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OCCUPATIONAL SAFETY AND HEALTH IN THE SYSTEM OF SECONDARY VOCATIONAL EDUCATION IN THE REPUBLIC OF SRPSKA - BOSNIA AND HERZEGOVINA

Abstract: Occupational safety and health education is essential throughout the formal education system, and especially in the vocational secondary education system. Secondary education and training for occupational safety and health involves acquiring specific knowledge and developing certain psychophysical skills, abilities, and habits for safe work, protection of health and beyond, the environment (broader and more complex aspects of natural-scientific, technical-technological and social knowledge), development of occupational, health and environmental awareness, ethics and culture vocational guidance and psychophysical preparation according to the requirements of cultural and safe behavior in the work and environment - in the profession and occupation for which the student expressed a certain interest and ability, etc. The acquired knowledge is a good basis for their further expansion and improvement both in the work environment and in the system higher education. An analysis of the current situation in Republika Srpska shows that the contents of occupational safety and health are studied integrally - within the other subject areas of secondary vocational education. The results of the research imply the need and importance of introducing special subject contents for occupational safety in the system of secondary vocational education in Republika Srpska.

Keywords: occupational safety and health, secondary vocational education, students

INTRODUCTION

Occupational safety experts think that the basic principles of occupational safety and health should be taught within primary education. Curricular and extra-curricular education of the final grade of primary school should incorporate special thematic units related to safety and health protection [6]. Taking into account how human beings develop and acquire knowledge, these opinions are correct and very acceptable from the perspective of the basic principles of occupational safety and health. The system of formal education in RS-B&H has changed following technical and technological development, but omitting the study of occupational safety as a separate science within a separate subject during the course of education (excluding the study of occupational safety in the field of higher education). An analysis of the syllabi and curricula of the Pedagogical Institute of the Republic of Srpska- B&H (Institution that prescribes syllabi and curricula of formal education) for vocations within secondary education shows Occupational Safety and Health does not exist as a school subject. From the point of view of the hazards encountered in secondary vocational schools during practical training and in the later employment, Occupational Safety and Health as a school subject should be a must in the educational

process of all, but primarily technical schools. In other secondary schools, the concepts of occupational safety and health should be presented through optional subjects or lectures that would be organized once a year. Continual improvement of the formal education system in the Republic of Srpska-Bosnia, and Herzegovina, i.e. by involving students in the real working environment during schooling, increases the need for learning about the concepts of occupational safety and health. The requirements of the economy and the labor market are such that students, after graduating in secondary school and finding a job, must have sufficient practical knowledge of their profession including the knowledge related to occupational safety for full involvement in work processes.

The aim of the research

This paper is a result of the analysis of the current status of the knowledge adopted in the field of occupational safety by the final grade students of secondary vocational and technical schools.

It also shows the data related to the student's interest in getting familiar with occupational safety and studying it. Within this research, an analysis of the syllabi and curricula of the Pedagogical Institute of the Republic of Srpska- B&H has been carried out to present the share

of occupational safety in other school subjects. The aim of the research is to demonstrate that the study of occupational safety within other subjects, rather than as a separate subject within the formal education system, is not sufficient to acquire the necessary knowledge of occupational safety in the engagement of students in the course of practical training and later inclusion in work processes after qualification acquisition. The study of occupational safety in a separate subject should enable the acquisition of the necessary knowledge (theoretical and practical) for easier and safer integration into working processes.

General Hypothesis

The study of occupational safety and health in the formal education system (in secondary schools) is the way to adopting basic concepts and knowledge in the area of safety at work that are sufficient for inclusion in the work process.

Objectives

The established objectives of the research are:

1. A survey instrument was developed: a questionnaire with established independent and dependent variables.
2. A survey was conducted on a determined sample.
3. The data from the questionnaire were collected and statistically processed.
4. The results obtained were interpreted through discussion and conclusion.

Methods

1. Methods of analysis

The number of hours in vocational subjects where the concepts of occupational safety and health appear as a teaching unit or as a part of a teaching unit was obtained through analysis of syllabi and curricula in secondary schools.

Research sample

The documents analyzed consisted of syllabi and curricula (PI of RS- B&H prescribes syllabi and curricula) applicable in secondary vocational and technical schools (54 occupations) and the research sample consisted of 8 occupations (the research sample was chosen on the basis of the number of students and potential hazards they are exposed to in the course of practical training) [7]. In the analysis of syllabi and curricula for these occupations, the syllabi and curricula of general subjects were not considered.

Interpretation of curriculum analysis results

The curriculum content of occupational safety (Table 1) is present in the range from 1.72% (the curriculum for Mechanical Engineering Technician) up to 8.25% of classes (the curriculum for Mason). In the current system of secondary education within the subject Basic Business Entrepreneurship, students in all professions are familiar with the concept of occupational safety. Depending on the occupation, students receive basic concepts of occupational safety through a smaller number of subjects (occupational technology, ecology, and environment protection, machines and appliances, processing technology).

Table 1. Percentage presence of occupational safety in syllabi and curricula

Percentage presence of occupational safety in syllabi and curricula								
Occupations	Mechanical Engineering Technician	Welder	Electrical engineering technician	Miner	Construction Technician	Mason	Woodworking technician	Joiner
Level of vocational education	IV	III	IV	III	IV	III	IV	III
Occupational safety training is possible within the subject	Basic Business Entrepreneurship							
	-Processing technology -Occupational technology	-Ecology and environment protection -Basics of electrical engineering	-Machines and appliances -Mining works	-Building organization -Occupational technology -Ecology and environment protection	-Machines and appliances -Processing technology			
Occupational safety within professional subjects	1,90%	4,17%	2,42%	5,10%	2,43%	7,67%	2,37%	4,21%
Occupational safety within practical training	9,80%	8,08%	5,50%	9,91%	12,50%	8,70%	5,94%	7,74%
Curriculum content of occupational safety	1,72%	6,57%	2,99%	8,02%	3,13%	8,25%	3,39%	6,31%

2. Survey method

The data were collected using a survey that was descriptive-analytical, written, voluntary and anonymous for the respondents. The questionnaire contains 23 closed-type questions categorized into 3 groups.

Research sample

The final grade students of secondary vocational and technical schools in RS in School Year 2018-2019 were defined as potential respondents in the survey, i.e. 3255 potential respondents.

Survey data

The survey was conducted in the period from February 1 to April 1, 2019. It was conducted in cooperation with the management of the following secondary schools: Technical School Banja Luka, Technical School Gradiska, SEC Petar Kocić Srbac, SEC Celinac, SEC Nikola Tesla Kotor Varos, and Mechanical Engineering School Prijedor.

A total of 520 respondents-students participated in the survey, 14 questionnaires were not accepted and all other questionnaires (506) were accepted as valid for statistical processing.

Research variables:

Independent variables:

1. Student profile
 - sex
 - type of school
 - level of vocational education
2. Occupational safety and health knowledge level (10 questions)

Dependent variables:

3. Learning about occupational safety in the formal education system
 - Occupational safety and health should be taught as a special subject in the curriculum for secondary vocational and technical schools
 - I need the knowledge about occupational safety for my professional work
 - Students who are trained for some profession (any) should know the basic concepts of occupational safety
 - The concept of occupational safety appears in vocational subjects but is not given enough attention
 - I learned more about occupational safety from other sources than from school subjects

- The knowledge about occupational safety I acquired in school subjects is adequate for my future work
- In secondary vocational and technical schools, the subject Occupational Safety is as necessary as any other subject
- I am familiar with all hazards and dangers that may arise during the practical training in my profession
- I am familiar with all occupational safety measures during the practical training
- During my practical training, my safety was jeopardized

3. Statistical methods

Statistical indicators used for the statistical analysis are:

- N - frequency
- % - percentage
- Σ - sum
- M - arithmetic mean
- σ - standard deviation
- V% - coefficient of variability
- r - Pearson's correlation coefficient - to test the correlation between independent and dependent variables.

RESULTS AND DISCUSSION

434 male students or 85.8% and 72 female students or 14.2% participated in the study. This sample structure was expected because it is a technical school where more than half of the students are male. According to the type of school, the structure of the sample is as follows: Technical School 122 students or 24.1%, Mechanical Engineering School 251 students or 49.6%, Electrical Engineering School 105 students or 20.8% and other technical schools 28 students or 5.5%. The structure of the research sample concerning the degree of vocational education and the level of the students' knowledge of occupational safety is presented in Tables 2 and 3.

Table 2. Degree of vocational education of the students (respondents)

	Frequency	Percent	Valid Percent	Cumulative Percent
Third-degree students	192	37.9	37.9	37.9
Fourth-degree students	314	62.1	62.1	100.0
Total	506	100.0	100.0	

Table 3. Level of occupational safety knowledge

	Frequency	Percent	Valid Percent	Cumulative Percent
0 - 20	31	6.1	6.1	6.1
20 - 40	121	23.9	23.9	30.0
40 - 60	155	30.6	30.6	60.7
60 - 80	147	29.1	29.1	89.7
80 - 100	52	10.3	10.3	100.0
Total	506	100.0	100.0	

The average grade of knowledge (grades 1 to 5) of the students of the Occupational Safety Learning in the formal education system obtained under the research is 3.15. The analysis of the research results has shown (Figure 1) [8] that fourth-degree students have a greater knowledge of occupational safety compared to third-degree students. This fact shows shortcomings within

the formal education system in the form of occupational safety studies. According to the Curriculum, third-degree students have many more teaching units dealing with occupational safety and lower level of knowledge compared to the fourth-degree students (Table 4). The results on the students' knowledge about occupational safety adopted in the formal education system reveal that the situation is unsatisfactory.

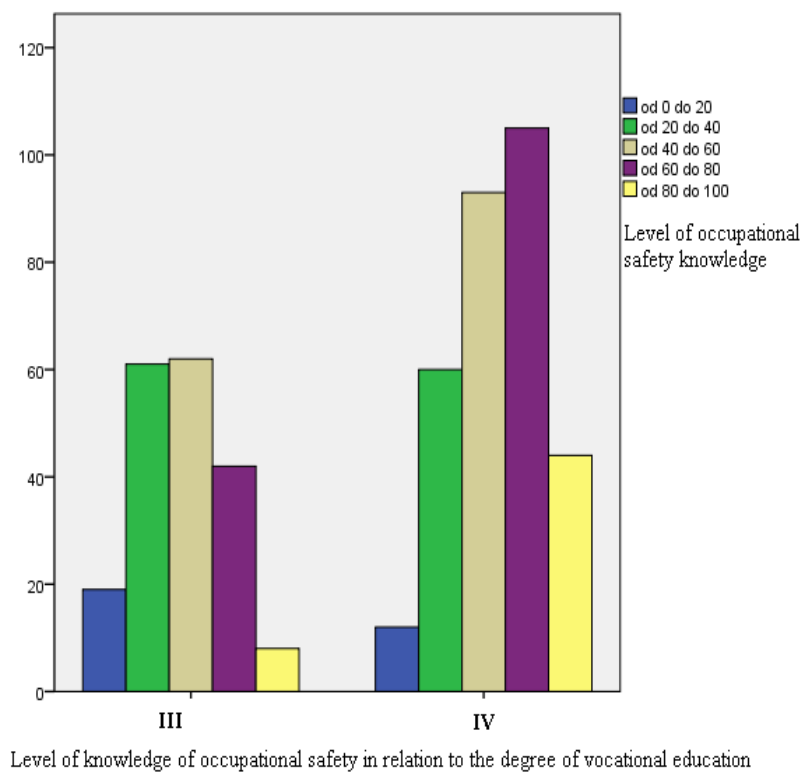


Figure 1. Level of knowledge of occupational safety in relation to the degree of vocational education

Table 4. Overview of the relationship between the presence of occupational safety concepts and the level of knowledge of the students of occupational safety

	Presence of occupational safety concepts	Level of knowledge of the students of occupational safety
Third-degree students	6,31% - 8,25% classes	2.79
Fourth-degree students	1,72% - 3,39% classes	3.35

Learning about occupational safety in the formal education system

Students of final grades of secondary vocational and technical schools as respondents were asked to rate the queries in the field of occupational safety by choosing a response on a 5-point Likert intensity scale [1,3]:

- 1 completely disagree
- 2 mostly disagree
- 3 I do not know (neither agree, nor disagree)

- 4 mostly agree
- 5 completely agree

The obtained statistical parameters of Learning about Occupational Safety in the formal education system are presented in Table 5 [9].

Table 5. Arithmetic mean (M), standard deviation (σ) and coefficient of variability of dependent variables of the research ($V\%$)

	Learning about occupational safety in the formal education system	Lowest rating	Highest rating	Arithmetic mean - M	standard deviation- σ	coefficient of variability - $V\%$
1.	Occupational safety and health should be taught as a special subject in the curriculum for secondary vocational and technical schools	1	5	3,36	1,08	29,77
2.	I need the knowledge about occupational safety for my professional work	1	5	<u>3,84</u>	1,06	27,72
3.	Students who are trained for some profession (any) should know the basic concepts of occupational safety	1	5	3,81	1,12	29,42
4.	The concept of occupational safety appears in vocational subjects but is not given enough attention	1	5	3,05	1,18	38,82
5.	I learned more about occupational safety from other sources than from school subjects	1	5	3,33	1,26	37,73
6.	The knowledge about occupational safety I acquired in school subjects is adequate for my future work	1	5	2,60	1,18	45,33
7.	In secondary vocational and technical schools, the subject Occupational Safety is as necessary as any other subject	1	5	3,68	1,11	30,24
8.	I am familiar with all hazards and dangers that may arise during the practical training in my profession	1	5	3,00	1,21	40,40
9.	I am familiar with all occupational safety measures during the practical training	1	5	3,06	1,29	42,10
10.	During my practical training, my safety was jeopardized	1	5	<u>2,58</u>	1,43	55,30
	Σ - sum	1	5	3,26	1,19	37,68

Correlation testing

Correlations between independent and dependent research variables were tested by Pearson's correlation coefficient. Correlation coefficient (r) has limit values: Degrees of freedom ($N-2$) = 506-2 = 504. Correlation significance levels [1]:

- A very significant correlation**-the risk of accepting the existence of a correlation between two indicators is less than 1%, $r \geq 0,115$

- Significant correlation-the risk of accepting the existence of a correlation between two indicators is less than 5%, $r \geq 0,088$

The tested correlations of the dependent and independent research variables are shown in Tables 6 and 7.

Table 6. Correlation between dependent variables of Learning about occupational safety in the formal education system and independent variables of a Student profile and Level of student awareness of occupational safety

	Dependent variables	Research variables			
		Student profile			Occupational safety and health knowledge level
		1.	2.	3.	1.
	Learning about occupational safety in the formal education system	Sex	type of school	level of vocational education	
1.	Occupational safety and health should be taught as a special subject in the curriculum for secondary vocational and technical schools	0,096*	0,022	0,135**	0,230**
2.	I need the knowledge about occupational safety for my professional work	0,056	0,048	0,170**	0,306**
3.	Students who are trained for some profession (any) should know the basic concepts of occupational safety	0,08	-0,004	0,174**	0,373**
4.	The concept of occupational safety appears in vocational subjects but is not given enough attention	0,008	-0,004	0,131**	0,186**
5.	I learned more about occupational safety from other sources than from school subjects	0,034	-0,036	0,168**	0,123**
6.	The knowledge about occupational safety I acquired in school subjects is adequate for my future work	0,092*	-0,058	-0,005	0,057
7.	In secondary vocational and technical schools, the subject Occupational Safety is as necessary as any other subject	0,042	0,058	0,133**	0,240**
8.	I am familiar with all hazards and dangers that may arise during the practical training in my profession	0,071	-0,046	0,009	0,149**
9.	I am familiar with all occupational safety measures during the practical training	0,020	-0,099*	-0,053	0,060
10.	During my practical training, my safety was jeopardized	-0,007	-0,040	0,052	0,000
	9/30 i 7/10	2	1	6	6

Table 7. Statistical analysis of coefficients of correlation of dependent variables of Learning about occupational safety in the formal education system and independent variables of a Student profile and Level of student awareness of occupational safety**1. Gender**

Women give:

- Higher rating variables: 1 ($r = 0,096^*$) i 6 ($r = 0,092^*$)

2. Type of school

Respondents from other schools in relation to the Technical School provide:

- Lower rating of the variables: 9 ($r = -0,099^*$)

3. Level of vocational education

Respondents who have a higher level of professional qualifications give:

- Higher rating variables: 1 ($r = 0,135^{**}$), 2 ($r = 0,170^{**}$), 3 ($r = 0,174^{**}$), 4 ($r = 0,131^{**}$), 5 ($r = 0,168^{**}$) i 7 ($r = 0,133^{**}$)

1. Occupational safety and health knowledge level

Respondents who have a higher level of occupational safety information give:

- Higher rating variables: 1 ($r = 0,230^{**}$), 2 ($r = 0,306^{**}$), 3 ($r = 0,373^{**}$), 4 ($r = 0,186^{**}$), 5 ($r = 0,123^{**}$), 7 ($r = 0,240^{**}$) i 8 ($r = 0,149^{**}$)

Source: Survey results

The analysis confirmed the correlation between the student profile and Learning about occupational safety in the formal education system because 9 out of 30 possible variable correlations were confirmed, i.e. 30% of the possible correlations.

Correlation between student awareness and Learning about occupational safety in the formal education system was confirmed because 7 out of 10 possible variable correlations were confirmed, i.e. 70% of the possible correlations.

CONCLUSION

The analysis of the syllabi and curricula for secondary schools shows that occupational safety is not an independent subject of study in the formal education system. In secondary schools, students become aware of occupational safety through teaching units within other subjects. Fourth-degree occupations have an insufficient number of classes to gain knowledge of occupational safety. This information clearly indicates that students are not able to adopt basic concepts and knowledge in the area of occupational safety during their formal education. Third-degree occupations (crafts) have a sufficient number of classes (occupational safety is not a separate subject) where they learn about occupational safety; however, statistically, this number of classes is insufficient while the level of knowledge gained is low. Most of the lessons related to occupational safety and health are taught within practical training classes which are attended outside school (in manufacturing organizations), where a nonprofessional (in terms of occupational safety expertise) is unable to properly transfer the knowledge to students. The analysis of the results shows that statement 2 - I need the knowledge of occupational safety to work in my profession - had the highest average rating of 3.84. This means that students recognize the importance of acquiring knowledge in the field of occupational health and safety within the formal education system. The statement 6 - The knowledge about occupational safety I acquired in school subjects is adequate for my future work - had a rating below the average of 2.60, which means that occupational safety and health in the formal education system does not prepare students for active and safe participation in work. What is encouraging is the fact that the statement 10 - During my practical training, my safety was jeopardized - had the lowest rating of 2.58, according to which there are no frequent situations that jeopardize the safety of students during practical training.

Based on the conducted survey and the results obtained, and the analysis of curricula in the secondary schools of RS- B&H, it is clear that the teaching of occupational safety is not adequately represented. Within the formal education system, occupational safety education is based on practical teaching within craft professions. In other occupations, systematic learning about occupational safety does not exist,

which is evident from the opinions of students. In the survey, the students answered they would like to learn about occupational safety during their education. What is worrying is the fact that 6% of students do not know anything about the concepts of occupational safety and 30% of the respondents in the survey do not have even the basic knowledge (according to pedagogical norms) of the subject matter. The research reveals that occupational safety education in the current formal RS-B&H education system is not sufficient and that the students are interested to acquire knowledge related to it. Learning about the concepts of occupational safety is carried out through informal learning, where only the Occupational Safety Act stipulates one-day training.

The system of education in the Republic of Srpska-B&H is in many respects coinciding with the education systems in the Republic of Serbia, Montenegro, and Federation of Bosnia and Herzegovina, which implies that the problem of occupational safety studies in the formal system is not local but regional.

The results of the conducted analysis and the fact that the only possibility of learning about occupational safety is through practical training lead to the conclusion that it is necessary to react systematically and introduce the subject Occupational Safety and Health into secondary vocational schools (1 hour per week during the school year), and into other schools through non-compulsory instruction or other forms of school activities (clubs, workshops, semi-annual and annual lectures). In this way, students would adopt a certain level of theoretical knowledge about the importance of occupational safety during formal education. The acquired knowledge would increase safety during practical training and enable easier involvement in security processes and procedures within a company.

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ACKNOWLEDGMENTS

This work is supported by the Serbian Ministry of Education and Science (Project No. III44006, and III42006).

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ZAŠTITA NA RADU U SISTEMU SREDNJEG STRUČNOG OBRAZOVANJA U REPUBLICI SRPSKOJ-BOSNI I HERCEGOVINI

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Rezime: Obrazovanje za zaštitu na radu je neophodno u čitavom sistemu formalnog obrazovanja, a posebno u sistemu srednjeg stručnog obrazovanja. Srednješkolosko obrazovanje i osposobljavanje za zaštitu na radu podrazumeva sticanje konkretnih znanja i razvoj određenih psihofizičkih osobina, sposobnosti, veština i navika za bezbedan rad, zaštitu zdravlja i šire, životne sredine (širi i kompleksniji aspekti prirodno-naučnih, tehničko-tehnoloških i društvenih znanja), razvoj radnotehničke, zdravstvene i ekološke svesti, etike i kulture; profesionalno usmeravanje i psihofizičko pripremanje prema zahtevima kulturnog i bezbednog ponašanja u radnoj i životnoj sredini - u struci i zanimanju za koje je učenik ispoljio određeno interesovanje i sposobnost i dr. Stečena znanja su dobra osnova za njihovo dalje proširivanje i usavršavanje kako u radnom okruženju tako i u sistemu visokoškolskog obrazovanja. Analiza postojećeg stanja u Republici Srpskoj pokazuje da se sadržaji zaštite na radu izučavaju integralno - u okviru drugih predmetnih oblasti srednjeg stručnog obrazovanja. Rezultati istraživanja impliciraju potrebu i značaj uvođenja posebnih predmetnih sadržaja za zaštitu na radu u sistemu srednjeg stručnog obrazovanja u Republici Srpskoj.

Ključne riječi: zaštita na radu, srednje stručno obrazovanje, učenik.