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**SURVEY OF ECOLOGICAL COMPETENCE OF STUDENTS WITH REGARD TO  
FOOD AS A RESOURCE AND WASTE**

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**Abstract:** Waste is defined as materials that have served their purpose, which also applies to food leftovers or edible food which has been mismanaged and has lost its nutritional value. Globally, due to population growth, this problem of loss of food resources is increasingly relevant and is further aggravated by the steadily increasing population. Alongside the lack of food resources, there are surpluses, which end up as waste. It can be noted that there is lack of attention and effective use of practices and innovations for the conservation of materials and energy. Therefore, improving the ecological culture of the population occupies a significant position in the management strategy of modern society. Currently, there are still no developed and tested didactic models to be adapted and implemented in education with regard to the issues of perception of the food and food waste, as a crucial resource and harmful waste. The development and modelling of didactic technology in this respect would improve and enhance the theoretical and practical aspect of Biology and Health education in the Republic of Bulgaria. Ecology education and training is a priority in the academic system. However, opportunities to create a pro-environmental relationship towards food and waste management are not being utilised effectively. This paper uses data from a survey performed among students in Bulgarian schools in 5-12 grade to establish attitudes and to register the daily practices related to food resources, products and waste management. The results were obtained using standardized surveys containing both open and closed questions on the topic. It examines the specific opinions of different groups of adolescents on their education and knowledge about food as resource and waste. Deficits in behaviour and attitudes towards the problem under study are reported. In this context, a content analysis of elementary and secondary school curricula in the natural sciences and ecology was conducted on topics and concepts related to food as a resource and waste. A future goal is to develop an experimental model of activity-based learning that enhances students' environmental competency and fosters food management culture.

**Keywords:** ecology, education, food, food waste, questionnaires.

**1. INTRODUCTION**

The management of food resources is a process that is highly dependent on the attitudes of society and the current regulatory framework on the territory of the European Union, as well as the one that has been adopted and ratified in the Republic of Bulgaria. Daily activities and lack of sufficient information among the population are often the main reasons for turning food into waste. Huge amounts of food waste are generated throughout the various stages of food production, as well as during the storage and logistics of food and food products. There is an urgent need to make the population aware of the factors affecting food waste, as well as subsequent environmental problems and damage. The aim of the adopted and ratified legislative provisions in Bulgaria and the European Union is to prevent and/or even eliminate the generation of waste from edible food by current and future generations through prevention and pro-environmental behaviour. Achieving optimal governance requires an active and fruitful interaction and creative dialogue between legislation, the population and the education system related to establishing habits among the population and sharing good and useful practices in the management of food resources and generated waste. Awareness of the topic of food loss could be achieved through national and local structures intertwined with the education system and school management. Education and positive attitudes and motivation can build competencies that accumulate to effect changes in the behaviour of young people in consideration of today's and tomorrow's state of affairs.

**2. SUBJECT AND OBJECT OF THE STUDY**

The subject of the study is the management of food waste in Bulgaria and the attitudes, opinions and patterns of behaviour of the population related to this issue.

The object of the study is the ecological competence of students aged between 12 and 18 with regard to food as a resource and waste.

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The education system and its development are influenced by political, economic and socio-cultural trends, factors and active strategies (Kostova, 2003). In recent years research has called for a rethinking of individual environmental behaviour as a social practice influenced by social policy (Vakleva, 2011; Lee & Koski, 2012). Today's problems require a change in the socio-cultural reality by updating the means which serve as the basis of current strategies in education. To secure the future, education must be systematically rethought as an indispensable factor in influencing the future behaviour of those who have gone through it. This can be achieved by enabling students to acquire knowledge that is most useful for effecting environmental change. In doing so, it must be understood that the learning process is an integral part of human society and it ensures survival. Good results in this respect can be achieved by educational models developed for the curricula intended for different ages (Panayotova & Vakleva, 2014; Vakleva, 2017a, 2017b; Vakleva et al, 2018).

The content analysis of primary education curricula in Bulgaria revealed the lack of up-to-date and adequate scientific information on the loss of food resources and its consequences for people and the environment. This naturally results in a deficit of suitable methodological models that support the education and development of a pro-ecological attitude towards food resources among students. Attracting learners to the cause of protecting the environment from food waste, including by incorporating environmental issues more broadly into the curriculum, can be part of the solution. Organizing and stimulating students' participation in pro-environmental actions and promoting pro-environmental patterns of thought and behaviour related to food and nutrition is a promising direction that needs to be developed in the future. The literature reviewed (Kostova, 2003; Vakleva, 2011, 2017a,b, 2018, Panayotova & Vakleva, 2014, 2016 et al.) lacks studies to trace the relationship between *nature-person-society* in the context of the problem under investigation. At the same time, the analysis of the literature did not reveal a description of approaches whereby the loss of natural resources can be perceived not merely as an economic consequence, but also as an ethical and moral problem, which can be solved using natural and logical means. Based on the above, it can be noted that there is a need for a complex study with theoretical and applied character, which considers the problem of food as a resource and waste in ecological and social aspect.

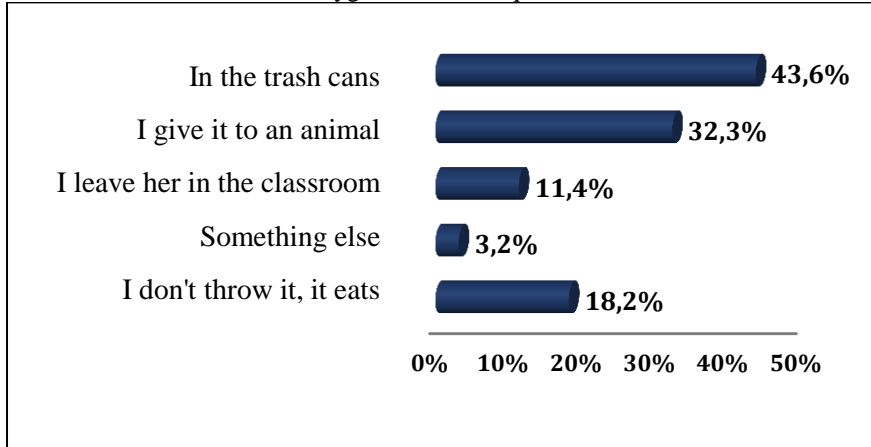
### 3. MATERIALS AND METHODS

For the purpose of this study, a survey of teenagers was conducted as a specific group, which is particularly important in examining the value attitudes of food as a resource and waste. The presented data are taken from survey performed among students in Bulgarian schools in 5-12 grade to establish attitudes and to register the daily practices with food resources, products and waste management. The results were obtained through standardized questionnaires with open-ended and closed-ended questions. The survey seeks ways to understand and analyse the attitudes and trends in the development of ecological culture among our respondents. It examines the specific opinions of different groups of teenagers on their education and knowledge about food as resource and waste and traces their daily behaviour in this regard. There are 3 open and 16 closed questions, but here we analyse the results only for two of them. 224 adolescents aged 12 to 18 were interviewed. Students from the city of Plovdiv studying at different types of schools were surveyed - schools with specialized classes in the field of food technology, elite and standard high schools of humanities with affinity towards social and human sciences, private and state secondary general education schools. They are selected in order to reach a wider range of respondents and to ensure greater representativeness of the data collected. The results obtained are processed by SPSS using quantitative methods for analysing the respondents' answers to the given environmental problem. A content analysis of the Human and Nature curricula for 5.-6. grade was performed as well as for Biology and Health Education in 7.-10. grade of primary and secondary education. The topics were selected and analysed as related to food and its perception as a resource and waste, touching upon the problem of waste and environmental pollution. The aim to improve the ecological competence among students and to a food management culture through the development of an experimental learning model with an activity-based approach.

### 4. DISCUSSION

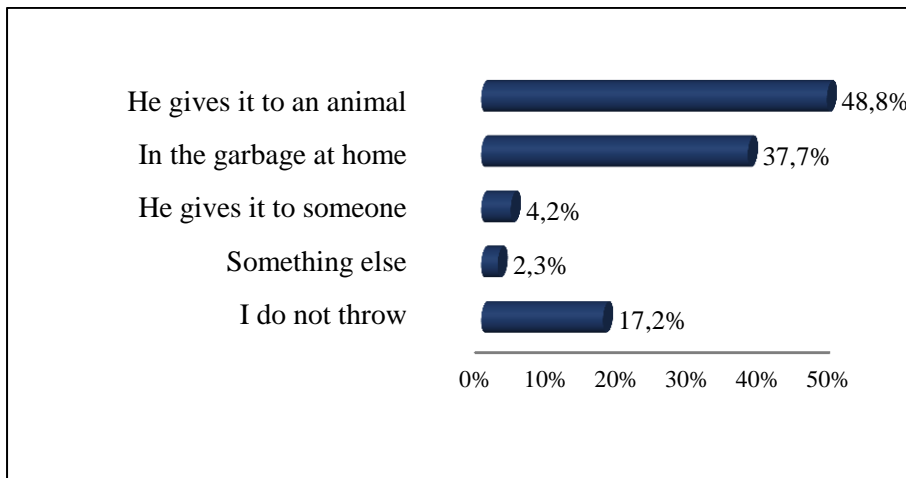
Students' actions related to daily leftover food can be defined as actions pertaining to waste products. Fig. 1 shows that a small percentage of the students asked (18.2%) are respectful and utilize food waste. The reason for this could be the existence of a good family example in food management. The act of disposing of unnecessary quantities of food does not take into account the fact that natural resources are lost. The subsequent environmental impact of the processes accompanying the decomposition of food waste is of not considered important. Easy access to food creates conditions for its disregard and neglect of its value. Conditions are created for the lack of respect for it as a valuable natural resource. The survey reported that over 55% of the students surveyed generate food waste (Fig. 1) 43.6% throw away the leftover food in the recycling bins in the school yard or those near the school and another

11.4% leave it under the desk in the classroom. There is great carelessness and disrespect for food among children between the ages of 12 and 18, and the lack of hygiene habits is quite noticeable.

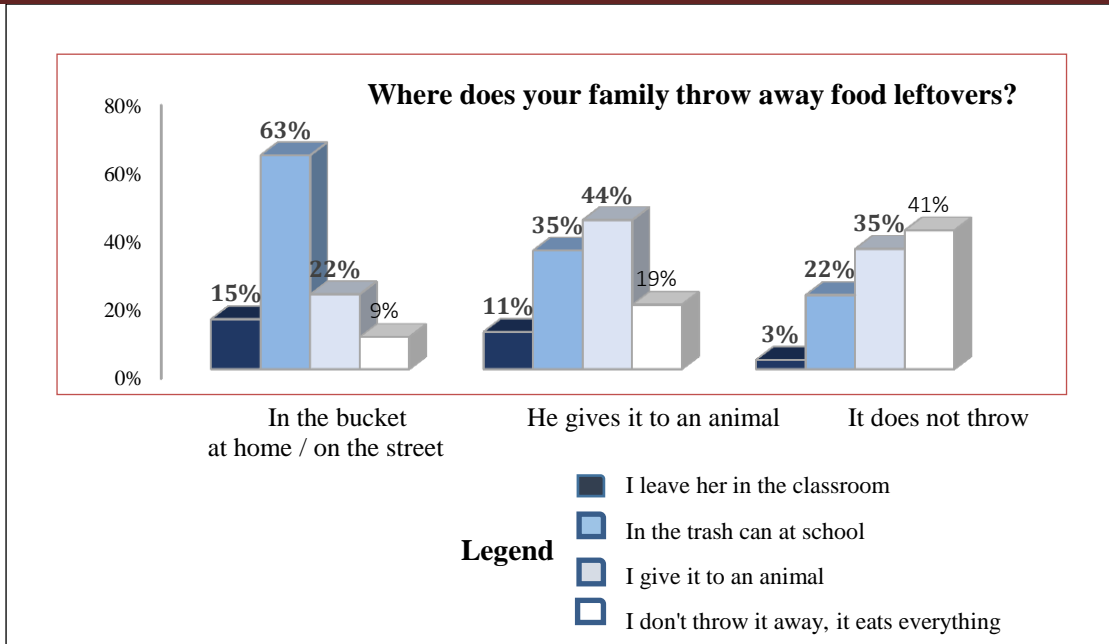


**Fig. 1. Answers in % to the question “Where do you throw away the leftover food when you’re at school?”**

When comparing the behaviour of children at school (Fig. 1) and practices in a family (Fig. 2) it is found that the children, who do not throw away the leftover food come from families where a positive attitude towards food has been established (Fig. 3). According to answers of the question from the questionnaire “Where does your family throw away the leftover food after the main dish?” 70.2% of households do not generate food loss (Fig. 2). However, not considering food as waste does not prevent a higher percentage of students from treating it as such (57% of respondents). Children at school age are a risk population group in terms of nutrition and food products. It is the family environment that is extremely strong and determines their actions. Lack of good practices at home (*Report on How to avoid food waste: strategies for a more efficient food chain in the EU* - 2011/2175 INI) leads to a lack of knowledge and actions related to food management and the sustainable development of natural resources which pollute nature.



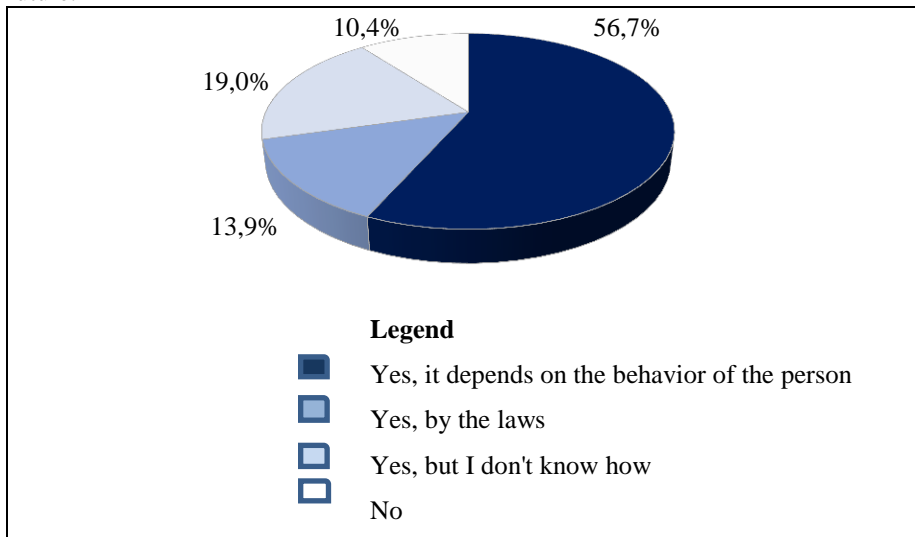
**Fig. 2. Answers in % to the question “Where does your family throw away the leftover food?”**



**Fig. 3. Answers in % to the question “Where do you throw away the leftover food when you’re at school?” considering practices in the family environment**

Empirical evidence shows that students do not receive sufficient information about food as an energy source and natural resource, and that its production is one of the major polluting activities worldwide, using up various non-renewable natural resources in huge quantities. At school, knowledge, skills and competences among students are not really formed in order to prevent and reduce or avoid food waste. It is surprising that adolescents of different ages are able to analyse and predict human impact on the environment and its resources, as well as to comment on the role of various polluting factors and the actions of those responsible for it, while at the same time they are incompetent about issues such as food as a source of waste. According to Dulov (Dulov, 2010), the most common motive for environmental inactivity (in 51.7% of the cases in his study) is the lack of confidence that the efforts made will have a real result.

More than 50% of the surveyed students believe that the generation of food waste can be restricted and controlled (fig. 4). Some students think that if people are taught from an early age to appreciate food, this will yield a positive outcome in the future.



**Fig. 4. Answers in % to the question “Do you think that food waste and its quantity can be controlled?”**

Regardless of whether students consider leftover food as waste or not, they are certain that it is not only desirable but also necessary to be educated at school with regard to food as a resource and waste (Fig. 5). For the two groups to different degrees, the preferred ways in which such an educational process can be implemented are biology lessons at school, specialized lectures by external tutors, or through specialized information boards at school, etc. Respondents openly stated that they lacked information on the issue we are researching and agreed that it is necessary to discuss further the topic in biology lessons related to environmental education and sustainable development.

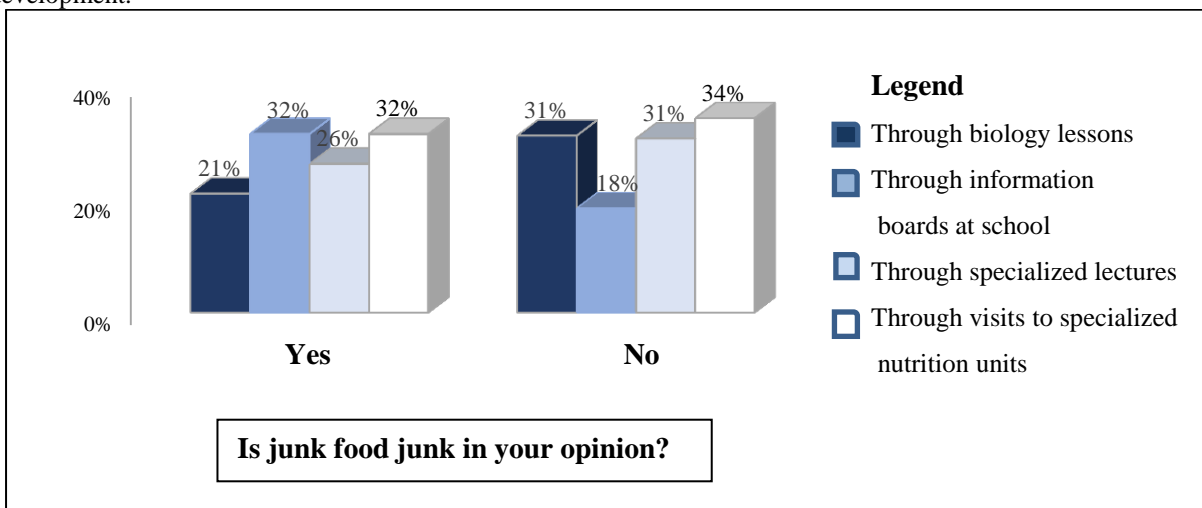


Fig. 5. Answers in % to the question "In what form would you like to receive information and knowledge about food as a resource and waste?"

## 5. RESULTS AND CONCLUSIONS

Teenagers understand that food must be approached in a responsible and committed manner, but at the same time, the sources of more information and good practice in everyday life are insufficient. On the one hand, food is perceived as necessary and vital to our survival. On the other hand, leftover waste is not perceived as waste, which requires special processing, the possibility of re-incorporating it into composting and reducing or avoiding negative environmental consequences. Throwing away leftover food is a daily routine and is not perceived in most of cases to be a serious problem. Respondents not only find it necessary, but also declare that they want their lessons at school to dedicate more time to achieving understanding that food can be a type of waste with negative impact on the environment.

The conclusions of the study are that:

- in the educational content, the topic of food is presented first and foremost as a source of good health, and in a very small part it is considered as a resource necessary for future generations;
- educational content lacks information on food waste management and the environmental footprint left by “food waste” and its environmental impact;
- there is a deficit in the level of knowledge, skills and competences of students related to food waste management, as well as a low level of pro-ecological everyday behaviour under the influence of the family and school environment in this context;
- in a future, it is necessary to develop an experimental model of training based on activities that increase students' environmental competence and foster a food management culture.

All of this necessitates a rethinking of the values and attitudes of the students (and of the population as a whole) by purposefully utilizing the possibilities of the educational process and training in biology in the context of this research.

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