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TEACHING STRATEGIES AMONG MATHEMATICS INSTRUCTORS

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ABSTRACT : The researcher aimed to identify the Teaching Strategies Among Mathematics Instructors of President Ramon Magsaysay State University for S.Y. 2020 – 2021.
The researcher utilized the descriptive research design and used survey questionnaire as the main instrument in gathering data from the total population of seventy Instructors and students – respondents.
The study revealed that the Instructor-respondents were typical male with less than five years in teaching and earned units in their Master's degree. The Instructor-respondents and student-respondents were perceived as "Always" on the behavioral strategies, cognitive strategies and affective strategies in teaching mathematics. The academic performance of student-respondents in Mathematics was rated as "Good". There was a significant difference on the teaching strategies used by mathematics teachers towards behavioral strategies in terms of sex according to the Instructor-respondents. There was a significant difference on the teaching strategies used by Mathematics instructors towards cognitive strategies in terms of educational attainment according to the Instructor-respondents. There was a significant difference on the teaching strategies used by Mathematics instructors towards effective strategies in terms of educational attainment according to the Instructor-respondents.
Based on the summary of the investigations conducted and the conclusions arrived at, the researchers offered the following recommendations: the Instructors may continue their graduate studies to be more efficient and effective instructors, the Instructors may attend/participate in in-service training programs and workshops to update their knowledge, pedagogical skills and learn other strategies in teaching Mathematics, students may develop a positive attitude towards Mathematics to improve their performance in the subject, the Instructors may utilize advanced technology in facilitating the lessons to improve the teaching and learning process and instructors may assess their teaching strategies for various topics in the subject and use the appropriate teaching strategies for the class, the school may give financial support to their instructors who continue their professional growth especially in their graduate study, and the school may review the proposed intervention program by the researcher for the development of the teaching skills of the instructors in the university.

Keywords–*Mathematics, Teaching Strategies, Behavioral, Cognitive, Affective*

I. INTRODUCTION

The educational schemes of today are seeking to enhance teachers' teaching skills/competencies through making them fully aware of the different teaching strategies; since an efficient teacher is decided by his/ her ability of choosing the proper teaching and learning strategies through which the objectives of the lesson are achieved and its content is fully covered; and by which students give the ability to acquire the formerly set lesson objectives which precisely meet their needs. However, choosing the appropriate teaching and learning strategies is a complicated process; it demands a deep thinking on the part of the teacher and the ability to make balance between the available strategies in the light of the many interrelated variables.

Effective teaching requires flexibility, creativity, and responsibility in order to provide an instructional environment able to respond to the learner's individual needs. [1] (Tomlinson, 2001 cited in Tulbure, 2012) puts it beyond the experiential evidence that pervasive uniformity in teaching fails many learners. There is a reason in both theory and research to support a movement towards an instruction attentive to students' variance manifested in at least three areas: the student's readiness, interest, and learning profile. Nowadays, one of the challenges in teaching-learning process is knowing the most effective teaching approach and strategies that are also in line with the learning styles of the students.

A teaching strategy is in essentially a general plan which includes all parts of the teaching situation; namely: objectives, teaching methods, teaching aids and evaluation strategies. The aforementioned parts are

actually the activities that a teacher does in classes for the purpose of achieving the lesson's objectives. Teaching strategies are basically based on kinds of patterns and theories that are called "Learning Theories". Such theories are classified into three categories: behavioral, cognitive and affective [2] (Pei-Shi, 2012).

In the last few years, much attention was paid to the cognitive and effective strategies while behavioral strategies – which enjoyed much domination over the fields of education in the last decades gained less attention. This is due to the attention paid increasingly to developing the ability of the students to acquire knowledge through different methods and improving the different thinking manners more than concentrating on merely having knowledge. Knowledge is changeable; it develops and increase all the time in terms of fields and resources. Hence, the need to learn methods of effective teaching that enable individuals and communities to choose that will suit them to use effectively [3] (Pongsuwan, Hoksuwan, In-Udom, & Chalakbang, 2011).

Modern Education states that a learner is a whole entity: the personality of whom is a combination of three main dimensions, and these are mental – cognitive dimension, affective – rational dimension, and psycho behavioral dimension. Such a combination demands that educators should provide teaching strategies serve for improving for these three dimensions which can create an integrated personality in the end. This very goal could only be achieved through using different teaching strategies. Researches in this field brought out three main approaches, and each created its own strategies that suit every dimension; these approaches are: behavioral approach, cognitive approach and effective approach. Deeply studying these approaches, one could easily notice the clear integration between them although there are differences in terms of theory and practical applications between them - since these approaches study the human soul as a whole [4] (Woolflolk, 2002, cited in Hamzeh, 2014).

Although, there are existing effective models and methods, and appropriate strategies used in learning mathematics developed by different mathematicians and scholars, researches on diverse areas in learning Mathematics are abounding and researching on Affective strategies in Teaching Mathematics is already proliferating especially on its concepts and practices. This study focused on the three main dimensions (the mental – cognitive dimension, the affective – rational dimension, and the psycho behavioral dimension) to identify which teaching strategies are mostly used by the mathematics instructors of President Ramon Magsaysay State University.

II. FIGURES AND TABLES

Table 1 Mean Rating on Perception of Instructor and Student Respondents in the Teaching Strategies of Mathematics Instructors in terms of Behavioral Strategies

No.	BEHAVIORAL STRATEGIES	Instructor Respondents			Student Respondents		
		Mean	D.E.	Rank	Mean	D.E.	Rank
1.	The teacher provides information to the student regarding his answer's accuracy all the time	2.60	Often	14	3.57	Always	1
2.	Teacher trains his students on distinguishing between different characteristics of the same mathematical concept	3.77	Always	2	3.46	Always	3
3.	Teacher uses specific questions that have specific answers	3.60	Always	4	3.29	Always	8
4.	Teacher helps his students imitate desired models	3.57	Always	5	3.26	Always	9
5.	Teacher awards students for his right answer	3.23	Often	11	3.20	Often	11.5
6.	Teacher uses direct presentation to provide students with information	3.40	Always	8.5	3.54	Always	2
7.	Teacher cares about rectifying students' undesired behaviors	3.83	Always	1	3.14	Often	14
8.	Teacher neglects undesired behaviors in the teaching – learning situations	3.31	Always	10	2.77	Often	15
9.	Teacher dissembles the teaching – learning material into specific tasks that need specific responses	1.91	Sometimes	15	3.17	Often	13
10.	Teacher depends on criteria in evaluating his	3.00	Often	12.5	3.34	Always	7

	students						
11.	Teacher trains students on learning simple behaviors until the students reach the complicated behavior	3.43	Always	7	3.23	Often	10
12.	Teacher eliminates any undesirable stimuli after student does the correct behavior	3.40	Always	8.5	3.20	Often	11.5
13.	Teacher trains students to determine the objectives they want to achieve	3.00	Often	12.5	3.37	Always	6
14.	Teacher makes advantage of the contract procedures he does with his students for the purpose of achieving the teaching – learning tasks	3.71	Always	3	3.43	Always	4.5
15.	Teacher provides students with a chance to apply new knowledge in new real-life situations	3.49	Always	6	3.43	Always	4.5
	OVERALL WEIGHTED MEAN	**3.28**	**Always**		**3.29**	**Always**	

The computed overall weighted mean in teaching strategies of mathematics teachers in terms of behavioral strategies for Instructor-respondents is 3.28 interpreted as Always and for the student-respondents is 3.29 interpreted as Always.

For the indicator 7, “Teacher cares about rectifying students' undesired behaviors” the computed mean for Instructor-respondents is 3.83 interpreted as Always (Rank 1). For the indicator 9, “Teacher dissembles the teaching – learning material into specific tasks that need specific responses” the computed mean for student-respondents is 1.91 interpreted as Often (Rank 15).For the indicator 1, “The teacher provides information to the student regarding his answers accuracy all the time” the computed mean for student-respondents is 3.57 interpreted as Always (Rank 1). For the indicator 8, “Teacher neglects undesired behaviors in the teaching – learning situations” the computed mean for student-respondents is 2.77 interpreted as Often (Rank 15).

The way students behave in a classroom setting could potentially set the tone for the way they perform on an assessment. Teachers use many ways to manage their classrooms and many studies have been done to determine strengths and weaknesses. The influence of efficacy beliefs on teacher performance and student success: Implications for Student Support Services outlines the importance of supporting students with diverse learning needs through developmental and learning theories. “Emotive behavior therapy is very popular because of the way it promotes the instruction and fostering student teacher relationships” [5] (Warren & Hale, 2016, p. 189). “It appears that teachers who display little confidence in their ability to complete classroom tasks often experience irrational beliefs and heightened or unhealthy negative emotions. Teachers model these thoughts, emotions, and behaviors daily”. “Teachers who exhibit unhealthy negative emotions in the classroom have difficulty building strong student relationships, delivering instruction, and managing their classroom, thus often confirming their sense of efficacy”. Teachers become more aware of their classroom environment and teacher and student performance develops and succeeds. When teachers give the appropriate learning environment, students can make connections and the impact of their learning shines.

2.2 Cognitive Strategies

Table 2 Mean Rating on Perception of Instructor and Student Respondents in the Teaching Strategies of Mathematics Teachers in terms of Cognitive Strategies

The computed overall weighted mean in teaching strategies of mathematics teachers in terms of cognitive strategies for Instructor-respondents is 3.36 interpreted as Always and for the student-respondents is 3.26 interpreted as Always.

For the indicators 3, “Teacher encourages students to verify information and facts before giving judgments.” and “Teacher uses problem solving strategy in the teaching situation” the computed mean for Instructor-respondents is 3.66 interpreted as Always (Rank 1.5). For the indicator 13, “Teacher uses problem solving strategy in the teaching situation” the computed mean is 3.66 interpreted as Always. For the indicator 7, “Teacher trains students to plan, observe, and evaluate their teaching activities”the computed mean is 2.86 interpreted as Often (Rank 21). For the indicator 1, “Teacher begins with presenting main ideas of the topic at the beginning of the class.” the computed mean for student-respondents is 3.69 interpreted as Always (Rank 1). For the indicator 21, “Teacher begins the teaching – learning situation with presenting a problem to students.” and “Teacher asks students to do written or verbal summaries of the information they get.” the computed mean for student-respondents is 2.83 interpreted as Often (Rank 20.5).

No.	COGNITIVE STRATEGIES	Instructor Respondents			Student Respondents		
		Mean	D.E.	Rank	Mean	D.E.	Rank
1.	Teacher begins with presenting main ideas of the topic at the beginning of the class	3.60	Always	4	3.69	Always	1
2.	Teacher ends reaching – learning situation with connecting the lesson parts together	3.23	O	15.5	3.29	Always	10.5
3.	Teacher encourages students to verify information and facts before giving judgments	3.66	Always	1.5	3.60	Always	2
4.	Teacher moves from the abstract to the examples	3.54	Always	6.5	3.37	Always	7
5.	Teacher begins the teaching – learning situation with presenting a problem to students	3.31	Always	12.5	2.83	Often	20.5
6.	Teacher asks students to do written or verbal summaries of the information they get	3.14	Often	19	2.83	Often	20.5
7.	Teacher trains students to plan, observe, and evaluate their teaching activities	2.86	Often	21	2.91	Often	19
8.	Teacher guides students to references such as dictionaries, encyclopedias, internet sites, …etc.	3.31	Always	12.5	3.03	Often	17
9.	Teacher trains students on generating unified answers for the stimulator raised for them.	3.43	Always	9.5	3.26	Always	12
10.	Teacher gives students a chance to generate new concepts	3.26	Always	14	3.31	Always	9
11.	Teacher's cognitive teaching strategies harmonize with students' learning strategies	3.54	Always	6.5	3.23	Often	15
12.	Teacher encourages students to generate as many alternatives as they can for the problem discussed	3.60	Always	4	3.26	Always	12
13.	Teacher uses problem solving strategy in the teaching situation	3.66	Always	1.5	3.49	Always	3.5
14.	Teacher facilitates for students make use of the procedures that organizes memory potentials (symbolizing information)	3.37	Always	11	3.40	Always	5.5
15.	Teacher gives students enough time to question and investigate to the desirable objective	3.43	Always	9.5	3.29	Always	10.5
16.	Students tend to generate new information through making comparison between their previous knowledge and new one	3.60	Always	4	3.49	Always	3.5
17.	Teacher ends teaching – learning situation with clarifying diagrams suitable for students	3.46	Always	8	3.17	Often	16
18.	Teacher makes use concept maps during the teaching – learning process	3.23	Often	15.5	2.94	Often	18
19.	Teacher takes part in training students on generating original responses for the stimulus presented to them	2.89	Often	20	3.40	Always	5.5
20.	Teacher begins with examples up to the concept in the teaching – learning situation	3.17	Often	18	3.26	Always	12
21.	Teacher helps students identify their own learning methods	3.20	Often	17	3.34	Always	8
	OVERALL WEIGHTED MEAN	**3.36**	**Always**		**3.26**	**Always**	

Researchers found that students with deficits in metacognition can be supported in math word problem solving by building awareness of task demand and providing direct instruction of appropriate word problem solving strategies [6] (Krawec & Montague, 2012; Montague, 2007). Cognitive strategy instruction (CSI) addresses these cognitive and metacognitive deficits. CSI combines and inserts metacognitive strategies into structured cognitive sequences. CSI consistently yielded positive effects for students of varying age and ability groups [7] (Fuchs et al. 2005; [8] Garrett, Mazzocco, & Baker, 2006; [9] Montague & Applegate, 1993; [10]Rosenzweig, Krawec, & Montague, 2011).

1.3. Affective Strategies

Table 3
Mean Rating on Perception of Instructor and Student Respondents in the Teaching Strategies of Mathematics Instructors in terms of Affective Strategies

No.	AFFECTIVE STRATEGIES.	Instructor Respondents			Student Respondents		
		Mean	D.E.	Rank	Mean	D.E.	Rank
1.	Teacher allows students to have more clarifications and explanations on a certain stimulus.	3.49	Always	9.5	3.63	Always	1
2.	Teacher supports students' sympathy towards others	3.71	Always	4	3.23	Often	12
3.	Teacher helps students have confidence in themselves	3.54	Always	7	3.37	Always	6.5
4.	Teacher encourages students to interact positively amongst themselves	3.94	Always	1.5	3.49	Always	2.5
5.	Teacher teaches students the way to identify their points of strength and weakness	3.94	Always	1.5	3.34	Always	8
6.	Teachers' trains students to refer to their success or failure to own capabilities	3.49	Always	9.5	3.31	Always	9
7.	Teacher strengthens leadership in his students	3.54	Always	7	3.37	Always	6.5
8.	Teacher applies group work in the class to serve desired objectives	3.83	Always	3	3.06	Often	15
9.	Teacher makes students take part in different roles in the teaching – learning situation.	3.29	Always	14	3.14	Often	14
10.	Teacher takes part in improving students' ability to control their reactions.	3.31	Always	13	3.23	Often	12
11.	Teacher distributes different teaching – learning tasks on students.	2.89	Often	15	3.26	Always	10
12.	Teacher lets students have their own conversations positively.	3.34	Always	12	3.40	Always	5
13.	Teacher teaches students how to change their negative reactions into positive ones.	3.54	Always	7	3.23	Often	12
14.	Teacher trains students to solve their problems in a comfortable way.	3.43	Always	11	3.49	Always	2.5
15.	Teacher gives students chance to initiate different debates amongst them.	3.66	Always	5	3.43	Always	4
	OVERALL WEIGHTED MEAN	**3.53**	**Always**		**3.33**	**Always**	

The computed overall weighted mean in teaching strategies of mathematics teachers in terms of affective strategies for Instructor-respondents is 3.53 interpreted as Always and for the student-respondents is 3.33 interpreted as Always.

The computed overall weighted mean in teaching strategies of mathematics teachers in terms of affective strategies for Instructor-respondents is 3.53 interpreted as Always and for the student-respondents is 3.33 interpreted as Always.

For the indicators 4 and 5, "Teacher encourages students to interact positively amongst themselves" and "Teacher teaches students the way to identify their points of strength and weakness. "the computed mean for Instructor-respondents is 3.94 interpreted as Always (Rank 1.5). For the indicator 11, "Teacher distributes

different teaching – learning tasks on students." the computed mean for Instructor-respondents is 2.89 interpreted as Often (Rank 15). For the indicator 1, "Teacher allows students to have more clarifications and explanations on a certain stimulus." the computed mean for student-respondents is 3.63 interpreted as Always (Rank 1). For the indicator 8, "Teacher applies group work in the class to serve desired objectives" the computed mean for student-respondents is 3.06 interpreted as Often (Rank 15).

Table 4
Test of significant difference on the teaching strategies used by mathematics instructorstowards behavioral strategies when group according to profile variables

BEHAVIORAL STRATEGIES		Sum of Squares	df	Mean Square	F	Sig.	Interpretation
Sex	Between Groups	0.566	1	0.566	14.044	0.001	Significant Reject Ho
	Within Groups	1.330	33	0.040			
	Total	1.896	34				
Length of Service	Between Groups	.204	2	0.102	1.924	0.163	Not Significant Accept Ho
	Within Groups	1.693	32	0.053			
	Total	1.896	34				
Educational Attainment	Between Groups	0.142	2	0.071	1.294	0.288	Not Significant Accept Ho

The computed significant value for sex is 0.001 which is less than to 0.05 Alpha Level of Significance, therefore the Null Hypothesis is Rejected, hence there is significant on the teaching strategies used by mathematics teacherstowards behavioral strategies in terms of sex. The computed significant value for length of service is 0.163 and for the educational attainment is 0.288 which is greater than to 0.05 Alpha Level of Significance, therefore the Null Hypothesis is Accepted, hence there is no significant on the teaching strategies used by mathematics teacherstowards behavioral strategies in terms of length of service and educational attainment.

Therefore, there is a significant on the teaching strategies used by mathematics instructorstowards behavioral strategies in terms of sex according to the Instructor-respondents. Teachers need to have a complex set of skills, insight, intelligence, knowledge, management, competence, dynamism, and diligence, to meet the challenges of the classroom. While both men and women teachers appear to possess these traits yet they may meet the challenges differently.

Table 5
Test of significant difference on the teaching strategies used by mathematics instructorstowards cognitive strategies when group according to the profile variables of Instructor-respondents

COGNITIVE STRATEGIES		Sum of Squares	df	Mean Square	F	Sig.	Interpretation
Sex	Between Groups	0.056	1	0.056	0.420	0.521	Not Significant Accept Ho
	Within Groups	4.426	33	0.134			
	Total	4.482	34				
Length of Service	Between Groups	0.038	2	0.019	0.135	0.874	Not Significant Accept Ho
	Within Groups	4.445	32	0.139			
	Total	4.482	34				
Educational Attainment	Between Groups	1.850	2	0.925	11.245	0.000	Significant Reject Ho
	Within Groups	2.632	32	0.082			
	Total	4.482	34				

Table 10 shows the test of significant difference on the on the teaching strategies used by mathematics instructorstowards cognitive strategies when grouped according to profile variablesof Instructor-respondents.
The computed significant value for sex is 0.521 and for the length of service is 0.874 which is greater than to 0.05 Alpha Level of Significance, therefore the Null Hypothesis is Accepted, hence there is no significant on the teaching strategies used by mathematics instructorstowards cognitive strategies in terms of sex and length of service. The computed for the educational attainment is 0.000 which is less than to 0.05 Alpha Level of Significance, therefore the Null Hypothesis is Rejected, hence there is a significant on the teaching strategies used by mathematics instructorstowards cognitive strategies in terms of educational attainment.

Therefore, there is a significant on the teaching strategies used by mathematics instructorstowards cognitive strategies in terms of educational attainment according to the Instructor-respondents.

Table 6

Test of significant difference on the teaching strategies used by mathematics instructorstowards affective strategies when group accordingto the profile variables of Instructor-respondents

EFFECTIVE STRATEGIES		Sum of Squares	df	Mean Square	F	Sig.	Interpretation
Sex	Between Groups	0.183	1	0.183	1.854	0.183	Not Significant Reject Ho
	Within Groups	3.257	33	0.099			
	Total	3.439	34				
Length of Service	Between Groups	0.202	2	0.101	1.000	0.379	Not Significant Reject Ho
	Within Groups	3.237	32	0.101			
	Total	3.439	34				
Educational Attainment	Between Groups	0.704	2	0.352	4.116	0.026	Significant Accept Ho
	Within Groups	2.736	32	0.085			
	Total	3.439	34				

The computed significant value for sex is 0.183 and for length of service is 0.379 which is greater than to 0.05 Alpha Level of Significance, therefore the Null Hypothesis is Accepted, hence there is no significant on the teaching strategies used by mathematics instructorstowards affective strategies in terms of sex and length of service. The computed for the educational attainment is 0.026 which is less than to 0.05 Alpha Level of Significance, therefore the Null Hypothesis is Rejected, hence there is a significant on the teaching strategies used by mathematics instructorstowards effective strategies in terms of educational attainment.

Therefore, there is a significant on the teaching strategies used by mathematics instructorstowards affective strategies in terms of educational attainment according to the Instructor-respondents. This is probably because they are more well acknowledged of the educational theories and their applications; the very thing that enables such instructors to comprehend more deeply the cognitive strategies and apply them through their studies. This supports their application them in the educational process.

III. CONCLUSION

The Instructor-respondents were typical male with less than five years in teaching and earned units in their Master's degree. The Instructor-respondents and student-respondents perceived "Always" on the behavioral strategies, cognitive strategies and effective strategies in teaching mathematics. The academic performance of student-respondents in mathematics subject was interpreted as "good".There was significant difference on the teaching strategies used by mathematics instructorstowards behavioral strategies in terms of sex according to the Instructor-respondents. There was a significant difference on the teaching strategies used by mathematics instructors towards cognitive strategies in terms of educational attainment according to the Instructor-respondents.There was a significant difference on the teaching strategies used by mathematics instructors towards effective strategies in terms of educational attainment according to the Instructor-respondents.The Instructors may continue their graduate studies to become more efficient and effective in their specialization.

The Instructors may attend/participate in-service training programs and workshops to update their knowledge, pedagogical skills and learn other strategies in teaching mathematics.Students may develop a positive attitude towards mathematics to improve their performance in the subject. The Instructorsmay utilize advanced technology in facilitating the lessons to improve the teaching and learning process and may assess their teaching strategies for various topics in the subject and use the appropriate teaching strategy for the class.The school may give financial support to their faculty members who continue their professional growth especially in their graduate study.The school may review the proposed intervention program by the researcher for the development of the teaching skills of the instructors in the university.

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