTION

"Applied ecology is the science of managing ecosystems for defined outcomes, such as conservation, sustainable harvest, and animal pest and weed control" (Hone et al. 2015). Environmental awareness can be explained as judgement of results of the deterioration of the environment (Kollmuss and Agyeman 2002). Environmental awareness includes an enthusiasm towards environment and its problems (Gurbuz and Ozkan 2019). Environmental attitude was defined as "a psychological tendency expressed by evaluating the natural environment with some degree of favor or disfavor" (Milfont and Duckitt 2010). Environmental attitudes can also be explained as positive and negative attitudes and thoughts of individuals showing environmentally friendly performance, getting an experience in judging and solving them. Environmentally friendly performance includes actions that harm the environment to the minimum (Gurbuz and Ozkan).

It is important to make research on students at different levels of educational stage. Another study at the same topic just concentrating on secondary school students concluded that, regardless of the secondary school type, students are interested in the quality of the environment and save water, but their attitudes towards the impact of anthropogenic activities on the quality of the environment, the assessment of environmental quality in the place of permanent residence and the knowledge of drinking water quality are ambiguous (Pavolová et al. 2022). For this reason, this study aims to study the attitudes of university students who are adult but still students and their opinions towards the environment, its problems and solving these problems is becoming more distinguished and less influenced by other people.

2. MATERIALS AND METHODS

For the purpose of obtaining information on the knowledge, skills and competences of university students in the environmental field, a questionnaire survey was conducted in the period of April – May 2022. In the survey 814 university students took part. The free software application from Google was used to create the questionnaire form. In creating the form, the following partial steps of the recommended procedure for creating a questionnaire were uncompromisingly followed (Stehlíková, Taušová, 2015, Žiaková a kol., 2009):

1. a list of necessary requirements determining the level of environmental education of secondary school students and the associated environmental behavior was created,
2. the formulation of questions to get the necessary information on the issues addressed in the field of environmental education and behavior was specified,
3. the specified questions were classified according to predefined areas of evaluation of the questionnaire survey and then they were logically arranged, thus finalizing the form of the questionnaire form,
4. the comprehensibility and non-suggestiveness of the questions was verified on a randomly addressed sample of 30 university students in cafeterias and libraries of the regional city of Košice, that is not only the mentioned intelligibility and non-suggestiveness of questions, but also their logical sequence, graphic design and clarity of instructions were monitored in an interactive contact with the respondents.

The questionnaire survey form was created exclusively by ten closed questions focused on the behavior of students in relation to individual components of the environment and their awareness of environmental quality, which was logically organized into two basic areas:

- the first area consisted of three questions and focused on obtaining demographic information and the type of secondary education,
- the second area focused on the level of environmental education and behavior of high school students, while five of them were rated by the Likert scale focused on the issues addressed in a clearly defined range below:
    - Definitely yes,
    - Rather yes,
    - On average,
    - Rather not,
    - Definitely not,

  and one that monitored respondents' ability to assess the environment in their place of permanent residence was rated using the Likert scale in the range below:
    - High, the environment is in a satisfactory condition,
    - Good, the environment is acceptable, I have no reservations,
    - Average, the environment is acceptable, but I have a few reservations,
    - Below average, the environment is not in a good condition,
    - Bad, the environment is in poor condition.

3. RESULTS

For determination of the level of environmental behavior and awareness of university students in the Košice region, the questionnaire survey, that was carried out, was responded by 814 university students, of which 558 answered all the questions in the questionnaire form and thus formed the research statistical

file with a total of 558 respondents. Of the total number of respondents, 74.9% (418 respondents) were female and 25.1% (140 respondents) were male (Fig. 1).

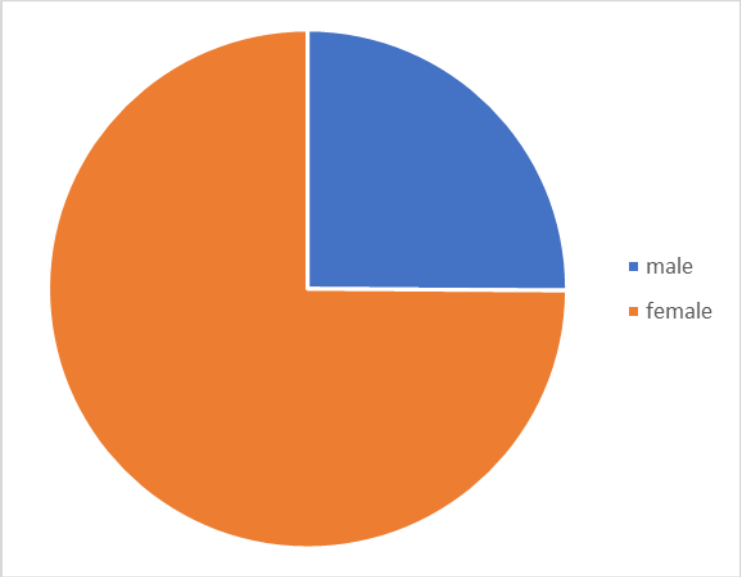


Fig. 1. Gender of respondents of the research statistical file

The most numerous age category consisted of university students at the age of 18–21, representing 53.4% (298 respondents), followed by university students at the age of 22–24, representing 30.6% (171 respondents), then university students at the age of 25–27, representing 11.1% (62 respondents) and university students at the age 28 and above, representing only 4.8% (27 respondents) (Fig. 2).

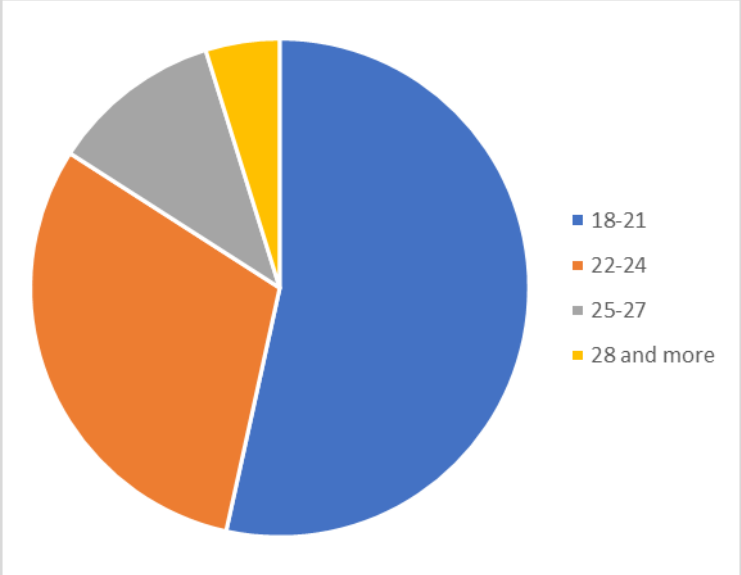


Fig. 2. Age of respondents of the research statistical file

With regard to obtaining an overview of the respondents' demographic indicators, the focus of their university studies (academic disciplines) was also questioned in a logical connection to the previous questions. 39.4% (220 respondents) were studying at a university with a medical or pharmaceutical

focus, 24.7% (138 respondents) were studying at a university with a technical focus, 16.5 % (92 respondents) were studying at a university with natural sciences focus, 14.0% (78 respondents) were studying at university with a humanities focus, 4,7 % (26 respondents) were studying at a university with an economic focus and only 0.7% (4 respondents) were studying at a university with art focus (Fig. 3).

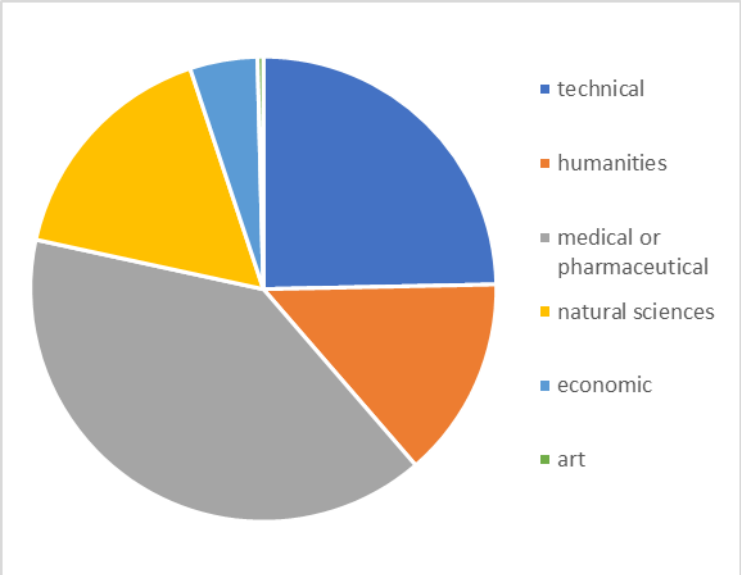


Fig. 3. Focus of study of respondents of the research statistical file

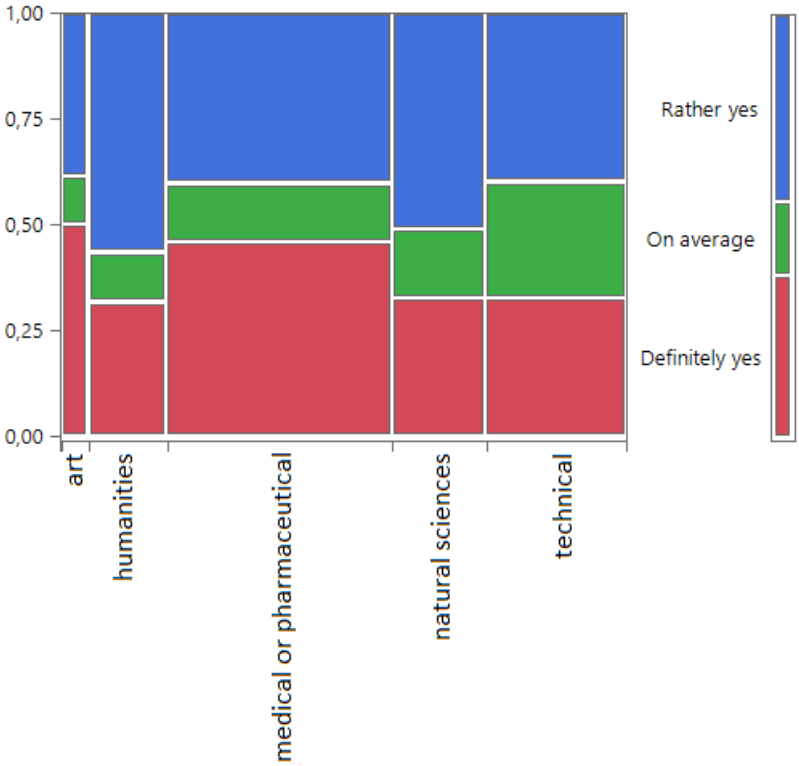


Fig. 4. Interest in the quality of the environment

From the detailed analysis, up to 44.09% (246 respondents) are more interested in the quality of the environment, 38.53% (215 respondents) are clearly interested in environmental quality and 17.38% (97 respondents) are only engaged on average in this area. Furthermore, it can be stated that only 0.18% (1 respondent) from a university with a focus on art, 1.79% (10 respondents) from a university with a focus on economics, 7.89% (44 respondents) from a university with a humanities focus, 15.95% (89 respondents) from a university with a focus on medical and pharmaceutical sciences, 8.42% (47 respondents) from a university with natural sciences focus and 9.86 (55 respondents) from a university with technical focus are interested in the quality of the environment out of the total number of respondents of university students in the Košice region. Only 38.53% (215 respondents) showed a definitive interest in environmental quality, with 4.48% (25 respondents) studying humanities, 18.28% (102 respondents) studying at a university with medical or pharmaceutical focus, 5.38% (30 respondents) studying at a university with a focus on natural sciences, and 8.06% (45 respondents) studying at a university with technical focus (Fig. 4).

From the detailed analysis it can be also stated that up to 39.78% (222 respondents) were informed about the state of the environment on average, 31.90% (178 respondents) were informed rather yes. 25.99% (145 respondents) had all available information on the environment and only 2.33% (13 respondents) expressed a satisfaction with the awareness of the state of the environment. Up to 16.31% (91 respondents) from a university with a focus on medical or pharmaceutical sciences, 9.32%, (52 respondents) from a university with technical focus, 4.48% (25 respondents) a university with a humanities focus, 5.56% (31 respondents) a university with natural sciences focus, 3.76% (21 respondents) a university with a focus on economics and only 0.36% (2 respondents) from a university with a focus on art expressed an average awareness of the state of the environment (Fig. 5).

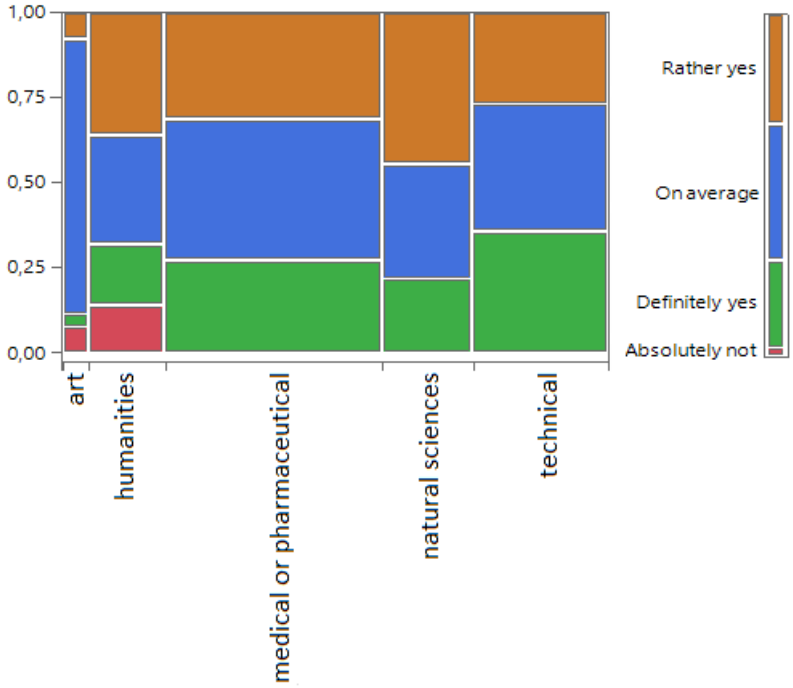


Fig. 5. Awareness of the state of the environment

In the field of environmental quality assessment in the place of permanent residence, it was found that up to 63.44% (354 respondents) described as average, the environmental quality acceptable with a few reservations, 19.89% (111 respondents) expressed acceptability with environmental quality, without any reservations, 11.29% (63 respondents) described the quality of the environment as below average or the environmental quality in poor condition, while up to 19.89% (111 respondents) marked the

environmental quality as acceptable and without reservations, and only 5.38% (30 respondents) marked the environmental quality as high that is in satisfactory condition. Up to 37.29% (132 respondents) were students from a university with a focus on medical and pharmaceutical sciences, 17.23% (61 respondents) are university students from a university with natural sciences focus, 16.13% (90 respondents) are university students with a focus on technical sciences, 12.71% (45 respondents) are university students with a focus on humanities, 4.48% (25 respondents) are university students attend a university with an economic focus

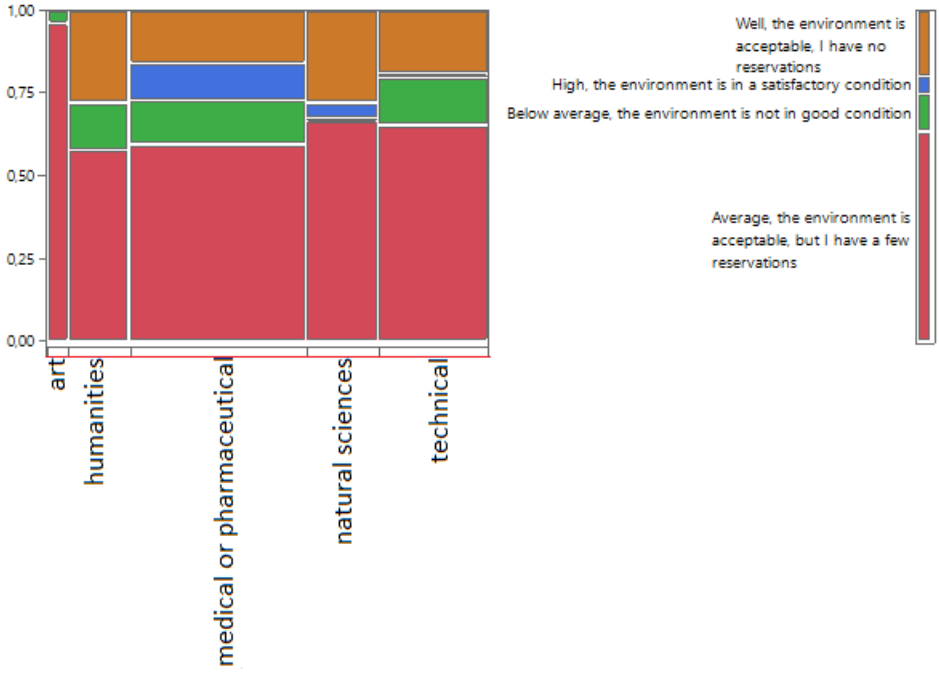


Fig. 6. Assessment of the quality of the environment in the place of residence

When it comes to the use of energy-efficient appliances (light bulbs, washing machines, dishwashers, high pressure shower heads, etc.), up to 42.83% (239 respondents) stated that they definitely use them, 40.50% (226 respondents) rather use them, 11.83% (66 respondents) use them only on average and 4.84% (27 respondents) rather not use them. Energy-efficient appliances use up to 15.41% (86 respondents) from a university with technical focus, 14.34% (80 respondents) from a university with a focus on medical and pharmaceutical sciences, 6.99% (39 respondents) from a university with a humanities focus, 0.18% (1 respondent) from a university with a focus on economics (Fig. 7)

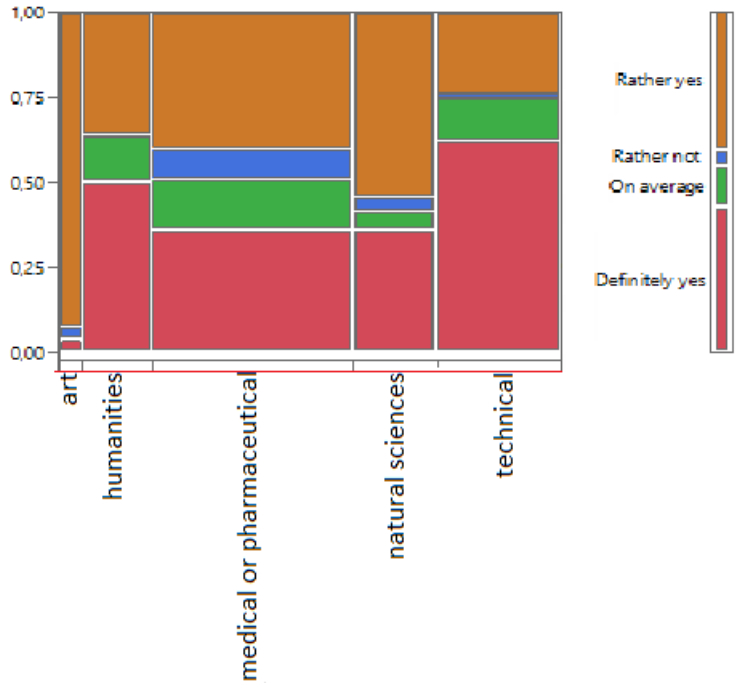


Fig. 7. Use of energy-efficient appliances

Concerning the satisfaction with the activities of the local authority in the field of the environment 6.81% (38 respondents) are absolutely satisfied, an average satisfaction was expressed by 35.13 (196 respondents), 32.26% (180 respondents) were rather dissatisfied, 25.81% (144 respondents) were rather satisfied and 6.81% (38 respondents) were definitely not satisfied. An average satisfaction with the activities of the local authority in the field of the environment was expressed by 10.39% (58 respondents) are students from a university with a focus on medical and pharmaceutical sciences, 7.35% (41 respondents) are students from a university with technical focus, 6.99% (39 respondents) are students from a university with a humanities focus, 6.27% (35 respondents) are students form a university with natural sciences focus, 3.94% (22 respondents) are students from a university with a focus on economics and only 0.18% (1 student) are students from a university with a focus on art (Fig. 8).

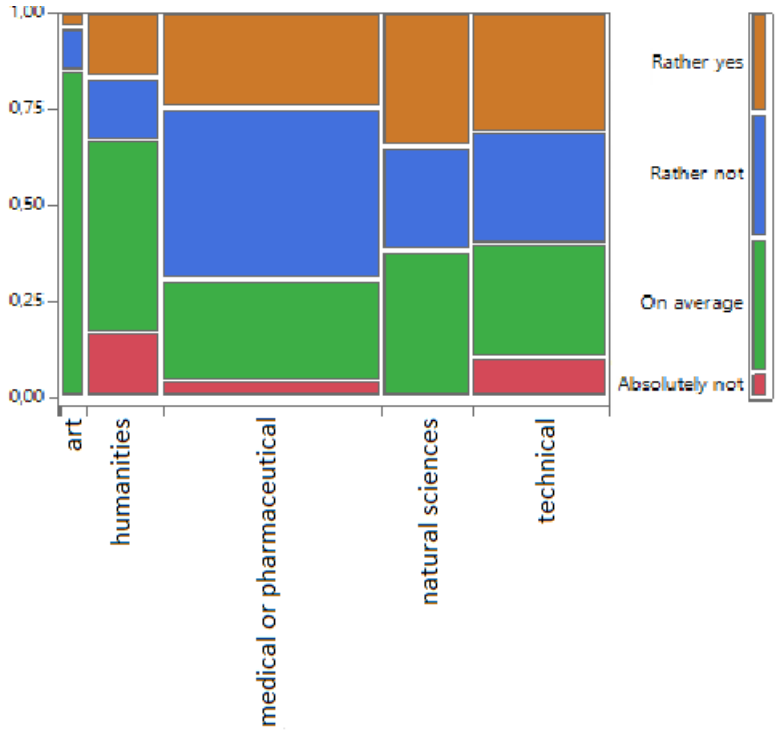


Fig. 8. The satisfaction with the activities of the local authority in the field of the environment

39.43% (220 respondents) practice voluntary activities contributing to the improvement of the environment in their place of residence, 33.33% (186 respondents) rather not practice such activities, 15.77% (88 respondents) rather practice such activities, 6.27% (35 respondents) definitely not practice such activities and 5.20% (29 respondents) definitely practice such activities. Average environmental activities are practiced by 17.20% (96 respondents) from a university with a focus on medical and pharmaceutical sciences, 11.47% (64 respondents) from a university with technical focus, 6.09%, (34 respondents) form a university with natural sciences focus, 4.48%, (25 respondents) from a university with a humanities focus, 0.18% (1 respondent) from a university with a focus on art and no students from a university with a focus on economics (Fig. 9).

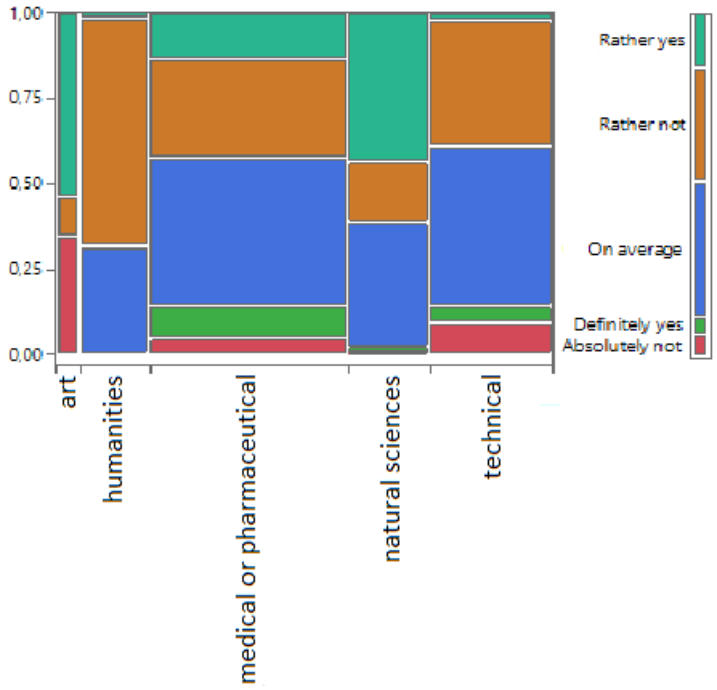


Fig. 9. Voluntary activities to improve the environment in the place of residence

39.96% (223 respondents) are fully informed about the impacts of climate change on the environment, 29.21% (163 respondents) are rather informed, 24.01% (134 respondents) are informed only on average and 6.81% (38 respondents) are rather not informed. 17.92% (100 respondents) from a university with a focus on medical and pharmaceutical sciences, 10.57% (59 respondents) from a university with technical focus, 6.81% (38 respondents) form a university with natural sciences focus, 4.48% (25 respondents) from a university with humanities focus and 0.18% (1 respondent) from a university with a focus on economics are fully informed about the effects of climate change on the environment (Fig.10).

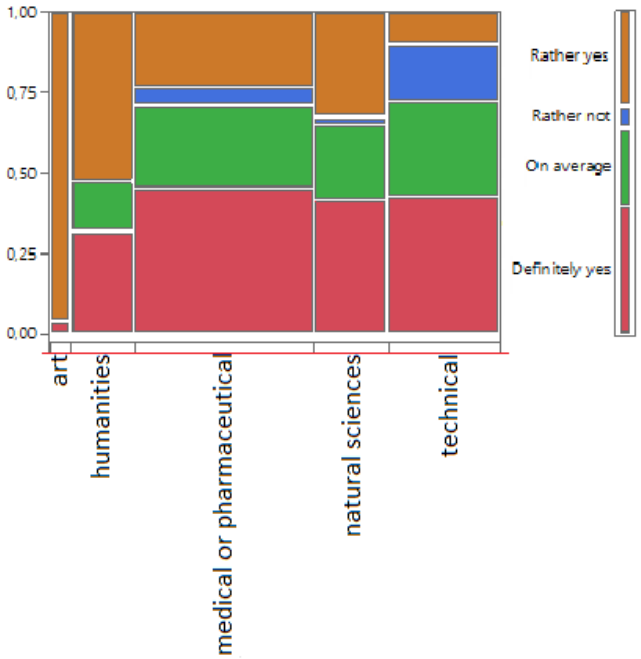


Fig. 10. Awareness of the impacts of climate change on the environment

When examining the causality of environmental knowledge and competencies of university students and the nature of university studies, the focus of university studies determines the level of environmental education and behavior of university students, as Pearson's test was < 0.0001 in all questionnaire responses.

4. DISCUSSION

588 respondents – university students from the Košice region, that can be found in the eastern part of Slovakia, took part in a questionnaire survey on the attitudes toward applied ecology – their attitudes towards the environment as applied ecology includes not only the study of ecosystem et different levels but also the environmental issues, of which 74.9% (418 respondents) were female and 25.1% (140 respondents) were male; 53.4% aged 18–21, 30.6% aged 22–24, 11.1% aged 25–27, and only 4.8% aged 28 and above; 39.8% were medical or pharmaceutical students, 24.7% were technical students, 16.5 % were natural sciences students, 14.0% were humanities students, 4,7 % were economic students and 0.4% were art students.

All the questioned students are interested in the quality of the environment, regardless of age, sex and focus of their study. Almost all the students are aware of the state of the environment, only a small percentage of students with focus on art and humanities. Most students consider the quality of the environment in the place of their residence average, good or high, only a small percentage of students with focus on art, humanities, medical or pharmaceutical and technical focuses consider it below average. Most students use energy-efficient appliances (definitely, rather and on average) only a small percentage of students with art, medical or pharmaceutical and technical focuses rather don't use them. The satisfaction with the activities of the local authority in the field of the environment ais not consistent but about half of the students are rather satisfied or on average and about a half are rather not are absolutely not satisfied, regardless of the focus of the study. Voluntary activities to improve the environment in the place of residence are also practiced not consistently as about half the students are rather or definitely practicing or on average and about a half are rather or absolutely not practicing, regardless of the focus of the study. Almost all the students are aware of the impacts of climate change on the environment, only a small percentage of students with medical or pharmaceutical, natural sciences and technical focuses are rather not aware.

Based on the results of this study the environmental awareness of university students is high but there are differences based on the focus of their study. Arshad et al. (2021) concentrated on students with five major focuses of study – arts and humanities, social sciences, physical sciences (mathematics-based), biological sciences, and environmental sciences in two public and two private sector universities and concluded that university students possess high levels of environmental awareness, environmental concern and environmental behavior, but very low level of environmental attitude. This study did not concentrate on the type of university as private or public. By another study it was found that those students who studied at private universities were more sensitive to environment (Gümüş 2018). Though not examined in this study, higher class students are saving water and donating on the environmental issues than first class students (Altineasak-Farina and Ergen 2016). The environmental knowledge on the environmental behavior of university students in developing countries and advanced countries was found to be positive and significant (Vicente-Molina et al. 2013).

5. CONCLUSIONS

This study focuses on perception of applied ecology by university of students using a questionnaire survey. The concerned area is the Košice Region, in the eastern part of Slovakia. The questionnaire was delivered by 558 university students by Google Forms of which 418 were female and 140 were male; concerning the age 298 students were at the age of 18–21, 171 students were at the age of 22–24, 62 students were at the age of 25–27 and 27 students were at the age 28 and above; concerning the focus of university studies (academic disciplines) 220 students were with a medical or pharmaceutical focus, 138 students were with technical focus, 92 students were with natural sciences focus, 78 students were

with a humanities focus, 26 students were with an economic focus and 4 respondents were with art focus. All the students are interested in the quality of the environment regardless of the focus of their study. Most students are aware of the state of the environment except for a small percentage of students with the focus of their study in art and humanities. Most students consider the quality of the environment in the place of their residence average, good or high, just a small percentage of students with focus of their study in medical or pharmaceutical and natural sciences consider it below average. Most students use energy-efficient appliances only a small percentage not, regardless of the focus of their study. About a half of the students are satisfied and a half are dissatisfied with the activities of the local authority in the field of the environment, regardless of the focus of their study. The same applies for the voluntary activities to improve the environment in the place of residence. Most students are aware of the impacts of climate change on the environment except for a small percentage of students with focus of their study in medical and pharmaceutical, technical and natural sciences.

ACKNOWLEDGMENTS

This research was funded by Kultúrna a edukačná grantová agentúra MŠVVaŠ SR, grant number 001UVLF-4/2020.

REFERENCES

1. Altineasak-Farina, İ, Ergen, A 2016, "Examining the sustainable consumption behavior of young gen Y'ers: the effects of environmental attitude and cosmopolitanism", 7th International Conference on Governance, Fraud, Ethics and Social Responsibility, Istanbul, December 9-11, 2016
2. Arshad, HM, Saleem, K, Shafi, S, Ahmad, T, Kanwal, S 2021, "Environmental Awareness, Concern, Attitude and Behavior of University Students: A Comparison Across Academic Disciplines", *Polish Journal of Environmental Studies*, vol. 30, no. 1, pp. 561-570.
3. Gümüş, H 2018, "Environmental Sensitivity, Urbanization and Recreational Areas", *Fresenius Environmental Bulletin*, vol. 27, no. 12, pp. 8553-8559.
4. Gurbuz, IB, Ozkan, G 2019, "What's going on at the universities? How much has the research revealed university students' attitudes towards the environment? A case study of Bursa, Turkey", *Applied Ecology and Environmental Research*, vol. 17, no. 2, pp. 5109-5138.
5. Hone, J, Alistair Drake, V & Krebs, CJ 2015, "Prescriptive and empirical principles of applied ecology", *Environmental Reviews*, vol. 23, no. 2, pp. 170-176.
6. Kollmuss, A, Agyeman, J 2002, "Mind the gap: Why do people act environmentally and what are the barriers to pro–environmental behavior?" *Environmental Education Research*, vol, 8, no. 3, pp. 239-260.
7. Milfont, TL, Duckitt, J 2010, "The environmental attitudes inventory: A valid and reliable measure to assess the structure of environmental attitudes", *Journal of Environmental Psychology*, vol. 30, pp. 80-94.
8. Pavolová, H, Bakalár, T, Sasáková, N, Zeleňáková, M, Bozakova, N 2022, "Perception of applied ecology by secondary school students", *Educational Alternatives*, in-print.
9. Stehlíková, B & Taušová, M 2015, *Metodika spracovania dát*, First Edition, TU, Košice, Slovakia, 1-81.
10. Vicente-Molina, MA, Fernández-Sáinz, A, Izagirre-Olaizola J. 2013, "Environmental knowledge and other variables affecting pro-environmental behaviour: comparison of university students from emerging and advanced countries", *Journal of Cleaner Production*, vol. 61, pp. 130-138,
11. Žiaková, K 2009, *Ošetrovateľstvo - teória a vedecký výskum*, Osveta, Martin, Slovakia, 1-322.