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### RESEARCH ARTICLE

#### GENDER STEREOTYPES AND MATHEMATICS: TEACHERS AND STUDENTS' PERCEPTIONS.

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#### Abstract

Nowadays, despite the positive changes that have been made in Kosovo society, gender stereotypes continue to negatively impact the academic achievement of girls in some scientific fields. One of these areas is the mathematics, which has traditionally been known as a male domain. In this case, boys are considered more capable than girls.

The purpose of this paper has been the introduction of teachers and students' perceptions about impact of gender stereotypes in the academic achievement of girls in mathematics. This paper presents the results of research conducted in Kosovo Elementary Schools, rural and urban areas. For the realization of this research are used quantitative and qualitative methods. The instruments used for research were questionnaires and interviews. The research has included in total 176 respondents, out of which 87 teachers and 89 students. Of the total number of teachers, 44 were women and 43 men. They were aged of 25-64. While 47 students were from the respondent group were females, and 42 males. Students were of the eighth grade of Law Secondary Schools. Respondent students were selected at random.

The results of this study present a clear picture regarding the perceptions of teachers and students about gender stereotypes and mathematics.

Such research will encourage teachers to focus towards the elimination of gender stereotypes in mathematics, as well as that of motivating girls to choose such professions, which traditionally known as male professions.

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#### Introduction:-

Kosovo, since 1999, all along with some other countries in transition, has paid special attention to the process of building the legal infrastructure and in setting up laws for the protection and promotion of gender equality. In this context, the first and fundamental condition for the achievement of gender equality is legal provisions and their implementation in practice.

In this regard, the government of Kosovo, with the support of the international organizations and women's rights activists has been engaged in the development of a relevant legal framework which aims at advancing the position of women in Kosovo society, defending their rights, and achieving gender equality that conforms to international

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standards (Wittberger, 2012, p.47). "Gender equality describes the concept that all human beings, both women and men, are free to develop their personal abilities and make choices without the limitations set by stereotypes, rigid gender roles or prejudices (p.68).

The presence of gender stereotypes and prejudices, affect women's gender discrimination in family, in schools, universities and workplace, etc. Hence, one of the factors that seem as an obstacle to achieving gender equality is considered gender stereotypes as well. Stereotypes are strong generalizations to people in a certain social category. When exaggerated gender roles, they return to gender stereotypes. Feminist Research and other researches have argued that gender stereotypes reduce self-esteem among girls and boys and girls get restricted in some fields of studies in terms of profession selection (Audit of gender issues in the education system, 2007 p.21).

In the current Kosovo society, gender stereotypes pose serious obstacles, inter alia, in the field of education. They have a negative impact on academic achievement of girls in mathematics and advancing their careers. Thus, gender stereotypes have influenced girls lag behind boys in mathematics. This issue is the main topic of this paper. The main reason to be defined in researching the impact of gender stereotypes in mathematics was the fact that, to us in Kosovo, there is little research in this direction, although the "Gender Equality as a cross cutting topic has to be considered always and everywhere "(Wittberger 2012, p.7-8). As such, gender equality is a topic which provides access to treatment by researchers of different fields. Conversely, gender equality is one of the main objectives of the 21 century, and it is another reason why we must focus research in the gender context. Nowadays, "the world has an Unprecedented Opportunity to improve the lives of billions of people by adopting practical approaches to meeting the Millennium Development Goals" (Grown, et al., 2005, p.iii). By law and punishment, by social agitation and discussion, society can regulate and establish itself in a more or less random opportunity (Dewey, 2003, p.40).

Besides law enforcement in terms of gender equality, important role plays education. The task of community education is the highest moral duty. In this context, we must say that if Kosovo is aiming to build a genuine democratic society and be integrated into the European family, it needs to develop its educational policies that rise towards the development of education for all. Comprehensive reforms, often well adapted to regional and global changes have also highlighted gender issues in education. These reforms in education are being implemented at all levels. They require a new and serious professional preparation of teachers. Changes and reforms in education are reflected in the New Curricula Framework of Kosovo in which among other things is stated: "Education in Kosovo aims to develop knowledge, skills, attitudes and values urging democratic society. This enables young people to be active and responsible citizens, to confront constructively challenges and differences and respect the other people rights. (Curricula Framework of Pre-University Education of the Republic of Kosovo (2011)). Hence, as noted above, legal infrastructure, as well as educational policy require respect of human rights. Therefore, women should be educated paralelly with men because, "Women's Rights and their social and economic status in relation to men are generally considered significant Indicators for measuring human and Sustainable, equitable development of country" (Wittberger, 2012. p. 10) "

We have predicted that gender stereotypes hinder girls, even though they have physical and mental ability to deal with mathematics and on the other hand, it is anticipated that teachers carry their share of guilt in this regard. A good part of blame falls on mathematics textbooks. According to the research "Audit of gender issues in the education system", in mathematics texts in most cases men are presented more in solving mathematical tasks than women (p.30).

Through this paper is aimed to be considered the impact of gender stereotypes of girls in mathematics performance as perceived by teachers and students. Also, there have been explored policies, practices and student-teacher interactions in mathematics.

Questions that will be addressed in this paper are: Do teachers have the same approach to boys and girls at math? Does exist a visible gender differences in class activities? Are boys and girls valued evaluated equally in mathematics? Are more males or females presented in mathematics textbooks? Do females evaluate themselves equally with male in mathematics?Etc.

Even though gender equality was placed as an imperative to achieve international standards of modern civilization and the objectives were defined in achieving gender equality, such equality has never been implemented because this achievement continues to be limited by many objective and subjective factors (Zylfiu, 2008, p.269).

In our opinion, research on the impact of gender stereotypes in the girls' achievements in mathematics as well as in all other fields of science, do have impact on improving gender equality in this regard. Also, legal infrastructure in education has highly great impact.

#### **The role of schools and teachers in increasing the participation of women in mathematics education:-**

Even after the creation of laws and different standards aimed at the progress of democratic society in Kosovo, the problem of gender stereotypes in mathematics remains an open question. In this field, girls' participation is lower compared to boys. Such a phenomenon is evident not only in our society, but also in different countries of the world. Gender stereotypes have impacted professions such as mathematics and technical sciences. Such professions are still considered more suitable for men than for women. Such a mentality must be changed very quickly; because the above mentioned professions are professions of the future. The females' mentality change is highly important in this context. In this context, the inclusion and implementation of gender issues in policies and educational programs are issues of priority in terms of females' preparation for the preparation of conformity with the requirements of the 21 century. In this regard, Wittberger (2012) goes even further when he said: "in the field of education, relevant bodies are to establish, implement and monitor policies aim at Ensuring equal access to education; Mainstreaming Gender Equality Goals Into curricula, texts and materials; and support females 'and males' non-traditional choice of profession "(p.48). For choosing nontraditional professions, especially the mobilization of schools in this direction is necessary and requires seriousness added." Regardless of the sources of gender gaps-Whether "nature" or "Nurture"-schools have a mission to educate all students to levels of competency and to broaden individual opportunities rather than reinforce group Stereotypes about students' skills and options" (American Association of University Women, 1998).

An important aim of the school is to help eliminate discrimination and negative thoughts. Students come to school with a collection of values and opinions on good and bad; these have been acquired from family, TV, friends, and other experiences (Nelson, Palonsky & McCarthy, 2004, p.309). Usually, children carry to school gender stereotypes, prejudices, etc. which acquire in their homes and schools, eliminate bigotry that still exists in society. In this context, Sadker and Sadker (1997), affirmed, saying that often, parents teach their children their prejudices. Besides prejudices and stereotypes, they also encourage their children to the choice of professions. In this context, Basow, (2003), has expressed its conviction saying that parents of children who are proficient in mathematics are more likely to encourage their boys in mathematics than girls (p.59). To eliminate this phenomenon, school is the most important institution to stop bad aspects which encourage discrimination (p.137). According to their view; we are in a new stage of human development which is more complex. Historical practices of the past are no longer appropriate to the complexity and individual development essential in modern society. Injection with traditional values is ineffective to eliminate these problems (p.344).

In this regard Dewey (2003), has also written. He said that the house is a form of social life in which children get education through their moral training. It is the duty of the school to deepen and expand the meaning of these values which start in houses, (P.16). Through education society female can formulate her goals and continue in the direction she wants to move. Related to this Dewey said that education was the fundamental method of social progress and its reform. Also, he thought that all our reforms based simply on the adoption of law, in particular threats of penalties, or changes of mechanical and external adjustments are transitory and wasteful. He believed that education was a process that manages to participate in social consciousness, and that the regulation of the activity of the individual under this social consciousness is the only true method of social reconstruction (p.27).

Besides school, important factors in eliminating gender stereotypes in mathematics are also teachers. Especially teachers of mathematics can help in this regard. Education is often seen as a way of providing opportunities which all may take advantage of; mathematics is in a very exposed position in the equality debate, as a subject in which individual differences in attainment are particularly visible. All these developments in the idea of the teacher's role have caused teachers of mathematics to have a much broader concept of their professional life. Some see themselves first as teachers, and secondly as teachers of mathematics; with others it is the other way round (Shuard & Quadling, 1980, p. 130).

In the opinion of researchers Shuard and Quadling (1980), "good teachers of mathematics are among the most valuable resources of an educational system" (p.1). Their professional life includes all those activities which support a teacher of mathematics in thinking more deeply about their work, keeping up-to-date with today's needs, and teaching mathematics more effectively and with more enjoyment at whatever level he works" (p.3).

Teachers are the main factors of management and social changes, so, our teachers have never been more crucial to our collective future (World Education Report, 1998). The task of teachers of mathematics has become enormously broader and more complex but they are not, of course, alone in experiencing this growth of complexity; much of it is shared with all teachers in primary and secondary schools. Taylor (1978), in a study of European teacher education has identified four other major aspects of the role of the teacher, as well as his responsibility in transmitting knowledge and skills and in upholding cognitive standards. First, the teacher is a moral and political agent of society; this task is, of course, the subject of ideological battles from which mathematics teachers cannot stand entirely aloof. Secondly, the teacher is an innovator. Thirdly, teachers now have a cooperative role. Fourthly, Taylor points out that the teacher is an agent of social and educational equality (Shuard & Quadling, 1980, p. 129-130).

Teachers, who are considered as agents of social equality and education, must fight against stereotypes that influenced the girls feel indifferent to mathematics because mathematics is regarded as the domain of male. The role of teachers in general, is too great, especially in realizing the objectives of the new century. Since the Gender Equality is cross-cutting issue, teachers of all subjects, especially math teachers should try to focus on motivating girls to study mathematics. Also, they should be careful not to create gender stereotypes in the process of teaching and learning activities.

In the end, we have to state that, nowadays, the call for gender equality in all spheres of life is a call that requires the commitment of the whole society and not only the commitment of schools and teachers. We are aware that, to answer this call, we have to overcome various barriers. According to Jaquette and Summerfield (2006), "the call for gender equity is fundamental and transformative, soft to the barriers are formidable achieving this goal ... (P.12)" However, the researcher Grown (2005), is optimistic as far as this aspect is concerned. According to her view, Gender Equality is a problem that has a solution (p. 27). There are practical steps that can reduce inequalities that restrict the potential to reduce poverty and achieve high levels of well-being in societies around the world. Also there are positive actions that can empower women. With this in mind, we think that the actions or activities of teachers undertaken in their daily work are crucial factors in reducing inequality in mathematics. Teachers and schools can come to the aid all along with leadership. Without leadership and political will, however, the world will fall short of taking these practical steps-and meeting the goal. Because gender inequality is deeply rooted in entrenched attitudes, societal institutions, and market forces, political commitment at the highest international and national levels is essential to institute the policies that can trigger social change and to allocate the resources necessary for gender equality and women's empowerment" (Grown, et. al, 2005. These are difficult obstacles to overcome, but with a serious commitment of all of us, implementation of this project is quite possible.

#### **Research methods:-**

To realize this research have been used mixed, quantitative and qualitative methods, including method of literature review, observation, and statistical methods as well. There were also used questionnaires and interviews as research instruments. The questionnaire includes questions that have helped us, to highlight various issues relating to gender stereotypes in mathematics.

In the research were included in total 176 respondents, of which 87 teachers and 89 students, from various schools of Kosovo. Of the total number of teachers, 44 of them were women and 43 men. They were aged 25-64 years. From the group of students, 47 of them were female and 42 male. Students were eight classes of lower secondary schools. The research was carried out in the second semester, during the period of March-June, during the school year 2015-2016.

During the research phase there were respected ethics researchers. Ethical principles have been at the forefront of research to its completion. Time for completion of the questionnaires was 45 minutes. To present the results obtained through the survey of students and teachers there were used statistical methods.

### Results and Discussions:-

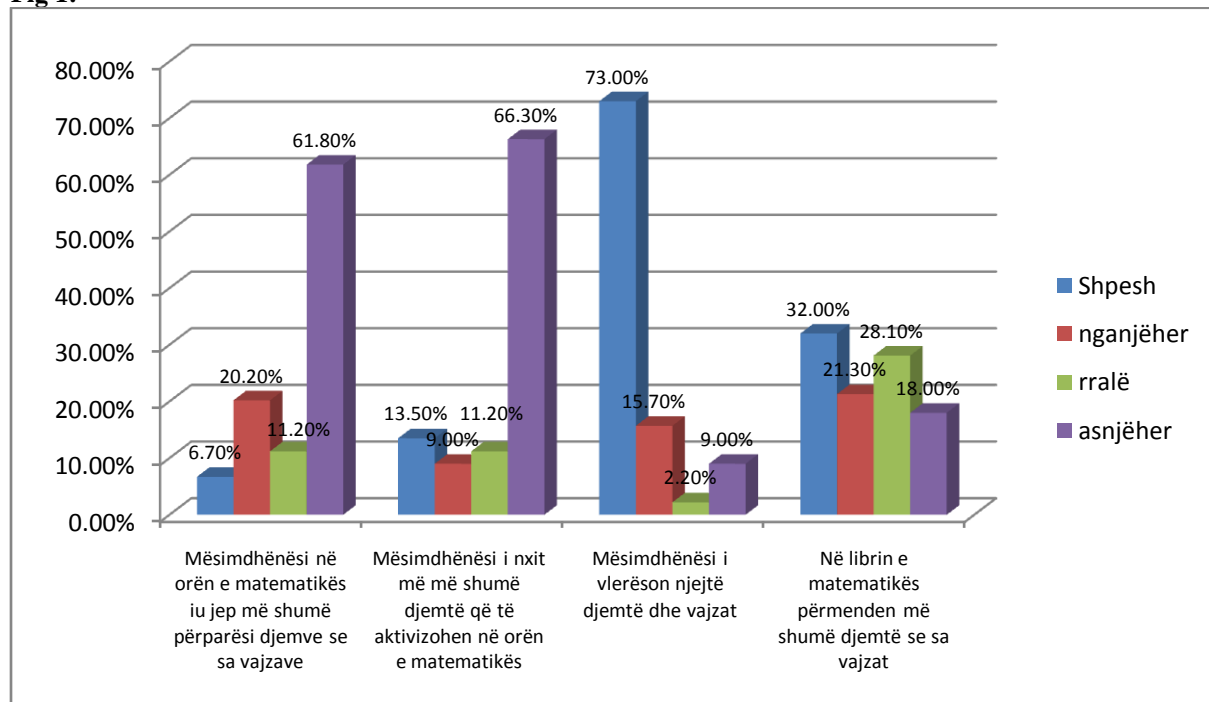
The results of the survey indicated the teachers and students' perceptions about gender stereotypes and mathematics. To create a clear mirror about their perceptions, initially were analyzed data that show about some important issues relating to gender stereotypes and math in lower secondary schools. The results of the analyzed questions are very interesting. Each of these results may be a separate topic for discussion. For example, at the question: Do teachers of mathematics stimulate more boys than girls in mathematics? Based on answers from the questionnaire, there are the following results: 6.7% of respondents have stated "often," 20.2%, replied with "sometimes," 11.2%, stated "rare", and 61.8% of them replied with "never".

The other question was: Do mathematics teachers encourage more boys to be active in their math class? The results of these questions are as following: "often", said 13.5% of respondents "sometimes" 9% of them, "rare" 11.2% of them, and "never" answered 66.3% of them.

To understand the perception of the respondents involved in the research, regarding the evaluation of boys and girls in mathematics, the questionnaire contained the question: Do teachers assess boys and girls the same way? Results are as follows: 73% of respondents said "often", 15.7% of them said "sometimes", 2.2% of respondents said "rarely" and only 9% of them said "never".

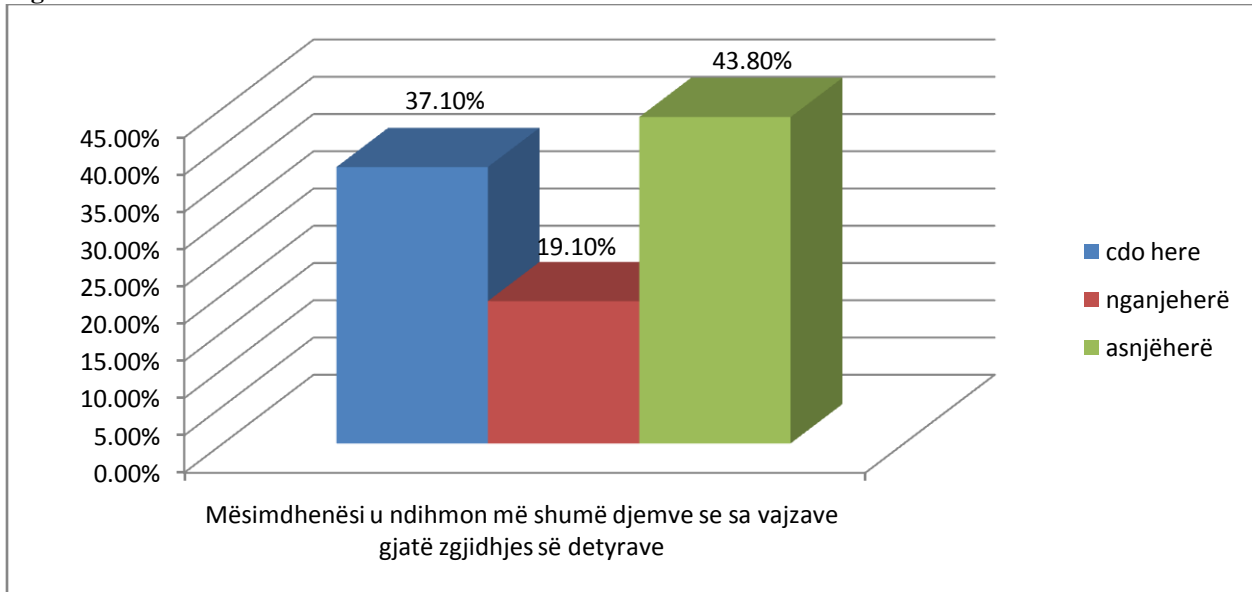
At the question: Do mathematics text-book contains more boys than girls. See the following results: 32% of respondents said "often", 21.3% said "sometimes", 28.1% responded said "rare", while 18% of them said "never". (Fig. 1)

Fig 1:-



At the question: Do teachers help more boys than girls in solving mathematical tasks? The outcome of the questionnaire is as following:37.1% replied with "sometimes", 19.1%, rarely and 43.8%,never (See. Fig.2)

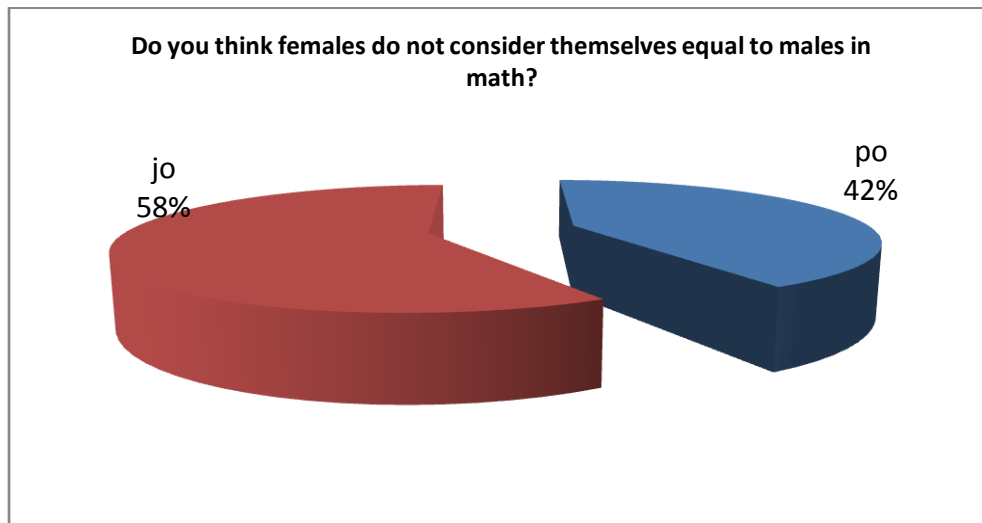
Fig.2:-



Thus, the results dealing with teacher assistance to solve tasks in mathematics (See. Fig.2) are very interesting and reflect the attitudes of teachers towards girls and boys in specific cases.

At the question:Do you think females do not consider themselves equal to males in math? of the total number of respondents, 41.6% of them said "Yes", while, 58.4% of them said "No", ie. They disagreed. (See. Figure 3)

Fig. 3:-



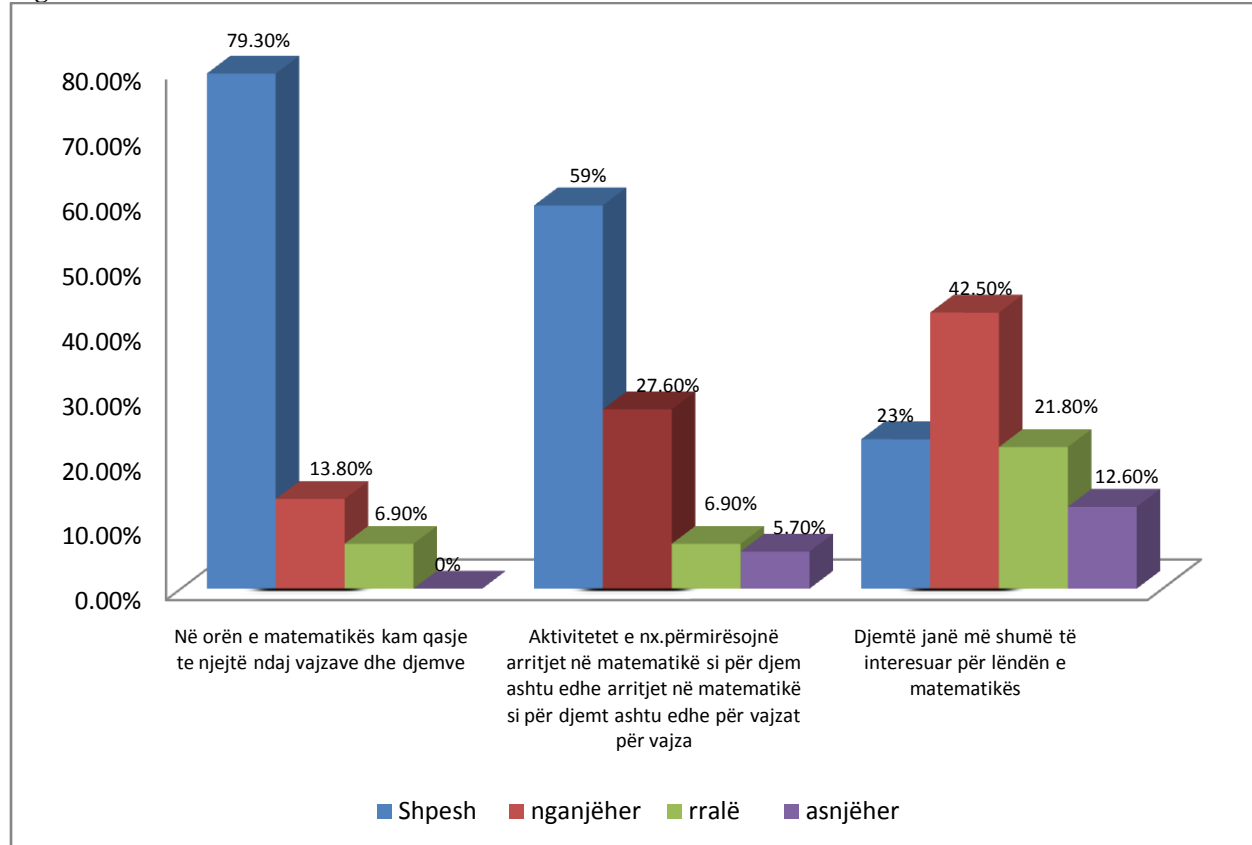
At the question: To what extension do teachers offer same access to males and females in mathematics? The respondents answered as follows: 79.3% of teacher respondents said "often", 13.8% said "sometimes" while 6.9% of them said "rarely", and no respondents answered with "never"

Through this questionnaire there have been also searched activities in mathematics. Students' activities improve achievement in math at both boys and girls. With this is intended to shed light on the perceptions of teachers regarding classroom activities in mathematics. Based on this questionnaire the following results are evident: 59% of respondents said "often", 27.6% of them said "sometimes", 6.9% said "rare", and 5.7% of them said "never."

According to Wittberger opinion, 2012 gender mainstreaming means that gender equality goals have to be addressed and included in the conception and the implementation of every activity (p.7-8).

At the question: Boys are more interested in mathematics than girls. Following See the results: 23% said "often", 42.5% of them said, "sometimes", 21.8% said "rarely", while 12.6% of them said "never". (See. Fig. 4).

**Fig 4:-**



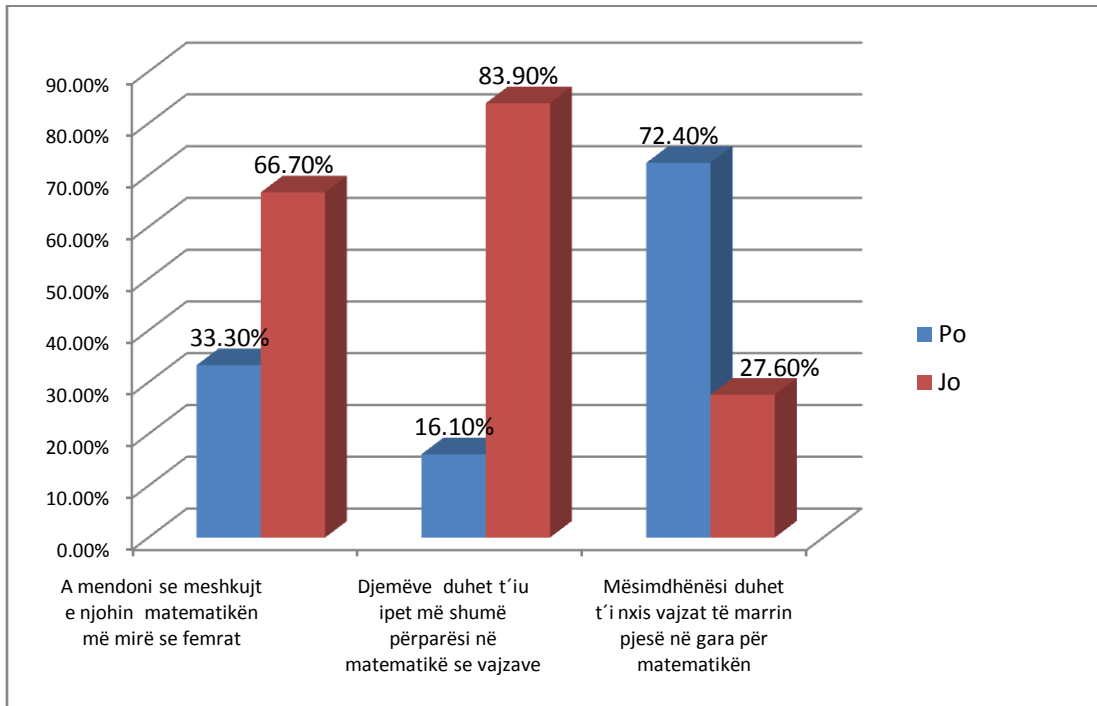
According to Wittberger, 2012 gender mainstreaming means that gender equality goals have to be addressed and included in the conception and the implementation of every activity (p.7-8).

At the question: Do you think that boys know better mathematics than female? "Yes" replied 33.3% of respondents, and "No" said 66.7% of them.

One more interesting question is: Do mathematics teachers have to force more boys than girls in mathematics? See the following results: "Yes", said 16.1% of respondents, but the larger number of respondents, respectively 83.9% of them said "No".

Having Into consideration the impact of teachers in encouraging and motivating students, the questionnaire contained a research question which said: The teachers should encourage girls to participate in competitions in mathematics? "Yes," said 72.4% of respondents, while "No", said 27.6% of them. Based on the answers of respondents, prevails the majority of those who think teachers should encourage girls to participate in competitions, it shows that the role and importance of teachers in this respect is very big. (See. Figure 5)

Fig 5:-



Based on the results of this research, we can recommend that girls should be more motivated by teachers and society to deal with studies from the fields of mathematics and other fields of science, which in the past were regarded as male domains.

### Conclusion:-

Gender stereotypes have a negative impact on education because due to their impact, technical sciences and mathematics continue to be considered areas where boys are better than girls. At the primary education, differences in females and males' achievements in mathematics are small, but difference at high schools goes deeper. The number of females who willingly would study mathematics is significantly smaller than that of males. Gender stereotypes have had impacts on females to lose their self confidence, and reluctantly they would enrolle themselves in mathematics. Having into consideration the fact that the occupations of the future, anticipated to be more required and more profitable, requires precisely preparation in this field. Focus on overcoming gender stereotypes in mathematical education is indispensable. Women should be encouraged in this regard; on the contrary, again women would be forced to carry trades less valued by society and less paid. In this way, they can not be equal with men competing in the occupations of the future.

However, we have to state that the legal infrastructure and schools and teachers, who are considered key agents for social change management, can influence overcoming gender stereotypes in mathematics. By motivating girls in learning mathematics, will directly affect the achievement of girls in this regard. In addition to these factors, in overcoming gender stereotypes in mathematical education of girls can also directly help scientific research in this direction, developing good educational programs, and their interrelationship, as relevant contributors to this progress.



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