World Journal of Research and Review (WJRR)
ISSN:2455-3956, Volume-2, Issue-5, May 2016 Pages 09-14

Language of Encouragement: Effects on Mathematics Anxiety, Self-efficacy and Mathematics Performance of College Students in the Philippines

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Abstract— **The main purpose of this study is to determine the effect of language of encouragement on mathematics anxiety, self-efficacy, and mathematics performance of college students. The study utilized the Pre-test Post-test Comparison Group Design. The effect of language of encouragement and praise on mathematics anxiety, self-efficacy, and mathematics performance was determined by comparing the students' pre-test and post-test scores. The results revealed that techniques have adaptive effects on mathematics anxiety, self-efficacy, and mathematics performance of students. To support the claim that encouragement is better than praise, the mean differences of the post-tests of two groups were obtained using t-test for independent samples. The results showed significant results in all outcome variables which reveals that encouragement can reduce mathematics anxiety, increase self-efficacy, and improve mathematics performance of students much better than praise. Mathematics anxiety and self-efficacy has a significant moderately low negative correlation, mathematics anxiety and mathematics performance has no significant correlation, and self-efficacy and mathematics performance has a significant moderately low positive correlation. Thus, mathematics performance of students can be better determined based on the level of their self-efficacy than on their level of mathematics anxiety.**

Index Terms— **Encouragement, Math Anxiety, Math Performance, Self-Efficacy**

I. Introduction

One specific skill that a teacher can work on to improve relationship with students is the language of encouragement used inside the classroom. Slade (2011) stated that the language of encouragement used inside the classroom can have an impact on students' sense of belongingness and connectedness. The encouragement a teacher makes can result to a difference on how students see themselves. Furthermore, encouraging words affect the quality of classroom instruction where students dig deeper and make connections (Johnston, et al., 2006).

Based on the experiences of the researcher as a mathematics teacher, she often observed the tension and fear the students are experiencing while doing assigned tasks. Also, the researcher noticed that a lot of students do not have the confidence that they can perform mathematical tasks successfully. The mathematics self-efficacy of students seems to be low. Because of these, this study attempted to find out if language of encouragement can alleviate mathematics anxiety, increase self-efficacy of students that could lead to a higher mathematics performance of students. The results of the study could answer global and national concerns about poor performance of students in mathematics.

A. Statement of the Problem

Specifically, this study sought to answer the following questions.

How may the students in the comparison and experimental groups be described before and after the use of language of encouragement in terms of the following?

1.1 Mathematics Anxiety
1.2 Self-Efficacy
1.3 Mathematics Performance

Is there a significant difference between the mean of two groups before and after the conduct of the experiment in terms of the following?

2.1 Mathematics Anxiety?
2.2 Self-Efficacy?
2.3 Mathematics Performance?

Is there a relationship between the following pairs of variables?

3.1 Mathematics Anxiety and Self-Efficacy
3.2 Mathematics Anxiety and Mathematics Performance
3.3 Self-Efficacy and Mathematics Performance

II. FRAMEWORK OF THE STUDY

The question on how to motivate students to put more effort in school-related activities continually plagues educators at all levels of the educational system. Teachers who want to motivate students to learn should provide a classroom climate that will make them feel comfortable during academic activities and support their learning efforts. The most effective technique that a teacher can use is the encouragement process (Curtain-Phillips, 2001).

In order to motivate students to learn, teachers should provide a classroom climate that would make the students comfortable. A positive classroom environment can be created if the teacher develops the skill in using the language of encouragement. The language of encouragement does not only uplift morale and develop self-confidence in the learners but also improve teacher-learner relationship.

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Encouragement emphasizes the positive aspects of behavior, recognizes efforts, communicates that the teacher trusts, respects, and believes in the student.

Consequently, teachers have an important role in the reduction or prevention of students' mathematics anxiety. To prevent or reduce mathematics anxiety, first and foremost requires a safe environment where students are secure in taking risks and where their thinking is respected (Haylock and Thangata, 2007). Some of the techniques that teachers can use to lessen the students' mathematics anxiety as stated by Curtain-Phillips (2001) are: (a) Encourage active learning. Students must be engaged in exploring, thinking, practicing, and using knowledge, rather than listening to verbal descriptions of concepts. (b)Organize students into cooperative learning groups. Cooperative groups provide the students the opportunity to exchange ideas, ask questions freely, verbalize their thoughts, and justify answers. (c)Provide support and encouragement. Teachers should provide encouragement to all students and emphasize that everyone makes mistakes. (d)Avoid putting students in embarrassing situations. Teachers should create an atmosphere in which students don't feel embarrassed in front of others or threatened when they are called on to give oral answers.

Self-efficacy can be developed through paying attention to prior successes and failures by evaluating them. Furthermore, it can also be developed through direct encouragement and reinforcement especially from people who are important to them. Self-efficacy judgment and feedback are important in the development of interest. Psychologists have been able to enhance the interest of students in learning and their level of performance by helping them to monitor their performance and providing them with feedback that can increase the level of self-efficacy (Feldman, 2008).

Berhenke et al. (2011) points out that motivation is related to academic achievement. This can lead children to pursue opportunities to learn, which is likely to result in increased effort, more practice, faster skill development, and higher academic achievement (Aunola et al., 2006).

Based from the concepts reviewed, it was hypothesized that language of encouragement has a negative relationship with mathematics anxiety. Scarpello (2007) stated that teachers who make intimidating comments frequently produce math-anxious students. Thus, if the teacher provides encouragement, the mathematics anxiety of the students can be lessened. On the other hand, language of encouragement was hypothesized to have a positive relationship to self-efficacy and mathematics performance. One possible source of self-efficacy is the verbal persuasion. As the students get encouragement, their belief on their capabilities will increase. In addition, as encouragement is given to students, they will be directed towards improvement. Evans (2005) stated that as students receive encouragement, they will exert greater effort to become successful. The relationship among the outcome variables was further investigated. The figure below summarizes the conceptual framework of the study.

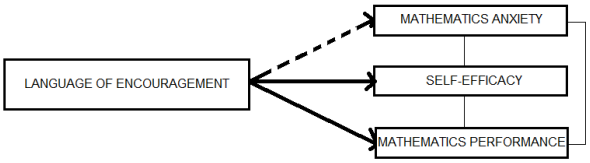

Fig 1.Conceptual Framework (solid arrowed line represents positive relationship; dashed arrowed line represents negative relationship)

III. METHODOLOGY

A. Research Design

This study used a quasi-experimental method, particularly the Pretest – Posttest Comparison Group Design where two homogeneous classes were randomly assigned to two different teaching methods: use of praise for comparison group while use of encouragement for the experimental group.

B. Sampling Plan and Participants of the Study

Four sections of 35 students each from College of International Tourism and Hospitality Management enrolled in Basic Statistics for the second semester of A.Y. 2014-2015 were officially requested Lyceum of the Philippines University General Trias, Cavite Philippines. These four sections were given the mathematics anxiety rating scale, self-efficacy rating scale, and mathematics performance test. The results were compared and selected the two sections whose means from the given tests are closest and have no significant difference to ensure that the two groups were statistically equivalent in terms of level of mathematics anxiety, self-efficacy, and knowledge of the lessons before the experiment. From the selected two sections, the assigned the experimental group (CLHS 201) and the comparison group (HRA 201) to avoid bias. Further, irregular students were removed from the participants deducing it to 30 participants from each section.

C. Research Instruments

All the tests and scales were validated by a panel of experts were pilot tested and were subjected to reliability analysis. The following research instruments were used in this study:

a) List of Encouragement and Praises

This test/summary includeslist of different statements that shows verbal and non-verbal language of encouragement as well as praises formulated through a focus group discussion.

b) Mathematical Anxiety Rating Scale

A four-point rating scale that determined the level of mathematics anxiety of students. It measured the mathematics anxiety based on four dimensions: test anxiety, numerical anxiety, abstraction anxiety, and mathematics class anxiety guided by the dimensions of mathematics anxiety defined by Tudla (2000) and Nolting (2002). Each dimension was composed of 10 situations wherein some statements from Ruado (2012) were adapted and reworded. The participants rated the level of anxiety they feel in each situation with the responses of 4-very much, 3-much, 2-a little and 1-not at all. This tool was subjected to content validation by the same

panel of experts. This tool was pilot tested on 30 students in the first semester of A.Y. 2014-2015 and obtained a reliability value of α = 0.88. The mean scores for this tool were interpreted based on the given scale inspired by the formula n/(n-1) where n is the number of responses used by Narzoles (2012) in his study.

3.25 – 4.00	Very High
2.50 – 3.24	High
1.75 – 2.49	Low
1.00 – 1.74	Very Low

c) Self-efficacy Rating Scale

This is a 4-point rating scale designed to measure students' self-efficacy in mathematics. The students were asked to rate themselves from 1 to 5 (1 being the lowest and 5 being the highest) according to how true the statements were for them. Some statements from the instruments of Domocrat (2010) and Joaquin (2007) were adapted, some items were reworded, and some statements were added and the researcher classified these statements based on the sources of self-efficacy: a.) Mastery experience, b.) Vicarious experience, c.) Verbal persuasion, d.) Somatic and emotional state (Pajares, 2002).This tool was pilot tested on 30 students on the first semester of A.Y. 2014-2015 and obtained a reliability value of α = 0.81. The mean scores for this tool were interpreted based on this scale:

3.25 – 4.00	Very high
2.50 – 3.24	High
1.75 – 2.49	Low
1.00 – 1.74	Very low

d) Mathematics Performance Test

A 30-item multiple choice test developed by the researcher using table of specifications comprising the topics of Basic Statistics for a 6-week implementation of language of encouragement to assess the mathematics performance of students. This tool was pilot tested on 30 students on the first semester of A.Y. 2014-2015 and obtained a reliability value of α = 0.79. The mean scores for this tool were interpreted based on this scale:

24.00 – 30.00	Outstanding
18.00 – 23.99	Very Good
12.00 – 17.99	Good
6.00 – 11.99	Poor
0.00 – 5.99	Very Poor

D. *Data Collection*

On the first meeting of class, orientation session provided the students with pre-knowledge of the subject, grading system, and expected behaviors of students emphasizing on respect to one another. In addition, the students answered the mathematics anxiety rating scale, self-efficacy rating scale, and Mathematics Performance Test to know the level of their mathematics anxiety, self-efficacy and mathematics performance respectively before the conduct of the experiment

The experimental group was taught using the words of encouragement while the comparison group was taught using instruction with praises. The researcher made sure that the lessons discussed to the said groups were the same. All the activities performed in class were guided by the researcher-prepared lesson plans. A timetable was used to guide the flow of discussion and activities during the experiment.

During discussions, students are called to answer problems on the board. In the experimental group, students who feel hesitant to answer problem on the board were encouraged by saying "Come on, try your best" and "I am very sure you can do it". After that, when a student answered the question correctly, the teacher say "See, I told you. You can do it". On the other hand, if the students did not give the correct answer, the teacher give encouragement like "I am happy to see you working like that" and "look at what you have done, you are improving". On the comparison group, the teacher called students who were raising their hands. If no one is raising their hand, the teacher will just call any student. If the student gave the correct answer, the teacher say: "Very good". If the student does not give the correct answer, the teacher say: "Who wants to try to solve the problem?" or "Who has other answer?" Every activity performed was returned to students the next meeting. The paper of every student in the experimental group has words of encouragement while papers who got perfect or highest scores was noted with praise for the comparison group.

On the 6th week of the experimentation process, both groups answered the Mathematics Anxiety Rating Scale, Self-efficacy Rating Scale, And Mathematics Performance Test to obtain their post-tests scores.

E. Data Analysis

The study used the following statistical test for analysis.

1. Cronbach Coefficient Alpha was utilized to determine the reliability of the research instruments.
2. Weighted Mean was computed to determine the level of mathematics anxiety, self-efficacy, and mathematics performance of participants.
3. Standard deviation was obtained to support the weighted mean and to see the homogeneity of data.
4. Dependent sample t-test was used to determine if there is a significant difference between the means of the pre-tests and post-tests of each group.
5. Independent samples t-test was used to determine if there is a significant difference between the means of the post-tests of the experimental and comparison group in terms of their mathematics anxiety, self-efficacy, and mathematics performance.
6. Pearson correlation coefficient was used to determine if there is a correlation between the mathematics anxiety, self-efficacy, and mathematics performance of respondents.

IV. RESULTS AND DISCUSSION

The mean scores of the pre-test and post-test of both

groups in terms of their mathematics anxiety, self-efficacy, and mathematics performance and their comparison was shown [insert Table 1 about here]. It shows that there is a high significant difference on the means of two groups on the level of their mathematics anxiety, self-efficacy, and mathematics performance before and after the experimentation process. This indicates that instruction using praise and instruction using encouragement can lessen the mathematics anxiety, increase the self-efficacy, and improve the mathematics performance of students.

This further shows that the mean of mathematics anxiety for both groups decreased from 3.04 to 2.68 for the experimental group while from 3.02 to 2.95 for the comparison group. This implies that both language of encouragement and praise can lessen students' mathematics anxiety but language of encouragement can do it better than praise. Haylock and Thangata (2007) states that in order to reduce mathematics anxiety, the students should be in a safe environment where they feel secure in taking risks and where their thinking is respected. Curtain-Phillips (2001) suggested that one technique the teacher can use to lessen mathematics anxiety is to provide support and encouragement.

On the other hand, self-efficacy of experimental group increased from 2.26 to 3.11 while the self-efficacy of control group also increased from 2.28 to 2.68. This result is further supported by Redmond (2010) who stated that using words of encouragement leads individuals to put more effort and thus have a greater chance of succeeding a given task. Further, LeFebvre (2011) who stated that overusing praise can actually lower child's self-esteem and makes them more competitive and less cooperative. He also added that the more a person is rewarded for doing something, the less likely they come to do it in the future without a reward.

Mathematics Performance of two groups were almost the same on the pre-test and both improved on the post-test. However, performance of experimental group is better than the performance of comparison group having a mean of 13.00 and 10.63 respectively. When students are motivated, this can lead them to pursue opportunities to learn, that likely result in increased effort, faster skill development, and higher academic achievement (Aunola et al., 2006).

Table 1: T-test for the Comparison of the Pre-test and Post-test Mean Scores of the Experimental and Comparison Groups

Variable	Group	Mean		Standard Deviation		df	t	p-value
		Pretest	*Posttest*	*Pretest*	*Posttest*			
Mathematics Anxiety	Experimental	3.04	2.68	0.45	0.39	29	7.50	0.000
	Comparison	3.02	2.95	0.33	0.28	29	2.94	0.006
Self-efficacy	Experimental	2.26	3.12	0.22	0.28	29	12.52	0.000
	Comparison	2.28	2.69	0.22	0.22	29	7.58	0.000
Mathematics Performance	Experimental	3.70	13.00	1.82	3.88	29	12.31	0.000
	Comparison	3.60	10.63	1.75	3.47	29	10.36	0.000

To further investigate which instruction technique can do it better, the significant difference of the post-tests of two groups were compared and summarized [insert Table 2 here]. It reveals that the mean of the post-test of the experimental group (2.68) and comparison group (2.95) has a high significant difference. The experimental group obtained a lower mean value which means that they have lower level of mathematics anxiety than the comparison group. This indicates that the language of encouragement is an effective method to reduce the anxiety level of the students better than praise. Shen (2009) indicated that emotional support had positive effects in alleviating mathematics anxiety and increasing mathematics learning. Further, a high significant difference between the mean of experimental and comparison groups in terms of self-efficacy was observed with t-value of 6.578 and p-value of 0.000. Specifically, the mean values were 3.11 and 2.69 for experimental and comparison groups respectively. This implies that those students exposed with language of encouragement have higher self-efficacy compared to the other group. Pajares (2002) stated that there were researchers who demonstrated the positive effects of self-efficacy on effort, persistence, goal setting, and performance of students. Williams and Williams (2010) noted that those individual who has high levels of self-efficacy considers difficult tasks as challenges to master rather than as threats to be avoided. Mean scores of 13 interpreted as Good and 10.63 interpreted as Poor were computed as the result of post-test for experimental group and comparison group as shown in [insert Table 2 here]. The computed t-value and p-value were 2.492 and 0.016, showing significantly different groups in terms of their mathematics performance. It can be concluded that the strategy used for the experimental group is more effective compared to the comparison group.

Table 2: T-test for the Comparison of the Post-tests Mean Scores of the Experimental and Comparison Groups

Variable	Group	Mean	Standard Deviation	df	t	p-value
Mathematics Anxiety	Experimental	2.68	0.39	58	3.090	0.003
	Comparison	2.95	0.28			
Self-efficacy	Experimental	3.11	0.28	58	6.578	0.000
	Comparison	2.69	0.22			
Mathematics Performance	Experimental	13.00	3.88	58	2.492	0.016
	Comparison	10.63	3.47			

The three variables were paired and their correlation was obtained using the post-tests values of both the experimental and comparison groups. The results were summarized [insert Table 3 here]. The correlation coefficient value (-0.40) and p-value (0.002) of mathematics anxiety and self-efficacy which indicates a high significant moderately low negative correlation between the two variables. This means that as the level of mathematics anxiety of participants goes higher the lower is their self-efficacy level and vice versa. This result further supported the findings of: Lee (2009) stated that self-efficacy can lessen the negative impact of mathematics anxiety, Galla and Wood (2012) found out that emotional self-efficacy moderates anxiety-related impairment on a mathematics test. However, mathematics anxiety and mathematics performance has a very low negative correlation but has no significant relationship. This shows a negligible

relationship between mathematics anxiety and mathematics performance. This means that a student can still perform well even if he/she has a mathematics anxiety. A possible explanation for this based on this study is that, some students have mathematics anxiety but can still manage their fear and can perform well in class in order for them to pass the subject while some students' anxiety affects their performance. Further, a high significant moderately low positive correlation can be observed between self-efficacy and mathematics performance having correlation coefficient of 0.49 and p-value of 0.000. This result shows that a student eventually will perform well if he has a high belief in his skills and abilities. Researchers have shown that mathematics self-efficacy is a strong predictor of students' mathematics performance. He also added that people will most likely to engage fully in school based learning activities if they have confidence in their ability to do well and place high value on doing well in school (Wigfield et al., 2004). Hackett and Betz (In Kvedere, 2014) revealed that students' mathematical self-parameters like self-efficacy influences the process of acquiring mathematics and mathematics achievement.

Table 3: Correlation among Mathematics Anxiety, Self-efficacy, and Mathematics Performance

Paired Variables	r	p-value
Mathematics Anxiety and Self-efficacy	-0.40	0.002
Mathematics Anxiety and Mathematics Performance	-0.03	0.817
Self-efficacy and Mathematics Performance	0.49	0.000

V. CONCLUSIONS AND RECOMMENDATIONS

Based from the findings, it was concluded that both encouragement and praise have adaptive effects on the mathematics anxiety, self-efficacy, and mathematics performance of students. However, encouragement has a better result in reducing mathematics anxiety, increasing self-efficacy, and improving mathematics performance of students than praise. Moreover, the relationship of self-efficacy and mathematics performance is much stronger than the relationship of mathematics anxiety and mathematics performance. Based on the findings of the study and the conclusions drawn, it was recommended to teachers to use language of encouragement in classes to alleviate mathematics anxiety, increase self-efficacy, and improve mathematics performance of students. Other forms of encouragement may be developed to provide more options for teachers to apply inside the classroom. Also, teachers should be given proper trainings on how to apply language of encouragement inside the classroom. Moreover, teaching strategies focusing on how to increase self-efficacy of students should be employed for the level of self-efficacy has a stronger relationship to mathematics performance. Further, researchers can investigate the effect of language of encouragement on mathematics anxiety, self-efficacy, and mathematics performance in other mathematics subjects (e.g. Algebra, Geometry, Trigonometry, etc.) and/or in other levels (e.g. elementary, high school). In addition, a further research may be conducted to further explore the relationship of the three outcome variables and which between mathematics anxiety and self-efficacy is a better predictor of mathematics performance.

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