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ENVIRONMENTAL AWARENESS FORMING AS A RESULT OF EDUCATION IN SECONDARY SCHOOL IN RESPECT OF THE USE OF SYNTHETIC PACKAGING FOR FOOD

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Abstract

The present work describes the results of a study designed to examine how the environmental thinking, development in the secondary school affects students' assessment of the benefit and risk of using synthetic packaging for food.

The high school students' perception of the risk and benefit of the use of synthetic packaging for food undergo changes in the course of study. Indices of risk and benefit are proposed for quantitative monitoring of changes, calculated from an inquiry data collected from 6 groups respondents with 48 members each – students at the beginning, at the middle and at the end of their secondary school education and citizens. The risk index goes through a minimum, and the benefit index reaches its maximum at the end of secondary education. The benefit index remains greater than the risk index in the course of study, which indicates formed students' notion of prevailing benefit over the potential harm from the use of synthetic packaging for food. Risk-benefit ratio for the surveyed groups is less than one (0,72). In comparison the same respondents estimate the risk-benefit ratio for industrial and agrarian production as 2.40 times higher.

Key words: *environmental awareness, education, secondary school, synthetic packaging for food, benefit, risk*

1. INTRODUCTION

With human civilization emerge new human induced environmental factors, affecting health and behavior of the individuals, the human population and the environment. Plastics and metals used for packaging, storage and preparation of most used food types – water, milk and dairy products, juices and soft drinks, cans and etc., come in contact with stored foods which have different acidity and with water in food, which is a good solvent. At the border contact between the food and its container, the ion exchange and chemical reactions occur, the effect on the health of which is not always fully understood.

An example is allergenic effects of nickel, found long after widespread use of nickel in food dishes and containers, as well as increased risk of a liver cancer if cooking in iron vessels, which is the longstanding practice in some areas of Africa.

I.e., the benefit of using food packaging is coupled with a risk - uncertainty regarding any remote health effects of consuming packaged and conserved food, as well as pollution of the environment with slowly degradable packaging.

Formation of public opinion is a complex process, beginning in primary school. The schoolteacher role is important in this process. The school is called upon to form public opinion supported by

scientific facts, regarding the benefits and risks of synthetic packaging for food. The problem with this man-made factor affecting health and the environment is discussed in Betta et al. (2011), Casado et al. (2010), Felter et al. (2009), Heckman (2005) and Silvestre et al. (2009).

The present work describes the results of a study designed to examine how the process of accumulation of knowledge and the development of environmental thinking in the secondary school affects students' assessment of the benefit and risk of use of synthetic packaging for food.

2.MATERIALS AND METHODS

A survey was conducted during the 2009/10 to trace the development of high school students' notion of the benefits and risks of use of synthetic packaging for food.

The survey covered three groups of students simultaneously: the entrance of secondary education – 7th grade, in the middle – the 9th grade and at the end – 12th grade (high school graduating seniors). In addition to trace effects of education in secondary schools on public opinion on the issue, two more groups finished their secondary education were interviewed – freshmen medicine students and citizens with secondary education.

All high school students' groups were from a school "St. Patriarch Evtimiy", Plovdiv, the medical students group was from the Medical University of Plovdiv. Respondents – school and medical students' groups were interviewed during the sessions. Respondents-citizens were randomly selected of places in the city where citizens have enough free time – gardens, train station, bus station, etc.

All groups were with 48 respondents each. The group of 12th grade students was interviewed twice – at the beginning and end of the school year, i.e. 6 surveys were conducted – 4 in the secondary school and two after the secondary school completion.

The structure of the questionnaire is shown in Table 1.

Table 1. Questionnaire of the survey to assess the respondents' perception of benefits and risks of use of synthetic packaging for food in five levels (separately for risk and for benefits).

Please, estimate the risk of use of synthetic packaging for food	*Very high*	*High*	*Moderate*	*Small*	*Negligible*
Please, estimate the benefit of use of synthetic packaging for food	*Very much*	*Much*	*Moderate*	*Small*	*Negligible*

Two indexes were calculated for each group based on the group members responses – benefit index and risk index respectively. The number of responses for each one of five levels were multiplied by appropriate weighting – 1 (for level "negligible"), 2, 3, 4 and 5, and the produts were summed.

Risk-benefit ratio was calculated for the groups of respondents – the ratio between the average risk index and the average benefit index, applicable for a given ecological factor in particular, for the use of synthetic packaging for food. If the ratio is less than one, i.e. prevailing group opinion of benefits, the average respondent (the voice of public opinion) is willing to take the risk without hesitation. The smaller is the ratio, the greater is decisiveness. Values of the ratio close to unit showed approximately balanced respondents' opinion about potential harm and benefit. The average respondent would have hesitated to undergo under the influence of the factor. For values of the ratio over the unit average respondent is reluctant to approve the application of that factor.

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3. RESULTS AND DISCUSSION

In Table 2 the responses of the 6 groups for the degree of the risk, are given. Graphically they are shown in Fig.1.

Table 2. Responses distribution of the 6 groups of respondents for the risk of use of synthetic packaging for food.

	Very high	*High*	*Moderate*	*Small*	*Negligible*	*Index risk*
Students 7th grade	1	4	10	15	18	99
Students 9th grade	2	3	9	15	19	98
12th grade students at the beginning of the year	0	4	6	17	21	89
12th grade students at the end of the year	0	2	11	18	17	94
Medicine students	6	0	12	20	10	116
Citizens	0	7	16	13	12	114

The maximum of the responses for the risk of the use of synthetic packaging for food remains at level "negligible" for the respondents from the first three groups of high school. At the end of secondary school this maximum shifts to the level "small", reaching a level "moderate" for the group of the citizens (Table 2 and Figure 1). Most pronounced is the maximum level of "moderate" for a group of medical students, among them is also the largest number of respondents assessed risk as "very high." The answers of students from the seventh and ninth grade were most scattered at the levels of risk are, i.e. a lack of certainty in their opinions as a group is noticeable, which is probably related to unformed opinion of the group as a whole. A shift in the minds of students towards a higher risk of the use of synthetic packaging for food was noticeable within the time frame of 12th class – at the end of the school year, the number of responses for levels of risk "small" and "moderate" increases at the expense of level "negligible". Apparently in the last year of their studies students receive the information needed to form their awareness about potential risks of the use of synthetic packaging for food.

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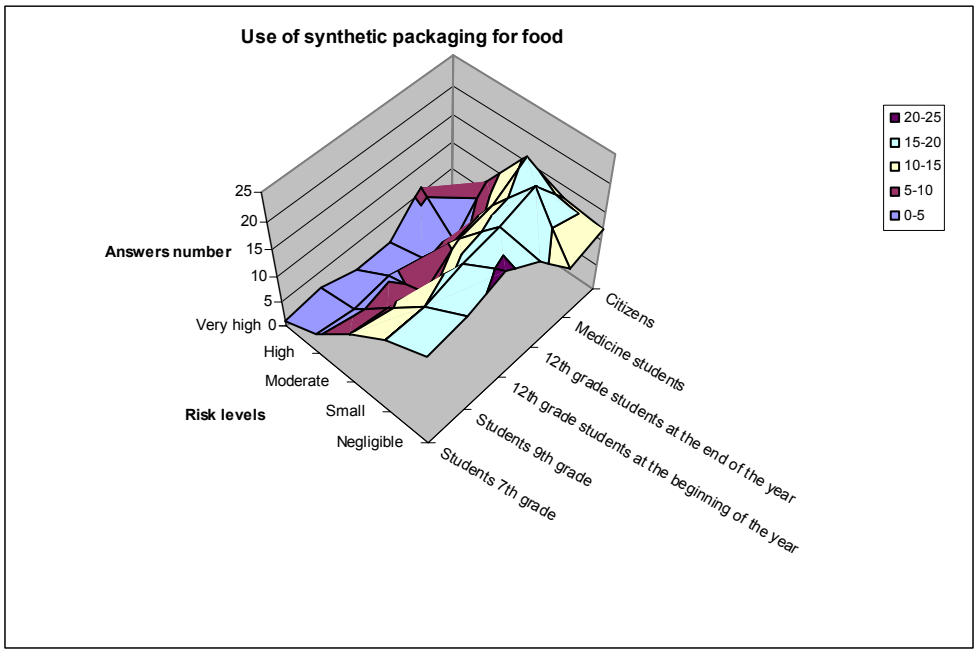

Figure 1. Responses distribution of the 6 groups of respondents regarding the risk of use of synthetic packaging for food.

The responses of the 6 groups regarding the benefit of the use of synthetic packaging for food are shown in Table 3. They are graphically shown in Fig. 2. The maximum in the distribution of responses for the high school student's groups gravitates at the levels "moderate" and "much" benefit. For medical students and citizens poorly outlined maximum at level "moderate" benefit is noticed. The answers are scattered between the levels, i.e. there is lack of certainty in the opinion of the groups about the benefit of the use of synthetic packaging for food.

Table 3. Responses distribution of the 6 groups questioned for the benefits of use of synthetic packaging for food.

	Very much	*Much*	*Moderate*	*Small*	*Negligible*	*Index benefit*
Students 7th grade	5	10	10	8	15	126
Students 9th grade	1	16	16	11	4	143
12th grade students at the beginning of the year	5	14	14	13	2	151
12th grade students at the end of the year	6	14	15	9	4	153
Medicine students	4	10	17	15	2	143
Citizens	1	9	17	13	8	126

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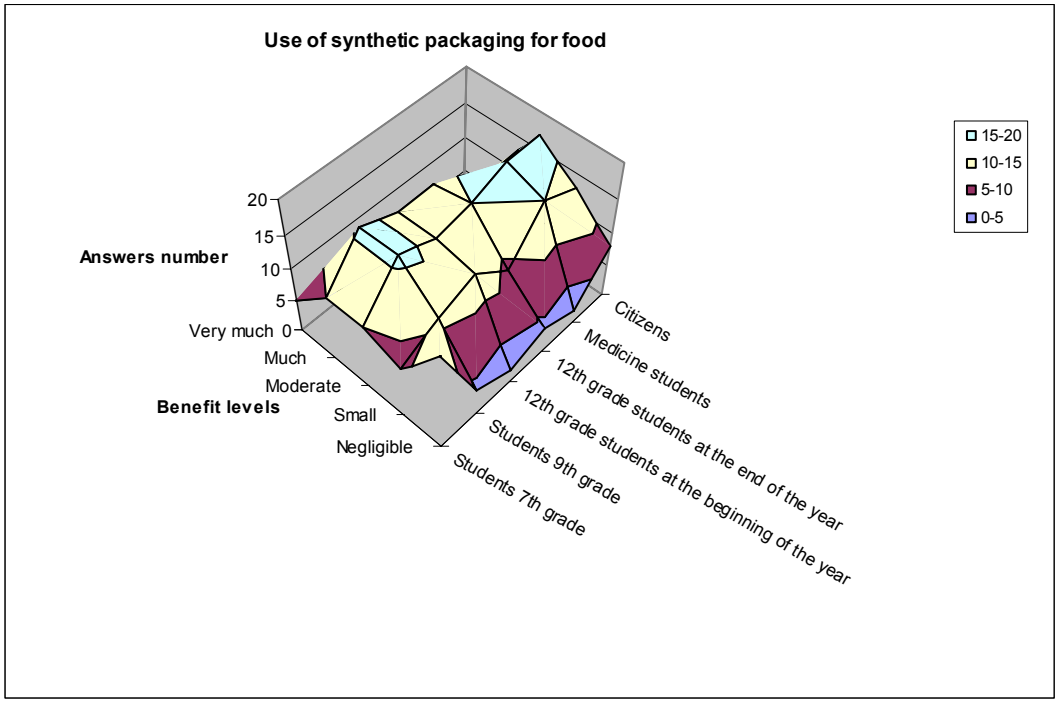

Figure 2. Response distribution of the 6 groups questioned for the benefits of use of synthetic packaging for food.

Indices of the risk and benefit (the right column of Table 2 and Table 3 for all groups) are shown graphically in Fig.3 and Fig.4. They change with the advancement of the educational process and are indicators of the effectiveness of the educational process.

The risk index reaches its minimum (89) at the beginning of 12th grade, and its maximum (116) for a group of medical students. Figure 4 shows that a complicated transition in the minds of the high school students was made about the risk of the use of synthetic food packaging – the index of risk decreases from the 9th to the early 12th class, then rises towards the end of the school year. The benefit index increases throughout the course of the secondary education.

For groups of medical students and citizens the risk index incrementally increased (20 points) compared to that of student groups, i.e. public opinion on the issue is mainly formed under the influence of information sources that are independent of school knowledge.

The benefit index of the use of synthetic packaging for food increases monotonically during training in secondary schools from 126 (minimum) for VII graders to 153 (maximum) for seniors. For medical students and citizens the benefit index is 143 and 126.

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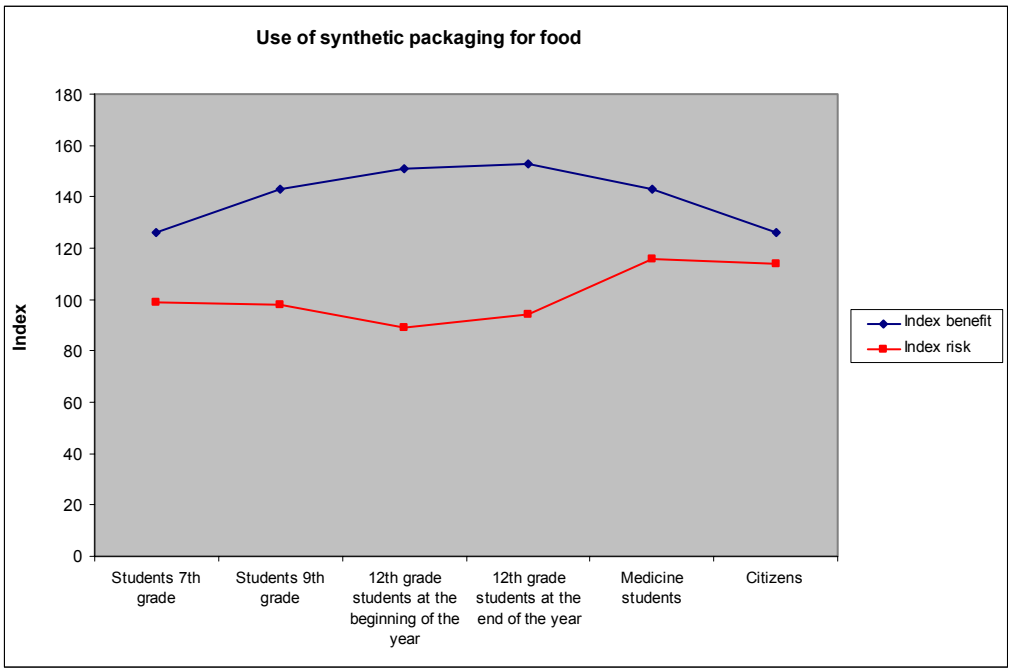

Figure 3. Indices of the benefit and risk for all groups

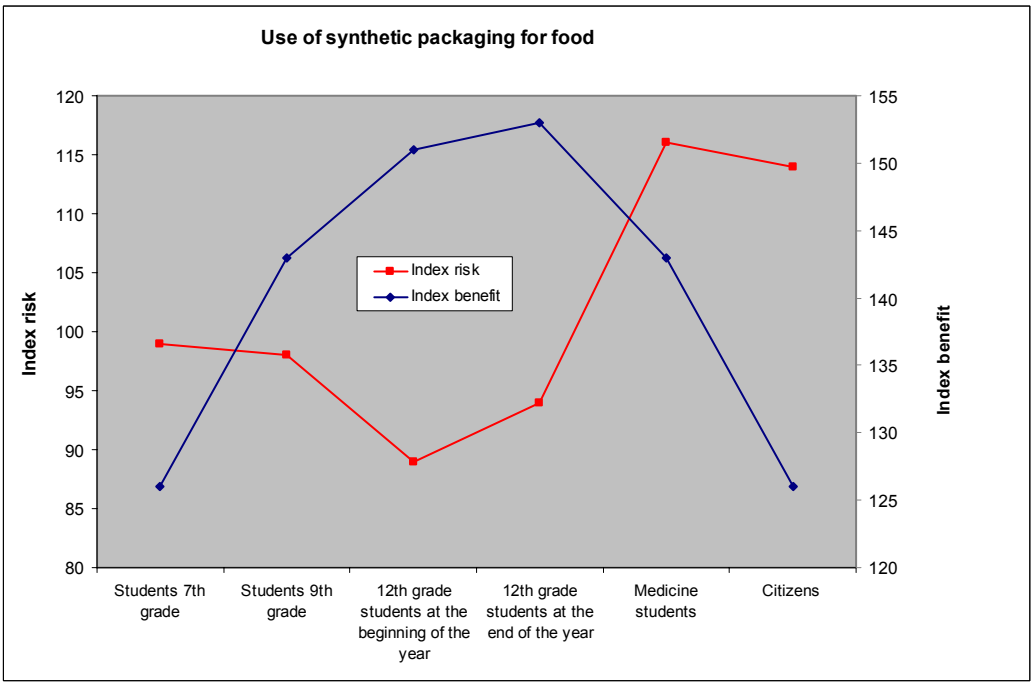

Figure 4. Detailed picture of benefits/risks indices for all groups.

The maximum of the responses for the risk of the use of synthetic packaging for food remains at level "negligible" for the respondents from the first three groups of high school. At the end of secondary

school this maximum shifts to the level "small", reaching a level "moderate" for the group of the citizens (Table 2 and Figure 1). Most pronounced is the maximum level of "moderate" for a group of medical students, among them is also the largest number of respondents assessed risk as "very high." The answers of students from the seventh and ninth grade were most scattered at the levels of risk are, i.e. a lack of certainty in their opinions as a group is noticeable, which is probably related to unformed opinion of the group as a whole. A shift in the minds of students towards a higher risk of the use of synthetic packaging for food was noticeable within the time frame of 12th class – at the end of the school year, the number of responses for levels of risk "small" and "moderate" increases at the expense of level "negligible". Apparently in the last year of their studies students receive the information needed to form their awareness about potential risks from the use of synthetic packaging for food.

4. CONCLUSIONS

The high school students' perception of the risk and benefit of the use of synthetic packaging for food undergo changes in the course of study.

These changes can be traced quantitatively by the indices of risk and benefit which are indicators of the opinion change.

The index of risk goes through a minimum, and that of benefit reaches its maximum at the end of secondary education.

The benefit index remains greater than the risk index in the course of study, which indicates formed students' notion of the prevailing benefit over the potential harm from the use of synthetic packaging for food.

Risk-benefit ratio for the surveyed groups is less than one (0,72).

Assuming that the group of citizens is the voice of public opinion, the indicator of the public opinion on the issue – risk-benefit ratio, is 0.90 for this group and shows that the average consumer rather not hesitate to use food packaging and stored in synthetic packaging and containers.

In comparison with other environmental factor – industrial and agrarian production which pollutes air, water and soil, the risk-benefit ratio computed from the same questionnaire data of the same respondents, is 2.14 (Takuchev et al. (2012)). The comparison between the risk-benefit ratios of these two factors shows that public opinion estimates the potential harm from the use of synthetic packaging for food 2.40 times less harmful to health than polluting industries.

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