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IMPORTANCE OF NATURAL DISASTER EDUCATION - CASE STUDY OF THE EARTHQUAKE NEAR THE CITY OF KRALJEVO- - First results-

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Abstract: Natural disasters education is a very important part in the prevention of natural disasters. If it is applied from an early age, it would be successful and will yield positive results, namely to reduce the risks and consequences. A good platform for the implementation of natural disasters education is the formal aspect of education, precisely, subjects in elementary and secondary schools, including the geography as an interdisciplinary science which provides broad opportunities for understanding of all aspects of natural disasters and thus plays an important role in preventing. Given the existing content of natural disasters in the curriculum, as well as in geography textbooks in which mainly deal with natural processes and partly their consequences, we conducted a survey of school-aged children which included checking of acquired knowledge, perception of risk of seismic hazard and response to a specific disaster. Selected territory was the town of Kraljevo, which was hit by an earthquake magnitude 5.4 on November 3rd 2010. The research was conducted through a survey testing of elementary school pupils. The questions are grouped into four segments: issues related to the activities and feeling of pupils "during an earthquake," feelings and activities "after the earthquake", "sources of knowledge about earthquakes" and "tipes of training they need." The results were analyzed by statistical methods, which have proven hypotheses relating to each of the above segments. They showed that only 12% of pupils responded correctly at the time of the earthquake, that 60% of pupils are not aware that their reaction was wrong during the earthquake, the earthquake has left a significant impression on the 61% of pupils and almost all pupils expressed an interest in training on appropriate behavior during disasters.

Key words: earthquake, city of Kraljevo, prevention, primary school pupils, geography.

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Introduction

Natural disasters can have significant and sometimes catastrophic consequences for the population and the areas in which they live and work. The economic, social and environmental effects can impinge on economic developments, lifestyle, emotional and psychological well-being of humans and animals—leading to disfunction of human society and degradation of natural resources. The extent of the damage depends on the intensity and frequency of natural hazards, and vulnerability of elements of the affected areas (population, buildings, infrastructure, etc.). Therefore, predicting the hazard event, and strengthening the resilience of people and property, significantly reduces the negative impact of hazards; by influencing one of the two factors, it is possible to reduce the risks, as described by the Pressure and Release (PAR) model (Wisner, Blaikie, Cannon & Davis, 2004). Since some natural processes are still largely unpredictable (e.g. earthquakes) the focus is placed on reducing the vulnerability of the population. In view of the above facts, since the 80-'s of the 20th century, risk and vulnerability assessment gained strategic importance in the process of risk reduction, which is taken as an important component of the general policy of every country (ISDR, 2008).

In order to mitigate the consequences of natural disasters it is necessary to build resilience of the society, which is achieved through prevention. In this context, the Hyogo Framework[2] for the 2005-2015 period—a program of actions for natural disaster risk reduction—has defined five priority actions, of which one involves the use of knowledge, innovation and education to build a culture of security and resilience at all levels (Hyogo framework..., 2005). Numerous studies have shown that the number of victims and those injured in natural disasters is far less if the community is aware of the risks, if the members of the community are informed about natural disasters and have correct behaviour under these circumstances (Morrissey, 2007; King & Gurtner, 2005). From the above, it follows that the role of education in prevention is multiple, especially if it focuses on children. Education is a platform for building a culture of prevention and resilience of the community[3]. Education of children fulfills two

[2] Hyogo Framework for Action 2005-2015: Building the Resilience of Nations and Communities to Disasters

[3] Name of the UNISDR campaign „*Disaster Risk Reduction Begins at School*" (2006-2007) and publications which are parts of it (*Let Our Children Teach Us! A Review of the Role of Education and Knowledge in Disaster Risk Reduction*; 2006; *Lessons for life - Building a culture of safety and resilience to disasters through schools*, 2006; *Towards a Culture of Prevention: Disaster Risk Reduction Begins at School - Good Practices and Lessons Learned,* 2007) point to the importance of the school as institution and education in natural disaster prevention.

important goals: it lasts a lifetime, and the children pass their knowledge on to parents and community members. Not surprisingly, Stoltman, Lidstone & Dechani (2007) call them "teachers at home and in the community," as confirmed by Finnis, Standring, Johnston, & Ronan (2004) who identified them as the holders of education with the ability to educate people around. Schools are an important link between children, families and the community in the process of preparing for unexpected events that may occur due to natural hazards of higher intensity (Johnston et al., 2011); children learn at school about natural processes and may recognize the indicators of impending natural disasters. A clear example is a ten-year old girl, Tilly Smith who—thanks to her geography classes where she learnt how to identify the signs of an oncoming tsunami—rescued about 100 people in Thailand, in 2004 (King & Gurtner, 2005).

An important goal of the education about natural disaster risk reduction is to convey a positive attitude and respect for the environment in general; the information that surrounds us, and is related to the above topics, does not necessarily lead to the education of the population, and changes in behaviour. More specifically, education about natural disasters should provide not only information, but also thorough understanding of the issues, as well as attitudes and skills that will enable adequate response in a crisis. In such an approach, formal education represents the basis on which the teachers should build further: transform information into knowledge and ideas into action (Murdoch, 2007). Disaster risk education is defined as the transfer of general (thematic, organizational, technical) knowledge and skills about natural disasters and risks from the professionals in the relevant institutions (schools, courses), to pupils or trainees (Kuhlicke, 2011). Various authors perceive natural disaster education as an integral part of national education strategy, which promote and creates successful and sustainable societies that can maintain educational activities, thereby saving lives and reducing damage. Morrissey (2007)—who has been promoting innovations in academic curricula—emphasized the need to increase awareness about disasters among the school population, and the necessity to adjust the contents of plans and programs according to the types of hazards that occur in the region and at the national level. In addition, many authors believe that geography has a long tradition in the study of natural hazards / natural disasters and vulnerability (Fucsh, Kuhlicke & Meyer, 2011; Tobin & Montz, 2011), but more importantly, that geography can respond to the requirements for the prevention and management of natural disasters, it studies space, time, environment, society, relationships and correlations (Hualou, 2011). Addressing the theoretical and methodological problems of geography, Grčić (2001) points out that the future of geography lies in interdisciplinary topics, which include also natural disasters.

Milošević, Kovačević-Majkić, Panić (2012) previously wrote about the position that natural disaster education has in the school curriculum and geography textbooks in Serbia; quantitative and qualitative analysis shows that the textbooks do not teach about the natural disasters adequately—they mostly describe natural hazards and processes, less their impact and consequences, and they offer almost no guidance on the proper response to situations before, during and after disasters. Of all the natural disasters, only earthquakes and volcanoes are taught as a separate educational unit, in the fifth grade of primary school and the first year of secondary school (National Council of Education, 2007). Positive examples are present in newer editions of fifth grade primary school textbooks (Sitarica & Tadić, 2010; Ćalić & Milivojević, 2012).

Problems and consequences of such situation were felt during the earthquake near city of Kraljevo on November 03, 2010. Earthquake, with the magnitude of 5.4, occurred in the Sirča village, 4 km north of the city of Kraljevo, at 00:56:54; there were two victims and considerable material damage. Over the next six days, 258 earthquakes were registered, with the magnitude ranging from 1.0 to 4.4 on the Richter scale (Republički seizmološki zavod, 2010). Considering that the textbooks do not include information on how to behave during an earthquake aim of our research was to determine the consequences of inadequate training of the population, especially children, during a natural disaster.

This paper presents the results of poll surveys conducted among the pupils of the city of Kraljevo. Here we include the first results that encompassed only primary school pupils.

Methodology

Figure 1. shows the conceptual model of the conducted research, based upon the poll survey of primary school children, aged 11-15 years, from 5th to 8th grade. The poll survey included a sample of 250 pupils, who had filled out questionnaires at school, during the classes. The questionnaire comprised close-ended questions, with multiple-choice answers. The questionnaire covered 17 questions grouped in four segments: issues related to the activities and feelings of pupils "during the earthquake", the activities and feelings "after the earthquake", "sources of knowledge about the earthquake" and "the type of training they need". The survey results were statistically analysed in SPSS software, including descriptive statistics and non-parametric test (Pearson chi-square test).

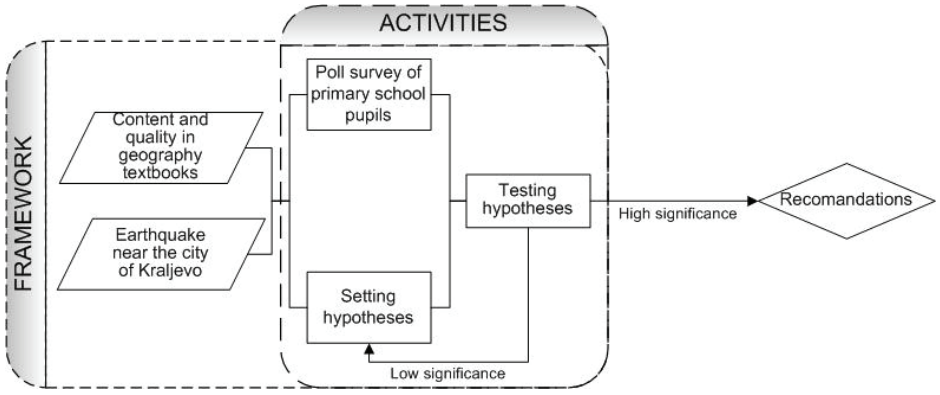

Figure 1. Conceptual model of the conducted research

Based on the results obtained by Milošević et al. (2012) regarding the qualitative content of geography textbooks in Serbia, we set up following hypotheses:

- reaction of the pupils at the time of the main earthquake was inadequate
- pupils are not aware that their reaction at the time of the earthquake was not correct
- pupils' experience of the earthquake has left significant impression on them
- pupils need training in order to behave correctly before, during and after an earthquake

These four hypotheses were tested using the poll survey results of one or more chosen questions for each hypothese.

Results

The poll survey included 250 primary school pupils from territory of the city of Kraljevo. Gender and age distribution of the participants shows that the survey involved 121 boys (48%) and 129 girls (52%), approximately evenly represented by different grades: in the 5th grade - 60 pupils (24%), in the 6th grade - 69 pupils (28%), in the 7th grade - 56 pupils (22%) and in the 8th grade - 65 pupils (26%). In different grades, gender structure varies, so that in the 5th and the 6th grade boys are in majority whereas girls predominate in the 7th and the 8th grade (Figure 2).

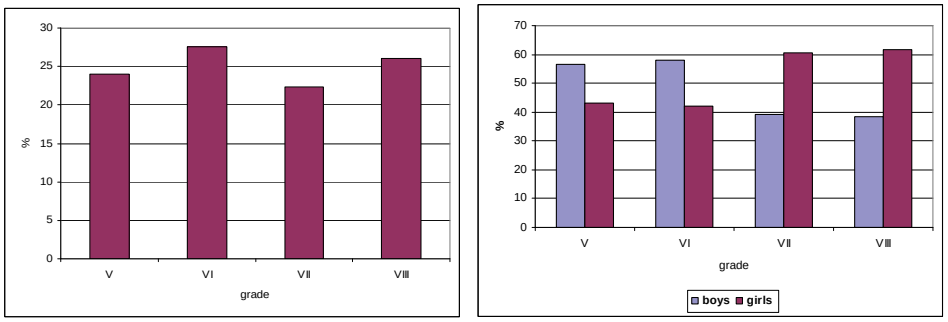

Figure 2. Age and gender distribution of the participants

When asked about their reaction during the earthquake, about 32% of all participants said that "they stayed in the place where they were at that moment", which is more common for boys (52%), than for girls (48%). Also, this response is more common for pupils in the 8th (30%) and the 6th (28%) grade. About 26% of participants was "immediately ran out" (girls 56%, boys 44%), and also this reaction is the most common in the 8th grade pupils (30%). Only 12% of participants responded adequately by "crouching under the table or under the door frame." In general, pupils, both boys and girls, had almost the same reaction at the time of the earthquake, with very little variation and deviation (Figure 3).

Conclusion is that many pupils reacted inadequately during the earthquake, and the type of their response does not correlate with gender or their age (grade). Since the earthquake occurred late at night, when the pupils were at their homes, with their families, it is clear that they did not have to make decisions independently. But, this situation indicates that adult people are not familiar with the proper way of reacting in these situations either. Also, it should not be ignored that about 30% of participants—the boys and the girls equally—

overslept the event. In this case, we decided not to categorize the correctness of the mentioned reaction.

Figure 3. Pupils reaction during the earthquake

When asked how they acted at the time of the earthquake, about 45% of the total number of participants thought "to have acted correctly", with no difference in response between the boys and the girls. About 34% of the pupils said they "did not respond" at the time of the earthquake, which is more common for boys (54%) than for girls (46%), regardless of the grade they attend. About 21% of pupils said that "I did not know what to do, and I had waited for help," which is a frequent response for girls (64%), and the 6th grade pupils (30%) (Figure 4). The aim of this question was to determine how pupils evaluate their own response in a crisis situation, considering they did not receive any formal education on this subject. Analysis of the results revealed that the majority of pupils had inadequate reaction, but failed to realize that—declaring that they had acted properly. About 47% of pupils, "stayed in the place where they were at that moment"; 28% "immediately ran out" and 6% overslept the earthquake. Also, pupils' attitudes and opinions about the actions at the time of the earthquake do not differ significantly with respect to their age and gender, so they can not be linked directly.

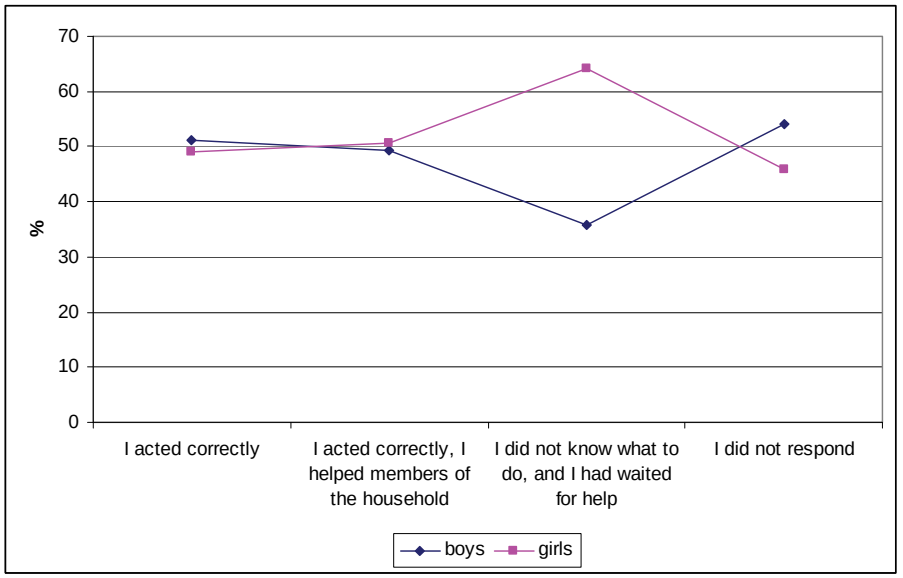

Figure 4. Pupils estimation of their reaction during the earthquake

When asked if they think about the earthquake, 38% of the participants said that "they do not, as if it has never happened," with boys (64%) and older pupils more likely to give such an answer. About 32% of pupils said that they "sometimes think about the earthquake," which is a response more common for girls (66%). About 29% of participants think "that an earthquake will occur again," which is more common for girls (61%), as well as younger pupils. About 2% of participants "do not think about the earthquake, but they dream about it." Overall, results show gender and age dependent variation (Figure 5). For boys (50%) and pupils in the 5th (42%), the 7th (45%) and the 8th (40%) grade, the most common attitude is "I do not think about the earthquake, as if it has never happened", while for girls (40%) and pupils in the 6th (38%) grade, the most common answer is "sometimes I think about the earthquake". The hypothesis that the pupils' experience of the earthquake has left significant impression can be accepted, because 61% of pupils declared that they often or occasionally think about the event, fearing that it will happen again. Although 38% of pupils said they “do not think about the earthquake, as if it has never happened”, we should interpret this statement with caution, because very often the children of that age suppress unpleasant events that have occurred, or hesitate to answer honestly and show some amount of fear (Durkin, Khan, Davidson, Zaman & Stein, 1993).

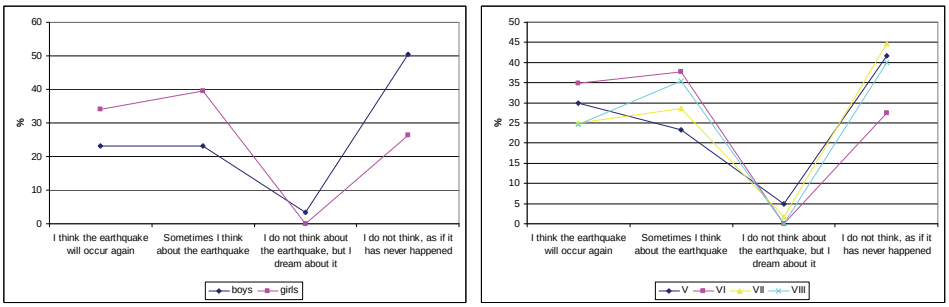

Figure 5. Gender and age distribution of frequency of thinking about the earthquake

On the question about the types of knowledge and training on adequate behaviour during natural disasters— that could also be a part of the school program—about 39% of participants said that "they need to learn how to behave during an earthquake", 31% of participants believe that "they need to learn how to behave during and after an earthquake", about 15% participants declared that "they need a practice session on the required behaviour", while 15% of pupils thought that "they need all types of knowledge (theoretical knowledge and practical training)". The most common attitudes for pupils of both gender, are that "they need to learn how to behave during an earthquake", and that" they need to learn how to behave during and after an earthquake". Also, the correlation of answers to age or grade of pupils shows some variation depending on the type of knowledge and training that has been emphasized as required (Figure 6). As we hypothesized, the pupils know that there are certain rules to follow in emergency situations, but they are not familiar with them; they should be, therefore, included in the content of geography textbooks.

About 52% of participants said "that after the earthquake, they have become more interested in natural disasters and have sought to read about this topic on the internet or in the books"; 48% did not express the same interest. For boys, this involved 50% positive and 50% negative responses, while, for girls, the ratio was slightly different, in favour of positive responses (54%), compared with 46% of negative responses (Figure 7). Also, only in the 6th grade, pupils showed an increasing interest in natural disasters (62%) after the earthquake (Figure 7).

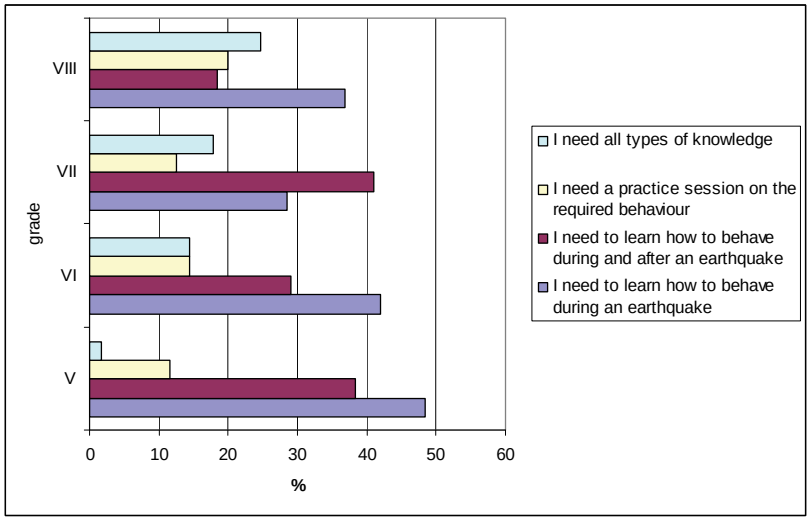

Figure 6. Required forms of knowledge in the crises event

At the same time, the analysis of results showed that the proportion of boys who got more interested in this subject, did not differ significantly from the proportion of girls that expressed the same interest, suggesting there is no relation between gender and interest in natural disasters that appeared after the earthquake. The same was true for pupils' age or grade they attend—no relation to the interest they showed in natural disasters.

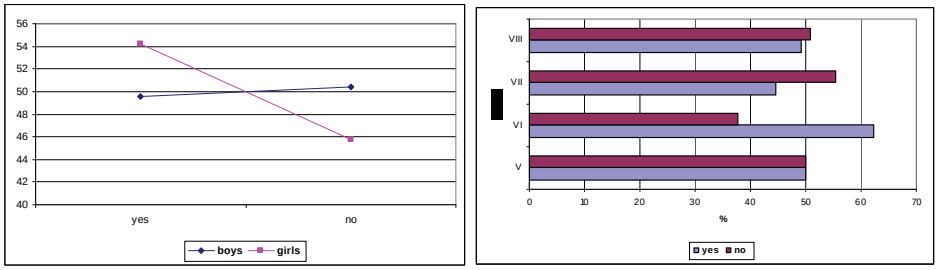

Figure 7. Change of interest for natural disaster after the earthquake

Conclusion

The number of victims and the injured people during natural disasters is significantly reduced if communities are aware of the risk and if people are familiar with proper measures which can reduce the consequences. A population that is educated on what to expect and how to behave during natural disasters contribute to the protection of life and property (Morrissey, 2007).

The research results presented in the works of Ronan, Johnston, Daly & Fairley (2001) and Ronan, Crellin & Johnston (2010) support the hypothesis that children who are involved in the school educational program about natural disasters show a more realistic perception of risk, they are less afraid, have more knowledge and greater awareness of the importance of knowing the correct behaviour, compared with the children who were not involved in this form of education. Children who are included in the education about natural disasters are less likely to get hurt or fatally injured.

The Report on the implementation of Hyogo Framework in Europe for the period 2009-2011 (ISDR, EUR-OPA and GFDRR, 2011)—related to the use of knowledge and education to build a culture of prevention and resilience of the society to natural disasters—shows significant variation in the success of implementing disaster risk reduction programs in the textbooks and through organizing adequate training; Georgia, Bulgaria and Turkey serve as positive examples of innovative approaches to education about the risks.

The first results obtained by conducting surveys among primary school pupils in the city of Kraljevo, confirmed our hypotheses. The hypothesis of an inadequate reaction of pupils at the time of the earthquake was confirmed by the fact that only 12% of pupils responded correctly at the time of the earthquake. 60% of pupils have not realized their behaviour was incorrect, confirming our hypothesis that pupils are not aware that their reaction at the time of the earthquake was inadequate. About 61% of primary school pupils, to some extent, still think about the earthquake or expected it to occur again, thus confirming the hypothesis that the experience of the earthquake has left an impression on them. About 52% of the pupils were propelled to find additional information on natural disasters, which is closely related to the fact that almost all the pupils have shown interest in training on appropriate behaviour during disasters; this confirms our last hypothesis that the pupils need training on appropriate behaviour before, during and after an earthquake.

Based on the literature and the survey results, we can conclude that it is necessary to make the guidelines on appropriate ways to respond to natural disasters, as a part of formal education in general—and not just at the level of individual, positive examples.

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