

Impact Of Teachers' Attitude On Students' Mathematics Achievement In Meitei Pangal Community Of Manipur

M.Abhilasha¹, Prof. Sahin Ahmed² & Ningthoukhongjam Vikimchandra Singh³

¹Ph. D. Scholar, Department of Mathematics, Rajiv Gandhi University, Rono Hills, Arunachal Pradesh, India, Email: mabhilasha1968@gmail.com, Mobile No: 6009005173

²Department of Mathematics, Rajiv Gandhi University, Rono Hills, Arunachal Pradesh, India, Email: sahin.ahmed@rgu.ac.in, Mobile No: 7085759135

³Department of Statistics, Rajiv Gandhi University, Rono Hills, Arunachal Pradesh, India, Email: n.vikim12@gmail.com, Mobile No: 7085406662

ABSTRACT

Secondary school students in the socio-economically and educationally backward indigenous Manipuri Muslim ethnic group the Meitei Pangal community in India's north-eastern state of Manipur do not perform well in mathematics when compared to their counterparts in other communities. There could be various reasons for this deficit in mathematics achievement. Research findings have indicated that mathematics achievement of students is determined by many factors including students' attitude towards mathematics which is shaped by several factors like classroom teaching methods, school support system, mathematics teachers' attitudes in teaching mathematics etc. Teachers' positive attitude towards mathematics will motivate students to form a favourable attitude towards learning the subject and achieve better in the subject while teachers' negative attitude could be responsible for their low mathematics achievement. This paper explores secondary school mathematics teachers' attitude towards mathematics and its influence on Meitei Pangal students' mathematics achievement in Thoubal district of Manipur. It also suggests measures to improve teachers' attitude towards mathematics to realise students' better achievement in the subject which will go a long way in enabling the socio-economically and educationally backward community's participation in various important fields in this age of science and technology. This research has implications for the secondary mathematics teachers, administrators and education policy makers.

Keywords: mathematics achievement, teachers' attitude, secondary school, Meitei Pangal.

I. INTRODUCTION

Mathematics is made compulsory in secondary school level considering its utility in daily life and its power to develop students' analytical thinking and problem-solving skills. Secondary school students in the socio-economically and educationally backward indigenous Manipuri Muslim ethnic group, the Meitei Pangal community, in India's north-eastern state of Manipur do not perform well in mathematics when compared to their counterparts in other communities. In the recent past there have been isolated occasions when individual Meitei Pangal students performed well in the High

School Leaving Certificate Examinations (HSLCE) conducted by the Board of Secondary Education, Manipur (BOSEM) by even getting letter marks in mathematics. However, the overall board examination results would indicate a dismal picture of the Meitei Pangal secondary school students' performance in mathematics. As a result, over the years, very few Meitei Pangals could join important professions which need sound mathematical knowledge. There could be various reasons for their low achievement in mathematics. Favourable attitude towards mathematics is correlated with better achievement which in turn help increase

the rate of participation in mathematics at higher classes. It would be crucial for enabling the students to get an opportunity for a bright career related to science, technology, engineering and mathematics (STEM) (LeGrand, 2013).

Research findings have indicated that mathematics achievement of students is determined by many factors including students' attitude towards mathematics which is shaped by several factors like classroom teaching methods, school support system, the common social perceptions about the usefulness of mathematics besides classroom teaching methods, school support system, parental involvement in child's mathematics learning, mathematics teachers' attitudes in teaching mathematics etc. According to Australian Education Council (1991), positive attitude towards mathematics is manifested as enthusiasm about own ability and enjoyable interest in dealing with situations involving mathematics. Teachers' positive attitude towards mathematics will motivate students to form a positive attitude towards the subject to learn it and achieve better in the subject while teachers' negative attitude could be responsible for students' low mathematics achievement. In a study, Mesut Tabuk (2018) used "Teaching Mathematics" questionnaire to collect data from prospective teachers and the results revealed that the prospective teachers had positive attitude towards teaching mathematics.

Teachers should be confident and able to teach mathematics while their positive attitudes towards the subject and enthusiasm for teaching it are important (Ernest, 1988). David Blazar and Matthew A. Kraft (2017) found that teachers' teaching practices, emotional support and classroom organization influenced students' attitudes and self-confidence in mathematics thereby making mathematics class enjoyable to them. Thus, teachers' attitude and behaviour are equally important for students' mathematics achievement.

Attitude with three separate measurable attitudinal dimensions or components (Han and Carpenter, 2014) is the manifestation of mental state in the form of a situation-specific behaviour (Allport, 1935) with

a tendency to react in a positive or negative manner (Aiken, 1970). The components - Affect (A), cognition (C) and behaviour (B) - comprise affective, cognitive and behavioural dimensions of attitude as stated in the ABC Model of Attitude which is widely used in the study of attitude towards mathematics (Ajzen, 1993).

In the formation of positive or negative attitude towards mathematics, teachers may relate themselves with mathematics through different dimensions of attitude i.e. cognitive dimension of attitude (Okyere, & Kuranchie, 2013), affective dimension of attitude (Ingram, 2015) and behavioural dimension of attitude (Akinsola & Olowojaiye, 2008). The cognitive dimension comprises perception and belief of the teacher about the subject, the affective dimension comprises the emotions of teacher about teaching mathematics, and behavioural dimension comprises the teacher's inclination to engage with mathematics. Thus, teachers' attitude towards mathematics can be described through the measurements of these dimensions.

From the review of literature for the study (not included here for reasons of space constraints), it has been inferred that there is a gap in literature about teachers' attitude towards mathematics and its influence on Meitei Pangal secondary school students' achievement in the subject. As no in-depth study has been conducted on this area, it is necessary to explore teachers' attitude towards mathematics through their perspectives. This paper reports the findings of a study conducted to explore teachers' attitude towards mathematics and its relationship with mathematics achievement of secondary school students in Meitei Pangal community in Thoubal district of Manipur.

2. OBJECTIVES

The main objectives of the study are-

- i). To find out mathematics teachers' attitude towards mathematics in secondary schools in Thoubal District of Manipur in northeast India.

- ii). To find out any significant correlation between mathematics teachers' attitude towards mathematics and Meitei Pangal secondary school students' mathematics achievement.
- iii). To suggest measures for enhancing mathematics teachers' positive attitude towards mathematics for students' better mathematics achievement in Meitei Pangal community.

3. RESEARCH QUESTIONS

To achieve the research objectives of the study, the following research questions were framed.

1. What kinds of attitude the secondary school mathematics teachers have towards mathematics in Thoubal District of Manipur?
2. Is there any significant correlation between teachers' attitude towards mathematics and Meitei Pangal secondary school students' mathematics achievement?

4. NULL HYPOTHESIS

The study formulated a null hypothesis as given below.

H₀: There is no significant association between mathematics teachers' attitude towards mathematics and Meitei Pangal secondary school students' mathematics achievement in Thoubal District of Manipur.

5. METHODOLOGY

The study adopted a survey method to explore secondary school mathematics teachers' attitude towards mathematics in Thoubal district of Manipur and its impact on the Meitei Pangal students' mathematics achievement. The study was conducted in government/government-aided and private high schools located in both rural and urban areas of the district where the institutions offered compulsory basic mathematics up to secondary school level. The

primary data were collected from 42 teachers teaching mathematics in Class IX and Class X in 42 secondary schools in the district and 328 secondary school students reading in Class X in these 42 schools.

After getting consent of the parents / guardians and school authority for students' and teachers' involvement in the study as per guidelines, the respondents were approached individually and informed about the purpose and nature of the research with assurance of their complete anonymity. Separate structured questionnaires were administered for the collection of data. After all their doubts were cleared, they were requested to fill up the questionnaire. While the teachers were asked to respond to various attitudinal questions, the students were asked to provide their mathematics marks secured in their last Annual Examination as self-reported scores to assess association of their mathematics achievements with teachers' attitude towards the subject. The secondary data were collected from government offices, Zonal Education Office, schools, books, reports, journals, websites etc. For proper analysis of the collected data, they were processed in the Statistical Package for Social Sciences (SPSS). Suitable statistical techniques like percentage, frequencies, mean, standard deviation, t-test, Pearson's correlation etc. were used for analysis and interpretation of the data.

5. 01. Population and Samples

Meitei Pangal population in Thoubal district of Manipur is relatively concentrated in some specific settlement areas only. So, most of the students in the community would get education from nearby schools located in Meitei Pangal areas while some of them may attend schools located in areas of other communities thanks to their popularity as good institutions. The district had 63 high / higher secondary schools which offered mathematics at Class IX and Class X levels. These included 6 Government Higher Secondary Schools, 20 Government High Schools, 13 Govt. Aided High Schools and 24 Private High Schools. Of these, 42 schools including 20 government/ govt-aided schools

(10-rural and 10-urban) and 22 private schools (11-rural and 11-urban) were selected for the study. The schools are located at Atoukhong, Haoreibi, Irong, Irong Cheshaba, Khangabok, Khekman, Khelakhong, Khongjom, Kshetri Leikai, Langathel, Leisangthem, Lilong, Moijing, Phundrei, Sabaltongba, Sangaiyumpham, Shikhong, Thoubal, Wanging and Yairipok.

The population of the study comprised all the mathematics teachers teaching in Class IX and Class X in these selected 42 schools during the academic session 2019-20. One mathematics teacher from each school was selected randomly as the sample of mathematics teacher. All the students in Class X in these 42 schools comprised the student's population (n=1470) from which a sample of 328 students was drawn by employing random sampling method to enhance accuracy of the study while a sample size of only 305 students was determined at 95 percent Confidence Level and 5 percent Confidence Interval by an online sample size calculator [website-https://www.surveysystem.com](https://www.surveysystem.com).

6. RESEARCH INSTRUMENTS

Joe Relich, Jenni Way and Andrew Martin (1994) found a 6-factor measurement of teachers' attitude most viable for assessing teachers' attitude towards mathematics and its teaching. These included attitudes towards mathematics teaching (ATMT), self-concept as mathematicians (SCM), mathematics teaching as a male domain (MTMD), usefulness of teaching mathematics (UTM), excellence as a teacher of mathematics (ETM) and other's perceptions as teacher of mathematics (OTM).

Osman Birgin et al. (2009) investigated the views of mathematics teachers towards Computer-Assisted Mathematics Instruction (CAMI). They used "CAMI Questionnaire" developed by Yenilmez and Sarier (2007) consisting of thirty 5-point Likert-type items was used as an instrument. This study showed that the views of mathematics teachers towards CAMI were positive.

Despite various tools developed over the years, no comprehensive single published research instrument was found suitable for measuring teachers' attitudes towards teaching of mathematics in the context of Meitei Pangal community. So, based on literature review and research objectives, a questionnaire with a Mathematics Teachers' Attitude Towards Mathematics Scale (MTATMS) was developed in consultation with experts of the research area including the research supervisor.

6.01. Mathematics Teachers' Attitude Towards Mathematics Scale (MTATMS)

The Mathematics Teachers' Attitude Towards Mathematics Scale (MAATMS) has a four-factor structure denoting four attitude components as Sub-scales namely 'Value of Mathematics', 'Expectation from Students', 'Teaching Mathematics, and 'ICT in Teaching Mathematics'.

The MTATMS has 16 questions while each Sub-scale has positively worded and negatively worded items to measure different aspects of teachers' attitude. The MTATMS was assigned weights in the five-point scale by assigning 1 score to Strongly Disagree (SD), 2 scores to Disagree (D), 3 scores to Neutral (N), 4 scores to Agree (A), and 5 scores to Strongly Agree (SA) for the positive statements. The weight was reversed for the negative statements.

Respondents were asked to indicate their level of agreement or disagreement with each item. Scores of each item in a Sub-scale were added to get the score for the attitude component represented in that Sub-scale. The sum of scores of all the four Sub-scales was the overall score of the MTATMS. With a possible score range from 16 to 80, the instrument has 16 as the lowest possible score and 80 as the highest possible score of the overall attitude scale. The mean of the scale points was 3. Therefore, the response with mean of 3 and above was regarded as favourable attitude while mean of less than 3 as unfavourable attitude. A high score suggest a favourable attitude and a low score suggest an unfavourable attitude towards the subject. Based

on the overall score, the responses were categorised into three levels of attitude variables

- Low, Medium and High as shown in the table below.

Table-1 : Level of Attitude Variables

Mean Score	Level
1.00 - 2.99	Low
3.00 – 4.00	Medium
4.01- 5.00	High

6.02. Reliability Test

A pilot study was conducted on 15 secondary school mathematics teachers to establish the reliability and validity of the Mathematics Teachers' Attitude Towards Mathematics Scale (MTATMS) with the help of statistical techniques. Cronbach alpha coefficients for each attitude dimension in the scale was calculated and Cronbach's Alpha's coefficient for the MTATMS was estimated as 0.752 which suggested that all components of the attitude scale have reliability and internal consistency.

7. RESULTS AND DISCUSSION

7.01. Secondary School Teachers' Attitude towards Mathematics

The data of the individual statements in the Sub-scales of the MTATMS were analyzed using descriptive statistics. The mean and standard deviation of each statement is stated in the table below.

Table-2 : Descriptive Statistics of Statements in MTATMS

Sl. No.	Statements	Mean	Std. Deviation
Value of teaching mathematics			
1.	I think mathematics is very important in day to day life.	4.31	.468
2.	I think mathematics taught in school will help students in real life.	4.00	.000
3.	I do not think students need to do well in mathematics to develop in life.	2.90	1.008
4.	I think mathematics should not remain compulsory subject at high school level.	3.31	.841
Mathematics Teaching as a male domain			
5.	I think mathematics is for intelligent students.	2.04	.215
6.	I think mathematics is a male domain.	2.69	.840
7.	I think boys perform better than girls in mathematics.	2.09	.431
Self-concept of Teaching Mathematics			
8.	I think student's mathematics aptitude can be improved.	3.17	1.034
9.	I think private tuition is necessary for students' mathematics achievement.	2.17	.537
10.	I have forgotten many of the mathematical concepts that I had learned.	2.50	.773
11.	I feel teaching mathematics gets monotonous at times.	1.57	.501
ICT in Teaching Mathematics			
12.	I think using ICTs motivates students in learning mathematics.	3.86	.521

13.	I think teaching mathematics through ICT is better than traditional pedagogy.	3.88	.453
14.	I feel more confident when I use blackboard rather than ICTs in teaching mathematics.	2.00	.000
15.	I get easily frustrated when I think of using ICTs in mathematics class.	2.04	.308
16.	I think teachers may waste time when using ICTs in classroom.	2.07	.345

The descriptive statistics show in value of mathematics component of attitude that majority of the teachers agreed with the statements that mathematics is very important in day to day life while they thought that mathematics taught in school would help students in real life. However, majority of them did not agree with the statement that they did not think students need to do well in mathematics to develop in life. And, more than half of them did not agree that they think mathematics should not remain compulsory subject at high school level. Thus, it can be concluded that majority of the participants understood value of mathematics though many of them had negative attitude towards mathematics in terms of need for mathematics for students' success in future.

In terms of attitude component of Expectation from Students, majority of the teachers agreed that mathematics is a male domain and boys perform better than girls in mathematics besides mathematics is for intelligent students. Thus, it can be concluded that majority of the participants had negative attitude towards gender and mathematics in terms of its complexity and gender difference while a small percentage of them had medium level positive attitude.

Regarding self-concept of Teaching Mathematics and related motivation, majority of the participating secondary school teachers had the attitude that student's mathematics aptitude can be improved. Thus, it can be concluded that they had positive attitude towards the subject.

However, majority of them had low attitude towards the subject as evidenced from their agreeing to the statements that private tuition is necessary for students' mathematics achievement. Agreeing to the statement that they had forgotten many of the mathematical concepts that they had learned and they felt teaching mathematics gets monotonous at times underlines their negative attitude towards the subject.

In regard to the attitude variable of ICT in Teaching Mathematics, majority of the teacher participants agreed that using ICTs motivates students in learning mathematics and teaching mathematics through ICT is better than traditional pedagogy. Thus, it can be concluded that they had a positive attitude towards the usage of Information Communication Technology (ICT) in mathematics teaching and learning process. However, their low attitude toward the ICT usage in mathematics teaching was underscored as majority of them felt more confident in using blackboard rather than ICTs in teaching mathematics. Besides, they agreed to the statements that they got easily frustrated in thinking of using ICTs in mathematics class and they thought that they might waste time in using ICTs in classroom.

After the analysis of the individual statements, descriptive statistics were used to analyze the data at the Sub-scale level and the overall attitude Scale. The mean and standard deviation scores for all the Sub-scales and the overall MTATMS are stated in the table below.

Table-3 : Descriptive Statistics of Four Sub-scales and Overall MTATM Scale

Attitude Component Subscale	Mean	Standard Deviation	95% CI of the difference	Level
Value of mathematics	3.19	.262	Lower 3.11	Medium

			Upper 3.27	
Expectation from Students	3.72	.320	Lower 3.62 Upper 3.82	Medium
Teaching Mathematics	2.95	.338	Lower 2.86 Upper 3.11	Low
ICT in Teaching Mathematics	3.92	.216	Lower 3.85 Upper 3.99	Medium
Overall MTATM Scale	3.44	.136	Lower 3.40 Upper 3.48	Medium

The mean score for Value of Mathematics was found to be 3.19 (95% CI: 3.11, 3.27). It shows majority of the teachers had a medium level of attitude in terms of the usefulness of mathematics in life. The sub-scale of Expectation from Students had a mean of 3.72 (95% CI: 3.62, 3.82). It shows that majority of them had a medium level of attitude in terms of the expectation they had from students for learning mathematics. The mean for Teaching Mathematics was found to be 2.95 (95% CI: 2.86, 3.11). It shows that majority of them could not enjoy teaching mathematics. The mean for ICT in Teaching Mathematics was found to be 3.92 (95% CI: 3.85, 3.99). It also shows that majority of them had a medium level of attitude towards ICT usage in mathematics teaching. However, very small number of the teachers actually integrated ICTs in their teaching mathematics owing to various reasons. The mean of the overall full MTATM scale was 3.44 (95% CI: 3.40, 3.48). It indicates that the

mathematics teachers had a favorable but medium level attitude towards mathematics.

8. MEITEI PANGAL STUDENTS' MATHEMATICS ACHIEVEMENT

After finding out the level of mathematics teachers' attitude towards mathematics from the above data, it is pertinent to find out its association with Meitei Pangal secondary school students' mathematics achievement.

8.01. Levels of Mathematics Achievement

This study adopts the mark distribution system of the Board of Secondary Education Manipur (BOSEM) and marks in mathematics were grouped into different categories to assess achievement. The categories of marks were - i). Fail (0-32.99%), ii). 3rd Division (33-44.99%), iii). 2nd Division (45-59.99%), iv). 1st Division (60-79.99%) and v). Letter Mark (80-100%). These are organized in five different achievement levels as shown in the table below.

Table-4 : Level of Achievement in Mathematics

Marks in %	Level
Less than 33	Very Low
33 - 44.99	Low
45 - 59.99	Medium
60 - 79.99	High
80 and above	Very High

8.02. Meitei Pangal Secondary School Students' Mathematics Achievement

Academic achievement is the end product of a learning experience in school and it is the display of knowledge attained or skill developed in the school subjects. The mathematics achievement

of the 328 Meitei Pangal secondary school students from Class X were analysed based on their self-reported marks which they scored in mathematics in their last Annual Examination. Achievement of students in mathematics in terms of marks obtained in mathematics in their

last Annual Examination is shown in the table below.

Table-5 : Respondents' Mathematics Achievement in Last Annual Examination

Marks (%)	Frequency	Percent age	Division	Result	Percentage	Achievement level
0-32.99	220	67.1	Fail	Failed	67.1	Very Low
33-44.99	58	17.7	3rd Division	Passed	32.9	Low
45-59.99	33	10.1	2nd Division			Medium
60-79.99	15	4.6	1st Division			High
80-100	02	0.6	Letter Mark			Very High
Total	328	100.0	--	--	100.0	--

The above table shows the number of students failed or passed in mathematics in their last Annual Examination. Majority of the respondents (67.1%) failed in their last Annual Examination, 17.7 percent achieved low (3rd

Division), 10.1 percent achieved medium (2nd Division), only 4.6 percent achieved high (1st Division), while a meagre 0.6 percent achieved very high (Letter Marks) in mathematics.

8.03. Students' Mathematics Achievement Based on Gender

Table-6: Gender wise Mathematics Achievement in Last Annual Examination

Gender	Fail	3rd Division	2nd Division	1st Division	Letter	Total
Male	97	34	22	9	2	164
	29.6%	10.4%	6.7%	2.7%	0.6%	50.0%
Female	123	24	11	6	0	164
	37.5%	7.3%	3.4%	1.8%	0.0%	50.0%
Total	220	58	33	15	2	328
	67.1%	17.7%	10.1%	4.6%	0.6%	100.0%

The above table shows the number of male and female students failed or passed in mathematics in their last Annual Examination. 29.6 percent of male students failed in mathematics and only 20.4 percent of them passed in mathematics. The achievement rate of female students was comparatively low as 37.5 percent of them failed in mathematics while only 12.5 percent of them could pass in mathematics.

9. ASSOCIATION BETWEEN MATHEMATICS TEACHERS' ATTITUDE TOWARDS MATHEMATICS AND STUDENTS' MATHEMATICS ACHIEVEMENT

To analyze possibility of any correlation between teachers' attitude towards mathematics and Meitei Pangal secondary school students' achievement in mathematics, the achievement of 328 Meitei Pangal students from Class X in Thoubal district of Manipur were evaluated based on their mathematics marks scored in their last Annual examination. For this a null hypothesis was framed as H_0 : "There is no significant association between teachers' attitude towards mathematics and the Meitei Pangal secondary school students' mathematics achievement." Accordingly, a correlation analysis was conducted on the data and the result is shown in the table below.

Table-7 : Correlation Analysis

		ACHM	VM	ES	TM	ICTM	OA
ACHM	PC	1					
	Sig. (2-tailed)						
	N	328					
VM	PC	.081*	1				
	Sig. (2-tailed)	.991					
	N	328	328				
ES	PC	.050*	.070	1			
	Sig. (2-tailed)	.363	.205				
	N	328	328	328			
TM	PC	.133*	.141*	.333**	1		
	Sig. (2-tailed)	.959	.011	.000			
	N	328	328	328	328		
ICTM	PC	.051*	.117*	.001	.202**	1	
	Sig. (2-tailed)	.354	.034	.983	.000		
	N	328	328	328	328	328	
OA	PC	.049*	.668**	.383**	.460**	.349**	1
	Sig. (2-tailed)	.374	.000	.000	.000	.000	
	N	328	328	328	328	328	328
*. Correlation is significant at the 0.05 level (2-tailed).							
**. Correlation is significant at the 0.01 level (2-tailed).							

PC= Pearson Correlation, ACHM = Achievement in mathematics, VM= Value of mathematics, ES= Expectation from Students, TM= Teaching Mathematics, ICTM = ICT in Teaching Mathematics, OA= Overall Attitude

Based on Cohen (1988) scale, the results of the correlation analysis show that all the independent variables have positive significant relationship with the dependent variable i.e. achievement in mathematics. The independent variable attitude component Value in mathematics ($r=.081$, $p<.005$), Expectation from Students ($r=.050$, $p<.005$), Teaching Mathematics ($r=.133$, $p<.005$), and ICT in Teaching Mathematics ($r=.051$, $p<.005$) show a positive association with mathematics achievement of the students. Consequently, the Overall Attitude ($r=.049$, $p<.005$) has a strong positive relationship with achievement in mathematics.

The correlation analysis results also show the relationships among the independent variables of attitude. Teaching Mathematics and Expectation from Students have the strongest

positive relationship ($r=.333$, $p<.001$) followed by relation between ICT in Teaching Mathematics and Teaching Mathematics ($r=.202$, $p<.001$) and the relationship between Value of mathematics and Teaching Mathematics ($r=.141$, $p<.001$). This was followed by strong relationships between ICT in Teaching Mathematics and Value of mathematics ($r=.117$, $p<.001$). Thus, it is concluded that there was a strong association between mathematics teachers' attitude towards mathematics and Meitei Pangal secondary school students' mathematics achievements.

The findings are in line with the findings of Aiken (1970) which suggested that teachers' attitudes determine students' attitudes towards mathematics and their performance in it. Besides, teachers' attitudes towards mathematics teaching influence students' attitudes and their mathematics learning. A teacher's attitude towards mathematics itself may affect his or her attitudes towards mathematics teaching which will influence ambience and ideal culture of the mathematics classroom (Ernest, 1989).

According to the findings of Phillips (1973), teachers with a positive attitude towards mathematics were eager to motivate for forming positive attitudes in their students. Teacher's positive attitude towards mathematics is key to students' better achievement (Schofield, 1981; Bishop and Nickson, 1983).

Research findings of Brush (1981), Carpenter & Lubinski (1990) and Williams (1988) show that teachers' attitudes and beliefs towards the mathematics would influence the instructional techniques used to teach the subject which may have an effect on students' attitudes. According to Hattie (2009), adequate knowledge of mathematics along with a positive attitude towards the subject are crucial for effective learning and key to academic achievement. Coleman & Miller (2014) observed that successful teachers help develop in children a positive attitude towards learning by encouraging them to engage in learning, by recognising effort for success rather than ability, and by emphasising on pursuing excellence rather than avoiding failure. They stated that enjoyment in mathematics and attitude were significantly associated with students' achievement which also confirms the results of this study.

9.01. Testing of Null Hypothesis

H₀: There is no significant association between mathematics teachers' attitude towards mathematics and Meitei Pangal secondary school students' mathematics achievement in Thoubal District of Manipur.

The possible association of the mathematics teachers' attitude score with the marks of the students was checked using Pearson's correlation coefficient in the above correlation analysis. The results of the correlation analysis show that all the independent variables had positive significant relationships with the dependent variable i.e. achievement in mathematics. The correlation between the overall teachers' attitude scores and students' average marks ($r=.292, p<.001$) shows that there

was a significant positive relationship between teachers' attitude towards mathematics and students' achievement in mathematics. Hence, the Null Hypothesis, H₀: "There is no significant association between mathematics teachers' attitude towards mathematics and Meitei Pangal secondary school students' mathematics achievement in Thoubal District of Manipur" is not accepted.

10. CONCLUSION

From the above findings it can be concluded that the attitudes of majority of the respondents among the secondary school mathematics teachers in Thoubal district of Manipur towards mathematics ranged from medium to unfavourable low level. It shows that teachers' attitude toward mathematics had a bearing on students' achievement in the subject and teachers' positive attitude correlated with students' better achievement while teachers' negative attitude correlated with students' lower achievement in mathematics. Other previous research findings also indicated that teachers' attitudes have potential influence on students even as teachers' positive attitudes shape the positive attitudes of students. While majority of them perceived the usefulness of mathematics in daily life, their lack of confidence on their students' in terms of mathematics achievement was associated with Meitei Pangal secondary school students' real low achievement in mathematics. The few teachers who felt comfortable in using ICT in teaching mathematics had better teaching engagement level.

Thus, the findings of the study suggest that there was a significant association between teachers' attitude towards mathematics and Meitei Pangal secondary school students' achievement in mathematics. This finding of teachers' attitude as a factor has answered the question as to why Meitei Pangal secondary school students could not achieve better in mathematics as expected. As such, improving mathematics teachers' attitude towards the subject will make a difference in increasing Meitei Pangal secondary school students'

mathematics achievement while it is necessary to address other reasons for their failure.

II. SUGGESTIONS

To improve teachers' attitude towards mathematics, efficient measures should be taken up to increase their self-confidence in teaching mathematics, remind them about the importance of mathematics, and motivate them so that teaching mathematics becomes an enjoyable engagement for enabling students to get better achievement in mathematics. Teachers should be oriented through proper training towards better mathematics teaching methods to keep pace with the changing trends in mathematics education. Efforts to improve attitude of teachers is crucial for improving Meitei Pangal students' attitude towards mathematics at lower level which would lead them to higher studies in mathematics ensuring the community's participation in mathematics-related professions.

This study had some limitations as it had considered the teachers' attitude in isolation in assessing its influence on students' mathematics achievement which could be impacted by many other factors like students themselves, their families, schools environment etc. The samples of teachers, students and schools taken in the study are also small which may affect the results. So, suggestion is made for further research in the field by taking more factors into consideration while increasing the sample size and population of the study for more depth in understanding the association between teachers' attitude towards mathematics and Meitei Pangal secondary school students' achievement in mathematics. The study used only the quantitative data for analysis. So, future research studies can include qualitative data from in-depth interviews and case studies to enhance the result of the study with more depth.

REFERENCES

1. Aiken, L. R. (1970). Attitudes toward Mathematics. *Review of Educational Research*, 40 (4), 551-596. doi:10.3102/00346543040004551.
2. Ajzen, I. (1993). Attitude Theory and the Attitude-Behavior Relation. In D. Krebs, & P. Schidt (Eds.), *New Directions in Attitude Measurement*, 41-57. Walter de Gruyter. [https://www.scirp.org/\(S\(lz5mqp453ed%20snp55rrgjt55\)\)/reference/referencepapers.aspx?referenceid=3118084](https://www.scirp.org/(S(lz5mqp453ed%20snp55rrgjt55))/reference/referencepapers.aspx?referenceid=3118084)
3. Akinsola, M. K., & Olowojaiye, F. B. (2008). Teacher Instructional Methods and Student Attitudes towards Mathematics. *International Electronic Journal of Mathematics Education*, 3(1), 60-73. <http://www.iejme.com/download/teacher-instructional-methods-and-student-attitudes-towards-mathematics.pdf>
4. Allport, G. W. (1935). Attitudes. In C. A. Murchinson (Ed.), *A handbook of social psychology*. 798-844. Worcester, MA: Clark University Press.
5. Australian Education Council (1991). *National report on schooling in Australia*. Carlton: The Curriculum Corporation <https://link.springer.com/article/10.1007/BF02692814>
6. Birgin, O. et al. (2009). The investigation of the views of student mathematicsteachers towards computer-assisted mathematics instruction. *Procedia-Social and Behavioral Sciences*, Volume 1, Issue 1, 676-680, ISSN 1877-0428, <https://doi.org/10.1016/j.sbspro.2009.01.118>. (<https://www.sciencedirect.com/science/article/pii/S1877042809001207>)
7. Bishop, A., & Nickson, M. (1983), *Research on the Social Context of Mathematics Education*, NFER -Nelson, Windsor. <https://files.eric.ed.gov/fulltext/ED302434.pdf>
8. Blazar, D. & Kraft, Matthew A. (2017). Teacher and Teaching Effects on Students' Attitudes and Behaviors. *Educ Eval Policy Anal.* 39(1): 146–170. doi: 10.3102/0162373716670260

9. Brush, L. (1981). Some thoughts for teachers on anxiety. *Arithmetic Teacher*, 29, 37-39.
10. Carpenter, T., & Lubinski, C. (1990). Teachers' attributions and beliefs about girls, boys and mathematics. *Educational Studies in Mathematics*, 21, 55-69.
11. Cohen, J. (1988). *Statistical power analysis for the behavioral sciences*. Hillsdale, NJ: Erlbaum. <https://www.sciencedirect.com/science/article/pii/S1877042809001207>
12. Coleman & Miller (2014) Coleman, A., & Miller, B. J. (2014). The IMSA© PROMISE: Igniting and nurturing diverse STEM talent. *IAGC Journal*, 1–14. Retrieved from http://digitalcommons.imsa.edu/pres_pr/23/
13. Ernest, P. (1988). The attitudes and practices of student teachers of primary school mathematics. A. Borbas (Ed.), *Proceedings of the 12th International Conference on the International Group for the Psychology of Mathematics Education*. Veszprem, Hungary: International Group for the Psychology of Mathematics Education.
14. Ernest, P. (1988). The impact of beliefs on the teaching of mathematics. Paper prepared for ICME VI. Budapest: Hungary. <http://www.ex.ac.uk/~PErnest/impact.htm>Hattie (2009).
15. Ernest, P. (1989). The knowledge, beliefs, and attitudes of the mathematics teacher: A model. *Journal of Education for Teaching*, 15 (1),13-34. DOI:10.1080 /02607 47890 150102
16. Han, S. Y., & Carpenter, D. (2014). Construct validation of student attitude toward science, technology, engineering and mathematics project-based learning: The case of Korean middle grade students. *Middle Grades Research Journal*, 9(3), 27-41. https://scholar.google.com/citations?view_op=view_citation&hl=en&user=YeCC3UAAAAJ&citation_for_view=YeCC3UAAAAJ:SeFeTyx0c_EC
17. <https://www.bosem.in>
18. <https://www.surveysystem.com>
19. Ingram, N. (2015). Students' relationships with mathematics: Affect and identity. In M. Marshman, V. Geiger, & A. Bennison (Ed.), *Mathematics education in the margins (Proceedings of the 38th annual conference of the Mathematics Education Research Group of Australasia)*,301-308). Sunshine Coast, Australia: MERGA. <https://acuresearchbank.acu.edu.au/item/884y2/mathematics-education-in-the-margins-proceedings-of-the-38th-annual-conference-of-the-mathematics-education-research-group-of-australia>
20. Joe Relich, Jenni Way and Andrew Martin (1994) *Attitudes to Teaching Mathematics: Further Development of a Measurement Instrument*, *Mathematics Education Research Journal* 6(1), 56--69 <http://citeseerx.ist.psu.edu/viewdoc/download?doi=10.1.1.588.3966&rep=rep1&type=pdf>
21. Veeranki S. R, Varshney M. (2022). Intelligent Techniques and Comparative Performance Analysis of Liver Disease Prediction, *International Journal of Mechanical Engineering*, 7(1), 489-503. <https://kalaharijournals.com/ijme-vol7-issue-jan2022part2.php>,
22. Dr. Ritika Malik, Dr. Aarushi Kataria and Dr. Naveen Nandal, *Analysis of Digital Wallets for Sustainability: A Comparative Analysis between Retailers and Customers*, *International Journal of Management*, 11(7), 2020, pp. 358-370.
23. Masood Abu-Bakr, Hersh F. Mahmood, Azad A. Mohammed, *Investigation of metakaolin and steel fiber addition on*

- some mechanical and durability properties of roller compacted concrete,
24. Case Studies in Construction Materials, Volume 16,2022, e01136.
 25. LeGrand, J. (2013). Exploring gender differences across elementary, middle, and high school students' science and math attitudes and interest (Doctoral dissertation). Retrieved from ProQuest Dissertations and Theses database (UMI No. 3556932). LeGrand, 2013
 26. Mensah, J. K., Okyere M., Kuranchie A. (2013). Student attitude towards Mathematics and performance: Does the teacher attitude matter? Journal of Education and Practice, Vol 4, No 3 (2013) <https://www.iiste.org/Journals/index.php/JEP/article>
 27. Phillips, R. B. (1973). Teacher attitude as related to student attitude and achievement in elementary school mathematics. School Science and Mathematics, 73,501-507.
 28. Schofield, H.L. (1981). Teacher effects on cognitive and affective pupil outcomes in elementary school mathematics. Journal of Educational Psychology, 73,462-471. <http://citeseerx.ist.psu.edu/viewdoc/download?doi=10.1.1.588.3966&rep=type=pdf>
 29. Tabuk, M. (2018). Prospective Primary School Teachers' Attitudes Towards Teaching Mathematics. Journal of Education and Learning 7(4):225. DOI:10.5539/jel.v7n4p225
 30. Williams (1988) Williams, W. V. (1988). Answers to questions about anxiety. School Science and Mathematics,88,95-105.