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Key Role of 'motivation for mathematics' on doing Mathematics home tasks during COVID-19 lockdown period

Shyamal Mistry
Assistant Teacher, Durgapur K.C.High School
E-mail: shyamal.spas.edu.in@gmail.com

Abstract
Purpose of current study was to determine the role of 'motivation for mathematics' on doing mathematics home tasks during COVID-19 lockdown period. The Statistical population involved the entire 5^{th}-8^{th} graded students studying in Durgapur K.C. high school in south 24 parganas in 2020. From these, two hundred late childhood students (10-13 yrs) were selected as sample through purposive sampling method. For gathering data, the following scale & data were used: Nicholl's Motivation Orientation Scales (MOS) and mathematics home tasks done by 5th -8th graded school students during COVID-19 lockdown period from March to June, 2020. Correlation & causal comparative design were the research method. For data analysis, Pearson's product moment correlation (r) and t test were used by SPSS. The Results showed that there is significant positive relationship between 'motivation for mathematics' and mathematics home tasks done by 5^{th} -8^{th} graded school students during COVID-19 lockdown period. Intrinsically motivated late childhood students solved mathematics home tasks far more than extrinsically motivated students.

Key words: Extrinsic motivation, Intrinsic motivation, Mathematics home tasks.

Introduction

Mathematics is one of the essential tools of everyday life. Being mathematically literate is important to being a productive citizen in a democracy, and all healthy and abled people are capable of becoming mathematically literate (NCTM, 2000). So, I dream of students coming home from school excited about mathematics. An orientation toward achieving success in mathematics can be built into the mathematics classroom. Although students feel that mathematics is important, the number of students who want to take more mathematics in school is declining steadily. So I think as a math teacher I have to pay attention to math and consider it as one of the important and necessary materials in school and everyday life. This could be done through the development of students' skills in mathematics knowledge in its various aspects, using suitable techniques and teaching methods for making mathematics interesting subject and attractive for the students. But the school was closed during COVID-19 lockdown period, so influence of the teacher or school on mathematics learners was totally barred. In this situation students were solving their mathematical home tasks by themselves, which were given by their mathematics teacher of school before lockdown either under control or no control from home environment. At that point, my assumption is that highly motivated students regularly solve their mathematical home tasks by their own instinct but relatively low motivated students avoid this practice regularly. The purpose of this article is regarding students' motivation in mathematics.

Researches related to motivation and mathematics achievement indicate that academic intrinsic math motivation is related to mathematics achievement (Yildirim, 2011, [8]Gottfried, et al, 2001). According to findings of [11]Khoush Bakht, and Kayyer, (2005), [12]Md. Yunus, and Wan Ali (2009), [13]Middleton, and Spanias (1999) there is significant positive relation between motivation and students' mathematics achievement. Motivation is the most evident learning factor that directly affects the success of the students in mathematics subject ([8]Gottfried, Fleming, & Gottfried, 2001). Bernard Weiner stated that

"Motivation is the psychological stimulus that directs people to act in a certain way to achieve their individual goals." Crow and Crow define it as "Motivation is considered with the arousal of the interest in learning and to the extent is basic to learning."Motivation refers to "a student's willingness, need, desire and compulsion to participate in, and be successful in the learning process" ([12]Md. Yunus, Wan Ali, 2009).

Determinant of motivation are: 1) locus of control 2) Learned helplessness 3) independent learning. 4) anxiety 5) interest 6) curiosity 7) co-operation 8) competition.

According to Zeinbado, "A locus of control orientation is a belief about whether the outcomes of actions are contingent on what we do (internal control orientation) or on events outside our personal control (external control orientation)." Thus locus of control can be understood as bipolar construct, ranging from external causes to internal causes. Internals, believe that they are personal responsible for and can influence what happen to them in mathematics performance but externals, believe that what happens in mathematics performance is decided by powers outside their own control or other people. Those with high internal locus of control have better control of their mathematical problem solving process and this determined by their hard work, attributes, or decisions. They are also more active in seeking information and knowledge concerning the step of mathematical problem solving than to externals. Locus of control is largely learned,[17]Seligman (1975) suggested that external are more likely to suffer from "learned helplessness". There are more likely to give up and withdraw in stressful situations while internals will attempt to cope during mathematical problem solving. Learned helplessness can lead to experience and emotional imbalance possibly giving rise to mathematics anxiety. Independent learning is very essential for mathematical problem solving at home during COVID-19 lockdown period. Curiosity & interest are important pillars of motivation among mathematics learners. If curiosity & interest can be aroused properly, learners intrinsically motivated toward mathematic subject. Interpersonal competition and cooperation among peers are also a strong incentive for motivating children towards mathematics.

According to the researches done, there are independent dimensions of success related to motivation term ([15]Nicholls, Cheung, Lauer, & Patashnick, 1989). The first dimension is task orientation, second dimension is ego orientation and the third dimension is work avoidance. [6]Duda and Nicholls (1992) expressed that, task orientation is the goal of improving one's skill or gaining insight or knowledge and the beliefs that, in order to be successful, work hard, attempt to understand schoolwork, and collaborate with peers. According to [13]Middleton and Spanias (1999), achievement motivation of children in mathematics, depends on task behavior. The second dimension is the ego orientation. It is defined as the goal of establishing one's superiority over others and the beliefs that success in school requires attempts to beat others and superior ability. The terms task orientation versus ego orientation are the two perspectives for the achievement motivation ([7]Duda, 1993; [15]Nicholls, 1989) and in addition to that researchers have also proposed that students may be avoidance-oriented in learning situations ([6]Duda & Niholls, 1992). Moreover the factor analyses indicate that task orientation, ego orientation, and avoidance orientation are distinct goal orientation factors ([6]Duda &Nicholls, 1992).During the task orientation, if students can be motivated intrinsically about the given mathematics tasks, they tend to exhibit a number of pedagogically desirable behaviors including increased time on task. If individuals are ego involved, their chances of mathematical ability depend on the mathematical ability of other individuals. The third dimension, work avoidance, entails the goal of not working hard. It is an especially disturbing goal pattern in which working hard is not valued for the students who are unable to solve math problem.

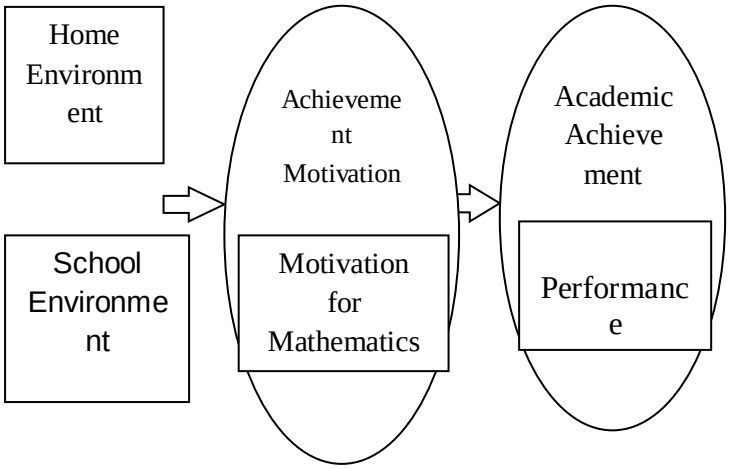
The important dimensions of motivation for mathematics are: (i) Motivation for achievement (evidenced by competitiveness and goal orientation); (ii) inner resources (evidenced by relaxed style, happiness, patience and self confidence); (iii) inter personal strengths (evidenced by assertiveness, personal diplomacy, extraversion and co-cooperativeness); and (iv)

work habits (evidenced by planning and organization, initiatives, and team spirit).

Motivation is divided into two primary types namely intrinsic and extrinsic motivation ([9]Grolnick, Deci, & Ryan, 1997). The former type of motivation refers to an innate, inclination of the individual to examine and master his internal and external environment while the latter type of motivation refers to behaviors motivated by the desire to achieve external rewards or social demands ([16]Ryan, Connell, & Grolnick, 1992).According to [3]Deci and Ryan (1985), intrinsic motivation fosters engagement and it is the result of the needs for competence, autonomy, and relatedness. In addition to that it is the purpose of performing a behavior is for the pleasure and satisfaction of the process and associated with feelings of control ([2]Biddle and Mutrie, 2001). On the other hand, extrinsic motivation can be defined as the purpose of a behavior is to gain benefits or avoid negative consequences that are expected to occur afterwards that promotes behavior through contingent outcomes that lie outside the activity. If the students' behaviours about their motivation are analyzed it can be seen that if the children are intrinsically motivated, then they believe to solve problem in different way to promote creative responses that are focused on the math tasks. Otherwise if the children are motivated externally, then they are not contingent on the presence of external reinforces.

Two motives are directly involved in the mathematics performance, implicit and explicit. Implicit motives are spontaneous impulses to act, also known as task performances, and are aroused through incentives inherent to the mathematics task. Explicit motives are expressed through deliberate choices and more often stimulated for extrinsic reasons. Also, mathematics learners with strong implicit needs to achieve goals set higher internal standards, whereas others tend to adhere to the societal norms.

Motivation is a driving force for learning. Late childhood school students are incorporated and welcomed to participate in daily mathematical activities and thus feel motivated to participate due to them seeking a sense of belonging in their well caring families. Their participation in math tasks is encouraged, furthering their motivation. So, the influence of home environment is highly necessary for arousing motivation of the students for mathematics. Furthermore, it is also important to note that despite the classroom environment and the teacher's teaching style, the overall school environment plays a role in late childhood school students' intrinsic motivation.



There are many students who are highly motivated and do anything their mathematics teacher and parents ask. However, the number of poorly motivated students is substantial and seems to be growing. In high schools, these students tend to be clustered in beginning level classes because their lack of effort keeps them from gaining the skills needed to take more advanced mathematics. It is a matter whether a late childhood student is motivated, unmotivated, or more motivated than other school students. So goal of the current study was to determine the role of motivation for mathematics on doing mathematical home tasks during COVID-19 lockdown period in two hundred samples of 5^{th}-8^{th} graded students aged 10-13 years. It is also a purpose of this article what motivate students before providing mathematical home tasks.

Review of related literature

[1]Belal Rabab'h & veloo (2015) studied "Prediction of Mathematics Learning Strategies on Mathematics Achievement among 8th Grade Students in Jordan." The study aimed to examine the extent of the student's Mathematics Learning Strategy (MLS) factors such as mathematics attitude, mathematics motivation, mathematics self regulation, mathematics self efficacy and mathematics anxiety contribution to mathematics achievement (MA). The results of

multiple regression analysis showed that mathematics attitude, mathematics motivation, mathematics self regulation, mathematics self efficacy significantly contributed to MA, with the exception of mathematics anxiety that was found to have an insignificant effect on MA. Educators, principals and teachers should focus on most MLS factors in classes and students should be motivated to understand that the subject could be studied and passed just like other subjects, and to appreciate that it is an essential tool and a prerequisite for further education in many vocations.

[5]Dr. Doley (2018) studied "The Impact of Home Environment Factors on Academic Achievement motivation of Adolescents". This Study indicates that students of Favourable and Moderately favourable Home environment groups differ significantly in their Academic Achievement motivation. It can be concluded from the result that, those students who have a moderately favourable home environment also have a higher academic achievement motivation as compared to the students who have favourable home environment. Thus, the influence of home environment level on academic achievement motivation of the students is highly indicated.

[10]Joshi and others (2013) studied "Home environment and achievement motivation of adolescents." study demonstrated that the dimensions of home environment such as protectiveness, conformity and reward are significantly positively correlated with overall and all the four areas of achievement motivation. Punishment and nurturance dimensions of home environment are significantly positively correlated with general interest, sports areas and overall achievement motivation. Deprivation of privileges, social isolation, permissiveness and rejection are significantly negatively correlated with academic area and overall achievement motivation of adolescents.

[13]Middleton and Others (1999) studied "Motivation for Achievement in Mathematics: Findings, Generalizations, and Criticisms of the Research" Researchers interested in studying motivation in the content domain of school mathematics need to examine the relationship that exists between mathematics as a socially constructed field and students' desire to achieve. First, findings across theoretical orientations indicate that students' perceptions of success in mathematics are highly influential in forming their motivational attitudes. Second, motivations toward mathematics are developed early, are highly stable over time, and are influenced greatly by teacher actions and attitudes. Third, providing opportunities for students to develop intrinsic motivation in mathematics is generally superior to providing extrinsic incentives for achievement. Fourth, inequities exist in the ways in which some groups of students in mathematics classes have been taught to view mathematics. Last, and most important, achievement motivation in mathematics, though stable, can be affected through careful instructional design.

[14]Moenikia and others (2010) studied "A study of simple and multiple relations between mathematics attitude, academic motivation and intelligence quotient with mathematics achievement." The Results showed that all of the variables correlate with together significantly. The shares of mathematics' attitude, academic motivation and intelligence quotient were .362, .030, and .360, respectively in predicting of math achievement. It is should be mentioned that the share of academic motivation in this prediction in the presence of two other variable is not significant.

[4]Sharma & Sharma (2018) studied "Relationship between motivation and academic achievement". To study whether there exists significant difference in academic achievement due to high, average and low level of achievement motivation in the late childhood school students. The study found that there were significant correlations between self-concept, motivation and academic achievement of late childhood school students. It was also found that female students are significantly more motivated than their male counterparts. The study concluded that the findings justify the importance of self-concept and motivation to academic achievement, and some recommendations were made regarding the enhancement of motivation and self-concept of late childhood school students.

Purpose of the present study

The main purpose was to determine the role of motivation for mathematics on doing

mathematics home tasks during COVID-19 lockdown period and to investigate to find out the way of enhancing of motivation for mathematics among 5th -8th graded school students whose intrinsic motivation are still developing. So specifically the objectives can be stated as under:

I. To study the relation between motivation for mathematics and mathematics home tasks done by 5th - 8th graded school students during COVID-19 lockdown period.

II. To study the difference between intrinsic & extrinsic motivation for mathematics on mathematics home tasks done by 5th -8th graded school students.

Hypotheses

H_0 -1: There is no significant relationship between motivation for mathematics and mathematics home tasks done by 5th - 8th graded school students.

H_0 -2: There is no significant difference between intrinsic & extrinsic motivation for mathematics on mathematics home tasks done by 5th -8th graded school students.

Methods

The entire 5th-8th graded students studying in Durgapur K.C. high school in south 24 parganas constitute the population. Two hundred late childhood students (10-13 yrs) were selected as sample through purposive sampling method.

The instruments of this research were Nicholl's Motivation Orientation Scales (MOS) ([15]Nicholls et al., 1989; [6]Duda & Nicholls, 1992) and mathematics home tasks done by 5th -8th graded school students during COVID-19 lockdown period from March to June, 2020.

Procedure

At first, the Nicholl's Motivation Orientation Scales (MOS) questionnaire was distributed among participants and data were gathered in January, 2020. Then mathematics home tasks done by students were continuously checked by me throughout COVID-19 lockdown period by online devices.

Statistical analysis

For data analysis, Pearson's product moment correlation (r) & t test method were used by SPSS.

	Motivation for Mathematics	Mathematics Home works done by students (%)	Mean	Std. Deviation
Motivation for Mathematics	1.00		49.379	12.72401
Mathematics Home works done by students (%)	0.845**	1.00	30.540	11.80098
N= 200 **- 0.05 level of significance				

Result and Interpretation

Objective-1

Testing of H_0 -1: There is no significant relationship between motivation for mathematics and mathematics home tasks done by 5th - 8th graded school students.

Table -1: Pearson's correlations coefficient, Mean and Standard deviation-

From table-1, it is evident that mean of motivation for mathematics is 49.379 and standard deviation is 12.72401, mean of percentage of mathematics home tasks done by students is 30.540 and standard deviation is 11.80098. Also table-1 showed that Correlation value (r) between motivation for mathematics and percentage of mathematics home tasks done by students is 0.845.It is significant at 0.05 level. The null hypothesis is rejected. So there is high positive relationship between motivation for mathematics and mathematics home tasks done by 5^{th} -8^{th} graded school students during COVID-19 lockdown period. The present findings are supported by the finding of [13]Middleton and et al (1999), [1]Belal Rabab'h & veloo (2015).

Objective-2

Testing of H_0 -2: There is no significant difference between intrinsic & extrinsic motivation for mathematics on mathematics home tasks done by 5th -8th graded school students.

Table-2: Mean, SD, t test-value of mathematics home tasks done by intrinsically & extrinsically motivated students-

Independent variable	Dependent variable	N	Mean	Standard Deviation	t test value	Significance at 0.05 level
Intrinsic motivation	Percentage of mathematics home tasks done by students	40	79.88	11.347	0.722	Significant. H_0 -2 is rejected.
Extrinsic motivation		160	20.45	4.621		

From table-2, Out of 200 5th -8th graded school students, 40 are intrinsically motivated students and 160 are extrinsically motivated students. Mean of Percentage of mathematics home tasks done by intrinsically & extrinsically motivated students are 79.88 and 20.45 respectively. t test value is 0.722 and p value is 0.535 ($p > 0.05$). Hence H_0 -2 is rejected. Alternative hypothesis is accepted. So it can be concluded that there is significant difference between intrinsic & extrinsic motivation for mathematics and mathematics home tasks done by 5th -8th graded school students. The present findings are supported by the finding of [8]Gottfried, et al, (2001).

There is significant positive relationship between motivation for mathematics and mathematics home tasks done by 5th -8th graded school students during COVID-19 lockdown period. Intrinsically motivated late childhood students solved mathematics home tasks far more than extrinsically motivated students.

Educational Implications

It is expected that in late childhood motivation for mathematics should be high as in this stage foundation of career is laid down .When the root of a sapling reaches to the deep of soil, it can stand upright without any support likewise if, intrinsic motivation of a learner is aroused then without nurturing, learner's performance will be high in mathematics. So, educational implication of this research is that how motivation will aroused among mathematics learners.

Student's motivation for mathematics can be uplifted by teachers, parents, school & home environment and peer group. Teacher's own locus of control and classroom management motivates the mathematics achievers. A student's effort can vary with the task at hand given by teacher, students were asked about their level of effort in mathematics class, on homework, they were also asked directly by the teacher about what motivate them in mathematics. Teachers motivate the mathematics learners by token economy, parent's counseling, checking mathematics home work daily, conducting regular class test and telling them biographies of famous mathematicians. Finally, mathematics teacher's teaching style strongly motivates the students through overall updation of the school climate. Modification of mathematics curriculum is also essential for motivation in mathematics learners. Careful instructional design helps them too. Low achievers should be taught mathematics calculation by joyful playing method using math playing card. The teachers must regularly conduct class test among high achievers who are always intrinsically motivated. Beside school climate, moderately favourable home environment also needs to motivatee ([5]Dr.Doley, 2018). In improving or stimulating motivation for mathematics the role of parents and home environment cannot be ignored. High motivation acquisition through vicarious social learning from peers which is known as peer effect, in the school or hostel, can also be beneficial. So, proper and effective peer bonding is also necessary for this purpose

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