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The Teaching of General College Physics in Jolo

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ABSTRACT

The purpose of this study is to record, examine and describe the common teaching strategies employed by college faculty members teaching general college physics in the five colleges in Jolo and to know as well what combination of teaching strategy employed by physics teacher in Jolo enhances achievement scores of students. Likewise, the evaluation on the learning facilities used in teaching physics was also taken into consideration. The study utilized the descriptive method of research and the normative survey technique was used for data gathering Purposive sampling was utilized and the respondents taken were composed of all faculty members handling college physics subjects and their respective students enrolled during the second semester of school year 2010 to 2011. The findings showed that the top three most common teaching strategies employed by teachers in teaching general college physics in Jolo are: problem solving, lecture, and board work. These strategies enhanced achievement scores of students. On the other hand, as far as learning facilities are concerned they were inadequate as most important equipment and tools necessary in the teaching of physics subjects were not available and if existing they were not functioning. However, despite the inadequacy of learning facilities, majority of the students have higher probability of passing the course based on their midterm exam. It is highly recommended that physics teachers must be exposed to various teaching strategies in order for them to be abreast with the latest methods in teaching physics. Furthermore, administrators are urged to upgrade school laboratories by procuring equipment, materials and other learning facilities indispensably needed in the teaching of general college physics.

1. Introduction

In a macro perspective, it is a common knowledge that our educational system - practically in all levels is undergoing deterioration at a rapid rate indicative of mediocre quality of education. The educational milieu of Sulu Province is no exception from this aforesaid educative predicament. In a more specific and simplified way of comprehending the nation-wide problem in education, in the context of Sulu, our greatest problem in the colleges or university is not only how to make students learn but likewise, for them to learn effectively or have a mastery of the

subject matter. Reckoning from historical experience, successful tertiary teaching is teaching that brings about effective learning for authentic results. Simply put: "good learning is the result of good teaching".¹ Accordingly, it would perhaps be accurate to aver that no one has proven hitherto that one method is superior over other methods in practically all situations or conditions (Ceteris paribus or other things being equal). As Gregorio¹ aptly puts it: "there is no best method of teaching for all educative process".



Today, various teaching strategies or techniques have been developed, modified, and integrated in the science program. However, in the course of facilitating the instructional dimension geared towards easy and clear understanding of the subject matter among student-learners, not one strategy or technique stands out as paramount as well as applicable in all conditions.

Basically, it would not be wide of mark to say that the failure to search for a paramount method to be used in science instruction is one of many serious problem besetting our educational system amidst the plight of improving the science (physics) quality of instruction not only in the school but nationwide as well.

Theoretically, the development of the learner has been at all times the focus of any educative endeavor. Parallel to this point is the fact that learning occurs as a result of the strategy a teacher uses in his pedagogical work geared towards delivering the goods among his students. Hence, it follows logically that: "a teacher who is aware of the methodology he uses to arrive at a completed solved problem, given his students a grain of discovery in the solution of the problem. He may create a taste for mental work and leave imprint on their minds and character for a lifetime".²

Like any other trade or profession in life, the problem of teaching has always been vulnerable to its critics. Virtually, teachers have been constantly accused of stifling the minds of the young by demanding pious submission to their authority while simultaneously charge with exacerbating the degree of lawlessness and moral decay by permitting the students to direct their own learning. More so, the teachers have been criticized for the declining achievement test scores, and the moral flabbiness of the youth.³

Physics is considered as the most problematic area within the realm of science, and it traditionally

attracts fewer pupils than chemistry and biology. Physics is perceived as a difficult course for students from secondary school to university and also for adults in graduate education. In developed countries, it has been determined that goals of science are never fully realized, that student success in physics is lower than chemistry and biology, that students do not like science lectures and that most have no preference for science, particularly physics.^{4,5}

In the domain of practice, survey done in the work place of the researcher reveals that: several of students failed in physics subjects. More specifically, secondary empirical data gathered from the records of the college registrar shows that most failures are obtained by students who are products of the different national high school in the rural areas in Sulu. Notably, this empirical finding is indeed not surprising in that it only reinforced the validated result of the poor performance of the secondary graduates particularly in the discipline of both science and mathematics in the entrance and scholarship qualifying examinations administered by the various colleges and universities in Mindanao.

Admittedly, various studies have been done to improve the quality of teaching science in the town of Jolo to meet the challenge of the times - i.e., to develop and upgrade the learning potentials of students in the field of science. Hence, it is on this premise that the researcher would like to contribute towards the existing body of knowledge. Accordingly, this inquiry will focus on determining the different strategies of teaching physics presently used in the colleges of Jolo, Sulu and simultaneously find out the most effective and appropriate method.

2. Literature Review

In science, the nature of inquiry depends on what is being investigated, and what is learned depends on the methods used Science teaching that attempts solely to impart to students the accumulated



knowledge of a field leads to very little understanding and certainly not to the development of intellectual independence and facility.⁶

Our experience shows that there is not a single unique teaching and learning strategy that could effectively produce complete student satisfaction in the class. Teaching strategies depends on many factors, e.g., student's attitude towards the subject, learning habits of individuals, year to year intake with wider ranges of student academic abilities associated with their background teaching and learning cultures.⁷

For many years, researchers have tried to unravel the mystery of effective teaching. Effective teaching may vary in their meanings. In this study, the underlying assumption is that effective teaching is directly proportional to academic achievement. A very important factor in effective teaching is variability of lesson presentation. Brophy et al., have indicated that the use of a variety of techniques, instructional materials, and evaluation increased student achievement.⁸ Specifically, the use of different learning materials, display, equipment, and activities encourages student involvement with lesson content.

Recent studies have shown that teaching methodologies should match the learning abilities of the students. According to Peterson et al., there are two factors to consider in choosing the appropriate teaching methodology.⁹ The first is the style of learning of the individual. This may be categorized as visual, aural, or physical. A person's basic style of learning is probably laid down early in life and is not likely subject to fundamental change. The second is the learning abilities of the students.

Learning styles are various approaches or ways of learning. They involve educating methods, particular to an individual that are presumed to allow that individual to learn best. Most people prefer an identifiable method of interacting with, taking in, and processing stimuli or information. Some educators

have observed that each individual has a certain style of learning. They categorized these styles as visual (reading), aural (listening), or physical (actively doing). Some students learn more by listening to lectures or tapes, while others learn more by reading or by reviewing notes or books. Still others find that learning is promoted by actual physical involvement like performing experiments. The different teaching methodologies may be categorized based on the transaction that occurs between teachers and students⁹ and learning outcomes.¹⁰⁻¹²

Based on the transactions that occur between teachers and students, Peterson organized the different teaching methodologies as follows: (1) listening-speaking teaching methods. These methods enhance the student's auditory learning; (2) reading writing teaching methods. These methods enhance the students visual learning; and (3) watching-doing teaching methods. These methods enhance the students' kinesthetic (touch) learning. Moreover each method is further classified according to the degree of teacher dominance and the usefulness of the method for groups of various sizes. There are certain methods that are used in more than one kind of transaction. For example, questioning method could be used in listening-speaking transactions or in watching doing transactions.^{9,10}

Brophy et al., have suggested two broad classifications that can be used to determine one's choice of teaching methodologies based on the type of learning outcomes.⁸ These are: (1) Type I - which includes facts, rules, and action sequences. These outcomes represent behaviors at the lower levels of complexity in the cognitive, affective, and psychomotor domains. In this classification: (a) cognitive includes knowledge, comprehension, and application levels (b) affective includes awareness, responding, and valuing levels (c) psychomotor includes imitation, manipulation, and precision levels; and (2) Type II - which includes concepts,



patterns, and abstractions. These outcomes represent behaviors at higher complexity. In this classification: (a) cognitive includes analysis, synthesis, and evaluation levels (b) affective include organization and value complex levels (c) psychomotor includes adaptation and organization levels.

The teaching of type I learning outcomes (facts, rules, and action sequences) efficiently achieved by direct instruction. Direct instruction is synonymous with expository or deductive teaching. It is primarily a teacher-centered strategy. The teacher passes on facts, rules, or action sequences to the students in the most direct way possible. There are many ways to do this: the teacher may lecture, give instructions, demonstration using scientific apparatus, lead a field trip, show films, and read to students.

Gregorio (1983), has enumerated various teaching methods in College teaching like lecture, discussion, question and answer, lecture-discussion, laboratory, and team-teaching of which some of these methods are practically used in teaching of general physics subject.¹ According to him, lecture method is a traditional procedure and carries prestige as a dignified and respectable College teaching procedure. Logically, lecture method is classified as an authoritative teaching procedure. The authoritative method is a procedure by which the instructor teaches by means of some kind of exposition, either oral or written. He further said that "Lecture Method" has been the time-honored procedure in Philippine Colleges and Universities. In physics, lecture method is the same as the so called traditional teaching method.

3. Methods

The research design is descriptive in nature. This study was conducted in the five colleges in Jolo, Sulu, Philippines. These are Hadji Butu School of Arts and Trade (HBSAT), Mindanao State University Sulu

(MSU-Sulu), Notre Dame of Jolo College (NDJC), Southwestern Mindanao Islamic Institute (SMII) and Sulu State College (SSC). The primary empirical data was generated from the two sets of respondents; the physics faculty members of the aforesaid colleges in Jolo, Sulu, and their students enrolled in general college physics subject. Moreover, since population is relatively small, purposive sampling was employed for determining teacher and student respondents. Before the questionnaire was administered to the respondents of each college, the researcher sought the permission and consent of the school's head. The researcher personally administered the distribution of the questionnaire, first to the teacher respondents and later to the student respondents. The questionnaire for teacher were handed to them with a word that they will be collected a day after to give them ample time to answer and were also assured that the information derived from them would be treated with utmost confidentiality.

There were two sets of questionnaire used in obtaining data aside from the midterm exam result of the students provided by the teachers. Questionnaire A designed for teacher was composed of three parts: Part I contains the demographic profile of respondents to assess their educational qualification and professional competence. Part II consists of various teaching strategies that could be used for the eighteen topics under the physics syllabus of WMSU which was adapted as standard syllabus. Part III is a checklist of usable learning facilities available in the School. Questionnaire B designed for student contains only various teaching methods and strategies for students to identify what strategy were used by their teachers in teaching general college physics. Since the purpose of this study is to document, examine and describe the teaching strategies of physics teacher, rating scale was used in the evaluation such that never, few times, many times and all the time were employed after each



question. To establish its content validity the questionnaire was scrutinized by a panel of 5 experts consisting of Ph. D. and master degree holder in Science Education. Reliability was established by using two sources of data namely: teacher and student.

The data derived from the responses in the questionnaire were scored, recorded and tabulated in a cross-break table. Weighted mean was used to

determine the trend of their responses. Verbal scale was assigned with corresponding points known as the "numerical scale." To compare the responses of two independent samples, Friedman's Analysis of Variance was employed. For thematic purposes, the presentation of data was supplemented by textual discussion.

4. Results and Discussion

Table 1. A distribution of students and physics teachers respondents by school name of school

Name of school	Students	Physics teachers
1. Hadji Butu School of Arts and Trade	10	1
2. Mindanao State University-Sulu	53	2
3. Notre Dame of Jolo College	20	1
4. Southwestern Mindanao Islamic Institute	15	1
5. Sulu State College	32	2
Total	130	7

Table 2. Teacher respondent profile

Number of Teacher	School	Degree	Highest Educational Attainment	No. of yrs. Teaching	Eligibility	Seminars Attended
1	1	BSE Gen. Science	None	24	PBET	None
2	2	BSE Gen. Science	Ed. D.	22	PBET, CS Professional	NDJC Lab. Teaching Approach in Physics, WMSU (SSI) – Physics
		BS Biology	With units in MST Bio	3	None	None
1	3	BSE Gen. Science	MA Sci. Ed.	26	PBET, CSSP	SPVM
1	4	BS Civil Engineering	With MAED units	6	CE Licensed	None
2	5	BSE Gen. Science	Ed. D.	16	PBET, CSSP	Summer Science Institute (SSI) WMSU
		BSE Gen. Science	MAED	14	PBET	None



Shown in table 1 is the respondents' distribution. Table 2 shows the profile of the seven teacher respondents teaching general college physics in the five colleges in Jolo. As can be gleaned in the table, five teachers are BSE graduates with general science as major of which three are masters' degree holder in Education and two are doctors of Education. Furthermore, among the seven teachers, one is a BS Biology graduate with master's units in MS Teaching Biology and one BS Civil Engineering graduate who is presently enrolled in master's degree in Education. Under the Commission of Higher Education (CHED) memorandum order #20 series of 2007 only one can teach physics in the tertiary level (CMO #20 series 2007, article VII). In this case, the BS Civil Engineering graduate since the civil engineering course is allied to physics course owing to the fact that engineering have more physics subjects compared to other science courses like BS biology and general science. Likewise, the language of physics employs mathematics. Out of the seven teachers, three have been teaching physics for over twenty 20 years, two have been teaching the subject for more than ten years and two are teaching the subject less than ten years. A closer look further on this table reveals that five teachers are board passers in Licensure Exam for Teachers and one in civil engineering. Only one is not a board passer.

General college physics is a course which provides a solid base to those students who will go on to careers in fields such as medicine, engineering, biology and earth science and for those students who simply seek to understand the physical nature of our environment.

Physics subject in school 1 is physics 201, the descriptive title is mechanics and heat. It is a 3-unit course. This course covers the fundamental concepts of mechanics: kinematics, forces and motions, Newton's laws of motion, work and energy, momentum, circular and rotational motion,

equilibrium, gravitation and heat. While in school 2, physics subject is physics 11/21 in which the descriptive title is general physics. This is also a 3 units course which is comprised of 2 units lecture and 1 unit laboratory. This course introduces students to basic concepts, principles and application of physics in everyday life. The course covers certain topics in mechanics such as units of measurements, forces and motions, Newton's laws of motion, work, power and energy, circular and rotational motion, equilibrium, gravitational, thermodynamics, sound and waves. The syllabus was prepared by the teacher concerned and was patterned after the syllabus of the main campus in MSU-Marawi.

In school 3, the physics subject is physics 1 it is a 5-unit course which comprised of 3 units lecture and 2 units laboratory intended for 162 hours. The descriptive title is mechanics. This course covers the fundamental concepts of mechanics: kinematics, forces and Newton's laws of motion, momentum, energy, circular and rotational motion, equilibrium, and gravitation. Laboratory work is an integral part of the course, which involves performance of experiments as a concrete supplement and illustration of the basic principles in physics, specifically mechanics. The syllabus was prepared by the teacher concerned and was structured into 5 columns wherein each column contains the specific objectives, topic content, time allocation, strategies and activities and evaluation. The syllabus was patterned from the CHED.

In school 4 the course number of the subject is college physics 1 and the descriptive title is general physics. It is a 3 units course in which students demonstrate their understanding of useful concepts of kinematics and dynamics, energy and momentum, waves and sound, fluids and thermodynamics. The syllabus was prepared by the teacher in-charge of the subject.



Lastly, in school 5 is physics 101, the descriptive title is general physics. It is a 3 units course which comprised of 2 units lecture and 1 unit laboratory also intended for nursing and education students. This course covers an introduction of the basic concepts and principles of Newtonian mechanics, thermodynamics, waves and wave motion. The syllabus was prepared by two professors who had attended seminar specializing on syllabi making. The

syllabus was patterned from the CHED. The syllabus is structured into seven columns wherein each column contains the time frame, topic content, specific objectives, strategy and materials, ribbons, BEC and evaluation.

Common teaching strategies employed in teaching general college physics

Table 3. Methods and strategies used by physics teacher in teaching general college physics in Jolo

Strategy	Topic												Ave. Score		Rank	
	I Vector		II Straight Line Motion		III Motion in 2 or 4 dimension		IV Newton's Law of Motion		V Applying Newton's Laws		VI Work and Energy		T	S	T	S
	T	S	T	S	T	S	T	S	T	S	T	S				
Problem Solving	3.7	3.6	3.7	3.6	3.7	3.6	3.8	3.5	3.8	3.5	3.8	3.5	3.8	3.6	1	2
Lecture	3.3	3.7	3.6	3.7	3.4	3.8	3.6	3.8	3.5	3.7	3.5	3.8	3.5	3.8	2	1
Board Work	3.3	2.9	3.4	2.9	3.3	2.9	3.4	2.9	3.2	2.7	3.2	2.7	3.3	2.8	3.5	3.5
Discussion	3.3	2.7	3.1	2.8	3	2.8	3.6	2.7	3.5	2.6	3.2	2.6	3.3	2.7	3.5	6
Drill	3	2.9	3.1	2.8	3.1	2.8	3.6	2.8	3.5	2.6	3.2	2.7	3.2	2.8	5	3.5
Questioning	2.9	2.8	3.1	2.8	3	2.8	3.2	2.6	3.2	2.5	3.2	2.4	3.1	2.7	6	6
Demo.	2.6	2.9	2.7	3	2.7	2.8	2.8	2.6	3	2.5	3	2.5	2.8	2.7	7	6
Discovery	2.4	2.6	2.3	2.6	2.4	2.5	2.6	2.2	2.8	2.4	2.8	2.6	2.6	2.5	9.5	9
Review	2.6	2.7	2.6	2.8	2.3	2.6	2	2.5	2.8	2.4	2.8	2.5	2.5	2.6	11	8
Recitation	2.3	2.3	2.3	2.2	2.3	2.3	2.8	2	2.8	2.2	2.8	2	2.6	2.1	9.5	10
Cooperative	2.9	1.9	2.9	1.9	2.7	2	2.8	2	2.2	2	2.8	1.9	2.7	2	8	11
Module	1.9	1.9	2	1.8	2	1.8	2.4	1.8	2.8	1.9	2.8	1.9	2.3	1.9	12.5	12
Concept Mapping	2.6	1.9	2.1	1.9	2.1	1.9	2.4	1.7	2.2	1.8	2.5	1.8	2.3	1.8	12.5	13
Laboratory	1.7	1.4	1.9	1.4	1.7	1.3	2	1.3	2.2	1.3	2.5	1.2	2	1.3	15	16
Project	2.3	1.4	2	1.3	1.7	1.3	2	1.3	2.2	1.2	2	1.3	2	1.3	15	16
Reporting	1.9	1.2	1.9	1.6	1.9	1.3	2.2	1.2	2	1.2	2.2	1.2	2	1.3	15	16
Slides Showing	1.6	1.4	1.6	1.3	1.4	1.3	1.4	1.4	1.5	1.5	1.5	1.5	1.7	1.4	17	14
Film Viewing	1.6	1.3	1.6	1.3	1.6	1.3	1.4	1.1	1.5	1.2	1.8	1.1	1.6	1.2	18.5	18
Games	1.4	1.3	1.7	1.2	1.4	1.1	1.6	1	1.8	1.1	1.8	1.0	1.6	1.1	18.5	19

Table 3 shows the methods and strategies used by physics teachers in each topic and the corresponding scores of each teaching strategy employed by teachers in teaching general college physics in the five (5) colleges in Jolo. The scores were obtained from the point scores given by each teacher and students

on each teaching strategies which was based from the Likert Scale. To get the average score for teacher's responses the sum of the score was divided by the number of seven (7) teachers while the students' scores were divided by the number of students. To obtain the rank the highest average score was used.



Thus, problem solving ranked first with the teacher because it obtained an average score of 3.8, followed by lecture method as second rank with an average score of 3.5, board work and discussion ranked as third with an average score of 3.3, drill ranked as fifth with an average score of 3.2, questioning method ranked as sixth since it obtained an average score of 3.1, demonstration ranked as seventh, cooperative ranked as eight, discovery and recitation ranked as ninth.

Furthermore as shown in Table 3, students affirmed that lecture method was the most commonly used by their teacher in teaching general college physics as it obtained the highest average score of 3.8 thus, it ranked first. Problem solving was ranked as

second method of teaching strategy as it obtained an average score of 3.6, followed by the board work and drill methods which ranked as third with an average score of 2.8, next on line was questioning method, discussion, and demonstration which ranked sixth with an average score of 2.7, review ranked as eight with an average score of 2.6, the ninth method went to discovery as it obtained an average score of 2.5, recitation method ranked tenth since it obtained an average score of 2.1, followed by the cooperative ranked as eleventh with an average score of 2.0, then module was ranked twelve as it obtained 1.9 average score.

Table 4. The most commonly used methods and strategies employed by physics teachers in teaching general college physics in Jolo

Strategy	Average Score		Qualitative Description		Rank	
	T	S	T	S	T	S
Problem Solving	3.8	3.6	All the time	All the time	1	2
Lecture	3.5	3.8	All the time	All the time	2	1
Board Work	3.3	2.8	Many times	Many times	3.5	3.5
Discussion	3.3	2.7	Many times	Many times	3.5	6
Drill	3.2	2.8	Many times	Many times	5	3.5
Questioning	3.1	2.7	Many times	Many times	6	6
Demo.	2.8	2.7	Many times	Many times	7	6
Discovery	2.6	2.5	Many times	Few times	9.5	9
Review	2.6	2.1	Many times	Few times	9.5	10
Recitation	2.5	2.6	Many times	Many times	11	8
Cooperative	2.7	2	Many times	Few times	8	11
Module	2.3	1.9	Few times	Few times	12.5	12

Table 4 shows the most commonly used methods and strategies employed by physics teachers in Jolo. The methods and strategies revealed in this table are the most commonly used teaching strategies employed by teacher in teaching general college physics in the tertiary level. These strategies are the top 12 ranks for both teachers and students. As indicated in the above table, the strategies that have been utilized by teachers were evaluated also by the students, but not all strategies have the same rank.

Only board work has been exactly ranked both by Teacher and students. Some methods and strategies have a difference of 1, 2, or 3 in terms of rank. Close examination of the rankings showed that problem solving is number one for teachers and lecture method is second, while for students it's the other way around; lecture first and problem solving second. The primary reason for this slight difference in rank is that to students' viewpoint when the teacher introduced problem solving in class, to their minds it



is still a part of lecture method. This implies that the most commonly used strategies in teaching general college physics in Jolo is the combination of lecture and problem solving methods. While the ranking of the teachers and students on the different strategies used may seem variant, however, Friedman's Analysis of Variance of table 4 data shows otherwise. Friedman Analysis gave an $F_r=21.5$ at $df = 11$. This value is less than the tabulated F_r $df = 11$ at $p \leq .025$ which is 21.9. This result indicates that there is no significant difference in the ratings of the teacher respondent and students on the different teaching strategies employed in physics teaching.

Based on the data gathered, the implication is that problem-solving and lecture methods are the most commonly used methods and strategies in general college physics among the five schools. What probably accounts for this trend is the fact that: teachers find such methods and strategies as very convenient in the course of teaching-learning process.

The work of Gok et al., revealed that the effects of directive and non-directive problem solving on

attitude and achievement of students in a developmental science course become more positive after instruction.¹³ Likewise, student's achievement increased remarkably. Therefore, it is reasonable to claim that the usage of problem -solving strategies is more useful for physics. Although the usefulness of other teaching strategies is widely examined today, according to Cashin, the lecture still remains an important way to communicate information.¹⁴

In the local scenario, according to Sanchez,¹⁵ similar critical commentaries have been aired by graduate school administrators, educators, students, and concerned others on the exclusive use of the lecture method either by professor or by the student reporter. But despite these indictments, it is still the most commonly used approach in the teaching of content subjects in colleges and universities up to the present.

Combination of teaching strategy employed by physics teachers in Jolo enhances achievement scores of students

Table 5. Number of strategies used by teachers and students' achievement scores

Teacher	Strategies Used	No. of Years Teaching	Low Achievement Percentage	High Achievement Percentage
Teacher 2	All nineteen strategies	22	21.4	17.9
Teacher 6	All except games, film viewing and slides showing	16	33.3	16.7
Teacher 4	All except laboratory, games and modules	26	35	15
Teacher 7	All except film viewing, slides showing, games, lab and module	14	35	15
Teacher 5	All except reporting	6	40	13.3
Teacher 3	All except discovery, film viewing, slides showing, module and reporting	3	40	12
Teacher 1	All except film viewing, games, laboratory and slides showing	24	30	10



Table 5 shows the number of teaching strategies used by each teacher in the different colleges and the corresponding percentage of low achieving and high achieving students in general college physics based on their midterm exam. The students under each teacher were classified based on their achievement ratings (midterm result) supplied by each physics teacher using the range/scale and qualitative description as follows:

<u>Performance in Midterm Exam</u>	<u>Qualitative Description</u>
74-below	low
75-79	below average
80-85	average
86-above	high

This scale is adapted from the work of Kuyong.¹⁶

Generally, despite the number of teaching strategies applied by teachers, it can be gleaned from table 5 that low achieving students prevail over high achieving students. In a report incorporated in volume 1 of the book entitled "Science Development Plan" (SEDP), schools located farther away from the National Capital Region (NCR), they tend to have much lower mean achievements. Mindanao students appear to have the lowest mean achievements in most of the subject areas even if their schools are located in the city.¹⁷

However, closer study of the table reveals that application of several teaching strategies somehow enhances performance achievement of students as in the case of teacher 2 who employed a total of nineteen (19) teaching strategies which complemented him a high percentage of high achievers (17.9) and got the lowest percentage of low achievers student (21.4) compared to other teachers.

Another faculty in another school which is teacher 5 applied a total number of eighteen teaching

strategies yet it resulted to a greater percentage of low achievers (40%). This could be attributed to teaching experience. This teacher has only few years of teaching experience as part-timer or lecturer as the data in table 2 provides. Murnane et al., conducted studies on the effects of teacher experience on student learning and they had found a relationship between teacher's effectiveness and their years of experience.¹⁸

Furthermore, Rosenholtz stressed that inexperience teachers are typically less effective than more senior teachers.¹⁹ The faculty profile as indicated in table 2 shows that there were two teachers, teacher 5 & teacher 3, who have been teaching less than ten years. Both of them have the same percentage of low achieving students that is forty percent. In a review of 65 studies of science teacher's characteristics and behavior, Seisana found students' science achievement was positively related to the teacher's course taking background in both education and in science.²⁰ As Murnane suggests, these findings may indicate that it is not only the knowledge acquired with ongoing professional development but also the teacher's enthusiasm of learning that relates to increased students achievement.²¹

Using the data from tables 4 & 5 together, the combination of teaching strategies employed by teachers in Jolo that seemingly enhanced achievement scores of students are problem solving, lecture and board work as these were the top rank strategies. As had been observed, the topics most discussed by the teacher was all about mechanics that involves analysis which simply suggest solving problems, lecture and board works were utilized most of the time. For students to be able to learn meaningfully it needs more practice and more practice means more board work. As the saying goes "practice makes perfect". Thus, the achievement score of students of teacher 2 was better compared to



other teachers who did not use problem solving and lecture methods most of the time.

Successful teachers tend to be those who are able to use a range of teaching strategies and who use a range of interaction styles, rather than a single, rigid approach. This finding is consistent with other research on effective teaching, which suggests that effective teachers adjust their teaching to fit the needs of different students and demands of different instructional goals, topics, and methods.²² Since achievement is important in the student learning process, physics teacher should be encouraged to use various strategies in order to improve performance in physics. According to Good et al.,²³ the use of different strategies occurs in the context of "active teaching" that is purposeful and diagnostic rather than random or laissez faire and that responds to

students' needs as well as curriculum goals.

The lowest percentage of high achieving students is teacher I (10%). The reason for the low percentage could be attributed to the difficulty of the subject. Among Tausug students' physics is regarded as a difficult subject. Johnson et al., stated that "physics has traditionally been recognized by students as being one of the most difficult areas of science". They claimed that student's knowledge is usually fragmented and compartmentalized. Calvin²⁶ concluded that there were several persistent conceptual difficulties in physics among students who were enrolled in a variety of introductory physics at the University of Washington.

Learning Facilities available in the colleges of Jolo that are used in teaching physics

Table 6. Learning facility

Learning Facility	School					Total	Percent
	1	2	3	4	5		
Classrooms	/	/	/	/	/	5	100
Faculty rooms	/	/	/	/	/	5	100
Library rooms	/	/	/	/	/	5	100
Light	/	/	/	/	/	5	100
Chairs	/	/	/	/	/	5	100
Reference Books	/	/	/	/	/	5	100
Laboratory rooms	0	/	/	/	/	4	80
Laboratory Manuals	0	/	/	/	/	4	80
Thermometer	0	/	/	/	/	4	80
Meter Stick	0	/	/	/	/	4	80
Balance	0	/	/	/	/	4	80
Spring Balance	0	/	/	/	/	4	80
Computers	0	/	/	/	/	4	80
Printers	0	/	/	/	/	4	80
Electric Fans	0	/	/	/	/	4	80
Tables	0	/	/	/	/	4	80
Carts	0	/	0	/	/	3	60
Incline Plane or piece of wood	0	/	/	0	/	3	60
Internet	0	/	/	0	/	3	60
Overhead Projector	0	/	/	0	/	3	60
Set of Masses	0	0	/	/	0	2	40
Stop Watch	0	/	/	0	0	2	40
Television (TV)	/	0	/	0	0	2	40
Magazines	0	0	/	0	/	2	40
Laptop Computers	0	/	0	0	0	1	20
Liquid Crystal Display (LCD)	0	0	0	/	0	1	20
Scientific Journals/Periodicals	0	0	/	0	0	1	20
Newspapers	0	0	0	0	/	1	20
Odometer	0	0	0	0	0	0	0
Washers	0	0	0	0	0	0	0
DVD Player	0	0	0	0	0	0	0
Pendulum	0	0	0	0	0	0	0
Pulley	0	0	0	0	0	0	0
Cassettes and VCR's	0	0	0	0	0	0	0



Table 6 shows the learning facilities available in the five colleges in Jolo that were used in this study. As shown in the table, all colleges in Jolo have classrooms, faculty rooms, library rooms, lights, chairs, and reference books. Eighty percent of the schools have laboratory rooms, laboratory manuals, computers, electric fans, printers, thermometer, meter sticks, balance, spring balance and tables. While 60% have internet, carts, incline plane or piece of wood and overhead projector (OHP). Only 40% have television (TV), stop watch, set of masses, and magazines and 20% have laptop computers, liquid crystal display (LCD), scientific journals/ periodicals and newspapers. All colleges in Jolo have no odometer, washers, pendulum, pulley, cassettes, VCR's and DVD player. By and large, the data suggest that the schools have fairly adequate physical facilities in terms of classrooms, faculty rooms; library rooms; lights; chairs; and reference books considering that there are relatively few students in every schools enrolled in physics subjects.

Furthermore, the schools should provide facilities to allow preparation, presentation and viewing of audio-visual materials to support instruction. Facilities like library holdings should conform to existing requirements for libraries. For the BS Physics, the libraries must provide at least twenty different titles of introductory or general physics books, including the standard textbooks, atleast ten of which have editions no more than eight years old. At least 126m² or approximately 2 classrooms shall be required for the library. It should include space for collections, shelving areas, stockroom, and office space for staff and reading area. The library must be able to accommodate 5% of the total enrollment at any one time.

There are three schools in Jolo which have laboratory component in their syllabi; however, it appeared in the survey that teachers in these schools did not use the laboratory method as part of their

teaching strategy in the class. As evidently shown in table 3, laboratory teaching strategy ranked fifteen. This simply indicates the loss of concern by teachers in the laboratory method of teaching. Perhaps, this deliberate disregard on the use of laboratory method could be the effect of the inconsistency of power supply in the town that often caused prolong brown-outs, or may be the lack of materials and equipment in the schools' laboratories which certainly affect the teachers' interest.

Many different types of technology can be used to support and enhance learning. Everything from video content and digital moviemaking to laptop computing and handheld technologies has been used in classrooms.²⁷ School facilities reinforce and enhance learning. Therefore, in order that teaching and learning is successful, the environment must be equipped with facilities. An important component in an environment that is conducive is clean, quiet, safe, comfortable and healthy. However, in Jolo students cannot be expected to benefit from technology because there are facilities that are non-functioning. For instance in the case of School 5 although there are available learning facilities like computers however teachers are not using them in the process of teaching. The primary reason teachers do not use new technology according to Mills in their classroom is a lack of experience with the technology.²⁸ On the other hand, Teacher 1, 6 and 7 did not use film viewing and slide showing strategies in class for the same reason of inexperience with the said technology. Another factor that hinders the use of learning facilities and other technology is due to electric power shortage in Jolo. In fact, every day Jolo experiences brownout. This power crisis is further affected by the unpredictability of peace and order situation of the place. For instance the recent spates of killings and bomb threats have resulted in suspension of classes. Furthermore, this condition is aggravated by the recent natural calamities brought by tornadoes and



heavy rains that made entire town of Jolo flooded tremendously. Thus, students miss their classes. These kinds of condition greatly influence the low achievement and poor study habits among Tausug students.

Hake²⁹ stressed that classroom lighting plays a particular critical role in student performance. Obviously students cannot study unless lighting is adequate, and there have been many studies reporting optimal lighting levels.^{27,28} Jago et al., cite results of seventeen studies from the mid-1930's to 1997.³⁰ The consensus of these studies is that appropriate lighting improves test scores, reduces off-task behavior, and plays a significant role in student achievement.

As shown in table 6, only forty percent of colleges have television, stop watch, set of masses, and magazines and twenty percent have laptop computers, liquid crystal display (LCD) Scientific journal or periodicals and newspaper. It shows that these learning facilities were inadequate in most colleges. This is the reason why most of the physics teachers did not use film viewing in their class.

The study on the Saginaw Schools in 1985 project showed the relationship between student achievement and building facilities. Guided by the belief that schools can influence and control variables that contribute to school learning, the Saginaw Public School launched a grassroots project involving thirty-one schools. The results of the survey during the five-year project, was that student achievement in both mathematics and reading rose in the highest achievement category.³¹ In the case of three colleges that achieved high percentage of students' academic achievement scores, by comparison have good building facilities than other schools included in this study.

A study by Adesoji found that students in school buildings in poor condition had achievement that was 6 percent below schools in fair condition and 11

percent below schools in excellent condition.³² Corcoran et al., also found that "where the problems with working conditions are serious enough to impinge on the work of teachers, they result in higher absenteeism, reduced levels of efforts, less effectiveness in the classroom, low morale, and reduced job satisfaction.³³ Where working conditions are good, they result in enthusiasm, high morale, cooperation, and acceptance of responsibility. Based on the researcher viewpoint it has been observed that the school she was conducted in which the building in poor condition has low percentage of high achievement score and has low performance rating of teachers compared to colleges where school building is still in good condition like the three colleges that belong to the high achievers in academic achievement.

5. Conclusion

Based from the findings of this study, the teaching of general college physics in Jolo schools is characterized as predominantly lecture type with problem solving and board work. These strategies especially problem solving appears to influence achievement of student in physics. All five colleges in Jolo have inadequate facilities considering the fact that most of the equipment and facilities important in the teaching of physics subjects are not available. If there are available they are not in good condition or non-functioning.

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