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THE SOCIO-POLITICAL AND ETHICAL DIMENSIONS IN MATHEMATICS EDUCATION IN BOSNIA AND HERZEGOVINA: SOME DILEMMAS AND CHALLENGES

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Abstract. Bosnia and Herzegovina [B&H] is a very specific socio-political creation. This community is under the protectorate by the so-called international community. In B&H there exist two entities (The Republic of Srpska [RS] - 49% of the territory and the Federation of Bosnia and Herzegovina [FBH] - 51% of the territory) and the 'Brčko District' in which only three the so-called constitutive people enjoy almost equal rights. Entities and the District have a significant number of elements of statehood. The FBH consists of 10 almost independent cantons (quasi-state).

Education is in the full competencies of the RS, the District and each individual canton. In such a political-economic environment, collective education of all levels is realized. Therefore, all kinds of education are under the political and financial (only for public institutions) coverage of the government's administrations of the RS, the District and the cantons.

In order to present to the world academic community dilemmas and what kind of challenges the mathematical education is this socio-economic-political situation in, we have intention to open a dialogue on the political and ethical dimensions of mathematics education in B&H. In this, relying on the orientations and attitudes of the international community of researchers in mathematical education, we will try to see the big picture, identify and politically correctly describe the specificity of mathematics education in B&H.

We deeply believe that such texts could be one of the supports to our academic community in negotiating with our socio-political community on raising the quality of mathematics education in B&H.

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INTRODUCTION

Education is a strategy designed by a political society for disseminations and promotion of how to be well supplied with information (scientific knowledge, technical-technological proficiencies and useful economical-social-humanistic information), creativity and feeling of identity with the community. By promoting and supporting the development of creativity, we mean conceptualizing, designing and shaping such social milieu that enables people to recognize and develop their skills, proficiencies and abilities. In this, we especially mean the ability to perceive rational thought and demonstrate conclusions from the premises. By promoting identification of one person with his own social community we mean accepting the history, culture, customs and social norms of that community as elements of his own personality and integrity. Often, many members of a social community on their identification with their whole community view as their own specific singularity. In addition, almost every social community encourages and supports this feeling of singularity (in relation to others and unlike) among its members by persuading them that the political community is a guarantee of their human, civic and citizenship rights. There are beliefs among many educational system researchers that during history educational system of any socio-political community in all civilizations are focused in two issues:

- Favors its own customs and its social norm from the past as values to be respected; and
- Promoting promising future.

In this, we think that the political commitments of a social community embedded in educational systems contains, inter alia, the aspect of the old (customs and social norms) and the aspect of the new (creativity, forecasting successes and strengthening the feeling of domiciliary status). The strategic instruments for achievement these goals are the curriculum. It is a common practice in us that the curriculum of a school subject in relation to one school year contains the following parts:

- Teaching goals;
- Teaching contents for the observed school class;
- Desirable teaching outcomes; and
- Methodical suggestion.

In our educational system, it is not a practice of curriculum designers to offers methods for transforming and teaching curriculum content.

Mathematics, mathematics education and research in mathematics education

Despite the effort of the entire academic community to understand the nature of mathematics, mathematics education, the teaching of mathematics and learning mathematics as similar but very different phenomena and despite significant achievements in these endeavors, we are still at the beginning of discovering the characteristic of these phenomena. In the field of Research in Mathematics education, it is generally accepted that the subjects: (1) Mathematics, (2) School mathematics and (3) Mathematical and mathematical-methodical knowledge which are necessary for teachers in schools are similar but significantly different between each other. This should be added domain that covers the understanding of the method teaching mathematics and students' learning. In modern literature covering this academic domain, recently (over the past twenty

years, approximately) sublimated classifications of knowledge necessary for meaningful, designing and implementing mathematical education at all levels of education.

Relying on the experience of over 40 years of work as a lecturer in mathematics high schools and some different mathematical courses at several universities, including a number of courses 'Mathematics teaching methodology' for primary school teachers, mathematics teacher in middle and high schools, we can estimate that our social and academic society gives insufficiency attention to modern trends in mathematics education:

- Our social community (Ministry for Civil Affairs of B&H; The RS Ministry for Sciences and Technology and City Administration of Banja Luka) took the view that there is no social interest in mathematical science, activities of the Scientific Society of mathematicians Banja Luka and Research in Mathematics Education.
- In addition, in our school system it is not unlikely that the teachers perform their work with insufficient dedication and that the evaluation of student success in mastering mathematical literacy is done in an unprofessional way.
- In our deep conviction, the policy makers of our socio-political society and the majority of members of our academic community in mathematics and mathematics education think in traditional view: mathematics and mathematics proficiencies are significant to them only if there are useful application where mathematics is involved.
- In our educational system, teaching of mathematics is realized within the following frameworks:

  The Ministry of Education of the RS prepares the draft of Law on Elementary and proposal of the Law on High School education.

  The National Assembly of the RS adopts these laws. These laws determine the principle-philosophical orientations of the social community that must be involved in the realization of mathematics education. These laws also include a selection of theoretical foundations (the so-called traditional approach) of teaching mathematics.

  The Minister of Education adopts the Curricula of Mathematics education programs for each class on the proposal for the Pedagogical institute. This institute has authorization related to the mathematics professions although there is no formal staff for it. Teachers in primary, middle and high schools do not have the authority to independently design any element of teaching – they are only implementers of the teaching process.

Values in mathematics education

Although our academic community hardly comprehends the affective aims in mathematics education, these aims cannot be ignored. In the studies of affective goals of mathematics teaching, attitudes, beliefs and values have to be taken into consideration. Many researchers argue that values are the most important elements in the process of rising the quality of mathematical education and students learning of mathematics [14]. Bishop [7] classifies value in mathematics classrooms into three different types: general educational values, mathematical values and mathematics educational values. We are convinced that it is more important to stimulate and encourage the development of emotional components as reflections on the affective goals of mathematics education. Among the most important of these components, we classify the development of various forms of mathematical thinking. In accepting this commitment, we have taken the view that mathematics teachers should create social-academic milieu in mathematical

classrooms by the careful selection of teaching assignments. This will enable students to supplement and expand their vocabulary and enrich their evolving cognitive levels with components of logical and mathematical thinking [39].

Terminology used about attitude, belief and value concepts becomes complementary. We recognize that acceptance of existence and research of values in mathematics education began about twenty five years ago although some texts appeared much earlier [27], [51]. For identifying and describing of some components of mathematics education that we associate with the social and political platforms of observing this education, the reader can look at some of the following texts for example: [8], [9], [14], [15], [16], [20], [21], [25], [26], [28] [45], [46]. Until the mid of the 20th century, the concepts of value-free culture and value-free education were mostly popular. Those days were dominated by the positive beliefs which did not attach any specific social value systems, were based on objective, rational and empirical criteria and established as a result of technological developments and scientific discoveries. Old theories ignored the importance of moral factors.

The transmission of values and culture is one of the aims of education. Schools and public media (television and social networks) are key institutions where this function is realized and sustained. Therefore, values appear in school's goals, activities, and curricula as well as in the requirements set by the state.

We fully accepted that mathematics is a human activity since it is a producer of human spirit. Especially, mathematics education is a human activity. This activity exists only in human environment and as such we should look at it from all the platforms that observe human activities.

Socio-political dimension in mathematics education

Our reflection on the social, political and ethical dimensions of mathematics education will be presented with more details on these aspects in the RS. In our previously published texts [40], [23]; [24], [42], we have presented some of our finding on these aspects of mathematics education.

What is considered the socio-political dimension o mathematical education? – is a natural question that is always posed when analyzing the principle-philosophical orientation of the mathematical education of a social community. Should we analyze the relationship between teaching mathematics and mathematics teachers according to socio-political issues in the world? This last aspect is taken on by some researchers in mathematics education. Others consider that the political dimension of mathematical education should include the choice of goals and tasks of teaching mathematics in each particular class in elementary and high schools. Members of this academic school accept orientation that mathematical contents and teaching methods should not be subjected to a political dimension. We believe that this aspect may be acceptable in democratic states that are strongly concerned with the professional opinion of their mathematical community. The theoretical concept of the term 'socio-political dimension of mathematical education' should be applied to all socio-political systems to the present time and in near future.

In this text, under 'the socio-political dimension of mathematical education', we will mean all the elements of that education in where the socio-political community is involved in any way directly (policy makers or policy implementers) or indirectly (by suggestive public opinion or by self-limiting of the mathematics teachers). In our school system, many times it happened that politicians through the Dean of a faculty at the University and even the Rector of the University are almost openly pressing teachers of mathematics and teachers of methodology of mathematics to satisfy their demands for different evaluation of student drlrcted in some isolated cases. In one

of such cases, after a rectory continuous pressure, one university professor of mathematics died under unexplained circumstances [13]. In another case, after years of maltreatment with the elements of religion chauvinism and national intolerance by the dean of the Faculty of Sciences, the university teacher left the University[1]. In the third case, it is known that the dean of the Faculty for teacher education independently and beyond his legal authorization demanded that the group of students selected by the his own choice to be recognized as having passed the exam of the methodology for mathematics teaching outside the regular assessment of student success and without the consent of the responsible teacher. Such cases are not a rarity in our educational system. These and analogous issues have one point in common: almost complete indifference of the academic community as a reflection on these events. Such events have a significant impact on the formation of belief among members of this community that the standards of mathematics education should be significantly lower that the standards or the community of mathematics teachers now recognizes. This last phenomenon should be covered by the term 'socio-political dimension of mathematics education' and, as such, it should be the subject of perception and deeper analysis of the researchers in mathematics education. In particular, researchers should consider the consequences of such orientation of a socio – political community. The reasons that argue against these assessments include, among other things, our academic obligation to observe, to make notes and to study general characteristic and particular peculiarities in mathematics education of a socio-political community.

Ethical dimension in mathematics education

Ethics is a philosophical discipline that has morality, moral values, moral phenomena and criteria of morality for its object of research [7]. As a philosophical discipline, ethics can be determined as a theory of morality. Therefore, the term 'ethics' should be distinguished from the term 'morality' and notions covered by these terms. The term 'morality' has more meanings. One aspect of this notion is its value of specific quality which recognizes the domain of its possible applications. The second aspect is the fact that by this notion a part of our socio-cultural reality is covered. Moral value can only be applied to human activities and aggregate of human processes. Human actions always follow intention and decision to implement these intentions. This implies the existence of 'free will'. This free will is a prerequisite for attributing responsibility for doing. Moral values are universal and moral reasons are global. Although ethics deals with all human actions, moral values limit ethics to the moral part of human practice. Since the application of moral criteria for assessment is a human activity, one must assume the existence of some narrow indeterminacy in these applications.

According to the above, the criteria of moral values can be applied only to human actions, to reflection of these processes, and to the results of these procedures or reflections. In this text, under the term 'ethical dimension in mathematics education' we mean the application of moral criteria for assessing the moral admissibility of the action of persons involved in the process of mathematics education in any way including the following: the relationship between the socio-political and academic community towards mathematical knowledge and mathematics education; the choice of the principle-philosophical orientation involved in the curricula of mathematics education in the school system; the commitment made in designing the curriculum; adopted attitude related to mathematics education; building, acquiring and facilitating the acceptance of

[1] That the reader of this text would not be in doubt about how this could happen at the beginning of the 21st century, we will add that the college dean asked only this particular teacher „to submit reports every day for every hours": That's even the Nazis did not ask from Jews during the World War II. This correspondence between the Dean and the teacher was conducted through the official faculty mail and it was preserved.

beliefs; designing standards for the necessary outcomes of mathematics education; teacher selection and application of methodical technologies in teaching mathematics; recognition and acceptance of socio-mathematical norms; teacher application of algorithms for evaluating students' success in mathematics learning; students' exposure of adopted mathematical proficiencies; and so on.

For example, the decision of the designer of the curriculum of philosophy studies at the University of Banja Luka that their students do not even have an optional opportunity to learn about elements of mathematical logic can be subjected to an assessment of the value of moral acceptability from the aspect of the quality of prospective teachers of philosophy. Similarly, since the Law of elementary and the Law of high school education of RS does not provide the possibility that the choice of philosophical orientation in mathematics education (the traditional approach of some of the contemporary theories of mathematics education) will be left to the realizers of teaching mathematics, it is possible to evaluate the moral justification of this relationship to socio-political community towards the academic community of teachers of mathematics. Also, these laws do not provide the possibilities of 'differentiated teaching' in mathematics classrooms. This choice can also be a subject of moral qualification from the aspect of perceiving the differences of pupils in cognitive development and their parents with commitments on the horizon of school mathematics. A very important example of the possibilities of assessing moral values in mathematics education is the teachers' choice of cognitive and affective goals of teaching mathematics (according to Bloom's taxonomy) as well as their interrelation for each class in primary and high education made by teachers: whether in an effort to develop students' mathematical proficiencies (according to a well-known book [30]) they insist only on procedural skills, or give enough attention to the development of the other proficiencies. In other words, do teachers think that solving mathematical tasks and problems is more important than conceptual understanding and/or students' recognition and acceptance of logical and various forms of mathematical thinking?

Let us recall, ten years ago, the question was raised: "What does it means to establish an ethical perspective on mathematics in action?" [47]. Of course, we are using this opportunity to inform the readers of this text that in this article there will be no question about moral dilemmas in research in mathematics education and the design of reports on such research. With this commitment, we do not oppose in any way the existence, academic interest, and necessity of perceiving ethical problems in this last mentioned research domain (see, for example: [3], [48], [49]. In addition, in the domain 'Research in Mathematics Education' the term 'Ethnomathematics' [1] is in use for more than 40 years, which should cover the specific of mathematics education in various socio-political environments. According the words of its designer [2], this term should not be identified with term 'Ethnic – Mathematics'. The 'program Ethnomathematics' work with different cultural environments and, as an ethnographer, try to describe mathematical ideas and practices of other cultures. In his text [2], the author pre-cover this term and its use with the slogan "The political and ethnical dimension of mathematics education".

What is our intention with this text?

Generally speaking, children in our social community (B&H) who become pupils at the beginning of this century are intellectually more capable that generation of children fifty year ago. They were born in socially healthy environments from parents who all were educated enough to enable them to provide unhindered development. Teachers who teach mathematics in primary and middle schools are mathematically literate. Teachers of mathematics in high schools, if they

studied at public universities, are well-mathematically educated. We believe that they are trying to achieve good results in the teaching mathematics. However, despite these efforts, quality results are not achieved. The previous statement was based on the following facts: In the previous school year in the RS, internal testing of elementary school pupils was conducted in order to gain insight into the actual state of mathematical literacy of the school population. Collected feedback is more than unsatisfactory. Almost half of the pupils have elementary schooling with excellent success. This should mean that children are enrolled in high schools with sufficient mathematical proficiencies. They should follow, understand and accept new mathematical concepts and processes associated with them without major problems. Although most of high school teachers say that the mathematical literacy of the elementary school pupils is very low, almost all high school students gradually finish their education. In this way, insufficiently high-quality mathematically educated candidates apply for enrollment at the University. In what way our social and academic communities fallen into such an unfortunate situation?

In this article we will pay attention to certain segments of mathematics education in our school system which, in our opinion, are the weak points of this system. The system contains of Elementary school (Primary and Middle classes) and secondary schools (Gymnasium – classical high school, technical school, medical school, economic school, etc.). Additionally, in this description, we intend to highlight the phenomena and causes of those phenomena that we think are obstructions in the mathematical education of the school population in our socio-political community. During the process of our description of observed failures and obstacles in mathematics education in our school system, we will evaluate their social justification and/or moral acceptability from the aspect of the expected quality of that education.

The discussion of ethical elements in mathematics education has been present in research in mathematics education for the past twenty years (See, for example: [6], [11], [12], [17], [18], [31], [51]. However, in almost all such texts that were available to us, we were not able to find any concrete example of accessing the moral evaluation (acceptability) of the actors' behavior in mathematics education and/or product and the consequences of their actions. Several examples of how components of the mathematics education can be treated as elements of socio-political influence on this education can be found elsewhere [42]. Also, several examples of thoughts about individual issues in mathematics education to which some scales to evaluate moral acceptance have been applied, can be found in [44].

It is quite justifiable to ask ourselves and others the following question: "What do we achieve by listing some examples of issues in mathematical education?" We also have a question: "What is the academic/research objective of registering and analyzing phenomena, states and decision made in mathematics education to which criteria for evaluating moral value can be applied?" First, we have an obligation to perceive, recognize, register, describe and analyze phenomena in mathematics education which we consider presenting issues that have a significant impact on the integrity and quality of that education. Secondly, our commitment is to look at such phenomena with an imaginary, desirable and idealized system of mathematical education, logically consistent and based on contemporary scientific knowledge, which includes both the integrity of that system and teaching staff in it, and the socially acceptable success of students of that system. In this way it is possible to bring value judgments about the social (non-)justification of registered issues, but also their moral admissibility. Thirdly, we deeply believe that the social-political situation in our country will change in favor of the general good of the majority citizens. We expect that our social reality, now recognizable by a large number of elements that characterize the 'feudal system' – the authority of one man and the great of privileges and influence of the priesthood – evolve into a society with civil values and considerably more social justice. If, and when this happens, this text

can be a reliable basis for the academic community in negotiating with the social community about raising the quality of mathematics education in our school system. In addition, this article can also be support the future effort of the academic community to restore the autonomy and strengthen the integrity of the universities in RS and B&H.

SOME DILEMMAS AND CHALLENGES IN MATHEMATICS EDUCATION IN B&H

The problem of harmonizing of mathematical curricula

Prospective primary school teachers acquire mathematics education at the College of Education by taking two mathematical one-semester courses. These courses are academic courses that consist of some of the elements of Calculus (short introduction to Set theory, very short introduction to Number theory, Introduction to Analytic geometry, Differential and integral calculus) and Introduction to Elementary geometry. Both courses have been designed so that the students can listen, understand and accept courses if they are well educated in high school mathematics. The first of these courses is almost identical to the course learned by students of mechanical engineering. In the curriculum of these courses, one cannot notice any specifics that should be related to the mathematics necessary for the mathematical education of teachers. These students listen two courses 'Methods of Teaching of Mathematics' (for example, see: [43]: pp. 50-51). These last courses are taught by didacticians (often) or working mathematicians (rarely). Didacticians have only high school mathematics education. Both have knowledge that is almost completely incompetent for methodical teaching of prospective teachers. This is the moment to remind the reader that the 'Methods of Teaching Mathematics' is a very specific mathematical – humanistic discipline which includes specificities such as: principle-philosophical orientations, inherent categorical terms, theories of teaching and learning mathematics, and so on. Add to this that we deeply convinced that there are characteristic and significant peculiarities in the following three methods of teaching mathematics: In primary grades, in middle grades and in the high school. The differences that can be identified immediately are the levels of understanding elements of Geometry according 'van Hiele classification'. The other significant differences are recognized in the need to accept the existence and understanding of Arithmetic and Arithmetical – Early Algebraic thinking among students in primary grades.

Professional mathematicians often do not know what and how to teach their students elements of mathematics didactics. They are not familiar with (generally speaking) didactical categories such as Bloom's taxonomy, teaching goals, teaching tasks, or mathematical-methodical categories specific within the domain' Mathematical-methodical knowledge' for example such as Logical thinking, Mathematical thinking (including important types: Arithmetic, Early-Algebraic, Algebraic, or Geometric thinking). Working mathematicians are convinced that it is enough for teachers to know to be able to solve mathematical tasks for primary classes. We fully accept the position of the international community of mathematics education researchers that the skill of solving mathematical tasks is useful, but it is not enough for a teacher to be mathematically literate. How will teachers develop other mathematical proficiencies in their pupils if they are not aware of the existence of these proficiencies? How will mathematicians choose mathematical tasks and questions with the intention that their students accept some of the socio-mathematical norms?

It is very difficult to accept that didacticians know and understand mathematical concepts. We believe that their mathematical knowledge is completely inadequate so that they can recognize, understand and accept processes involving mathematics concepts.

For example, within the framework of these courses, students are not allowed to become familiar with fundamental logical concepts (such as, for example: hypothesis, corollary, formula, truth value, contradiction, and so on), important tautologies (principle of exclusion of the third, principle of non contradiction, the law of double negation, contraposition, and so on) nor with the most important rules of deduction (Modus Ponens, Modus Tollens, The rule of universal generalization). The teacher instructs his students to point-and-straight line relation, a point and a segment, a point and line in the second grade in primary school. How will a teacher know which logical tools he teaches his students trough this teaching, if he never knew the existence and importance of such tools? Naturally, this analysis does not need to be understood that we are going to teach teachers to teach students logical notions. We come to the conclusion that teachers know which elements of logical thinking pupils accept as they teach the basic geometric concepts and relationship between them. Thus, when teachers try to make their students to accept the elements of geometric thinking by adopting basic geometric concepts and processes among them, they teach students simultaneously with the elements of logical thinking.

As a second example, what confirms our conviction that the curriculum of the mathematics course for prospective teachers is insufficiently inadequate is the use the concept of 'parity'. In 'Mathematics', a natural number is odd if and only if it is not divisible by number 2. This is completely unacceptable to teachers. The notion of 'odd natural number' is taught in the second semester of the second grade of the primary school. So, before children learn to multiply and to divide. Do teachers need to resolve this inconsistency?

These examples and previous consideration should point to the following challenges: The mathematics curriculum should be harmonized with the curriculum of 'Methods of Teaching Mathematics'. The dilemmas that occur in this case can be identified in the insufficient competencies of the implementers of these courses. In this way, we identified two important segments in the mathematics education of primary school teachers. These identified weak points in our system of mathematics education of prospective teachers should be of interest not only in academia but also in the responsible persons of the socio-political community.

Now we are in a position to ask the following questions:

- Why are most of the members of the academic community in B&H still not accepting that the domain of 'Research in mathematics education' is one of the scientific disciplines within Mathematics?

- What steps can we take to ensure that the social community starts to give enough attention to the indexed phenomena in the mathematics education of prospective teachers?

- In what way would we be able to assess the moral evaluation of the commitment of the social and academic community that results in such issues?

Some dilemmas and challenges in middle school mathematics teachers' education

In our schools system, middle classes (6-9 grades) are included in the elementary schools. In these grades, more different teachers are teaching. Mathematics is taught by mathematics teachers trained for this teaching obligation. Prospective teachers of mathematics are trained during three years at university. The curriculum that was to educate these teachers differs from the curriculum by which students are taught for high school mathematics teachers. In addition, both these groups of students listen to the same course of 'Method of teaching mathematics'. It is not uncommon for high school teachers of mathematics to teach mathematics in middle classes in elementary schools.

The primary school is nominally realized through three triads (a whole that consist of three consecutive years). In practice, elementary school is realized through Primary grades (1-5 grades) and Middle grades (6-9 grades). In the first part of the system, the entire teaching is carried out by primary school teachers. The second part of the system is realized in the so-called 'the subject concept': for each individual subject of instruction, teaching is carried out by the appropriate subject teacher. Under the term 'plan of teaching' in our system, we understand the planned number of hours of mathematics during one school year. The term 'teaching program' covers the objectives of teaching mathematics, teaching assignments, teaching content methodical suggestion and expected learning outcomes. The mathematics curriculum for grades 6 – 9 of the elementary school was prepared in 2014 by a commission appointed by the head of the Republic Pedagogical Institute. The commission had ten members. Among them, only one member was a university teacher of mathematics – a mathematician whose field of interest is Algebraic topology and Graph theory. Unfortunately, for the members of this commission, we have not been able to check the competencies of members of this commission for this type of professional activities. Committee members are elementary and high school mathematics teachers, but that does not mean they are competent to design mathematics curricula. Designing mathematics curriculum and making it meaningful is a very demanding project [19], [35], [37]. The questions that we have for ourselves, among other things, are the following:

- Why was there no mathematician in the commission who is competent in the Methods of Mathematics Teaching?

- In designing a mathematical curriculum, it is necessary to establish a proper measure between mathematics teaching of the cognitive and affective goals and mathematics teaching of the tasks through which these goals can be achieved. Did the commission take sufficient account of that? This question becomes rough if we assume that its members are not familiar with the form of mathematical thinking. This question becomes much crueler, assuming that members of the commission do not recognize the types of proficiencies other that procedural skill.

- What socio-mathematical norms should insist on implementers in accordance with the years of educated pupils if these norms are not mentioned in the curriculum? What tools should teachers use in teaching in order for students to adopt some of the planned socio-mathematical norms?

- Why did the RS Ministry of Education support this method of designing mathematical syllabus? Will planned intention be realized with such designed mathematical syllabuses for middle grades in elementary schools?

Small cosmetic changes in mathematics syllabuses for middle grades in elementary schools will not bring about significant changes, in our opinion. In our school system, the problem is not a mathematical syllabus. Problems that can be detected in the mathematical education of children in middle grades in elementary school are more present in the relation of the socio-political community towards that education. Our social and academic community never paid enough attention to this education. As a support of this conclusion we can illustrate with information that in the past ten years no research of mathematics education in middle grades has been published [29], [32].

When we read and analyze the goals of teaching mathematics in the adopted syllabuses for middle grades in elementary school, the following questions can be raised:

- Are the creators of these mathematical syllabuses familiar with some taxonomy of the goals of teaching mathematics as are, for example, Bloom's taxonomy or MATH taxonomy?

The general objectives of teaching mathematics in these syllabuses almost do not differ in different classes. How will teachers make the difference in achieving the goals of teaching mathematics in teaching their students in different classes? What level of understanding of geometry should students be trained in the seventh grade as opposed in the sixth grade?

A completely analogous question can be asked about the pupils development of algebraic thinking:

- What components of algebraic thinking will students master in the sixth grade? What in the seven grades?

- What tools, according to this curriculum, encourage classroom students to develop their strategic competencies in sixth grades?

It is not uncommon for some parents of middle school students to be aware that this school system does not provide sufficient mathematical knowledge. That is why they are looking for additional mathematical education for their children. Since the school system does not provide these services, the demand for additional education is satisfied with private instruction. With regular school education and additional mathematical education, these parents provide their children with more chances of enrolling in the highest quality high schools. It seems to us that their way of thinking is socially acceptable and morally justified: with their high general success and with increased mathematical proficiencies, such educated students will either pass the entrance examination or will realize their significant advantage by quality passing the entrance examination in such high schools. Some parents overcome this problem in a socially unacceptable and morally unjustified way. The size of last-mentioned phenomena can be evaluated by a very large number of primary school pupils with maximum success certificated. Public opinion has a benevolent attitude towards this deep-rooted issue. The academic community is also not opposed to such moral decay in our educational space. Even more, the heads of schools and institutions take care to enable and justify these phenomena with the power of authority.

Although the previous analysis is superficial, however, we still detected significant number of dilemmas in the mathematics education of students in middle classes in elementary school. The focus of the problems observed in the mathematics education of middle grades pupils should be transformed to the field of mathematical and methodological education of their teachers. With this conclusion, we do not suggest that teachers of mathematics are not well educated. We believe that the responsibility for the existence of a significant number of dilemmas that we encounter in mathematical education in middle grades is significantly more on the shoulders of the socio-political community then on the academic community. It is completely acceptable that we can now assess the social responsibility and moral acceptability of the commitments of the socio-political and academic community in the relation to the previously mentioned challenges.

We feel free to suggest to our academic community that it should require amendments of the Law on primary education in the following directions: Amendments should provide for the possibilities of introducing differentiated classes into middle grades of elementary schools. An external and independent assessment of the success of teachers and their students in the process of middle grades mathematics should be provided. The Law should allow for the design of the Standard in Mathematics Education in this system. Also, we are advocating that we should give up deciding students achievement by numbers: 1 (the knowledge of mathematics is unacceptably low), 2 (knowledge of mathematics is low but satisfactory), …, 5 (knowledge of mathematics is extraordinary). We strongly support the idea that teachers descriptively express students'

achievements in mathematics learning and, possibly, assess their success on topics individually using percentages.

Some dilemmas and challenges in high school mathematics teachers' education

In the last 25 years, in the field of 'Research in Mathematics Education', there are many theories that try to improve the teaching of mathematics in secondary schools. Also, many theories have emerged in which researchers try to explain the processes of students understanding, acceptance, and application of mathematical knowledge in such schools. There is a belief in the academic community of researchers in mathematics education that some of these theories had influenced the improvements of the quality of teaching and learning in secondary schools (see, for example, [22]). The application of some of these theories of mathematics education seeks to illuminate the socio-political and ethical connectedness between principal-philosophical environment, classroom practice and goals of teaching. The aforementioned author is convinced that we still have no proof that teaching and learning mathematics is functional in motivation of development of students socially-psychological peculiarities. In this text we are not talking about the social function of mathematics education. So, we are not talking about the influence of quality mathematics education on a social and academic community. Also, we are not talking about raising the awareness of the social and academic community about the need to accept and observe the undisputed social norms and ethical values. By contrast, in this text, we strive to bring closer to the international academic community the B&H's socio-political landscape and ethical milieu and how they have effect on high school mathematics teaching and learning.

According to our conviction, acquired during the many years of work with graduated high school students in B&H, the secondary school system is under big and very strong influence of the socio-political environment. A large number of pupils of these schools gained formal recognition that they successfully completed high school. However, there is no external and independent confirmation of qualifications about their mother tongue literacy and mathematics proficiencies. Our insight into the levels of mathematical and linguistic literacy of graduated high school students was partially achieved by testing the population of candidates applying for the enrollment at the university. Although the results of these tests indicate a very low level of mathematical and linguistic literacy of the candidates tested, almost all applicants are admitted to enrollment. This is the commitment of our academic community: 'Much less is harmful if poor quality candidates enroll in public university studies than apply to private universities. At public universities, even if they never finish their studies, they will learn at least somehow, unlike on private faculties, where is enough to pay tuition fees for completing studies.' Exceptions from this statement are only some students of classical high schools (grammar schools) and very rare students from secondary vocational schools.

Let's try to elaborate the question 'Why is that?' Teaching programs of mathematics in all grades of secondary schools are passed by the Minister of Education at the proposal of the Pedagogical Institute. The usual practice in our educational system is that the Director of the Pedagogical Institute forms a Commission for the design of a mathematics curriculum. For example, a commission formed 2016 by the FB&H Pedagogical Institute consisted of 6 members of which only one knew what to do. In the RS Ministry of Education document (Identification Number: 07.021/020-373/11), it was not possible to determine the names of the members of the commission that designed the curriculum for mathematics for secondary schools in the RS. It was possible to identify the names of members of the editorial staff of one part of this document that relates to mathematics programs. Only one of them is a university mathematics teacher at a local

public university. The field of his scientific and academic work is neither 'Research in Mathematics Education' nor 'Methods of Teaching Mathematics'. The other members are secondary school teachers of mathematics. It is obvious that the directors of the pedagogical institutes are satisfied with the formal selection of the members of the commission since none of the commission members has any evidence confirming their deeper knowledge of the contents related to the design of mathematics programs for secondary schools.

The offered program for the first grade of the gymnasium contains the following sections (seven pages of text with spacing):

1. General objectives of the program;
2. Specific objectives of the program;
3. Content and operational goals (outcomes) of the program;
4. Didactic instructions and recommendations.

The reader can be made certain of the inconsistency of this program if he or she compares the first general goal of teaching mathematics and elements of the program content of mathematics teaching in the first grade of the gymnasium: 'Developing the ability of logical thinking (rules of formal logic)', while, on the other hand, in the curriculum, there is no envisaged topic containing elements of mathematical logic. How will mathematics teachers achieve this goal? What teaching tools can they achieve this planned general goal of teaching mathematics? How will teachers determine whether this goal has been achieved? In the section of 'Didactic guidelines and recommendations' for the theme 'Real numbers' it is written: "Relationships should not be done at all." How will students understand the concept of the linear order in sets of natural, integral, rational and real numbers if they have not previously learned what the order relation is? In the 'Operational Objectives / Learning Outcome' section, it literally states: "The student should recognize relations $\mathbf{N} < \mathbf{Z} < \mathbf{Q}$ at calculating with rational numbers." We can only guess what the designers of this curriculum thought when writing the mentioned part of the program. In theoretical-sets sense, we know that the following is valid $\mathbf{N} \subset \mathbf{Z} \subset \mathbf{Q}$ but $\mathbf{N} \cong \mathbf{Z} \cong \mathbf{Q}$, where the symbol '$\subset$' is marked proper inclusion and symbol '$\cong$' the same potency between sets. Such and similar examples of inconsistencies and / or irregularity in program teaching for any gymnasium class we can find a sufficient number to illustrate the significant presence of carelessness in the design of these programs.

The training of high school teachers of mathematics includes three courses (for example: Banja Luka University) that relate to the necessary methodology of knowledge. The study program for the education of secondary school teachers in mathematics at the University of East Sarajevo has two courses in the teaching methods of mathematics domain. Other universities in B&H have only one or none of the methodology of the teaching mathematics. Therefore, some prospective mathematics teachers should be well prepared according to the previous sentences. In order to gain a more accurate insight into the quality of methodological education, we should inspect the candidates' mathematical and methodical knowledge over several generations. We can find out about levels of methodical competence of teachers of mathematics in secondary schools only indirectly. A reader can look at the mathematical literacy of candidates for enrollment at the University of Banja Luka in one of our previously published texts (for example: [41] or [50]). The knowledge gained by perceiving the success of applicants for enrollment in universities in B&H has created in this mathematic education researcher belief that over 80% of the tested population has very low mathematical proficiencies. If you talked to me in the language of production management, you might ask: Why does our social and academic community support this

extremely poor quality production in education? This situation becomes much more complex if one accepts our conviction that most secondary schools in B & H are raising the success of their students by internal machinations. Of course, this is done with the powerful encouragement of the social-political community, but also with the unspoken concordance of public opinion.

Another indicator that also indirectly illuminates mathematical-didactic literacy of high school teachers of mathematics is the didactic-methodical competences of university teachers who implement appropriate courses. In order to form our insight into the professional and scientific competences of those who teach 'Mathematics Teaching Methods' courses at the universities in B&H, we examined the 'Google scholar' and the 'Math. EductDatabase' on published articles within the 'Research in Mathematics Education' and 'Methodology of teaching mathematics' domains. We were able to identify only eight published articles of all B&H's lecturers of these courses. None of these texts has been published in any of the more prominent journals covering these domains. It is very likely that these authors have published more texts in some magazines that are not included in the 'Math. EductDatabase '

FINAL OBSERVATION AND CONCLUSIONS

"The Scientific Society of Mathematicians Banja Luka" was founded in 2007 with the aim of improving mathematical and mathematical-methodical competencies of teachers of mathematics education at all levels of education. The Society edits and publishes two national journals (MAT-KOL[2], founded in 1995 and IMO[3], founded in 2009) and one international magazine (IMVI OMEN[4], founded in 2011). These journals covering the domains 'School Mathematics', 'Methods of Teaching Mathematics' and 'Research in Mathematical Education'. In the first issue of IMO, this author in his editorial article [38] invited mathematics teachers to take part in identifying, describing, analyzing phenomena in mathematics. The number of contributions of the authors (Primary school teachers, mathematics teachers in Middle and in High schools) from the B&H area is very low. The number of contributions in magazines and the quality of thought in these contributions is the best indicator of the level of mathematical and mathematical-methodical competences of teachers. It is almost impossible to speak about the research and scientific competences of the implementers of mathematical contents in the B&H school system within the domain 'Research in mathematical education'.

There is an unusual phenomenon in academic communities in B&H: Each of the three so-called "the constituent peoples" of B&H strongly endorse the conviction that their norms, standards and successes in these domains are of high quality. For example, the RS Ministry of Science proclaimed that local journals editing and publishing by the RS public universities are by top quality. Similarly, one attempt to collect, analyze and evaluate the number and quality of published mathematical articles and articles in the field of "Research in Mathematics Education" by the authors in B&H failed due to a strong opposition from the B&H university managements.

Why should this text be of interest to the international academic community? Does its content provide researchers of mathematical education with some information or thoughts they have not met before? No, of course – not, in our opinion. This text is conceived as a testimony of one time and phenomena of a socio-political community related to mathematical education. We estimate that the our next generation will accept the information presented in this article in same way that

[2] *MAT-KOL (Banja Luka),* ISSN (p): 0354-6969, ISSN (e): 1986-5228 (http://www.imvibl.org/dmbl/dmbl.htm)
[3] *IMO-Istraživanje matematickog obrazovanja*, ISSN (p) 2303-4890, ISSN (o) 1986-518X (http://www.imvibl.org/dmbl/meso/imo/imo2.htm)
[4] IMVI Open Mathematical Education Notes, ISSN (p) 2303-4882, ISSN (o) 1840-4383 (http://www.imvibl.org)

our generation has unwittingly accepted information about the phenomena in education, and around it, in time immediately after the Second World War. In the former Yugoslavia, after the Second World War there were two systems of education. One was the visible system – the public system of education. In addition to it, there was also a parallel system that consisted of short-term processes in which the State acknowledged that illiterate or insufficiently literate persons completed primary and/or secondary education. In the observed period after the so-called 'democratic changes', the situation in B&H education is very similar to the previous one, unfortunately with a dramatic decrease in quality in the visible part of that system.

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