

## ANALYZING THE IMPACT OF TEACHERS' ROLES AND GENDER DIFFERENCES ACROSS URBAN AND RURAL SETTINGS ON SECONDARY STUDENTS' MATHEMATICS ACHIEVEMENT AND SELF-PERCEPTION

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### ABSTRACT

The aim of this study was to investigate the students' beliefs and teachers' roles influence on mathematics performance at the secondary level in District Muzaffargarh, Pakistan. Mathematics plays a vital role in various aspects of life, yet many students face challenges in mastering it. The research explores the connection between students' perceptions of mathematics, their confidence in their abilities, and the role teachers play in creating a supportive learning environment. The study tests three main hypotheses: the impact of school location on teachers' roles in mathematics performance, the effect of gender-based beliefs on student performance, and the combined influence of teachers' roles and students' beliefs on mathematics achievement. A survey methodology was used, involving a sample of 692 students from both public and private schools in urban and rural areas. A five-point Likert scale questionnaire was designed, validated, and tested for reliability, achieving a Cronbach's alpha value of 0.7. Data were gathered with necessary permissions and analyzed using statistical methods such as t-tests and ANOVA through SPSS. Key findings indicate that demographic factors like school location, gender, and parental education significantly affect students' perceptions and beliefs about mathematics. Urban students demonstrated a stronger acknowledgment of teachers' roles than rural students. Gender-based differences in beliefs about mathematics were found to be statistically insignificant. Parental education was positively associated with students' confidence and academic success in mathematics. The study emphasizes the critical role of teachers in shaping students' attitudes toward mathematics and highlights the influence of demographic factors. Recommendations include conducting similar research at primary and higher secondary levels, incorporating teachers' and parents' perspectives, and exploring strategies to strengthen students' social, emotional, and cognitive skills for better performance in mathematics.

**Keywords:** Mathematics Achievement, Secondary School, t-test, Self-Beliefs, Gender Differences

## INTRODUCTION

Students are required to take mathematics classes because it is a crucial topic. The learner must actively participate in mathematics since it is a human endeavor. Social learning environments allow pupils to develop mathematical concepts and relations rather than rote memorization of rules (Brophy, 2013). The four basic concepts of mathematics are numbers, structures, space, and change. From science and technology to society and culture, and even into everyday life with personal health and finances, mathematics' impact on school mathematics has grown beyond its original context in today's dynamic world (Attard et al., 2016; Awan et al., 2011; Chen & Pajares, 2015). A large number of pupils fail to demonstrate proficiency in Maths despite having learnt the material. Math's education will be affected by the difficulties pupils face in understanding the fundamental ideas. This part of the study aims to find out if students' understanding of mathematics impacts their performance in the subject and, by extension, their overall grades. Students' mentality towards a subject has a significant impact on how well they do in it, said by Mullis et al. (1992). Having a good attitude towards a subject frequently leads to improved performance in that area for students. It was found that students' negative views of mathematics have an effect on their interest in the subject, similar to what Bandura (2001) found. In particular, his research by Middleton & Spanias (1999) revealed that a big issue in mathematics education research has been the correlation between students' views of mathematics and their actual performance. For example, according to Lomas et al. (2012), the link between the two is due to mutual influences. What this means is that perceptions influence accomplishment, and accomplishment influences perceptions.

## Literature Review

According to Mullis et al. (2000), confidence is the self-assessed capacity to design and carry out the activities that will bring about the outcomes one seeks (Bandura, 1997). How hard people try and how determined they are to succeed depends on how confident they are in their abilities. A person's self-beliefs are their convictions in their ability to achieve to their full potential in a particular situation (Woolfolk, 1998). When educators have faith in their

own abilities as educators, they are more likely to inspire their students to reach their full academic potential. Teachers with high efficacy were more likely to try out novel approaches to education (Rao et al., 2000; Ryan & Deci, 2000; Schunk & Pajares, 2002; Pajares & Miller, 1995).

They overcame challenges by persistently modifying their methods of instruction. Teachers are only as good as their students are, say Tschannen Moran and Hoy (2001). Teachers who have faith in their own abilities are more likely to help their students reach their full potential. Students' critical thinking skills and motivation to learn are enhanced as a result. According to Zimmerman (2000), the efficacy of educators was defined by how well they helped students overcome gaps in their knowledge and abilities.

According to Ho and Haou (2004), there are two sides to the coin that is teacher efficacy. Both the students' and the teachers' confidence in their own abilities to teach have a positive feedback loop. In mathematics, Marsh (1986) argues that teachers' confidence in their own talents has a direct correlation to their students' ability to learn. At the primary, middle, and high school levels, it improved students' verbal learning abilities in mathematics and their mathematical performance (Nyberg et al., 2019).

Chang (2015) asserts that one's higher-level efficacy beliefs are a reliable predictor of future success in mathematics. In 2010, Chen and Pajares confirmed the facts that at every grade level, students' self-beliefs were the most important factor in their mathematical performance and accomplishment. Murphy (1992) argues that teachers' strong convictions in their own abilities to help students learn constitute a crucial component of student agency in the classroom. At the secondary level, effective educators demonstrated a dedication to bringing about the intended learning outcomes. Eliminating criticism of students' learning failures in secondary classes was a defining feature of real improvement.

Educators who score low on the self-belief scale are more likely to place the responsibility on their pupils when they don't grasp the material. According to research by Ryan and Deci (2000), gender role has a substantial effect on students' performance in the

classroom when examined through the lens of teachers' self-beliefs. Factors and disparities in students' academic achievement at the secondary school level were investigated by Mandler (1989) in the area of student mathematics achievement. When comparing men and women, there was no discernible gender gap in numerical proficiency, algebraic reasoning, or statistical acumen. The gender gap in mathematical aptitude, according to some studies, has its roots in deep-seated cultural bias.

According to various research, disparities can be attributed to a multitude of causes. In their review of the literature, Sprigler and Alsup (2003) found that girls and boys were equally capable of learning and succeeding in mathematics. Females, in particular, demonstrated a strong determination to learn solid foundational mathematics skills at the primary level, highlighting their mathematical thinking abilities. Researchers Ding, Song, and Ruffell et al. (1998) sought to quantify the degree to which men and women tended to gravitate towards mathematical fields.

The researchers noticed a rising interest in and satisfaction with mathematical education. Students come to understand that their teachers genuinely care about their learning and achievement when teachers maintain high-level beliefs in their own efficacy. Regarding how helpful and compassionate teachers are, students and their parents had different opinions. According to Romo and Falbo (1996), determining a teacher's efficacy is not an easy undertaking because students evaluate teachers based on the amount of work they put into turning low performers into high achievers. Consistently putting in the necessary work requires a significant investment of time and energy.

Teachers' self-beliefs, according to the researchers, are a key factor in students' mathematical understanding and performance in the classroom. Teachers' effectiveness in the classroom is revealed by their experimenting with fresh ways of thinking about and delivering knowledge (Wilkins, 2008). Researchers went on to say that students whose instructors had a firm grasp of the subject area had superior mathematical proficiency. The gender pattern in enrolment in secondary mathematics courses was investigated by Goldin et al. (2006). It also showed a similar propensity to enroll in math classes. The results showed that both sexes were equally enthusiastic in taking Math's classes. The

results of linked studies show that there is a strong context effect between teachers' self-belief and their students' academic performance.

Students' academic performance, especially in mathematics, differs across countries due to differences in instructors' self-beliefs, which in turn vary among cultures and environments. Researchers in Pakistan have looked at the effects of self-belief in the classroom in a number of studies. Teachers' self-beliefs in the classroom were studied by Wilkins (2008) in relation to demographic factors such as gender, age, education level, and years of experience in the field. According to the study's summary, female instructors had more powerful beliefs in their ability to effectively teach in a classroom setting and achieve their desired outcomes than male teachers did. Findings of the study suggested that instructors in the urban areas received more respect as compared to the Relationship between Mathematics instructors Self Efficacy and SAA at SL 174 teachers teaching in the remote locations.

Their professional and academic credentials bolstered faith in their skills. There was a considerable correlation between classroom teaching proficiency and higher-level belief about talents. Beliefs in efficacy were unaffected by age. Teachers' self-confidence in their own talents as educators was bolstered by their gender role and years of classroom experience. According to research by Tella (2007), while comparing male and female teachers, the former had a more robust belief in their own abilities as educators. According to these scholars, female educators in Pakistan's school system have proven themselves to be suitable role models for their students.

Mathematics self-beliefs and their effects on pupils' mathematical performance and achievement was the focus of a primary school research project. The effects of self-beliefs on factors including test anxiety, self-regulation of learning, school identification, and academic achievement were studied by Smith (2000). Students' self-beliefs and their ability to self-regulate their learning showed a strong link. In terms of academic performance, there was also a discernible improvement. Women also voiced their determination to participate in the study. A study was carried out by Swars (2005) to determine the relationship between students' self-beliefs and their performance in university, as

measured by their cumulative grade point average (CGPA). The researchers calculated the students' cumulative grade point averages and administered tests to gauge their academic achievement and learning efficacy. They came to the conclusion that pupils' academic performance and accomplishment were better correlated with their level of efficacy views. Additionally, they found that there were gender disparities in self-views, with male learners displaying higher levels of effectiveness beliefs than their female counterparts.

Researchers in the fields of psychology, sociology, academia, and education have poured a lot of time and energy into studying the correlation between one's level of self-confidence and their IQ and other measures of general cognitive capacity. Everyone agrees that these two skills go hand in hand when it comes to success in school. Being consistent with other beliefs about efficacy and having faith in one's own intelligence and how to put it to use are the most crucial factors. Students who failed to believe in their own brilliance and who failed to use it effectively failed to complete the assignment (Swars, 2005; Tella, 2007).

Learners with an incremental conception of intelligence have more challenging learning objectives, according to incremental theorists such as Rao et al. (2000). On the other hand, Mullis et al. (2000) and other researchers found only weak and unsatisfactory significant relationships between intelligence beliefs and three objective orientation measures: mastery, technique, and prevention. The concept and capacity of self-beliefs and their association with academic accomplishment have been the subject of numerous high-quality research investigations. Various viewpoints and academic contexts have been used to conduct the investigations. Therefore, there has been a meteoric rise in the quantity and quality of self-beliefs used in mathematical education, which is a subset of the broader field of education (Jennings & Greenberg, 2009; Philippou & Christou, 1998; Rao et al., 2000). A number of studies have looked at students' arithmetic beliefs throughout age groups; one of these claims is that, in contrast to elementary school, secondary school reinforces a set of negative beliefs that undoubtedly contribute to the unfavorable outcomes. These ideas spread through secondary school since Maths is becoming a more and more

challenging subject, which in turn leads to poor grades (Gafoor & Kurukkan, 2015). The insight students have on mathematics remains very critical in educational stakeholder's desire to find a lasting remedy to the issue of low academic outcome and lack of interest in mathematics. These impressions of students about mathematics might be a consequence of encounters students go through in the beginning phases of their educational life.

In this paper, a total of 692 students' sample was taken from target population. The participants belonging to rural, urban, male and female gender also, After the analysis of data, it was found from the descriptive as well as inferential statistics analysis of data that demographic characters like tehsil, school sector, current class, school location, student gender, student subjects of study, student residential area, math achievement ranking, fathers' qualification, mothers' qualification, students' age and obtained marks in 8<sup>th</sup> class were having positive significant effect on the teachers' role and students' self-belief in mathematics at secondary level. Moreover, it was also found that most of the demographic factors having positive effect on the study and having sig. value 0.00. Similarly, it was concluded that demographic characters were important for mathematics performance at secondary level in connection with teachers' role and students' self-belief also. The descriptive statistics including frequency, percentage and Standard Deviation and inferential statistics having independent t-test as well as ANOVA t-test for demographic information as well as on all statements of students and students were calculated and their findings as well as interpretations were taken also.

## Research Questions

Following three hypotheses were formulated to test the main objectives of the study.

To determine the effect location on the teachers' role in relationship on mathematics performance at secondary level.

To examine whether students' beliefs about mathematics affects mathematics performance at secondary level based on gender basis.

To find out the effects of teachers' role and student's beliefs on mathematics achievement at secondary level.

## 3. Research Methodology

### 3.1 Study Design, Population and Sample

All the secondary public schools of District Muzaffargarh (Pakistan) will be included in the population of the study and it was depicted the data about the total population of students were taken for from public and private sector, from Muzaffargarh Tehsil, there were 8662 (Male=4867, Female=3795), from Alipur Tehsil total students were taken 3762 (Male= 2108, Female= 1654), and from Jatoi total participants were 3975 (Male=1964, Female=2011). The total population of students was 16399 for both public and private sector including male (8939) and female (7460) students also. Similarly, it was also depicted the data about the total sample of students were taken for from public and private sector from Alipur total students were taken 197 (Male= 84, Female= 113), from Muzaffargarh, there were 375 (Male=163, Female=212) and from Jatoi total participants were 120 (Male=42, Female=78). The total sample of students was 692 for data analysis.

### 3.2 Tool Development and Validation

A research tool is used to measure the reliability and consistency of data which also measure the future predictions. A questionnaire was designed to measure the student's perceptions and outcomes of study. Questionnaire was designed on the structure of Likert scale in which degree of selection is five which is strongly agree, agree, satisfactory, disagree and strongly disagree. The research tool was developed according to the need of study. To calculate the students' responses on distributed leadership, and trust in head teacher 5-point Likert scale was used. The items of questionnaire were ranging from "Strongly Agree" to "Strongly disagree". The scoring to the items were assigned (i.e., Strongly Agree=5, Agree=4, No idea=3, Disagree= 2 & Strongly Disagree =1). Codes were assigned to demographic information of respondents (i.e., 1, 2, 3, 4 & 5). These scores and codes were helped in analyzing responses and perception differences.

The developed questionnaire was observed by senior teachers, administration staff and expert of university. They found it observe able for the topic and easy to understand for the participant going to fill it. This method is also used as an instrument to make long-term predictions. For long term this research is

used on the basis of student's perception on social, emotional and cognitive competence at secondary level at district Muzaffargarh. A pilot test was organized to twenty participants and then tested their reliability. The result showed positive and significant relationship. The test also showed that the students have positive perception about their education system.

The reliability of research tool was measured through SPSS. The value of Chronbach alpha was found 0.7 for my survey design which was highly reliable for research. In this regard, the research tool was found valid for further use for study.

### 3.3 Tool Administration and Data Collection

Before starting data collection, mandatory approvals had been obtained from CEO of district Muzaffargarh for public schools and from principals of private schools. After obtaining approval to conduct the study, the researcher, with the assistance of the DEO of public and private schools, was provided with a list of the secondary schools.

After finalization of the research survey design questionnaires, the researcher took permission from Chief Executive Officer (DEA), Muzaffargarh. Researcher visited the elementary schools and distributed the survey questionnaires. The researcher briefly described the purpose of study to the students also. Researcher requested all to fill or gave response honestly and fairly. Researcher visited the all secondary schools of four tehsils of district Multan. After a month, researcher made a visit of these schools again. Researcher collected the questionnaires. Similarly, researcher collected the questionnaires from the students of secondary schools of district Multan. Data collection procedure is important and major step in research thesis in which complete demographics were discussed. In this research a data was collected through students of secondary schools and analyzed their responsiveness against factors leading to social, emotional and cognitive competence at secondary level in district Multan. SPSS software is used to get more accurate results from the collected data.

It was examined by applying both the descriptive and inferential statistics. Analysis of demographic information was examined by measuring frequency and percentage of the respondents. The descriptive analysis of each item was conduct through

calculating percentage (%), mean and standard deviation (SD). For ease of analysis, responses on options “Often” and “always” were combined into one option i.e., “often”. Likewise, “rarely” and “never” were combined into one option i.e., “rarely”. To analyze the possible differences between the perceptions of participants inferential statistics (i.e., t. test, ANOVA) were conducted.

### 3.4 Data Analysis and Results

The study was conducted at district Muzaffargarh and secondary schools were taken as population of study. The students were the population and sample of the study. The demographic information of the participants especially location is given in the Table 1.

**Table 1**

*Independent t-test about the perception of students’ beliefs about mathematics teachers’ role with respect to location*

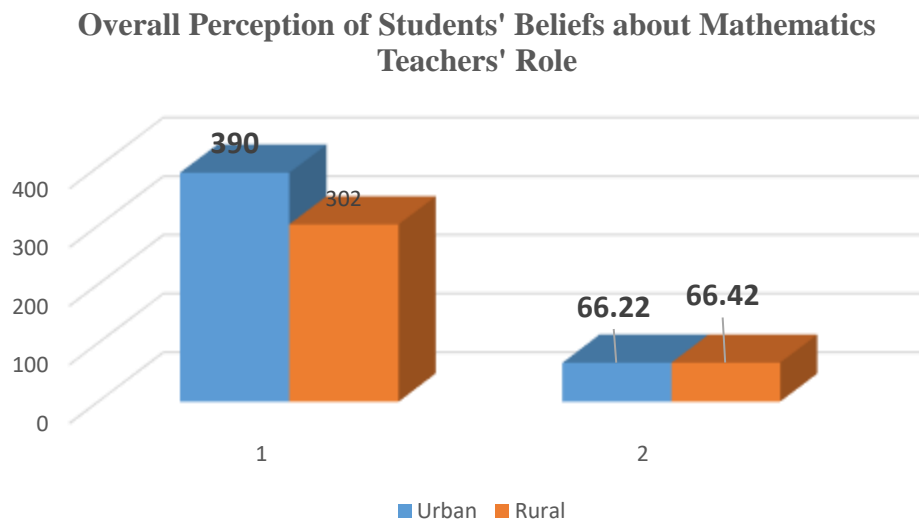
Factor	Groups	N	Mean	Std. Deviation	df	t	Sig.
Overall Perception of Students' Beliefs about Mathematics Teachers' Role	Urban	390	66.22	7.26	690	-0.39	0.00
	Rural	302	66.42	6.54	674.42	-0.40	

Table 1 displayed the analysis of Independent t-test about the perception of students’ beliefs about mathematics teachers’ role with respect to location and it was found that the urban group have N=390, mean (N=66.22), standard deviation (SD=7.26), df=690 and value of t= -0.39 while rural group have N=302, mean (N=66.42), standard deviation (SD=6.54), df=674.42 and value of t= -0.40. It was concluded that the urban group having greater value of mean (N=390) which inferred that having

more effective for belief beliefs about mathematics teachers’ role with respect to location. Similarly, the value of sig= 0.00 was found and value of sig. 0.00 is less than the standard sig= 0.05 which was concluded that the effect of school location on about the perception of students’ beliefs about mathematics teachers’ role was found significant and having positive effect with respect to school location as shown in Figure 1.

**Figure 1**

*Independent t-test about the perception of students’ beliefs about mathematics teachers’ role with respect to location*



**Table 2**

*Independent t-test about the perception of students' beliefs about mathematics teachers' role with respect to gender*

Factor	Groups	N	Mean	Std. Deviation	df	t	Sig.
Overall Perception of Students' Beliefs about Mathematics Teachers' Role	Male	289	65.49	6.83	690	-2.61	0.87
	Female	403	66.89	6.98	628.78	-2.62	

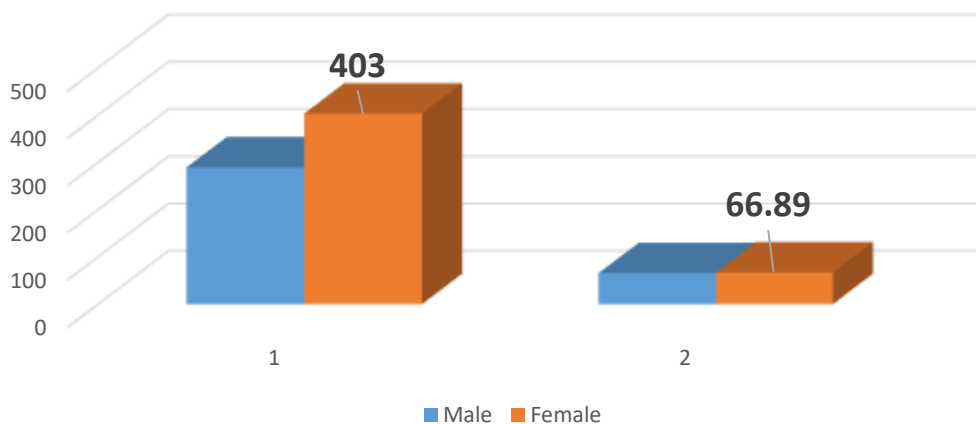
Table 2 displayed the analysis of Independent t-test about the perception of students' beliefs about mathematics teachers' role with respect to gender and it was found that the male group have N=289, mean (N=65.49), standard deviation (SD=6.83), df=690 and value of t= -2.61 while female group have N=403, mean (N=66.89), standard deviation (SD=6.98), df=628.78 and value of t= -2.62. It was concluded that the urban group having greater value of mean (N=403) which inferred that having

more effective for belief beliefs about mathematics teachers' role with respect to gender. Similarly, the value of sig= 0.87 was found and value of sig. 0.87 is greater than the standard sig= 0.05 which was concluded that the effect of gender on about the perception of students' beliefs about mathematics teachers' role was found insignificant and having no positive effect with respect to gender as shown in Figure 2.

**Figure 2**

*Independent t-test about the perception of students' beliefs about mathematics teachers' role with respect to gender*

### Overall Perception of Students' Beliefs about Mathematics Teachers' Role



### Discussion

The objectives of the research study were to find out students about teachers' role and students' self-beliefs in mathematics performance at secondary level. The main objectives of the study were as effect of the teachers' role in relationship on mathematics performance at secondary level and students' beliefs about mathematics which are affecting on

mathematics performance at secondary level were the main objectives of the study. The study focused on determining the relationship between teachers' role and students' self-beliefs at secondary school level.

Researcher used the methodology regarding survey based research and research tool was developed in questionnaire form with a five-point Likert scale to

find results on the basis of findings and conclusion. A total of 692 students sample was taken from target population. The participants belonging to rural, urban, male and female gender also. The participants of sample were taken as from Tehsil Muzaffargarh was 375 (54.2%), Alipur were 197 (28.5%) and from Jatoi were 120 (17.3%).

After the analysis of data, it was found from the descriptive as well as inferential statistics analysis of data that demographic characters like tehsil, school sector, current class, school location, student gender, student subjects of study, student residential area, math achievement ranking, fathers' qualification, mothers' qualification, students' age and obtained marks in 8<sup>th</sup> class were having positive significant effect on the teachers' role and students' self-belief in mathematics at secondary level. Moreover, it was also found that most of the demographic factors having positive effect on the study and having sig. value 0.00.

Similarly, it was concluded that demographic characters like tehsil, school sector, current class, school location, student gender, student subjects of study, student residential area, math achievement ranking, fathers' qualification, mothers' qualification, students' age and obtained marks in 8<sup>th</sup> class were important for mathematics performance at secondary level in connection with teachers' role and students' self-belief also. It was also recommended that similar research study will also be conducted at primary and higher secondary level and teachers will also be taken for participants also. It was also suggest that the same study will also produce fruitful results in future at different level of schooling also and It was suggest that it is also necessary to discover how institutions might focus on making pleasurable things useful by promoting educational mathematics as a tool for not just communication and amusement, but also for learning

Data was collected and put into SPSS and excel sheet. The frequency of responses was recoded into tables, for different interpretation descriptive and inferential statistical tools are applied. First of all, mean and standard deviation were found, and then variance and co-relation are found. All factors were tested through an independent t-test for the mean difference of factors, and all descriptive as well as inferential statistics will be applied for results.

As reported in previous studies that one must comprehend what was taught previously in order to comprehend new concepts in Mathematics at secondary level because they are all interconnected and difficult to comprehend and solve problems without prior knowledge about student's perception of social, emotional and cognitive competence at secondary level (Genene, 2014). It was further recommended that similar study would also be conducted at post graduate level to investigate the factors on social competence, emotional competence and cognitive competence having significant relationship for Mathematics at Secondary level.

The descriptive statistics including frequency, percentage and Standard Deviation and inferential statistics having Independent t-test as well as ANOVA t-test for demographic informations as well as on all statements of students and students were calculated and their findings as well as interpretations were taken also. It was also concluded that different factors from demographic information were most important for social competence, emotional competence and cognitive competence having significant relationship for Mathematics at Secondary level.

Moreover, it was suggested that This study cannot analyzed overall teachers and parents' views regarding their views their social competence, emotional competence and cognitive competence having significant relationship for Mathematics at Secondary level. Future researchers may focus on analyzing views of teachers based on their specific subject of teaching or area/discipline at any level.

## Conclusions and Recommendations

It was concluded that the fathers' qualification having positive significant effect students' perception of their self-beliefs about mathematics at secondary level. Moreover, it was concluded that the mothers' qualification having positive significant effect students' perception of their self-beliefs about mathematics at secondary level. This study was delimited to seeking perception of students' at secondary level of District Muzaffargarh only. The future researcher may conduct research on other levels of Schools and Colleges in others Districts also. This study focused on investigating views of students only. Future research can be extended to examining head teachers' perception about the



perception of teachers' views about self-beliefs in Mathematics at secondary level. This study cannot analyze overall students' views regarding their views about the self-beliefs and usefulness of Mathematics at primary level. It is also suggested that the same study will also produce fruitful results in future at different level of schooling also and it is also necessary to discover how institutions might focus on making pleasurable things useful by promoting educational mathematics. It is also recommended that similar research study will also be conducted at primary and higher secondary level and teachers will also be taken for participants also.

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