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DIFFERENCES IN THE EXPERIENCE OF SCIENCE CONTENTS AND ITS IMPLEMENTATION IN CLASSROOM TEACHING

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Abstract: The educational process for every individual has an important role in life. An even more important role is played by the teacher, on whom the quality of teaching depends a lot. Teachers fight their own battles along the way - how to interest the student and develop positive attitudes about teaching and teaching content, how to implement teaching as high-quality as possible, how to contribute to better student achievements, etc. One of the key things for quality acquisition of knowledge is students' awareness of the importance and applicability of the teaching content they learn. The concept of the content of natural science, on which we will base this work, refers to the content of natural sciences that are covered within the subject My environment (in the first three grades) or Nature and society (fourth and fifth grade) in the Republic of Srpska according to the Curriculum for elementary education (2021). The aim of the paper is to examine the differences in experiencing the content of science and their realization in the teaching of nature and society among students of younger grades of elementary school. A survey questionnaire was conducted with 343 students of grades II-V. The Likert-type questionnaire consisted of 13 statements to which the students responded by circling one of the provided answers on a five-point scale - "strongly agree", "partially agree", "not sure", "mostly disagree" and "disagree". The following research tasks were set: examine the homogeneity of the variance in student answers; perform a one-factor analysis of variance according to the independent variable "class"; examine the existence of statistically significant differences in responses between groups; interpret and analyze the obtained results. The results of the research indicate that the differences appear in favor of second-grade students, who experience the teaching of nature and society more positively, and adopt the material with more enthusiasm, than students of other grades. Classes organized according to some of the active learning models leave a better impression and effect, as found. Enthusiasm for learning declines already in the third grade, but returns with a slightly lower intensity in the fourth and fifth grade. What they all have in common is that they can be used by active learning models, of which ambiental teaching of nature and society, followed by multimedia teaching, stands out. Since through the research we have gained knowledge about the experience of science content and its implementation among students of younger school age, in the next research we should deal with each grade individually, trying to find out what actually happens at the transition from the second to the third grade, and what from the third to in the fourth, or in the fifth, regarding the adoption of the contents of nature and society, with special reference to specific learning models.

Keywords: classroom teaching; teachers' role; experiencing teaching contents; nature and society.
Field: Social Sciences and Humanities

1.INTRODUCTION

Starting school is a big step in an individual's life. Then he gets to know a new environment and new people, he gets to know the numerous findings and achievements of science that should be incorporated into his knowledge fund, he develops the competencies necessary for adequate functioning in the social community, etc. Throughout the entire process, the students are guided by a teacher. Very often, administrative workload, organizational problems and department size can significantly affect the quality and dynamics of teaching, which is especially pronounced among teachers from the region (Đerić et al., 2020).

Despite the difficulties that exist in any job, quality student-oriented teaching should be the main goal. "If the meaning of educational activity is in actions, we need to create situations so that students act in this way, and we need to motivate them to be active. Students' motivation to learn increases by increasing the level of student activity, so this directs teaching to the highest forms of learning, characteristic of problem-based teaching, in which the student encounters obstacles and difficulties that enhance a number of psychological functions. These highest forms of learning turn into creativity, and it is the most precious potential in teaching, which renews, improves and enriches... And when students become so independent in learning that they can already educate themselves, then they have really understood what learning is and how can they manage it successfully" (Pecko, 2015: 70). According to Bloom's taxonomy, only at the level of application does the acquired knowledge really become functional and suitable for manipulation and coping in new situations (Gavrić & Radivojević, 2022a), which is the desired learning outcome.

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The concept of the content of natural science, on which we will base this work, refers to the content of natural sciences that are covered within the subject My environment (in the first three grades) or Nature and society (fourth and fifth grade) in the Republic of Srpska according to the Curriculum for elementary education (2021). The content refers to: inanimate nature, natural phenomena and materials, plants and animals, man, ecology, cosmos etc.Thus, through the teaching of My environment/Nature and Society (hereinafter: nature and society), the student is enabled to enter the world of things and phenomena that surround him, in accordance with his psychophysical capabilities.

2. MATERIALS AND METHODS

Today's educational process is increasingly faced with students' lack of motivation to learn and apply science content, their indifferent attitude towards their own education and their resistance when it comes to school obligations. The question arises as to what can motivate students to learn and what is their experience of the content of science. In accordance with the research problem, the aim is to examine the differences in experiencing the contents of science and their realization in the teaching of nature and society among students of grades II-V. The following research tasks were set: examine the homogeneity of the variance in student answers; perform a one-factor analysis of variance according to the independent variable "class"; examine the existence of statistically significant differences in responses between groups; interpret and analyze the obtained results.

H (1): There are statistically significant differences in the perception of the contents of science and its application in the teaching of nature and society among students of grades II-V.

H (2): Younger students perceive science contents more positively and are more encouraged to learn it.

A descriptive and comparative method was used in the research. Of the research techniques, the survey technique and the measuring instrument - the survey questionnaire, which was created for the purposes of the research, were used. The Likert-type questionnaire consisted of 13 statements to which the students responded by circling one of the provided answers on a five-point scale. Experts from the field of nature and society teaching methodology and an expert from the field of pedagogical psychology participated in the preparation, selection and sorting of the questionnaire. The questionnaire originally consisted of 15 items, two of which were omitted by adapting the questionnaire to the research aim. The reliability of the measuring instrument is determined by Cronbach's alpha, whose coefficient is 0.81.

The obtained results were analyzed using the IBM SPSS 20 statistical program. Descriptive statistics measures, Levene's homogeneity of variance test, univariate analysis of variance ANOVA and Post Hoc LSD test were used for statistical data processing.

The research was conducted at the end of the first semester of the 2022/23th school year. The population consists of II-V grade students of primary schools from the territory of the Republic of Srpska, the Federation of Bosnia and Herzegovina and the Brčko District. The sample was convenient and originally consisted of 555 students from a total of 15 schools from the mentioned areas, but by equating the respondents according to achievement from Nature and Society/My Environment, the answers of 343 respondents were taken into consideration. Among the respondents are 87 second-grade students, 84 third-grade students, 87 fourth-grade students, and 85 fifth-grade students who have an average mark of "very good" or "excellent" in the subject Nature and Society/My Environment.

3.RESULTS

Results of Levene's test of homogeneity of the variance of student responses to statements (significance level ρ=0.05) showed statistical significance for all items of the questionnaire (ρ =0.000; 0.001; 0.005 and 0.025 were the values), which indicated that the variances are not equal and that the analysis of the results should be further directed to a more detailed examination of the inequality of the variances.

Table 1. Results of F-test

	F	Sig.
S1	11.411	0.000
S2	14.139	0.000
S3	5.836	0.001
S4	11.451	0.000
S5	5.393	0.001
S6	13.198	0.000
S7	8.367	0.000
S8	3.653	0.013
S9	3.369	0.019
S10	11.083	0.000
S11	3.335	0.020
S12	3.918	0.009
S13	4.919	0.002

Legend: S – statement; F – value of ANOVA test; Sig. – statistical difference.

The F-test values from Table 1 in all variables were high and statistically significant, which implied that respondents' answers differ significantly in all examined statements, when the independent variable "class" was included as a factor.

Descriptive indicators of students' answers are shown in Table 2. We noticed that the arithmetic means for all statements were the highest among students in the second grade of elementary school, and that in the same group the standard deviation was significantly lower.

Table 2. Descriptive indicators

	M_2	SD_2	M_3	SD_3	M_4	SD_4	M_5	SD_5
S1	4.77	0.522	3.99	1.114	4.23	1.008	4.14	0.990
S2	4.84	0.400	4.04	1.011	4.30	0.864	4.32	0.916
S3	4.83	0.595	4.43	0.854	4.70	0.667	4.75	0.486
S4	4.32	0.994	3.50	1.375	3.48	1.265	3.35	1.212
S5	4.75	0.702	4.32	0.971	4.29	0.963	4.29	0.924
S6	4.83	0.487	4.04	1.113	4.17	1.037	4.14	0.928
S7	4.75	0.575	4.07	1.015	4.37	1.013	4.45	0.880
S8	4.78	0.579	4.67	0.781	4.38	0.979	4.53	0.983
S9	4.66	0.760	4.27	0.923	4.52	0.790	4.56	0.794
S10	4.49	0.901	3.54	1.256	3.89	1.214	3.74	1.197
S11	4.74	0.655	4.43	0.935	4.30	1.122	4.51	0.971
S12	4.86	0.347	4.49	0.857	4.62	0.839	4.61	0.773
S13	4.84	0.547	4.37	0.991	4.51	0.847	4.46	0.983

Legend: S – statement; M – mean; 2 – II grade, 3 - III grade, 4 - IV grade, 5 – V grade; SD – standard deviation.

Based on the descriptive indicators from Table 2 and the results from Table 3 (below), statistically significant differences could have been observed in the answers of students by class. In statements no. 1, 2, 4, 5, 6, 12 and 13, there was a statistically significant difference in the value of Sig.=0.000, 0.001 and 0.002 for students of the second grade compared to all other grades. Judging by this, second-grade students like to learn the contents of My Environment, which interest them very quickly and easily, learning the given contents is more interesting to them than learning the contents of other subjects, they achieve a correlation with previously acquired knowledge, they often determine the material in order to prevent forgetting, and they especially like learn in their own way. In statement no. 3, which refers to experiencing the content of science as something that is applicable in everyday life and through which one gets to know the environment, significant differences occur between students of II and III grades (Sig.=0.000), but also between students of IV and III (Sig .=0.008), and V and III grades (Sig.=0.002). This indicated that third-grade students have a somewhat different perception of content than older students, but also from the youngest. Answers to statement no. 3 support the answers to statement no. 7, which refered to the extent to which students apply the acquired knowledge, where we still see that the II grade is ahead of the others according to the values of Sig.= 0.000, 0.135 and 0.027, as well as that the IV and V grades are ahead of the III grade (Sig.= 0.006 and 0.030), which we concluded from the negative sign

in the values of the average difference. Statement no. 8 refers to the realization of scientific content using multimedia and computers. A statistically significant difference Sig.=0.002 occured between II and IV grades, between II and V Sig.=0.052, and between III and IV Sig.=0.027, which implied that this way of realizing teaching content is preferred by II grade students compared to IV and V, and that in this regard there was't significant differences between II and III grades, that such classes are preferred by III students over IV grade students, and that there wasn't significant differences between III and V, and IV and V grades. Statement no. 9 examined experiencing problem-based teaching as one of the known models that activates students' thought processes.It is liked more by II grade students than by III grade students (Sig.=0.000), and by V grade students more than by III grade students (Sig.=0.021). How much students want to acquire new knowledge beyond what they already had the opportunity to learn at school was examined by statement no. 10. According to the values of the mean M2=4.49, M3=3.54, M4=3.89 and M5=3.47, students of grade II gave more positive answers. We could see that the answers of students of class II were statistically significantly different compared to other classes (Sig.=0.000, 0.001 and 0.000), while the difference also occured between classes III and IV (Sig.=0.048) in favor of class IV with a negative sign MD=-0.349. The teaching of nature and society in an ambient environment is preferred by students of grade II than students of grade III and IV (Sig.=0.033 and 0.002), but there wasn't statistically significant differences between the other groups (statement 11), from which we concluded that this is one of the more popular models of realization of scientific contents.

Table 3. Post Hoc LSD test

		III		IV		V	
		MD	Sig.	MD	Sig.	MD	Sig.
S1	II	0.782	0.000	0.540	0.000	0.629	0.000
	III			-0.242	0.092	-0.153	0.288
	IV					0.089	0.534
S2	II	0.803	0.000	0.540	0.000	0.521	0.000
	III			-0.263	0.039	-0.282	0.028
	IV					-0.019	0.882
S3	II	0.399	0.000	0.126	0.209	0.075	0.461
	III			-0.273	0.008	-0.324	0.002
	IV					-0.052	0.609
S4	II	0.822	0.000	0.839	0.000	0.969	0.000
	III			0.017	0.926	0.147	0.433
	IV					0.130	0.485
S5	II	0.426	0.002	0.460	0.001	0.453	0.001
	III			0.034	0.804	0.027	0.843
	IV					-0.007	0.961
S6	II	0.792	0.000	0.655	0.000	0.686	0.000
	III			-0.137	0.333	-0.105	0.458
	IV					0.031	0.824
S7	II	0.676	0.000	0.379	0.135	0.300	0.027
	III			-0.296	0.030	-0.376	0.006
	IV					-0.079	0.559
S8	II	0.115	0.376	0.402	0.002	0.252	0.052
	III			0.287	0.027	0.137	0.293
	IV					-0.150	0.246
S9	II	0.381	0.002	0.138	0.207	0.090	0.469
	III			-0.243	0.053	-0.291	0.021
	IV					-0.047	0.704
S10	II	0.959	0.000	0.609	0.001	0.753	0.000
	III			-0.349	0.048	-0.205	0.246
	IV					0.144	0.412
S11	II	0.307	0.033	0.437	0.002	0.230	0.108
	III			0.130	0.366	-0.077	0.592
	IV					-0.207	0.148
S12	II	0.374	0.001	0.241	0.030	0.250	0.026
	III			-0.133	0.238	-0.124	0.273
	IV					0.009	0.936
S13	II	0.470	0.000	0.333	0.011	0.380	0.004
	III			-0.137	0.299	-0.090	0.497
	IV					0.047	0.720

Legend: S – statement; MD – mean difference; Sig. – statistical significance.

4.DISCUSSIONS

The presented results open up many directions in which differences can be observed in experiencing the contents of science and their realization among students. The question arises, do younger students have beginner's enthusiasm that declines during the years of schooling due to numerous school obligations, or does it weaken due to non-innovative ways of realizing and adopting the contents?

Something that particularly demotivates students is the so-called rote learning, which implies mere reproduction of content, which is more common among older than younger students, which corresponds to an increase in the amount of facts they need to learn. Blagdanić and Kovačević (2013) examined what kind of historical knowledge teachers expect from their students in teaching nature and society. They find out that the acquisition of historical content is mainly based on historical facts, which can be very unmotivating for students.

One study among teachers and students in Dutch schools (Vos et al., 2015) showed that students develop less positive attitudes towards science and technology during the years in primary school, where it was observed that girls have a less positive attitude than boys. One gets the impression that girls' attitudes depend to a large extent on teachers' attitudes and their enthusiasm for teaching science and technology. Similar conclusions were reached by Schiefele and Schaffner (2015), where teachers' attitudes and orientations are directly related to student motivation. Schulze and Heerden (2015) state that the environment has a great influence on the motivation to learn scientific content, implying that an adequate environment contributes to the development of science literacy, and the environment certainly includes the teachers who implement the given content. In support of this is the fact that teachers feel certain that when they use active learning, students learn more effectively and develop the ability to express their feelings confidently and succeed in solving problems (Dagniew, 2023: 123).

Zubac, Milinković and Marković (2021) investigated about students' internal motivation and mathematical knowledge. They conclude that interestingly organized teaching awakens internal motivation and gives better results in achieving success in mathematics, which can be connected with the teaching of nature and society considering the correlation of these two subjects and the possibility of an integrative approach to learning the contents of nature and society and mathematics.

Homework and other independent activities can greatly encourage students to learn scientific content. Borić and Zečević (2021) indicate the importance of homework in the teaching of nature and society, stating that they should be planned, designed and evaluated in order to justify their use. Assigning homework without its purpose and recording has no value when it comes to better student achievements.

Letina (2016) indicates that active forms of learning have not yet succeeded in replacing direct teaching, which is necessary, especially in the teaching of nature and society. The author especially emphasizes research teaching as an active form of learning. As frequent mistakes of teachers, which can explain certain negative experiences of students when it comes to research teaching, insufficiently elaborated levels of achievement are mentioned while neglecting the set goal, insufficiently designed group work, disorganized material, lack of feedback, etc., which creates a wrong image for students about the value of such content (Prnjavorac, 2016).

Multimedia teaching can also be classified as active teaching methods that have a positive effect on students. Solaković, Pećanac and Janković (2016) examined the influence of the electronic classroom as an interactive model in the teaching of nature and society, finding that the students of the experimental group who adopted content about the creation of the planet Earth based on the electronic classroom model had better results. Better results were determined according to the levels of Bloom's taxonomy. Also, Bulić and Blažević (2020) find out that online teaching can be very motivationg in contents of science and biology. Damapolii, Iwan and Kurniadi (2018) aiming to train students' thinking skills using problem-based learning integrated with virtual mobile learning concluded that problem-based learning combined with virtual mobile learning can be applied to encourage students' thinking skills.

Popescu (2012) reveals that one of the strategic goals and actions in lifelong learning on universities in Europe is making innovative learning pathways. Applying innovative ways of learning to pedagogical faculties, we directly implement innovations in modern education. Without innovative learning, we cannot expect the acquisition of quality knowledge and positive attitudes towards learning content.

5.CONCLUSIONS

Through this research, it was established that there are certain differences in experiencing the content of science and their realization in classroom teaching. Differences occur mainly in favor of second grade students, thus confirming both research hypotheses. It has been shown that second-grade students

adopt the contents of nature and society with much more enthusiasm, they like the subject much more and are more motivated to learn it. Enthusiasm for learning declines already in the third grade, but returns with a slightly lower intensity in the fourth and fifth grade. What they all have in common is that they can be used by active learning models, of which ambiental teaching of nature and society, followed by multimedia teaching, stands out.

In addition to the method of content realization, the teacher himself plays an important role, that is, his experience of these contents and their importance. Only the teacher who experiences science in the right way will be able to convey it to the students in the right way, as many other authors point out.

Since through the research we have gained knowledge about the experience of science content and its implementation among students of younger school age, in the next research we should deal with each grade individually, trying to find out what actually happens at the transition from the second to the third grade, and what from the third to in the fourth, or in the fifth, regarding the adoption of the contents of nature and society, with special reference to specific learning models.

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