

## ARTICLES

**IMPACT OF BIOLOGY EDUCATION ON INFECTIOUS DISEASES KNOWLEDGE AMONG STUDENTS IN THE MUNICIPALITY OF ILIJAŠ***AUTHORS****Mahir Gajević, Renata Bešta-Gajević****Department of Biology, Faculty of Science, University of Sarajevo, Zmaja od Bosne 35, 71000 Sarajevo, Bosnia and Herzegovina.**e-mail:mahirgajevic@gmail.com, e-mail: renatabestagajevic@gmail.com****Elvedina Bajrović****Elementary School "Hašim Spahić", Krajiška bb, 71380 Ilijaš, Bosnia and Herzegovina. e-mail:elvedina.bajrovic@bih.net.ba**DOI: 10.35666/23038950.2021.44.27**UDC: 371.3:616.9:373.3(497.6) "2017/2018"**ABSTRACT****Impact of Biology Education on Infectious Diseases Knowledge among Students in The Municipality of Ilijaš***

*The research in this paper is based on the collection of data on the knowledge of infectious diseases through the application of Sequence of the Objective Type Tasks (SOTT) in elementary school students in the municipality of Ilijaš. This research was conducted on a sample of 123 ninth grade students in the elementary schools "Hašim Spahić" and "Podlugovi". The testing was conducted in the period from May 25 to 31, the 2017/18 school year. The comparison of students' answers to a sequences of 10 questions created according to the material of the biology textbook for the ninth grade of elementary school showed a slightly higher level of knowledge among elementary school students "Podlugovi". Statistical analysis showed that there is no statistically significant difference between the compared classes when it comes to knowledge in the field of infectology.*

*KEY WORDS**sequences of objective tasks type, infectious diseases, elementary school, curriculum.*

## 1. Introduction

Evaluation as a process of determining the level of achievement of educational goals and tasks in school practice often involves the use of written methods of assessment, among which are especially the series of tasks of the objective type and knowledge tests (Bašić, 2001; Strugar, 2006). According to Mužić (1964), the application of a sequences of tasks of the objective type is justified and very useful - both in teaching and in educational research. To achieve the purpose, the Sequence of the Objective Type Tasks should include all relevant teaching content or its representative sample, which contributes to the validity of the instrument, and the solution is not affected by factors other than the knowledge, abilities and skills of students, which means that the tasks must be clear and appropriate to each student (Mužić, 1999).

Objective-type task sets consist of different types or types of tasks. The examination instrument usually consists of several types of tasks: two-member choice or alternative type, multiple choice, recollection type, comparison, supplementation and arrangement (Strugar, 2006). For the purposes of this paper, we created one such examination instrument that was related to testing students' knowledge of the infectious disease.

It is known that man comes into the world from a sterile environment and sterile conditions of development (mother's uterus). However, immediately after passing through the birth canal and immediately after birth, it comes into contact with certain types of bacteria, fungi, viruses or parasites. With the first inhalation of air and with the intake of the first food, microorganisms inhabit and follow certain systems of the human organism throughout their entire life cycle. Most of these microorganisms form the normal microbiota of the human body. They actively participate, as permanent biota, in many physiological processes (Kučišec - Tepeš, 1994). In the natural environment, microorganisms are maintained and multiplied, participating in certain processes of matter circulation in nature, as well as in establishing various interrelations and associations. From the natural environment, pathogenic microorganisms can directly or indirectly reach humans or animals through certain animal species or objects, infecting them (Kučišec - Tepeš, 1994). All known microorganisms can represent potentially significant infectious agents for humans, animals or plants. They can infect them, but also contaminate the environment, and be one of the links in the chain of circulation of elements and metabolism of matter in nature (Volner, 1993).

Classes in the subject of biology for ninth grade students of elementary schools in Sarajevo Canton, according to the curriculum for the school year 2017/2018 year is represented by two hours per week, which is a total of 68 hours per year. With the curriculum for the ninth grade of elementary schools in the Sarajevo

Canton, the content of teaching is focused on the topic of infectious diseases within the teaching contents of human anatomy and physiology. Comparing with the lower grades, we can say that this topic is mostly covered in the final grade of elementary schools.

The goal of this research was to determine the level of knowledge about infectious diseases in students of two elementary schools in the municipality of Ilijaš. Based on the defined goal of the research, four tasks were determined:

1. Develop a sequence of objective-type tasks on infectious diseases;
2. Carry out testing of knowledge on infectious diseases of ninth grade students in two elementary schools in the municipality of Ilijaš at the end of the 2017/18 school year;
3. Compare students test results;
4. Using a two-tailed t-test, perform statistical analysis of the obtained data.

The research was started under the assumption that there is no statistically significant difference between the correct (incorrect) answers of the surveyed students of the two elementary schools in Ilijaš.

## 2. Methods

The basic methodological procedure for collecting data on student achievement is testing, and a sequence of objective tasks was used as an instrument. This sequence had 10 objective tasks, four tasks of two-member or alternative choice, two tasks of multiple choice, two tasks of the correlation type and two tasks of the recall type. The testing was conducted in the period from May 25 to 31, the 2017/2018 school year. 123 ninth-graders from the elementary schools "Hašim Spahić" and "Podlugovi" participated in the testing (Table 1).

*Table 1. Review of respondents.*

School	ES „Hašim Spahić“			ES „Podlugovi“	
Class	IX-1	IX-2	IX-3	IX-1	IX-2
M	11	12	14	13	14
F	13	10	10	14	12
Total	24	22	24	27	26

In ninth grade students, knowledge of infectious diseases was tested immediately after the study. With the sequence of objective tasks, we tried to determine the level of knowledge about infectious diseases acquired in regular classes, according to the material of the Biology textbook for the ninth grade of elementary school (Halilović & Begić, 2015).

In statistical data processing, a two-tailed t-test was applied to test the significance of differences between arithmetic means of different classes in same schools with a significance level of 0.05. Processing of data obtained by the survey and testing of the null hypothesis was done using the software package Microsoft Office - Excel 2010.

In order to determine the average number of questions to which all tested students gave correct answers, a weighted arithmetic mean was calculated:

$$\bar{x} = \frac{x_1 f_1 + x_2 f_2 + x_3 f_3 + \dots + x_{15} f_{15}}{f_1 + f_2 + f_3 + \dots + f_{15}}$$

The parameter  $x_i, i = 0,1,\dots,15$  represents the number of correct answers and denotes a statistical characteristic, while the parameter  $f_i, i = 0,1,\dots,15$  represents the frequency of the statistical characteristic, ie. the number of students who answered the question correctly.

### 3. Results

By solving a sequence of 10 objective tasks, 70 students of the elementary school "Hašim Spahić" could produce a total of 700 correct or incorrect answers, while 53 students of the elementary school "Podlugovi" could produce a total of 530 correct or incorrect answers. So, the total number of correct answers could have been 1230, as well as the total number of incorrect answers. Students answered exactly 76.83% of the questions asked, incorrectly 15.61% of the questions, while the rest of the questions were unanswered. These results are summarized in Table 2.

Table 2. Results of students' answers.

School	Number of students	Correct		Incorrect		Not answered	
		n	%	n	%	n	%
ES „Hašim Spahić“	70	519	74,14	126	18,00	55	7,86
ES „Podlugovi“	53	426	80,37	66	12,45	8	1,52
<b>Total</b>	<b>123</b>	<b>945</b>	<b>/</b>	<b>192</b>	<b>/</b>	<b>63</b>	<b>/</b>

In order to obtain data on whether there is a statistically significant difference in students' knowledge in individual classes, a two-tailed t-test was applied. The results of the t-test show that there is no difference in the number of correct answers between the three grades in the elementary school Hašim Spahić, nor between the two grades in the elementary school Podlugovi (Table 3).

Comparing the results of correct answers between classes in the same schools, we can conclude that no statistically significant differences were observed ( $p > 0.05$ ).

Table 3. Results of the t-test.

Correct answers	ES "Hašim Spahić"						ES "Podlugovi"	
	IX-1	IX-2	IX-1	IX-3	IX-2	IX-3	IX-1	IX-2
Mean value	16,9	16,6	16,9	18,4	16,6	18,4	20,8	21,8
t test	0,9		0,52		0,49		0,71	
	Sig		p>0,05		p>0,05		p>0,05	

The weighted arithmetic mean was calculated to obtain information on the average of correct answers according to the data shown in Table 4. Students answered on average 5.33 of the 10 questions offered (76.83% of correct answers) that belong to the regular school material which indicates well-acquired knowledge, which students acquire within the school program in the subject of Biology. The most common data in the statistical series  $x_i = 8$  and its frequency is 123 (Table 4).

Table 4. Data used to determine the weighted arithmetic mean.

Number of correct answers $x_i$	Number of students with correct answers $f_i$	Product $x_i f_i$
0	0	0
1	100	100
2	118	236
3	101	303
4	53	212
5	106	530
6	87	522
7	102	714
8	123	984
9	107	963
10	48	480
Total	945	5044

#### 4. Discussion and conclusion

In order to find research with which we could compare the collected data of this paper, an insight into scientific papers and other literature was performed. To test the hypotheses in this research, a t-test was used in which the correct and incorrect answers obtained on the basis of a sequences of objective-type tasks

from the five examined classes of the two elementary schools. The hypothesis that there is no statistically significant difference between the correct answers of the surveyed classes of two elementary schools in the municipality of Ilijaš was accepted. In the research that referred to the knowledge of high school youth about some significant infectious diseases, it was concluded that young people have insufficient knowledge about infectious diseases. It was also concluded that the level of knowledge about infectious diseases increases as the age of the respondents increases, and that females are better informed about infectious diseases than males (Fatić, 2012). The master's thesis aimed at examining students' knowledge of sexually transmitted diseases in high schools in Sarajevo Canton leads to the conclusion that very few curricula are dedicated to the topic of sexually transmitted diseases, and that students have partially adopted the content present in the curriculum of their school (Solaković, 2014).

During the school year 2017/18, a survey was conducted in two elementary schools in the Municipality of Ilijaš, with the aim of assessing the level of knowledge of materials in the field of infectious diseases, as an important branch of biology, in ninth grade students because according to the curriculum from this area is represented in the final grade. A total of 123 students participated in the research. Analysis, synthesis, comparison and statistical processing of collected data, using a sequence of objective-type tasks as an instrument for testing students' knowledge, and surveys to examine their attitudes and opinions related to knowledge of infectious diseases allowed to perform the following conclusions:

- the highest level of knowledge during the research was shown by the students of the ninth grade of the elementary school "Podlugovi", who had 80,37% correct answers and 12,45%.
- the results of students' answers to the 9th and 10th questions showed a slightly lower level of students' knowledge about ways of transmitting infectious diseases.
- statistical analysis showed that there is no statistically significant difference between the compared classes when the answers to the question are correct or incorrect.
- based on the calculated weighted arithmetic mean, it turned out that the students answered on average 5,33 out of 10 offered questions that belong to the regular school material, or in the percentage of 76,83%, which indicates a fairly well-acquired knowledge.
- in order for the knowledge about infectious diseases in elementary school students to be even better, it is necessary to carry out continuous education of teachers through seminars, and to harmonize the curriculum.

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