



## Investigating the Level of the Tenth-grade Students' Self-Efficacy in Mathematics and its Impact on their Performance: A Study in Pemagatshel District

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### Authors' contributions

This study was carried out in collaboration between both authors. Both authors have participated in each stage of the study; design of the study, data collection, analysis and interpretation of the results. Both authors read and approved the final manuscript.

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### Abstract

The study aimed at finding out the level of Mathematics self-efficacy and its relationship with the Mathematics performance of tenth-grade students. The study used a quantitative method. The data was collected from one middle secondary school and three central schools under the Pemagatshel district from 3<sup>rd</sup> March to 16<sup>th</sup> March 2020. A total of 300 students comprising 150 males and females each were included for the study. The data was collected using Mathematics Self-Efficacy Scales and analyzed using SPSS. The overall finding indicated that students had an average level of Mathematics self-efficacy ( $M=3.25$ ;  $SD=0.60$ ). Among the four sources of self-efficacy, the study revealed that the students had high Mathematics self-efficacy in vicarious experience ( $M=3.67$ ;  $SD=0.62$ ). The Pearson correlation indicated a moderate positive correlation ( $r=.467$ ,  $P=.05$ ) between Mathematics self-efficacy and Mathematics performance. Higher the Mathematics self-efficacy, better the Mathematics performance, and lower the Mathematics self-efficacy, poorer the Mathematics performance. Therefore, it is imperative to strengthen the skills and strategies that enhance the Mathematics self-efficacy of the students.

*Keywords:* Mathematics; self-efficacy; performance; students; mastery experience; vicarious experience; social persuasion; physiological state.

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## ABBREVIATIONS

- BCSE* : Bhutan Certificate for Secondary Education.  
*BCSEA* : Bhutan Council for School Examinations and Assessment.  
*MSE* : Mathematics Self-Efficacy.  
*MSES* : Mathematics Self-Efficacy Scales.  
*SD* : Standard Deviation.  
*SPSS* : Statistical Package for Social Sciences.  
*STEM* : Science, Technology, Engineering and Mathematics.

## 1 Introduction

### 1.1 Background

Education is one of the nation's most important investments in her people. It increases productivity, creativity, encourages entrepreneurship, and technological advancements [1]. In Bhutan, with the beginning of planned development, the modern education system commenced in 1961 [2]. Since then, education has played a very important role in the pursuit of the country's political, cultural, environmental, and socio-economic development to give a different identity as a small, peaceful, progressive, and happy nation [3].

Throughout the country, various schools have been established. Over the years, the number of schools and students grew rapidly. In the early 1960s, there were only a few hundred students, however, in 2014 the number of students in about 600 schools and institutions has increased to about 200,000 [3]. Moreover, there were 256,216 students in 1,860 schools in 2018, including non-formal education, early learning centers, and institutions [2]. The yearly increase in the number of schools and students shows that the Ministry of Education is placing importance on Education.

There is widespread public concern over a decline in the quality of education despite the Ministry of Education placing importance on Education. According to the Pupil Performance Report of Bhutan Council for School Examinations and Assessment [BCSEA] [4], the pass percentage of Bhutan Certificate for Secondary Education (BCSE, Class: 10) in 2011, 2012, 2013, and 2014 is 97.04%, 96.88%, 95.93%, and 93.73% respectively. The gradual decrease in student's pass percentage over the years is one of the indications of poor performance in academics.

Many factors are affecting the students' performance. They are socioeconomic status [5], parental support [6], conducive learning environment [7], and self-efficacy of the students [8,9] to mention a few. Among all, self-efficacy appears to be an important factor because it affects the motivation and learning of students while other factors seemed to influence student's self-efficacy [10]. Therefore, Self-efficacy is one of the effective factors related to student's academic performance.

### 1.2 Problem Statement

Mathematics is the science of structure, order, and relationship that has evolved from the basic practices of counting, measuring, and describing object shapes [11]. It prepares learners with reasoning power, creativity, critical thinking, and the ability to solve problems. To be successful in the twenty-first century, all nations require people who have a good understanding of logic, problem-solving, data handling, and creativity [12].

Despite the importance of Mathematics in personal and national development, the student's interest in Science, Technology, Engineering, and Mathematics (STEM) careers has declined over the years [13]. Similarly in our country, the number of students in middle secondary schools is 52,023, however, it was decreased in higher secondary schools to 37,983 [2]. This is one of the indications that the number of students taking Mathematics is declining as they move to higher schools.

Mathematics has been and continues to be one of the mandatory subjects in Bhutan from pre-primary till middle secondary school. The subject's mandatory status, however, has done little motivation in student's performance. Although, findings by Dukpa [14] revealed that the attitude of Bhutanese students towards Mathematics was medium, yet their performance was unsatisfactory. According to the National Education Assessment conducted by BCSEA [15], the overall performance of the class X students in the Mathematics test was 38.03 out of 100 which was much lower than other subjects. Similarly, the performance of Mathematics was the lowest among all the subjects in class X BCSE [16,17].

Human intelligence is not only a factor affecting academic performance. Self-efficacy also plays a crucial role in the student's academic performance [8, 9]. It acts as an effective output precursor [18]. Students with a high self-efficacy towards Mathematics perform well and opt for a technical and scientific career compared to those with low self-efficacy [19]. Therefore, the study investigated the level of tenth-grade students' self-efficacy in Mathematics and its impact on Mathematics performance.

## **2 Literature Review**

### **2.1 Self-efficacy and its Sources**

According to Bandura [20] who originally proposed the concept of self-efficacy defined as the beliefs of individuals about their ability to produce designated performance levels. He further developed four major influencing sources of self-efficacy. They are Mastery Experience; it refers to the people's beliefs in their ability gained from their own experiences, Vicarious Experience; it refers to the people's beliefs in their ability gained from the observation of the conduct and performance of the people around them, Social Persuasion; it refers to the people's belief in their ability gained from the feedback provided by the people around them, and Physiological State; it refers to the people's belief in their ability gained from the physiology and mental state.

### **2.2 Relationship between Self-efficacy and Mathematics Performance**

Self-efficacy affects the performance of all the subjects. It is widely accepted as being both the cause and effect of academic achievement [21]. The level of self-efficacy beliefs varies among the subjects. Dullas [22] found that student's performance in Mathematics posed a highly significant relationship with their self-efficacy beliefs. On the other hand, there was a moderate relationship between their self-efficacy and academic performance in English. However, there were significant relations between the self-efficacy of Mathematics and Science to their academic performance. The relation between the self-efficacy of these two subjects is correlated with their academic performance [23].

Self-efficacy is one of the key factors for effective teaching of Mathematics [24]. Many studies have shown that this was correlated to the performance of Mathematics in such a way that students with higher self-efficacy in Mathematics will have higher performance [21,25,26]. It has a direct effect on Mathematics attitude and anxiety and thus has an impact on the performance of Mathematics [27]. Additionally, Stevens et al., [28] have also found that it predicts motivational orientation and Mathematics performance. The study also revealed a strong relationship between prior Mathematics achievement and self-efficacy. However, Hackett and Betz [29] found that Mathematics performance was moderately correlated with Mathematics self-efficacy.

### **2.3 Relationship between Self-efficacy Sources and Mathematics Performance**

In terms of the relationship between self-efficacy sources and Mathematics performance, it was found that there are high and medium-level significant relations between them [30]. The study also revealed that among the sources, Mastery experiences, Social persuasions, and Physiological states are significant predictors of Mathematics achievement, whereas vicarious experiences have not a significant effect on it. However, a study conducted by Brand and Wilkins [31] found that Mastery experience is most influential in Mathematics achievement.

### 3 Methods

Since the study was intended to find out the level of Mathematics self-efficacy in Bhutanese tenth-grade students in the Pemagatshel district, it requires a large number of participants to survey. Therefore the study was carried out using the quantitative method.

#### 3.1 Research Site and Participants

This study was conducted in Nangkor Central School, Pemagatshel Middle Secondary School, Yurung Central School, and Yelchen Central School in the Pemagatshel district. The research site was selected based on the convenience of the researcher. The study involved a total of 300 tenth-grade students comprising of 150 males and females each.

#### 3.2 Data Collection Tools

##### 3.2.1 Survey questionnaire

The study adopted the 24-item sources of Mathematics Self-Efficacy Scale (MSES) developed by Usher and Pajares [32]. It consists of four dimensions namely; Mathematics Self-Efficacy from Mastery experiences (6 items, item no: 1, 2, 3, 4, 5 & 6), Mathematics self-efficacy from vicarious experiences (6 items, item no: 7, 8, 9, 10, 11 & 12), Mathematics self-efficacy from social persuasion (6 items, item no: 13, 14, 15, 16, 17 & 18) and Mathematics self-efficacy from physiological state (6 items, item no: 19, 20, 21, 22, 23 & 24). Mean values were interpreted as per the following table.

**Table 1. Interpretation of mathematics self-efficacy score**

Self-Efficacy Level	Mean Range	Interpretation
Very Poor	1.00-1.80	Very Low
Poor	1.81-2.60	Low
Average	2.61-3.40	Average
Well	3.41-4.20	High
Very Well	4.21-5.00	Very High

Mathematics Self-Efficacy interpretation was adapted from the study done by Saligumba and Segumpan [33] on “Mathematics Performance and Self-Efficacy of Grade-9 Students”. The study is similar to the present study and both used the same MSES questionnaire. Since the study had adopted a 5-point Likert-type scale where 1 refers to “strongly disagree” and 5 refers to “strongly agree”, the highest level of Mathematics self-efficacy which can be recorded using the questionnaire is 5 and the lowest is 1. Therefore, there should be 5 classes with an interval of 0.8 ( $Class\ Interval = \frac{Maximum\ Value - Minimum\ Value}{no.\ of\ classes} = \frac{5-1}{5} = 0.8$ ) to interpret the different level of Mathematics self-efficacy.

##### 3.2.2 Test score

Test scores were collected from their respective subject teacher in the form of annual exam marks for each participant and mentioned in the questionnaire itself. It was used to assess the relationship with their self-efficacy and draw inferences on the performance impact.

#### 3.3 Validity and Reliability of Instrument

The Mathematics Self-Efficacy Scale used in this study was a pre-established standardized instrument used by many Mathematics self-efficacy researchers. It is presumed to have high validity. Usher, and Pajares, [32] the developer of MSES claimed that the items were validated and refined in three phases and finally came up

with 24-items. This final model was invariant across gender and ethnicity and results suggest that it is psychometrically sound and could be adapted for use in other domains as well.

Since MSES was a pre-established standardized instrument, it is presumed to have high reliability. According to the developer, Usher and Pajares, [32], the six items in each of the four sub-scales showed adequate internal consistency with Cronbach’s alpha coefficients above the cut-off of .80 recommended by Henson [34]. .88 for mastery experience, .84 for vicarious experience, .88 for social persuasions, and .87 for the physiological state.

### 3.4 Data Analysis Procedure

The survey questionnaire completed by the participants was documented. To analyze the data, separate numeric codes were encoded to the data of the student participants. The data were punched in the statistical package for social sciences (SPSS) and analyzed using appropriate descriptive and inferential statistics. Using descriptive statistics, means and standard deviations were calculated to find the level of Mathematics self-efficacy. Using inferential statistics, Pearson correlation was done to find the relationship between self-efficacy and Mathematics performance.

## 4 Results

The data obtained from the survey questionnaire are presented using tables for easy interpretation. The mean, standard deviation, and Pearson correlation were used to interpret the results. The results are presented as follows;

### 4.1 Mathematics Self-Efficacy (MSE)

MSE indicates student’s self-beliefs in their ability to understand, solve, explain, apply, and overcome Mathematics problems. Data analysis revealed that the overall MSE level of students was in the average category with a mean = 3.25 and SD = 0.60 as reflected in Table 2. Among the four sources of self-efficacy, it was found that student participants had a high level of Mathematics self-efficacy from vicarious experience with a mean = 3.67 and SD = 0.64 as indicated in Table 2.

**Table 2. Comparison of overall mathematics self-efficacy with four sources of self-efficacy**

Sources of Mathematics Self-Efficacy	N	Mean	SD	Level
Mathematics Self-Efficacy from Mastery Experiences	300	3.23	0.65	Average
Mathematics self- Efficacy from Vicarious Experiences	300	3.67	0.62	High
Mathematics Self-Efficacy from Social Persuasions	300	2.81	0.78	Average
Mathematics Self-Efficacy from Physiological State	300	3.29	0.78	Average
Overall Mathematics Self-Efficacy (MSE)	300	3.25	0.60	Average

(Note: 1.00-1.80 = Very Low, 1.81-2.60 = Low, 2.61-3.40 = Average, 3.41-4.20 = High, and 4.21-5.00 = Very High)

#### 4.1.1 Mathematics self-efficacy from vicarious experience

As apparent in Table 3, all the items of vicarious experience were rated in the high category with the highest mean score in item 9 “Seeing kids do better than me in Mathematics pushes me to do better” and lowest in item 11 “I imagine myself working through challenging Mathematics problems successfully”. Similarly, the standard deviation of item 12 is the highest and item 11 the lowest.

**Table 3. Comparison of mean and SD of vicarious experience items**

Items	Mean	SD	Level
7. Seeing adults do well in Mathematics pushes me to do better.	3.78	0.88	High
8. When I see how my Mathematics teacher solves a problem, I can picture myself solving the problem in the same way.	3.70	0.91	High
9. Seeing kids do better than me in Mathematics pushes me to do better.	3.84	0.89	High
10. When I see how another student solves a Mathematics problem, I can see myself solving the problem in the same way.	3.52	0.88	High
11. I imagine myself working through challenging Mathematics problems successfully.	3.47	0.85	High
12. I compete with myself in Mathematics.	3.71	0.94	High

(Note: N= 300, 1.00-1.80 = Very Low, 1.81-2.60 = Low, 2.61-3.40 = Average, 3.41-4.20 = High, and 4.21-5.00 = Very High)

**4.1.2 Mathematics self-efficacy from physiological state**

Among the six items of physiological state, item 19 “Just being in Mathematics class makes me feel calm and relax” has the highest mean score, and item 24 “My whole body becomes relax when I have to do Mathematics” has the lowest. Likewise, the standard deviation of item 20 is the highest and item 19 the lowest as shown in Table 4.

**Table 4. Comparison of mean and SD of physiological state items**

Items	Mean	SD	Level
19. Just being in Mathematics class makes me feel calm and relax.	3.51	0.92	High
20. Doing Mathematics work gains all of my energy.	3.22	1.06	Average
21. I start to feel energized as soon as I begin my Mathematics work.	3.27	0.94	Average
22. My mind gets a lot of ideas and I am able to think clearly when doing Mathematics work.	3.34	1.00	Average
23. I get to relax when I think about learning Mathematics.	3.25	0.99	Average
24. My whole body becomes relax when I have to do Mathematics.	3.17	1.04	Average

(Note: N= 300, 1.00-1.80 = Very Low, 1.81-2.60 = Low, 2.61-3.40 = Average, 3.41-4.20 = High, and 4.21-5.00 = Very High)

**4.1.3 Mathematics self-efficacy from mastery experience**

Among the six items of mastery experience, item 3 “When I study very hard, I do Mathematics very well” has the highest mean score and item 6 “I do well on even the most difficult Mathematics assignments” has the lowest. Likewise, the standard deviation of item 2 is the highest, and item 5 the lowest as reflected in Table 5.

**Table 5. Comparison of mean and SD of mastery experience items**

Items	Mean	SD	Level
1. I make excellent grades on Mathematics tests.	3.10	0.83	Average
2. I have always been successful in Mathematics.	3.13	0.91	Average
3. When I study very hard, I do Mathematics very well.	3.92	0.82	High
4. I got good grades in Mathematics on my last report card.	3.06	0.96	Average
5. I do well on Mathematics assignments.	3.46	0.81	High
6. I do well on even the most difficult Mathematics assignments.	2.68	0.84	Average

(Note: N= 300, 1.00-1.80 = Very Low, 1.81-2.60 = Low, 2.61-3.40 = Average, 3.41-4.20 = High, and 4.21-5.00 = Very High)

#### 4.1.4 Mathematics self-efficacy from social persuasion

All the items of social persuasion were rated in the average category with the highest mean score in item 16 “I have been praised for my ability in Mathematics” and lowest in item 14 “People have told me that I have a talent for Mathematics” and 15 “Adults in my family have told me what a good Math student I am”. Also, the standard deviation of item 17 and 18 are the highest, and item 16 the lowest as indicated in Table 6.

**Table 6. Comparison of mean and SD of social persuasion items**

Items	Mean	SD	Level
13. My Mathematics teachers have told me that I am good at learning Mathematics	2.90	0.93	Average
14. People have told me that I have a talent for Mathematics.	2.63	0.99	Average
15. Adults in my family have told me what a good Math student I am.	2.63	0.99	Average
16. I have been praised for my ability in Mathematics.	3.01	0.91	Average
17. Other students have told me that I am good at learning Mathematics.	2.98	1.01	Average
18. My classmates like to work with me in Mathematics because they think I am good at it.	2.73	1.01	Average

(Note: N= 300, 1.00-1.80 = Very Low, 1.81-2.60 = Low, 2.61-3.40 = Average, 3.41-4.20 = High, and 4.21-5.00 = Very High)

#### 4.2 Relationship between MSE and Mathematics Performance

Pearson correlation product revealed a moderate positive correlation and statistically significant between Mathematics Self-efficacy and Mathematics performance ( $r = .467, P=.05$ ) as shown in Table 7.

**Table 7. Correlation between mathematics self-efficacy and mathematics performance**

		MP
MSE	Pearson Correlation	.467**
	Sig. (2 – tailed)	.000
	N	300

\*\* . Correlation is significant at the 0.01 level (2-tailed)

### 5 Discussion

#### 5.1 Mathematics Self-Efficacy and Sources of MSE

Among the four sources of self-efficacy, the vicarious experience has the highest level of MSE. The other three sources of self-efficacy such as physiological state, mastery experience, and social persuasion have an average level of MSE thus resulting the overall level of MSE in an average level. Therefore, the tenth-grade students had an average level of MSE.

Bandura [35] mentioned that vicarious experience originates from the observation of the people around us, particularly those regarded as role models. The Bhutanese always look at their predecessors who have been very successful in their life and are regarded as role models. They get encouraged and try to follow in their footsteps. Even the parents and teachers advise their children to look at their friends who are doing well in their studies. Bhutanese value the advice provided by the elders, as it is one of the Bhutanese etiquettes. Therefore, once children see their friends doing well in Mathematics, they get encouraged to learn and thus develop more self-efficacy in Mathematics. His Majesty the king always emphasizes the importance of Bhutanese values and etiquettes. Lamzang [36] reported that on the joint convocation of the two education colleges of the Royal University of Bhutan, His Majesty emphasized that;

Culture is our unique way of life, manners, etiquette, and thoughtfulness – the characteristics that define us as Bhutanese. Right thoughts, actions, and speech combined with respect and regard for the feelings of others – these qualities have brought unity and cohesion in our small society.

Since the establishment of modern education in Bhutan, the education system in the country has developed gradually over the years. In the past few years, there has been a dramatic change in the education sector. The education system puts more emphasis on the learning needs of learners in the 21<sup>st</sup>-century. However, when it comes to real classroom teaching, teachers still dominates lesson in the primary classrooms [37]. Similarly, Dolma [38] also found the presence of an authoritarian concept of teaching Mathematics and the knowledge transferred by teachers through prolonged talks. Teachers tend to focus on what they do, not on what students do. The teacher-dominated teaching method, therefore, make students believe that the teacher is always right and regard them as their role model, thus developing MSE through the observation of their role models.

However, Loo and Choy [39] and Yurt [30] found that mastery experience is one of the most influential predictors of Mathematics performance. According to their studies, student's judgment was framed mainly based on the experience they had while solving Mathematics problems and not so much on how they feel about their ability. Their findings also support Bandura's [20] theory that the most effective way of instilling a strong sense of efficacy is through mastery experiences. On the other hand, Lau et al., [40] revealed that social persuasions are the most influential predictor of Mathematics performance for third, fourth, and fifth-grade students of U.S. International Baccalaureate Schools. The variations in the result could be due to different grades, age groups, social, and cultural backgrounds of the students.

Among the six items of vicarious experience, finding suggested that; "*Seeing Kids do better than me in Mathematics pushes me to do better*", has the highest mean score. Therefore, students gain more self-efficacy in Mathematics from vicarious experience when they see kids or friends younger than them perform better in Mathematics.

Similarly, from the physiological state; "*Just being in Mathematics class makes me feel calm and relax*" has the highest mean score as indicated in the findings. It means that the classroom environment must be conducive, friendly, stress-free, and safe. Hence, students gain more self-efficacy from the physiological state, when the classroom environment is conducive and safe.

"*When I study very hard, I do Mathematics very well*" has the highest mean score among the six items of mastery experience. It means that good performance in the past develops higher self-efficacy. Therefore, students gain more self-efficacy in Mathematics from mastery experience when they perform well in Mathematics.

Finally, "*I have been praised for my ability in Mathematics*" has the highest mean score among the six items of social persuasion. Thus, students gain more self-efficacy in Mathematics from social persuasion when they were praised for their ability in Mathematics. Further, it was supported by Rumfola [41] that positive reinforcement benefits students in the classroom if it is effectively implemented.

## **5.2 Relationship between Mathematics Self-Efficacy and Mathematics Performance**

The study demonstrates a moderate positive correlation between student's Mathematics self-efficacy and their Mathematics performance. Therefore, it was concluded from the findings that students who had higher MSE perform better in Mathematics.

The findings were consistent with the study done by Chowdhury and Shahabuddin [42]; Hackett and Betz [29]; Kaya and Bozdog [43] where students had a moderate positive correlation between Mathematics self-efficacy and Mathematics performance. Similarly, Dullas [22] found that Mathematics self-efficacy significantly correlated with Mathematics performance. The findings supported Bandura's [44] theory of self-efficacy where the higher the level of induced self-efficacy, the higher the performance accomplishment and lower the emotional arousal. Therefore, self-efficacy is one of the factors influencing the performance of Mathematics.



## 6 Conclusion

The findings of this study showed that tenth-grade students had an average level of Mathematics Self-efficacy. Among the four sources of self-efficacy, students gain more MSE from vicarious experience. There was a moderate positive correlation between Mathematics self-efficacy and Mathematics performance. Higher the MSE, better the Mathematics performance, and lower the MSE, poorer the Mathematics performance.

This study, therefore, recommends Ministry of Education to strengthen different strategies to enhance the MSE of the students. Teachers and parents may provide enough opportunities for students to observe their friends' successful performance, create a safe and conducive classroom environment, and provide positive reinforcement while doing Mathematics tasks.

The findings of this study may not be generalized to other students and schools in Bhutan considering the research site employed in the study. Therefore, a detailed study on the Mathematics self-efficacy of students representing different schools, students, and grades from different parts of the country is recommended for the generalizability of the findings.

## Consent and Ethical Approval

The researchers have well-taken care of the ethical issue in this study. Written approval to conduct the study in respective schools was obtained from the concerned authority before data collection. Moreover, consent letters were duly signed by all the participants before doing the survey questionnaire.

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## Competing Interests

Authors have declared that no competing interests exist.

## References

- [1] Ozturk I. The role of education in economic development. *Journal of Rural Development and Administration*. 2001;33(1):39–47.  
Available:<https://doi.org/10.5367/000000099101294492>
- [2] Ministry of Education. Annual education statistics (13<sup>th</sup> ed.). Policy and Planning Division, Ministry of Education; 2018.  
Available:<http://www.education.gov.bt/wp-content/downloads/publications/aes/Annual-Education-Statistics-Book-2018.pdf>
- [3] Ministry of Education. Bhutan education blueprint 2014-2024. Ministry of Education, Royal Government of Bhutan; 2014.  
Available:[https://www.globalpartnership.org/sites/default/files/bhutan\\_education\\_blueprint\\_2014-2024.pdf](https://www.globalpartnership.org/sites/default/files/bhutan_education_blueprint_2014-2024.pdf)
- [4] Bhutan Council for School Examinations and Assessment. Pupil performance report. School

- Examination Division, BCSEA; 2015.  
Available:<http://www.bcsea.bt/publications/PPR-2015.pdf>
- [5] Rabgay TA. Study of factors influencing students academic performance in a higher secondary school in Bhutan. Rabsel. The CERD Educational Journal. 2015;16(2):74–97.
- [6] Damme V, Fraine D, Landeghem V, Fraine D. Factors affecting mathematics achievement of first-year secondary school students in central Uganda. South African Journal of Education. 2015;35(3): 1–16.  
Available:<https://doi.org/10.15700/saje.v35n3a1106>
- [7] Usman S. Factors influencing students’ academic performance at higher secondary level: Teachers’ perception. Language in India. 2012;12:524–548.
- [8] Bandura A, Locke EA. Negative self-efficacy and goal effects revisited. Journal of Applied Psychology. 2003;88(1):87–99.  
Available:<https://doi.org/10.1037/0021-9010.88.1.87>
- [9] Zajacova A, Lynch SM, Espenshade TJ. Self-efficacy, stress, and academic success in college. Research in Higher Education. 2005;46(6):677–678.  
Available:<https://doi.org/10.1007/s11162-004-4139-z>
- [10] Dinther M, Van Dochy F, Segers M. Factors affecting students’ self-efficacy in higher education. Educational Research Review. 2011;6(2):95–108.  
Available:<https://doi.org/10.1016/j.edurev.2010.10.003>
- [11] Nunez R. What is mathematics? Pauli, jung, and contemporary cognitive Science. Recasting reality. Wolfgang Pauli’s Philosophical Ideas and Contemporary Science. 2008;251.  
Available:<https://cogsci.ucsd.edu/~nunez/web/PauliJung.pdf>
- [12] Curriculum and professional support division. Mathematics curriculum framework for classes PP-XII. Curriculum and professional support division, Department of school education; 2005.
- [13] Sadler PM, Sonnert G, Hazari Z, Tai R. Stability and volatility of STEM career interest in high school: A gender study. Science Education. 2012;96(3):411–427.  
Available:<https://doi.org/10.1002/sce.21007>
- [14] Dukpa P. Bhutanese student’s attitude towards mathematics: Findings from a cross-sectional survey of grade six students. The CERD Educational Journal. 2015;16(2).  
Available:<https://doi.org/10.13140/RG.2.2.34484.30082>
- [15] Bhutan council for school examinations and assessment. A study of student achievements in english literacy and mathematics literacy at grade X. Bhutan Council for School Examinations and Assessment; 2013.  
Available:<http://www.bcsea.bt/publications/NEA2013-2014.pdf>
- [16] Bhutan Council for School examinations and assessment. Pupil performance report. School Examination Division, BCSEA; 2017.  
Available:<http://www.bcsea.bt/publications/PPR-2017.pdf>
- [17] Bhutan Council for School examinations and assessment. Pupil performance report. School Examination Division, BCSEA; 2019.  
Available:<https://www.bcsea.bt/publications/PPR-2019.pdf>
- [18] Bong M, Skaalvik EM. Academic self-concept and self-efficacy : How different are they really?

- Education Psychology Review. 2003;15(1):1–40.  
Available:<https://doi.org/10.1023/a:1021302408382>
- [19] Lent RW, Brown SD, Larkin KC. Self-efficacy in the prediction of academic performance and perceived career options. *Journal of Counseling Psychology*. 1986;33(3):265–269.  
Available:<https://doi.org/10.1037/0022-0167.33.3.265>
- [20] Bandura A. Self-efficacy; Motivational processes. *The Corsini Encyclopedia of Psychology*. 2009; 1–3.  
Available:<https://doi.org/10.1002/9780470479216.corpsy0836>
- [21] Schober C, Schutte K, Koller O, McElvany N, Gebauer MM. Reciprocal effects between self-efficacy and achievement in mathematics and reading. *Learning and Individual Differences*. 2018;63:1–11.  
Available:<https://doi.org/10.1016/j.lindif.2018.01.008>
- [22] Dullas AR. Academic performance and self-efficacy of Filipino Science high school students on Mathematics and English subjects. *SSRN Electronic Journal*; 2012.  
Available:<https://doi.org/10.2139/ssrn.2152791>
- [23] Kesan C, Kaya D. Mathematics and science self-efficacy resources as the predictor of academic success. *International Online Journal of Educational Sciences*. 2018;10(2):45–58.  
Available:<https://doi.org/10.15345/iojes.2018.02.004>
- [24] Unlu M, Ertekin E. The relationship between Mathematics teaching self-efficacy and Mathematics self-efficacy. *Procedia - Social and Behavioral Sciences*. 2013;106:3041–3045.  
Available:<https://doi.org/10.1016/j.sbspro.2013.12.350>
- [25] Cheema JR. Effect of math-specific self-efficacy on math literacy: Evidence from a Greek survey. *Research in Education*. 2018;102(1):13–36.  
Available:<https://doi.org/10.1177/0034523717741914>
- [26] Kvedere L. Mathematics self-efficacy, self-concept and anxiety among 9th grade students in Latvia. *Procedia - Social and Behavioral Sciences*. 2014;116:2687–2690.  
Available:<https://doi.org/10.1016/j.sbspro.2014.01.636>
- [27] Azar FS, Mahmoudi L. Relationship between mathematics, self-efficacy and students' performance in statistics : The meditational role of attitude toward mathematics and mathematics anxiety. *Journal of Educational Sciences and Psychology*. 2014;4(1):32–43.
- [28] Stevens T, Olivarez A, Lan WY, Tallent-Runnels MK. Role of mathematics self-efficacy and motivation in mathematics performance across ethnicity. *The Journal of Educational Research*. 2004;97(4):208-221.  
Available:<https://doi.org/10.3200/JOER.97.4.208-222>
- [29] Hackett G, Betz NE. An exploration of the Mathematics self-efficacy/mathematics performance correspondence. *Journal for Research in Mathematics Education*. 1989;20(3):261–273.  
Available:<https://doi.org/10.2307/749515>
- [30] Yurt E. The predictive power of self-efficacy sources for mathematics achievement. *Education and Science Tedmem*. 2014;39(176):159–169.  
Available:<https://doi.org/10.15390/EB.2014.3443>
- [31] Brand BR, Wilkins JLM. Using self-efficacy as a construct for evaluating science and mathematics

- methods courses. *Journal of Science Teacher Education*. 2007;18(2):297–317.  
Available:<https://doi.org/10.1007/s10972-007-9038-7>
- [32] Usher EL, Pajares F. Sources of self-efficacy in mathematics: A validation study. *Contemporary Educational Psychology*. 2009;34(1):89–101.  
Available:<https://doi.org/10.1016/j.cedpsych.2008.09.002>
- [33] Saligumba IPB, Segumpan L Lou. Mathematics performance and self-efficacy of grade 9 students in a differentiated assessment. *International Journal of English and Education*. 2019;8(1).  
Available:<https://doi.org/ISSN: 2278-4012>
- [34] Henson RK. Understanding internal consistency reliability estimates: A conceptual primer on coefficient alpha. *Measurement and Evaluation in Counseling and Development*. 2001;34(3):177-189.  
Available:<https://doi.org/10.1080/07481756.2002.12069034>
- [35] Bandura A. Self-efficacy. *Encyclopedia of Human Behavior*. 1994;4:71–81.  
Available:<https://www.uky.edu/~eushe2/Bandura/Bandura1994EHB.pdf>
- [36] Lamzang T. Be good role models and not a symbol of authority: His majesty addresses teachers. *The Bhutanese*; 2013.  
Available:<https://thebhutanese.bt/be-good-role-models-and-not-a-symbol-of-authority-his-majesty-addresses-teachers/>
- [37] Sherab K, Dotji P. Bhutanese teachers’ pedagogical orientation in the primary classes: A factor on quality education. *JISTE*. 2013;17(1):18–28.  
Available:<https://www.researchgate.net/publication/281605431%0ABHUTANESE>
- [38] Dolma P. Investigating bhutanese mathematics teachers’ beliefs and practices in the context of curriculum reform. *Office of Education Research*. 2016;1–259.  
Available:[https://eprints.qut.edu.au/95624/1/Phuntsho\\_Dolma\\_Thesis.pdf](https://eprints.qut.edu.au/95624/1/Phuntsho_Dolma_Thesis.pdf)
- [39] Loo CW, Choy JLF. Sources of self-efficacy influencing academic performance of engineering students. *American Journal of Educational Research*. 2013;1(3):86–92.  
Available:<https://doi.org/10.12691/education-1-3-4>
- [40] Lau C, Kitsantas A, Miller AD, Drogin Rodgers EB. Perceived responsibility for learning, self-efficacy, and sources of self-efficacy in mathematics: A study of international baccalaureate primary years programme students. *Social Psychology of Education*. 2018;21(3):603–620.  
Available:<https://doi.org/10.1007/s11218-018-9431-4>
- [41] Rumfola L. Positive reinforcement positively helps students in the classroom. *Education and Human Development*. 2017;786.  
Available:[http://digitalcommons.brockport.edu/ehd\\_theses/786](http://digitalcommons.brockport.edu/ehd_theses/786)
- [42] Chowdhury MS, Shahabuddin AM. Self-efficacy, motivation and their relationship to academic performance of Bangladesh college students. *College Quarterly-Winter*. 2007;10(1):1–9.  
Available:<https://files.eric.ed.gov/fulltext/EJ813750.pdf>
- [43] Kaya D, Bozdağ HC. Resources of mathematics self-efficacy and perception of Science self-efficacy as predictors of academic achievement. *European Journal of Contemporary Education*. 2016;18(4):438–451.  
Available:<https://doi.org/10.13187/ejced.2016.18.438>

- [44] Bandura A. Self-efficacy: Toward a unifying theory of behavioral change. *Advances in Behaviour Research and Therapy*. 1978;1(4):139–161.

Available:[https://doi.org/10.1016/0146-6402\(78\)90002-4](https://doi.org/10.1016/0146-6402(78)90002-4)

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