

# MATHEMATICS TEACHERS' TEACHING EFFICACY AND IRRATIONAL BELIEFS AND THEIR EFFECTS ON STUDENTS' ACADEMIC ACHIEVEMENT

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**Abstract.** This particular study was performed to identify the Mathematics teachers' irrational beliefs and teaching effectiveness and the relationship of theirs to students' academic achievement in almost all public secondary institutions of Quality Learning Circle I in the province of Zamboanga del Sur during the School Year 2018 to 2019. It used the descriptive correlational study look together with the questionnaire checklist as information collecting instrument plus the inferential and descriptive statistics as information analysis tools. The study results disclosed that a much better bulk of the teachers had a moderate sense of teaching efficacy as well as firm irrational opinions. Most of the pupils had shown development in attaining mastery of fundamental competencies in Mathematics. Generally there was no substantial connection between the teachers' instructing efficacy and also the students' academic achievement. Moreover, an insignificant connection existed between the teachers' irrational beliefs and also the students' academic achievement.

**Keywords:** *mathematics teachers, teaching efficacy, irrational beliefs, academic achievement*

## Introduction

The modern teacher faces a mountainous climb, one filled with underachieving students' avalanches, along with the scorching temperatures of the rigid district and state standards, and little support. One wrong move can lead to a pummeling descent down a ravine that many educators never recover from. For all of these reasons, teaching is often seen as one of the most stressful occupations. Teacher burnout, low teacher self-efficacy, and irrational thoughts are experienced by most teachers in the teaching profession (Kyriachou, 2001). Teacher burnout can have many consequences, and some of them are even serious. When teachers frequently face high levels of day-to-day stress, this can really manifest in a litany of physical issues (Wilhem et al., 2000). Teacher burnout isn't the only element which might negatively influence a teacher's efficiency. Based on the Social Cognitive Theory, effectiveness mirrors someone's view in his or maybe the capability of her to exercise control over the level of theirs of working as well as events affecting his or maybe the life of her (Bandura, 1993). Effectiveness is a motivational construct primarily based on an individual's self perceived competence level (Tschannen Moran and Woolfolk Hoy, 2007) which may affect how one gets motivated, thinks, can feel, and also acts (Bandura, 1993).

Efficacy beliefs are proven to influence the period of time and energy teachers put into the classes of theirs, both within and outside of the classroom. Teachers that don't look to achieve success are more likely to put forth fewer initiatives to plan and also provide teaching (Tschannen Moran and Woolfolk Hoy, 2007). Besides, it's been found

that teachers with lower efficacy could stay away from planning things they feel might go beyond the abilities of theirs and may well not invest extra attempt to locate resources (Schunk, 2000), while instructors with good efficacy have a tendency to build tough classroom activities they assist their pupils complete (Ross, 2001; Schunk, 2000).

In addition to the teacher's sense of efficacy, another important factor that may adversely affect a teacher's performance are the irrational beliefs that the teachers hold about themselves, other people, and conditions. Irrational beliefs refer to teachers' perceptions of situations, which may increase their experience of negative affective states (Hakanen et al., 2006). Studies revealed that teachers' irrational beliefs were positively and significantly correlated with burnout, depression, and absenteeism. Teachers endorsing higher levels of low frustration tolerance, or the belief that something is too difficult and should not be that way, also indicated higher distress levels (Bermejo-Toro and Prieto-Ursua, 2006). Irrational beliefs also play a significant role in the consultative process among teachers. Endes (2001) found out that the more strongly a teacher holds irrational beliefs, the less effective they may be in implementing effective treatment in the classroom. More specifically, teachers with higher rates of irrational beliefs received lower treatment effectiveness ratings than teachers endorsing low levels of irrational beliefs.

The likely consequences that teachers' irrational beliefs plus teaching effectiveness have on students' academic achievement couldn't be undermined. As a result, the researcher clearly believed that these constructs must be thoroughly analyzed, considering that a lot of the secondary Mathematics teachers received a reduced feeling of teaching effectiveness as well as firm irrational values based on knowledge that is individual. Consequently, this particular study was performed to look at the teaching efficacy and irrational opinions of Mathematics coaches as well as students' academic achievement in all public secondary institutions of Quality Learning Circle I (QuaLCi I) within the province of Zamboanga del Sur for School Year 2018 to 2019.

Specifically, it endeavored to provide answers to the following sub-problems;

1. What is the teaching efficacy level of the Mathematics teachers in terms of the following dimensions; (a) Mathematics Teaching Outcome Expectancy; and (b) Personal Mathematics Teaching Efficacy?
2. What is the level of the irrational beliefs of the Mathematics teachers as to the following aspects; (a) Self-Downing Attitudes; (b) Low Frustration Tolerance Attitudes; (c) Attitudes Toward School Organization; and (d) Authoritarian Attitudes Toward Students?
3. What is the students' academic achievement based on their first and second grading Mean Percentage Scores in Mathematics?
4. Is there a significant relationship between the Mathematics teachers' teaching efficacy and the students' academic achievement?
5. Is there a significant relationship between Mathematics teachers' irrational beliefs and the students' academic achievement?

## ***Literature review***

### ***Mathematics teaching self-efficacy***

Mathematics teaching self efficacy describes an individual's self perceived capability to instruct Mathematics efficiently (Enochs et al., 2000). It's a judgment on the aspect of coaches about whether they are able to efficiently teach Mathematics ideas provided

their private competence in those Mathematics concepts (Tschannen Moran and Woolfolk Hoy, 2007). Coaches with a feeling of Mathematics teaching self efficacy are prone to test methods that are various when coaching, focus on coaching when pupils don't study and possibly are positive in individual capability for instruct Mathematics (Bates et al., 2011). Mathematics capability in particular doesn't ensure where a person is going to be a highly effective instructor. Nevertheless, pre-existing opinions on the subject of Mathematics power, learning, as well as instructing become an important job in the preparation as well as using math instruction for the pre-service coaches plus to those brand new on the teaching profession (Benbow and Arjmand, 1990). Furthermore, pre-existing research suggests that teachers' pre existing beliefs about Mathematics are grounded in previous experiences, negative or positive, as Mathematics pupils (Smith, 1996). This's in line with Bandura (1977; 1986) efficacy concept, that shows that mastery experiences will supply a person with a heightened amount of confidence in doing future tasks or performance. A mastery on the experience in a teachers are includes the teaching in a session properly. Teacher preparation plans as well as pupil teaching part on the teacher preparation programs offer opportunities in the mastery encounters.

Based on Tschannen Moran and Woolfolk Hoy (2006), students' Mathematics mastering abilities sprang from their teachers' high teaching efficacy beliefs. These beliefs acquire students' mathematical spoken learning abilities and Mathematics accomplishment from elementary to tertiary and secondary levels. Armstrong (2000) further included that teachers' instructing effectiveness is a strong tool for forecasting Mathematics learning as well as achievement.

### ***Irrtional beliefs***

In addition to the sense of efficacy being related to teaching behavior, it may also be important to examine teachers' perceptions of situations, leading to an increase in their experience of negative affective states. While there are many stressful aspects related to the profession of teaching such as managing student misbehavior (Hakanen et al., 2006; Kyriachou, 2001), time pressures, and workload (Hakanen et al., 2006; Kyriachou, 2001), individual teachers may perceive and react to these stressful situations differently. To understand these individual differences in teachers' stress level, it may be helpful to consider an explanatory model for stress, such as Rational Emotive Behavior Therapy (REBT). Albert Ellis developed REBT (originally called RET for Rational Emotive Therapy) in 1955 (Ellis and Dryden, 1987). REBT follows an "ABC" framework in which people can form rational or irrational beliefs (B) about an activating event (A). Rational beliefs tend to lead to self-helping consequences (C) while irrational beliefs tend to lead to self-defeating consequences (Ellis and Dryden, 1987). Bernard and Joyce created a list of 16 major irrational beliefs that they proposed were held by teachers (Forman, 1990). These irrational beliefs included: "Events in my classroom should always go the way I want them to," "I must be a perfect teacher and never make mistakes," and "Students with a history of academic or behavioral problems will always have problems."

Forman (1994) provided an example of how two teachers may have different beliefs about the same student exhibiting behavior problems. An irrational teacher may believe that the student should always behave in class and that they are awful for misbehaving. This teacher may also believe that he or she should always have complete control over the class at all times. When working with the same student, a teacher who endorses

more rational beliefs may acknowledge that the student is difficult, but recognize that students do not always behave in this way and that while difficult, the behavior is not, in fact, awful and that it is unrealistic to think that they should always have control over their classroom. These healthier beliefs may help manage negative effect and help them more effectively think about ways to manage student behavior.

### ***Students' academic achievement***

The importance of Mathematics in contemporary society can't be overemphasized. Mathematics underachievement in status, international and national assessments denies the pupils the rewards connected to the importance of Mathematics, which includes academic development and employment prospects, and also the country, the basic financial worth of an educated citizenry. In the U.S., as in various other evolved nations, it's of great concern to institutional and political administrators that being outperformed in Mathematics, a primary subject in and also with technology, science and engineering, will result in naturally competitive disadvantage, an action towards being economically outdone by other evolved nations.

Steel (2012) found that Science, Technology, Engineering, and Mathematics (STEM) subjects are consistently stressed in fitness training programs across the globe. Any technical development is determined by exactly how generations to come comprehend the subjects. Mathematics is of especially great concern and interest due to the essential role of its in academic development, its strategic part as instrument and partner in another subject matter, and its rigor and need like a stand alone discipline.

## **Materials and Methods**

### ***Research design***

This study used the descriptive correlational study design as it largely endeavored to determine the connection between the Mathematics teachers' irrational beliefs and teaching effectiveness and also the students' academic achievement. This process had also been used since it mainly involved finding facts and carefully interpreting the information gathered from the study's identified individuals. Descriptive correlational research design mainly tries to identify the scope of a relationship between 2 or maybe more variables using statistical information. In this particular design type, the connection between and among many information is wanted and interpreted. Additionally, it recognizes the observable patterns and trends in data, though it doesn't go up to now in its analysis to prove the sources for these noticed patterns (Creswell, 2009).

### ***Participants***

The participants who were involved in this study were the 63 Grades 7, 8, 9, and 10 Mathematics teachers from the public secondary schools of Quality Learning Circle I (QuaLCi I) in the municipalities of Dumingag, Mahayag, and Josefina, Zamboanga del Sur for School Year 2018-2019.

### ***Research instrument***

This study used the questionnaire-checklist as the chief instrument in gathering the needed data from the participants of the study. It consisted of two parts. Part I of the questionnaire checklist was the 21 item Mathematics Teaching Efficacy Beliefs Instrument (MTEBI) that had been taken and also utilized by the researcher in examining the teaching effectiveness of the Mathematics teachers (*Table 1*). Created by Enochs et al. (2000), this particular instrument was composed of 2 sizes, namely: Mathematics Teaching Outcome Expectancy (Personal Mathematics and MTOE) Teaching Efficacy (PMTE). Statements 1, 4, 7, 9, 10, 12, 13, and 14 pertained to Mathematics Teaching Outcome Expectancy while statements 2, 3, 5, 6, 8, 11, 15, 16, 17, 18, 19, 20, and 21 pertained to Personal Mathematics Teaching Efficacy. The teachers answered this instrument. To ascertain the mathematics teachers' teaching efficacy level, their overall raw scores were categorized using the following range with their corresponding adjectival equivalent.

**Table 1.** Range of teaching efficacy scores.

Range	Adjectival equivalent
76-105	High efficacy
43-75	Medium efficacy
21-42	Low efficacy

Part II of the questionnaire-checklist was the 22-item Teacher's Irrational Belief Scale (TIBS), which the researcher adopted to ascertain the teachers' irrational beliefs (*Table 2*). Developed by Bernard (1990), TIBS evaluated the irrational beliefs of teachers across various teaching-related areas which included Self-Downing Attitudes (items 1-8), Low-Frustration Tolerance Attitudes (items 9-12), Attitudes Toward School Organization (items 13-17), and Authoritarian Attitudes Toward Students (items 18-22). The teachers also answered this instrument. To determine the mathematics teachers' irrational beliefs, their overall raw scores were classified using the following range with their adjectival equivalent.

**Table 2.** Range of irrational beliefs scores.

Range	Adjectival equivalent
74-110	High
37-73	Medium
22-36	Low

Furthermore, to ascertain the students' mastery level in their first and second grading examinations in Mathematics, their Mean Percentage Scores (MPS) were grouped and interpreted using the Achievement Levels based on Memorandum Order No. 160 dated September 10, 2012, of the Department of Education which are presented below (*Table 3*).

**Table 3.** NAT mean percentage scores.

Mean percentage score (%)	Descriptive equivalent
96-100	Mastered
86-95	Closely approximating mastery
66-85	Moving towards mastery
35-65	Average

15-34	Low
5-14	Very low
0-4	Absolutely no mastery

### ***Statistical treatment of data***

The researcher employed simultaneously inferential and descriptive data to make certain the correct interpretation and analysis of the information gathered from the research participants. Frequency counts and percentages were used to identify the amount of the Mathematics teachers' instructing efficacy, irrational beliefs, as well as the students' academic achievement in the second and first grading examinations in their Mathematics topic. Chi-square, meanwhile, was put on to determine the significance of the connection between the Mathematics teachers' irrational opinions and teaching effectiveness and their students' academic achievement.

## **Results and Discussion**

### ***Teaching efficacy level of Mathematics teachers***

Table 4 presents the information that mirror the teaching efficacy amount of Mathematics teachers. The teaching effectiveness of teachers is evaluated in regards to the next dimensions, including Mathematics Teaching Personal Mathematics and outcome Expectancy Teaching Efficacy.

**Table 4.** *Teaching efficacy level of Mathematics teachers.*

Range	Description	Frequency (N)	Percentage (%)
76-105	High efficacy	8	12.70
43-75	Medium efficacy	53	84.13
21-42	Low efficacy	2	3.17
Total		63	100

Based on the table presented, the results show that out of the 63 teachers, 53 or 84.13% of them have obtained raw scores which range from 43–75 which have the corresponding description of "Medium Efficacy"; 8 or 12.70% have garnered raw scores which range from 76–105, having the corresponding description of "High Efficacy"; and only 2 or 3.17% of them have yielded raw scores which range from 21-42, described as "Low Efficacy." Analysis of the foregoing findings clearly reveals that a greater majority of the teachers possess a medium sense of teaching efficacy in Mathematics. The findings further indicate that the teachers generally perceive that they have adequate competence to teach their students mathematics concepts and skills effectively. They also tend to exert effort in planning and preparing their daily lessons and class routines as well as in providing classroom-based tasks and activities that could help their students to learn Mathematics easily. Moreover, the specified findings support on the list of promises of Bates et al. (2011) that coaches who've a good sense of Mathematics teaching self-efficacy are prone to test methods that are various when coaching, focus on coaching when pupils don't learn, and are positive in their capability to teach Mathematics.

### ***Irrational beliefs level of Mathematics teachers***

Table 5 displays the data that reflect the teachers' irrational beliefs as to the following dimensions: Self-Downing Attitudes, Low Frustration Tolerance Attitudes, Authoritarian Attitudes Toward Students.

**Table 5. Irrational belief level of Mathematics teachers.**

Range	Description	Frequency (N)	Percentage (%)
74-110	High	40	63.49
37-73	Medium	23	36.51
22-36	Low	0	0.00
Total		63	100

Based on the table shown, the results reveal that among the 63 teachers involved, 40 or 63.49% of them have yielded raw scores which range from 74–110 which have the corresponding description of "High"; 23 or 36.51% of the same group have earned raw scores which range from 37–73, having the corresponding description of "Medium"; and no teacher-participant has garnered a raw score which ranges from 22-36, described as "Low." Analysis of the preceding findings evidently indicates that most teachers possess a high level of irrational beliefs. These findings support one of Ellis (1997) claims that teachers having firm irrational beliefs hold negative outlook about their school as an organization and its members and demonstrate controlling attitudes toward their students. Moreover, the specified results help support one more case of Bernard (1990) that instructors with higher irrational beliefs have a tendency to generate rigid needs of themselves for endorsement and achievement and get really lack of criticism and achievement.

### **Academic achievement of students**

Table 6 vividly displays the data that reflect the students' academic achievement based on their Mean Percentage Scores (MPS) during the first and second grading examinations in their Mathematics subject.

**Table 6. Academic achievement of students.**

Mastery/achievement level (%)	Frequency (N)	Percentage (%)
Mastered	96-100	0
Closely approximating mastery	86-95	0
Moving towards mastery	66-85	46
Average	35-65	17
Low	15-34	0
Very low	5-14	0
Absolutely no mastery	0-4	0

Based on the table presented, the results disclose that 46 or 73.02% of the classes have obtained MPS of 66-85%, described as "Moving Towards Mastery"; 17 or 26.98%, 35-65%, "Average"; and no class has earned MPS which can be described as "Mastery," "Closely Approximating Mastery," "Low," "Very Low," and "Absolutely No Mastery." Analysis of the foregoing findings clearly elucidates that most students have an academic achievement at the "Moving Towards Mastery" level. The findings also reveal that the students have shown progress in attaining mastery of the basic competencies in Mathematics. Furthermore, the given findings strongly support one of

Armstrong (2000) claims that teachers' teaching efficacy is found to be a strong source for forecasting Mathematics learning and achievement.

***Significance of the relationship between the teachers' teaching efficacy and the students' academic achievement***

Table 7 distinctly presents the significance of the relationship between the teachers' teaching efficacy and the students' academic achievement.

**Table 7.** *Significance of the relationship between the teachers' teaching efficacy and the students' academic achievement.*

Teachers' teaching efficacy	Students' academic achievement		MTR
	Moving towards mastery	Average	
High efficacy	6	2	8
Medium efficacy	40	15	55
MTC	46	17	63

According to the table given, the computed chi square value of 0.02 is much less than the essential worth of 3.84 with 1 degree of independence at the 0.05 degree of significance. Thus, there's adequate evidence to admit the null hypothesis. The foregoing result indicates that there is no close association between the teachers' teaching efficacy and the students' academic achievement. The result further suggests that the teachers' teaching efficacy does not significantly affect the students' academic achievement. Although the previous numerical results on teaching efficacy clearly indicate that the teachers generally hold a medium or moderate sense of teaching efficacy, it can be accurately inferred that the teachers' level of perceived competence or general ability to teach Mathematics is not that sufficient to improve the academic achievement of the students or enhance the students' mastery of the basic competencies in the Mathematics subject. Furthermore, the given result does not support one of Tschannen-Moran and Woolfolk Hoy (2006) claims that teachers' teaching efficacy beliefs develop the students' mathematical verbal learning skills and Mathematics achievement from the elementary to secondary and tertiary levels.

***Significance of the relationship between the teachers' irrational beliefs and the students' academic achievement***

Table 8 displays the significance of the relationship between the teachers' irrational beliefs and the students' academic achievement.

**Table 8.** *Significance of the relationship between the teachers' irrational beliefs and the students' academic achievement.*

Teachers' irrational beliefs	Students' academic achievement		MTR
	Moving towards mastery	Average	
High	30	10	40
Medium/low	16	7	23
MTC	46	17	63

As evidently proven, the computed chi square value of 0.22 is much less than the essential worth of 3.84 with 1 degree of independence at the 0.05 degree of significance.



Hence, there's evidence that is ample to admit the null hypothesis. The preceding result clearly implies that there is no direct association between the teachers' irrational beliefs and the students' academic achievement. The result also indicates that the teachers' irrational beliefs do not substantially affect the academic achievement of the students in Mathematics. Furthermore, the given result does not strongly support one of Terjesen and Kurasaki (2009) claims that the irrational beliefs of teachers also affect student performance as irrational beliefs have become one of the potential mediators between teacher stress and efficacy.

## **Conclusion**

The study results show that Mathematics teachers have adequate self-perceived ability to teach the Mathematics subject to their students effectively. However, they highly manifest rigid, inconsistent, and unrealistic beliefs toward themselves, their students, their schools' organizations, and their work. Students, meanwhile, have demonstrated progress in attaining proficiency of the basic competencies in Mathematics. Furthermore, tests of the hypotheses reveal that Mathematics teachers' teaching efficacy and their irrational beliefs are not closely associated with their students' academic achievement.

This study recommends that the school administrators regularly send their teachers to training and seminar workshops to enhance their teaching efficacy and conduct consultation and counseling activities to help teachers deal with their irrational beliefs effectively. Teachers must actively participate in the training and seminar-workshops and consultation and counselling activities to improve their teaching efficacy and reduce their irrational beliefs. Students must exert more effort in studying their lessons to reach the desired mastery level. Furthermore, a similar study be conducted in other clusters and includes identifying factors affecting teaching efficacy and irrational beliefs.

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## **Conflict of interest**

The authors would like to certify that they have no affiliation with or involvement in any organization or entity having financial or non-financial interest in the subject matter or materials discussed in this paper.

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