Effects of Private Tuition, Time Allocation and Perceived Difficulty on Achievement in Mathematics of Secondary School Boys and Girls in Kerala

ABDUL GAFOOR K.* AND SARABI M. K.**

ABSTRACT

This study examines the effect of gender, perceived difficulty, time allocation and private tuition on achievement in mathematics among secondary school students. A total of 988 students in grade nine from government and government-aided schools of Malappuram district of Kerala participated in the study. They completed a questionnaire on Mathematics Learning, and a grade-appropriate test of achievement. Results showed that whereas achievement in mathematics does not vary by gender, increase in perceived difficulty of mathematics adversely affects achievement. Students devoting less time on learning achieve significantly less. Private tuition is found to have positive impact on achievement in mathematics, especially of girls perceiving mathematics as highly difficult and among students allotting moderate time on learning mathematics at home. Even students perceiving high difficulty achieve better with moderate to high time allocation. The study suggested the need for putting efforts by students, teachers, parents and administrators to enhance the quality of students' learning in mathematics.

Introduction

Achievement in mathematics is known to be influenced by a number of personal, familial, and instructional factors. Many studies also

**Professor*, Department of Education, University of Calicut. Email: gfr.abdul@yahoo.co.in

***Junior Research Fellow*, Department of Education, University of Calicut. Email: sarapadne@gmail

report for gender gap in mathematics achievement. Hyde (2016) states that males and females are quite similar on most, but not all, psychological variables. Many studies have reported a lead of boys in mathematics test scores (Dickerson, McIntosh and Valente, 2015; Campbell and Beaudry, 1998); in mathematical reasoning ability (Benbow and Stanley, 1980); small but stable mean differences in senior secondary mathematics (Reilly, Neumann, and Andrews, 2015); and in measures of spatial visualisation, and high school mathematics (Feingold,1988).

However, there are reasons to believe that gender difference in mathematics performance is not generalisable across achievement levels and across mathematics tasks. Differences favouring males are reported in many studies (Reilly, Neumann and Andrews, 2015; Fan, Chen and Matsumoto, 1997; Stoet and Geary, 2012; Feingold, 1988). Though female and male do not differ in math calculation, geometric concepts, basic math concepts, and addition, males perform relatively better on complex math problems (Stewart, Root, Koriakin, Choi, Luria, Bray, and Courville, 2016) and advantage of males on this count seems to increase with age (Hyde, Fennema, and Lamon, 1990; Bharadwaj, Giorgi, Hansen, and Neilson, 2016). However, studies that reject the existence of gender gap are also available (Lindberg, Hyde, Petersen and Linn, 2010; Saritas and Akdemir, 2009; Hyde, Lindberg, Linn, Ellis and Williams, 2008; Chaman, 2014; Choudhury and Das, 2012), even from South Indian samples consisting of students from high schools of Kerala that report higher mathematics anxiety for girls (Venkatesh and Karimi, 2010). Performance on none of the 11 mathematics tasks in elementary schools demonstrated gender based differences among upper primary students of Kerala (Gafoor, 2011) and in elementary mathematics in general elsewhere in India (Wu, Goldschmidt, Boscardin and Azam, 2007). However, even studies that see stable female advantage in school marks reports such advantage as smallest for mathematics courses (Voyer and Voyer, 2014). Therefore, gender differences in maths achievement call for further attention in research.

Perceived difficulty and lack of confidence are important reasons for students not continuing with mathematics (Brown, Brown and Bibby, 2008) and their poor mathematics achievement. Mathematics self-concept had important direct effects on the boys' mathematics achievement, but had little effect on the girls' achievement (Campbell and Beaudry, 1998). Some studies state

that girls are more likely to report that they dislike mathematics or find mathematics difficult (Goetz, Bieg, Ludtke, Pekrun and Hall, 2013; Bharadwaj, Giorgi, Hansen and Neilson, 2016); yet others (Guo, Marsh, Parker, Morin and Yeung, 2015) find out that girls tend to have higher mathematics achievement and educational aspirations despite boys and girls having similar levels of math self-concept and values. Taking into account that in developing countries like India, self-efficacy beliefs of secondary students continues to be influenced more by social and domestic factors than personal experience and mastery, and especially so in boys (Gafoor and Ashraf, 2012), and that elsewhere also direct and indirect influences on achievement from the psychological constructs is more for females (Ethington, 1992), how perception of difficulty in maths impacts mathematics achievement of boys and girls in Kerala requires further investigation.

Time spent on learning mathematics at home affects student achievement (Young and Mundial, 1996) and is positively correlated with higher achievement for almost all students (Dunleavy, Willms, Milton and Friesen, 2012; Grave, 2011; Stinebrickner and Stinebrickner, 2008), after school tutoring adds to time on learning. Tutoring in academic subjects is provided for a fee and takes place outside school hours (Bray and Lykins, 2012). Before and after school and weekend programmes had a positive effect on students' academic motivation. However, there was no evidence of effect of tutoring on achievement (Kidron and Lindsay, 2014). In India, though private tutoring is prevalent at all levels of education, it is widespread at the level of secondary education and a higher percentage of boys attend private tutoring than girls. And, among Indian states, Kerala has the highest percentage of students going for private tuition at secondary level irrespective of locale (Sujatha, 2014). While a positive effect of private tutoring on private and government school students is reported at elementary school level on Asian samples (Aslam and Atherton, 2012; Suleman and Hussain, 2013) and more specifically on mathematics scores of Indian samples (Dongre and Tewary, 2015); evidence of effect of private tuition at the secondary levels are mostly anecdotal (Azam, 2016). Tuition is more beneficial for students belonging to low achievement group, and having lower learning levels (Dongre and Tewary, 2014) including in Kerala (Gafoor and Sunnummel, 2007). It is in this context, this study aimed to identify interaction effect of perceived difficulty, time allocation and private tuition on achievement in mathematics among boys and girls at secondary level.

Research Questions

The study attempted to answer the following questions:

- Is achievement in mathematics affected by gender and perceived difficulty?
- Does achievement in mathematics increase by time allocation and private tuition? If so, does time allocation alone and along with gender modify the effect of perceived difficulty on achievement in mathematics?
- Does private tuition alone and along with gender modify the effect of perceived difficulty on achievement in mathematics?

Method

Descriptive Survey procedure comprising questionnaire and testing, and statistical analyses viz. t-test, and multi-way ANOVA were employed.

Participants

There were 988 participants, Class IX students randomly selected from 12 government and eight aided schools from both urban and rural area of Malappuram district of Kerala, India. Among 988 Students, 408 students did attend private tuition and remaining 580 students did not go for private tuition in mathematics. Only 85 students perceived mathematics as easy, 316 as moderately difficult and 587 students as a highly difficult subject. Around 68 students allotted high time on learning whereas 806 students allotted moderate time on learning mathematics at home. Number of students' allotting less time for learning mathematics at home was 114.

Research Instruments and Procedure

Information on private tuition, time allocation and perceived difficulty were obtained through a questionnaire. Students marked the daily sessions they were allotting for learning mathematics on working days (morning, evening and night) and on holidays (morning, daytime, evening and night) separately and were accordingly categorised into less time allotting (if they spend only one session per week), moderate time allotting (2–4 sessions per week) and high time allotting (5–7 sessions per week). Likewise students' allocation of out-of-school hours on private tuition on both school days and holidays were obtained and identified as No

private tuition and Tuition Groups. Groups perceiving maths as easy, moderately or highly difficult were identified on the basis of students' self-rating of feeling of difficulty of learning mathematics. The second instrument used, Test on Achievement in Mathematics for Grade 9 (Mumthas, 2016), was a test with 60 multiple-choice items for measuring achievement in mathematics among secondary school students in Kerala. It contained items on concepts in class lower than 9, it tested achievement of mathematics concepts up to Class IX, on which mean score was 31.59 (SD=10.46).

Results and Discussion

Achievement in Mathematics by Gender, Perceived Difficulty, Time allocation and Private Tuition.

Table 1 shows the results when achievement in mathematics of students were compared by gender, perceived difficulty (easy, moderately or highly difficult), time allocation (less, moderate or high time on learning) and private tuition (Private tuition or No tuition).

Table 1

Analyses of Variance of Achievement in Mathematics by Gender, Perceived Difficulty, Time allocation and Private Tuition

Factor	Gender	N	Mean	SD	f (df=)
Gender	Boys	431	31.00	10.13	2.44 (1, 986)
	Girls	557	32.05	10.69	
Perceived Difficulty	Easy	85	37.40	12.89	24.48** (2,987)
	Moderate	316	33.06	10.77	
	High	587	29.96	9.46	
Time Allocation	Less	114	28.41	10.30	7.47** (2,985)
	Moderate	806	31.83	10.39	
	High	68	34.06	10.61	
Private Tuition	No Private Tuition	580	30.83	10.76	7.50** (1, 986)
	Private Tuition	408	32.68	9.94	

Note: **p<.01

Achievement in mathematics did not vary significantly by gender, but by perceived difficulty in mathematics; time allotted for learning mathematics and private tuition. There was a significant but small effect (η^2= .014) of perceived difficulty on achievement in

Mathematics. Students who perceived mathematics as easy achieved significantly higher than students who perceived it as moderately difficult (t=3.16, p<.01) or highly difficult (t=6.44, p<.01); and students who perceived mathematics as moderately difficult achieved significantly higher than students who perceived it as highly difficult (t= 4.46, p<.01). While the effects of shift in perception of difficulty of mathematics from easy to moderate (Cohen's *d*=0.38) or from moderate to high (Cohen's *d*= 0.47) were significant but small on mathematics achievement, shift in perception of difficulty in mathematics from easy to highly difficult had large effect (Cohen's *d*= 1.52).

There was a significant but small effect (η^2= .047) of time allocation on achievement. Students who allotted less time on learning achieved significantly less, than students who allotted high time (t= 3.51, p<.01) and, than students who allotted moderate time (t=3.32, p<.01). While increase in time allocation from less to high had moderate effect (Cohen's *d*= 0.54) on achievement in mathematics; increase in time allocation from less to moderate had significant but small effect (Cohen's *d*=0.33). Achievement in mathematics did not differ significantly due to moderate or high time allotted by the students at home (t=1.66, p>.05).

In mathematics, students who received private tuition achieved significantly higher than those without private tuition (p<.01). Effect of private tuition on achievement in mathematics though significant was negligible (η^2= .007).

Two-way Interactions of Gender, Perceived Difficulty, Time allocation and Private Tuition on Achievement in Mathematics.

Interaction of the effect of gender with perceived difficulty, time allocation and private tuition on achievement in mathematics were studied using 2-way analysis of variance. Results are summarised in Table 2.

Table 2

Two-way ANOVAs of Achievement in Mathematics by Gender, with Perceived Difficulty, Time Allocation and Private Tuition

Model	Gender	Perceived difficulty	N	Mean	SD	f (df=)
Gender* Perceived Difficulty	Boys	Easy	48	35.15	12.51	12.79** (5, 982)
		Moderate	147	31.22	10.78	
		High	236	30.02	8.94	
	Girls	Easy	37	40.32	12.95	
		Moderate	169	34.66	10.53	
		High	351	29.92	9.81	

Gender * Time Allocation	Boys	Less	68	27.54	9.08	3.53* (5,982)
		Moderate	335	31.37	10.23	
		High	28	35	9.33	
	Girls	Less	46	29.70	11.88	
		Moderate	471	32.17	10.49	
		High	40	33.40	11.49	
Gender* Private Tuition	Boys	Private tuition	166	31.47	9.38	3.78* (3,984)
		No tuition	265	30.71	10.58	
	Girls	Private tuition	242	33.50	10.24	
		No tuition	315	30.93	10.92	

Note: *p<.05, **p<.01

Effect of Perceived Difficulty on Achievement in Mathematics by Gender

The observed parity between boys and girls in achievement in mathematics cannot be generalised across the three levels of perceived difficulty in mathematics. The interaction effect of gender and perceived difficulty on achievement in Mathematics was significant and of moderate size (η^2= .061). Girls who perceived moderate difficulty in mathematics had significantly higher achievement in mathematics than boys (t=2.86, p<.01). The effect of gender on achievement in mathematics of moderate difficulty perceiving students was small (Cohen's *d*=0.323) and in favour of girls. Similarly, achievement in mathematics of girls perceiving mathematics as easy was significantly higher than that of boys (t=1.97, p<.05). Among the students who perceived mathematics as easy, gender difference was significant and large (Cohen's d=1.04). However, gender difference was not observed among students who perceived mathematics as highly difficult (t=0.129, p>.05).

Effect of Time Allocation on Achievement in Mathematics by Gender

Table 2 shows that the effect of time allocation on achievement in mathematics varied across gender. There was significant gender difference in the influence of time allocation on mathematics achievement ($p<.05$). Interaction effect of gender and time allocation (less, moderate and high) was small ($\eta^2= .018$). Further simple main effect analysis for this interaction showed that time allocation had significant [$F (2, 428) = 6.53$, $p < .01$] but small effect ($\eta^2= 0.029$) on boys' achievement in mathematics; whereas girls' achievement was not significantly affected by the same [$F (2, 554) = 1.46$, $p>.05$].

Among boys, achievement in mathematics is significantly less for those who allotted less time than those who assigned moderate time on learning ($t=3.09$, $p<.01$) or those allotting high time on learning mathematics at home ($t=3.59$, $p<.01$). Achievement in mathematics was significantly greater for boys allotting higher time than boys allotting moderate time on learning ($t=1.96$, $p=.05$). Among boys, increase in time allocation from less to moderate (Cohen's d=0.38) or from moderate to high (Cohen's d= 0.36) had significant but small effect on their mathematics achievement; increase in time allocation from less to high has large effect on boys' achievement (Cohen's d= 0.82).

Effect of Private Tuition on Achievement in Mathematics by Gender

As per Table 2, the effect of private tuition on achievement in mathematics varied by gender. The interaction effect of gender and private tuition (with or without private tuition) on achievement though significant was small ($\eta^2= .011$). Achievement of boys in mathematics was not affected by private tuition ($t= 0.78$, $p>.05$). However, girls with private tuition achieved significantly higher than that of girls without private tuition ($p<.01$). Effect of private tuition on girl's mathematics achievement was small (Cohen's d=0.24).

First order interactions among perceived difficulty, time allocation and private tuition on impacting achievement in mathematics were studied using 2-way analyses of variance. Results are summarised in Table 3.

Table 3

Two-way ANOVAs of Achievement in Mathematics by Perceived Difficulty, Time Allocation and Private Tuition

Factors			N	Mean	SD	f (df=)
Perceived Difficulty *Time Allocation	Easy	Less	10	39.7	16.19	8.19** (8,979)
		Moderate	63	36.95	12.91	
		High	12	.37.83	10.37	
	Moderate	Less	25	31.08	11.01	
		Moderate	266	33.16	10.52	
		High	25	34.04	13.61	
	High	Less	79	26.14	7.91	
		Moderate	477	30.42	9.63	
		High	31	32.61	8.11	
Perceived difficulty * Private Tuition	Easy	Private tuition	48	38.35	12.36	10.89** (5,982)
		No Private tuition	37	36.16	13.61	
	Moderate	Private tuition	126	34.02	10.24	
		No Private tuition	190	32.43	11.08	
	High	Private tuition	234	30.79	8.62	
		No Private tuition	353	29.41	9.95	
Time Allocation* Private Tuition	Less	Private tuition	33	29.24	10.42	4.12** (5,982)
		No Private tuition	81	28.07	10.31	
	Moderate	Private tuition	338	32.81	9.98	
		No Private tuition	468	31.13	10.62	
	High	Private tuition	37	34.51	8.56	
		No Private tuition	31	33.52	12.77	

Note: **p<.01

Effect of Perceived Difficulty and Time Allocation on Achievement in Mathematics

Interaction effect of perceived difficulty and time allocation was significant and was observed to be of moderate size (η^2= .063). The students perceiving high difficulty in mathematics, time allocation had significant [F (2, 584) = 8.44, p < .01] but small effect (η^2= 0.028) on achievement in mathematics. However, mathematics achievement did not vary by time allocation neither among students who perceived mathematics as easy [F (2, 82) = 0.20, p > .05] nor among those who perceived it as moderately difficult [F (2, 313) = 0.54, p>.05]. Among students who perceived high difficulty in mathematics, the effect was significant (t= 3.79; p<.01) and large (Cohen's d= 0.812) when time allocation increased from less to high; whereas the effect was significant (t= 4.31, p<.01) but small (Cohen's *d*= 0.455) when time allocation increased from less to moderate. Nevertheless, among these students, assigning moderate or higher time did not make any significant difference in mathematics achievement (t=1.44, p>.05).

Effect of Private Tuition on Achievement by Perceived Difficulty in Mathematics

The effect of private tuition on achievement in mathematics is modified by students' perceived difficulty in mathematics. Interaction effect of perceived difficulty and private tuition on mathematics achievement is significant (p<.01) but small (η^2= 0.053). Influence of private tuition on mathematics achievement is observed only for students who perceive mathematics as highly difficult. Among them too, effect of private tuition on achievement in mathematics is significant (t=1.78, p<.05) but negligible (Cohen's *d=0.146*). And, mathematics achievement does not vary by private tuition neither among students who perceive mathematics as easy (t=0.77, p>.05) nor among those who perceive it as moderately difficult (t=1.31, p>.05).

Effect of Private Tuition on Achievement in Mathematics by Time Allocation

The effect of private tuition on achievement in mathematics varied by the students' time allocation. Interaction effect of private tuition was significant (p<.01) but small (η^2= .021). Influence of private tuition on mathematics achievement is observed only among students who allotted moderate time in learning mathematics.

There also, effect of private tuition on achievement in mathematics was significant (t=2.29, p<.01) but negligible (Cohen's *d*=0.162). Otherwise, mathematics achievement did not vary by private tuition neither among students who assigned less time (t=0.55, p>.05) nor among those who devoted high time (t=0.38, p>.05).

Interaction Effect of Gender, Perceived Difficulty and Private Tuition on Achievement in Mathematics

The interaction effect of gender, perceived difficulty, and private tuition on achievement in mathematics was significant (F= 6.77, df= 11, 976, p<.01) with medium effect size (η^2= .071). Among girls who perceived high difficulty, effect of private tuition was significant (t= 2.75, p<.01) but small (Cohen's *d*=0.294). However, private tuition did not significantly add to achievement in mathematics of girl students perceiving mathematics as either easy (t=0.68, p>.05) or moderately difficult (t=0.23, p>.05). On the other hand, private tuition did not influence boys' achievement at all, whether their perception of mathematics is as easy (t=0.44, p>.05), moderately difficult (t=1.29, p>.05) or highly difficult (t=0.82, p>.05).

Interaction Effect of Gender, Perceived Difficulty and Time Allocation on Achievement in Mathematics

Interaction effect of gender, perceived difficulty and time allocation was significant (F=5.31, df=17, 970, p<.01) with medium effect size (η^2= .085). Further analysis on this interaction showed that among students perceiving high difficulty in mathematics, main effect of time allocation was significant with medium effect size both in boys (F [2, 233] = 6.29, p<.01; η^2= 0.02) and girls (F [2, 348] = 3.18, p<.01; η^2=0.02). However, time allocation had no effect on achievement in mathematics neither of boys perceiving mathematics as moderately difficult [F (2, 144) = 1.85, p>.05] or as easy [F (2, 45) = 0.09, p>.05] nor of girls perceiving mathematics as moderately difficult (F [2,166] = 0.73, p>.05) or as easy (F [2, 34] = 1.19, p>.05).

Among high difficulty perceiving boys, though effect of increase in time allocation from less to moderate on achievement in Mathematics was significant (t=3.3, p<.01) but small (Cohen's *d*=0.495); effect of increase in time allocation from less to high time was significant (t= 3.32, p<.01) and large (Cohen's *d*= 1.05). However, whether those who devoted moderate or high time on learning mathematics at home, there was no significant difference

between achievement in mathematics of high difficulty perceiving boys (t=1.65, p>.05).

Among high difficulty perceiving girls also, though effect of increase of time allocation from less to high was significant (t= 2.07, p<.01) and large (Cohen's *d*=1.05); effect of increase of time allocation from less to moderate on achievement in Mathematics was significant (t=2.78, p<.01) but small (Cohen's *d*=0.44). Like the boys, whether girls allotted moderate or high time on learning mathematics at home, there was no significant difference between achievement in mathematics of high difficulty perceiving girls (t=0.34, p>.05).

Conclusion and Implications

Many of the findings of the present study corroborate findings of earlier studies, at times modifying the previous observations found especially from culturally and educationally dissimilar samples. This study has helped to fine-tune the understanding on the interaction effects of gender, self-beliefs, time allocation and private tuition on mathematics scores among secondary school students.

Achievement in Mathematics Vary by Perceived Difficulty, Time Allocation and Private Tuition

In general, students who feel mathematics as easy or moderately difficult, and those allotting high time on it achieve above average; whereas those devoting less time and those feeling it as highly difficult achieve below average. Gender and allocating moderate time on mathematics learning do not predispose students to high or low achievement in mathematics per se. Achievement decreases with increase in perceived difficulty in mathematics from easy through moderate to high difficulty. Students who allot less time on learning mathematics at home achieve significantly less than students who allocate moderate or high time. Seemingly, achievement in mathematics is enhanced by private tuition.

No Main Effect of Gender on Achievement is Observed, but Girls with Private Tuition Achieve Strikingly Higher Despite Perceiving Mathematics as Highly Difficult

The finding of this study that achievement in mathematics does not vary by gender among secondary school students is similar to the findings concerning upper primary students of Kerala (Gafoor, 2011) and at the elementary level elsewhere in India

(Wu, Goldschmidt, Boscardin, and Azam, 2007). The study further suggests that advantage for boys in mathematics related performance in secondary and post-secondary stages often reported from the West (Dickerson, McIntosh and Valente, 2015; Campbell and Beaudry, 1998; Benbow and Stanley, 1980; Reilly, Neumann, and Andrews, 2015; Fan, Chen and Matsumoto, 1997; Stoet and Geary, 2012; Feingold, 1988) needs to be applied with caution to secondary students in India. The study also reveals that achievement in mathematics of boys is not affected by private tuition. However, girls with private tuition achieve significantly higher than that of girls without private tuition.

This study corroborates the beneficial effects of private tuition for students belonging to lower learning levels (Dongre and Tewary, 2014; Gafoor and Sunnummel, 2007) but generally rejects the often projected benefits from private tuition for students at secondary level. Private tuition has influence on achievement in mathematics of high difficulty perceiving girls only. Private tuition does not significantly add to achievement in mathematics of girl students who believe maths as either easy or moderately difficult. Regardless of perceived difficulty, private tuition does not influence achievement of boys. There is a small effect of private tuition on girl's mathematics achievement, and this effect though small is profitable especially for girls who perceive high difficulty in mathematics learning.

Influence of Private Tuition on Achievement is Observed Only among Students who Allot Moderate Time on Learning Mathematics at Home

Private tuition had negligible though significant value-addition for students who perceive high difficulty in mathematics learning, or for those allotting moderate time on learning mathematics at home. The students who assigned moderate time, with private tuition, had significantly higher achievement in mathematics. However, mathematics achievement did not vary with private tuition neither among students who allotted less time nor among those who devoted high time in learning mathematics at home.

Time Allocation has Significant Effect on Boys' Achievement in Mathematics, but Not of Girls

Time allocation in case of boys affected their achievement, but not for girls. However, girls tended to allot more time on learning

mathematics than boys. Boys who allot less time achieve significantly less in mathematics when compared to boys allotting moderate or high time in learning mathematics. Girls perceiving easy or moderate difficulty in mathematics achieve higher than boys with same level of difficulty. Irrespective of gender, students perceiving high difficulty achieve higher if they allot moderate or high time in learning.

The study shows that parents need to be made aware about the effects of private tuition and time allocation. Schools and teachers can support parents in this regard by guiding and counselling students as well as parents on how the students perceive mathematics and what such perception implies for students' progress. Organising and sending student for private tuition and providing additional support in school have to be based on a clear analysis of the student perception of difficulty and learning time in mathematics. Schools must focus on students' attainment of basic concepts and skills in mathematics from early grades on. The importance of self-beliefs, time allocation, and need for private tuition beyond school hours are all indicative for students, parents, teachers and administrators that there is no shortcut to quality learning other than putting every stakeholder' effort together in a concerted manner to achieve the set goal of students' learning.

References

Gafoor, Abdul, K., and M. Sunnummel. 2007. Effect of Private tuition on Achievement in Science of Secondary School Pupils. *Journal of Community Guidance and Research* vol. 24, No. 3, pp. 316–325.

Aslam, M. and P. Atherton. 2012. The 'Shadow' Education Sector in India and Pakistan: The Determinants, Benefits and Equity Effects of Private Tutoring. *Education Support Programme Working Paper Series*, 38.

Azam, M. 2016. Private Tutoring: Evidence from India. *Review of Development Economics*, vol. 20, No. 4, pp. 739–761.

Benbow, C. P., and J. C. Stanley. 1980. Sex Differences in Mathematical Ability: Fact or Artifact? *Science*. vol. 210, No. 4475, pp. 1262-1264.

Bharadwaj, P., De Giorgi, G., Hansen, D., and C. A. Neilson. 2016. The Gender Gap in Mathematics: Evidence from Chile. *Economic Development and Cultural Change*. vol. 65, No. 1.

Bray, M. and C. Lykins. 2012. *Shadow Education: Private Supplementary Tutoring and Its Implications for Policy Makers in Asia* (No. 9). Asian Development Bank.

Brown, M., P. Brown and T. Bibby. 2008. "I Would Rather Die": Reasons Given by 16-year-olds for not continuing their study of mathematics. *Research in Mathematics Education*, vol. 10, No. 1.

Campbell, J. R. and J. S. Beaudry. 1998. Gender Gap Linked to Differential Socialization for High-Achieving Senior Mathematics Students. *The Journal of Educational Research*. Vol. 91, No. 3, pp. 140–147.

Chaman, M. J. 2014. *Factors Influencing Mathematics Achievement of Secondary School Students in India* (Doctoral dissertation, University of Tasmania).

Choudhury, R. and D. Das. 2012. Influence of Attitude Towards Mathematics and Study Habit on the Achievement in Mathematics at the Secondary Stage. *International Journal of Engineering Research and Applications*. Vol. 2, No. 6, pp. 192–196.

Dickerson, A., S. McIntosh, and C. Valente. 2015. Do the Maths : An Analysis of the Gender Gap in Mathematics in Africa. *Economics of Education Review*. Vol. 46, pp. 1–22.

Dongre, A., and V. Tewary. 2015. Impact of Private Tutoring on Learning Levels. *Economic and Political Weekly*. Vol. 50, No. 41, pp. 73.

———. 2014. Do Private Tuitions Improve Learning Outcomes. *Annual Status of Education Report*.

Dunleavy, J., J. D. Willms, P. Milton and S. Friesen. 2012. The Relationship Between Student Engagement and Academic Outcomes. What Did You Do in School Today? Research Series Report Number One Toronto: Canadian Education Association.

Ethington, C. A. 1992. Gender Differences in a Psychological Model of Mathematics Achievement. *Journal for Research in Mathematics Education*. pp. 166-181.

Fan, X., M. Chen and A.R. Matsumoto. 1997. Gender Differences in Mathematics Achievement: Findings from the National Education Longitudinal Study of 1988. *The Journal of Experimental Education*. Vol. 65, No. 3, pp. 229–242.

Feingold, A. 1988. Cognitive Gender Differences are Disappearing. *American Psychologist*. Vol. 43, No. 2, pp. 95.

Gafoor, K. A. 2011. Elementary Competencies in 3R's Among Upper Primary Pupils of Kerala: A Secondary Analysis. *Innovations and Researches in Education*. Vol. 1 No. 1, pp. 51–68.

Gafoor, K. A. and P. M. Ashraf. 2012. Contextual Influences on Sources of Academic Self-Efficacy: A Validation with Secondary School Students of Kerala. *Asia Pacific Education Review*. Vol. 13, No. 4, pp. 607–616.

Goetz, T., M. Bieg, O. Ludtke, R. Pekrun and N. C. Hall. 2013. Do Girls Really Experience More Anxiety in Mathematics? *Psychological Science*. Vol. 24, No. 10, pp. 2079–2087.

Grave, B. S. 2011. The Effect of Student Time Allocation on Academic Achievement. *Education Economics*. Vol. 19, No. 3, pp. 291–310.

Guo, J., H.W. Marsh, P.D. Parker, A.J. Morin and A.S. Yeung 2015. Expectancy-Value in Mathematics, Gender and Socio-Economic Background as Predictors of Achievement and Aspirations: A Multi-cohort Study. *Learning and Individual Differences*. Vol. 37, pp. 161–168.

Hyde, J.S. 2016. Sex and Cognition: Gender and Cognitive Functions. *Current Opinion in Neurobiology*. vol. 38, pp. 53–56.

Hyde, J.S., E. Fennema, and S.J. Lamon. 1990. Gender Differences in Mathematics Performance: A Meta-Analysis. *Psychological Bulletin*. vol. 107, No. 2, 139.

Hyde, J.S., S.M. Lindberg, M.C. Linn, A.B. Ellis and C.C. Williams. 2008. Gender Similarities Characterize Math Performance. *Science*. Vol. 321, No. 5888, pp. 494–495.

Kidron, Y. and J. Lindsay. 2014. The Effects of Increased Learning Time on Student Academic and Non-Academic Outcomes: Findings from a Meta-Analytic Review. REL 2014-015. *Regional Educational Laboratory Appalachia*.

Lindberg, S.M., J.S. Hyde, J.L. Petersen and M.C. Linn. 2010. New Trends in Gender and Mathematics Performance: A Meta-Analysis. *Psychological bulletin*. Vol. 136, No. 6, pp. 1123.

Mumthas N.S. 2016. *Adversities and Achievement in Mathematics Among Muslim and Non-Muslim Secondary School Students in Malappuram District*. Directorate of Minority Welfare, Government of Kerala, Thiruvananthapuram

Reilly, D., D.L. Neumann and G. Andrews. 2015. Sex Differences in Mathematics and Science Achievement: A Meta-Analysis of National Assessment of Educational Progress Assessments. *Journal of Educational Psychology*. Vol. 107, No. 3, pp. 645.

Saritas, T., and O. Akdemir. 2009. Identifying Factors Affecting the Mathematics Achievement of Students for Better Instructional Design. *International Journal of Instructional Technology and Distance Learning*. Vol. 6, pp. 26.

Stewart, C., M.M. Root, T. Koriakin, D. Choi, S.R. Luria, M.A. Bray and T. Courville. 2016. Biological Gender Differences in Students' Errors on Mathematics Achievement Tests. *Journal of Psychoeducational Assessment*. 0734282916669231

Stinebrickner, R. and T. R. Stinebrickner. 2008. The Causal Effect of Studying on Academic Performance. *The BE Journal of Economic Analysis and Policy*. Vol. 8, No. 1.

Stoet, G. and D.C. Geary. 2012. Can Stereotype Threat Explain the Gender Gap in Mathematics Performance and Achievement? *Review of General Psychology*. Vol. 16, No. 1, pp. 93.

Sujatha, K. 2014. Private Tuition in India: Trends and Issues. Revue International D'education De Sevres [En ligne], Colloque: L'education en Asie en 2014: Quels enjeux mondiaux?

SULEMAN, Q. AND I. HUSSAIN. 2013. Effects of Private Tuition on the Academic Achievement of Secondary School Students in Subject of Mathematics in Kohat Division, Pakistan. *International Journal of Learning and Development*. vol. 3, No. 3, pp. 253–269.

VENKATESH KUMAR, G. AND A. KARIMI. 2010. Mathematics Anxiety, Mathematics Performance and Overall Academic Performance in High School Students. *Journal of the Indian Academy of Applied Psychology*. Vol. 36, No. 1, pp. 147–150.

VOYER, D. AND S.D. VOYER. 2014. Gender Differences in Scholastic Achievement: A Meta-Analysis. *Psychological Bulletin*. Vol. 140, No. 4, pp. 1174.

WU, K.B., P. GOLDSCHMIDT, C.K. BOSCARDIN AND M. AZAM. 2007. Girls in India: Poverty, Location and Social Disparities. *Exclusion, Gender and Education: Case Studies from the Developing World*. pp. 119–143.

YOUNG, M. E. AND B. MUNDIAL. 1996. *Early Child Development: Investing in the Future*. World Bank, Washington, DC.