JOURNAL OF CRITICAL REVIEWS

ISSN- 2394-5125 VOL 7, ISSUE 11, 2020

LEVEL OF PROFICIENCY IN DEVELOPING MULTI-MODAL STRATEGY AMONG TEACHERS

Pedro P. Suyu[1]

[1]Cagayan State University, Andrews Campus suyupeter@gmail.com

Received: 05 May 2020 Revised: and Accepted: 15 July 2020

ABSTRACT: Teaching science to a diverse class of learners requires a variety of approaches and strategies to accommodate all levels in the science classroom. With this in mind, an effective teaching strategy according to Jared Lewis (2009) is not so much a single one size fits all approach as an armory of ideas, activities, thought provoking questions, experiments and demonstrations. To become a good teacher, you need to put yourself in the shoes of your students and attempt to understand their learning styles. Incorporating various methods of teaching in your classroom can stimulate learning for many different students who may benefit from a variety of instructional methods. This study focused on the proficiency levels of teachers in developing multi-modal strategy in teaching science. Specifically, it looked into profile and proficiency of teachers as perceived by the coordinators, the students, and the teachers themselves. It made use of the descriptive method or approach to describe the variables. The teachers and coordinators who were chosen in total enumeration, and the students who were chosen by Slovins sampling method come from the different high schools in Tuguegarao City. The results revealed that teaching of science is dominated by females and not all them have attended trainings especially along pedagogy. The science teachers perceived themselves as proficient in developing all multimodal strategies. Regardless of their profile, science teachers perceive themselves as highly proficient in developing multi-modal strategies in teaching science along visual, aural, read/write, and kinesthetic study strategy.
KEYWORDS: level of proficiency in science, multi-modal strategy, science teaching

I. INTRODUCTION

Chemistry is one of the most important branches of science because it enables learners to understand what happened around them. Because chemistry topics are generally related to or based on the structure of matter, chemistry proves a difficult subject for many students. Chemistry curricula as emphasized by Taber (2002) commonly incorporate many abstract concepts, which are central to further learning in both chemistry and other sciences. Moreover, Coll & Treagust (2001) posited that abstract concepts are important because further chemistry concepts or theories cannot be easily understood if these underpinning concepts are not sufficiently grasped by the student.

Despite the importance of chemistry to students and the efforts of teachers to improve on its teaching and learning, Adesoji, F and Olatunbosun, S. (2008) pointed out that the achievement of students in the subject remains low. Further, he cited that among the factors that have been identified outcomes in chemistry are, poor methods of instruction, teacher's attitude, laboratory and poor science background. Effective teaching and learning in any subject is dependent on the instructional strategies used which are believed by Mahajan, D. S. & Singh, G. S. (2003) as a major factor responsible for the level of performance in any subject by the students.

Teacher factor is also one of the factors that affect the performance of students in Science. One approach to understand teacher quality considers individual teacher qualifications and characteristics associated with teacher performance. Researchers have studied the following factors: academic or intellectual ability, academic subject matter preparation, teaching experience, and pedagogical knowledge for various learners. In the research conducted by Tizo (2013**),** she found out that Teacher factors like age, gender, number of years in teaching and educational qualifications play an important role in teaching, but professional education or relevant training is more important because a trained teacher can teach better than an un-trained teacher**.**

Matter is the main subject of chemistry which is composed of atoms and molecules. Atoms and molecules are measured in micro units, a size that cannot be seen by naked eyes unless modern technologies are used to view

these component particles of matter. Study of the interactions of these unseen components of matter is the reason of the difficulty encountered in learning chemistry concepts which gave students the ill feeling which consequently give them poor performance in the subject.

II. SCIENCE TECHNOLOGY EDUCATION IN THE PHILIPPINES

The government recognizes the importance of developing its science and technology capability as a means of addressing the concerns of industrialization and globalization. The education sector, along with other government agencies according to Marinas (1997) is tasked to contribute to the achievement of the national development goals. As such, DECS which is now DepEd has focused its efforts towards programs and projects aimed at improving English, science, and mathematics education in basic education.

As posited by Bureau of Elementary Education (1998), the objectives of elementary school science is that, at the end of grade VI, the child is expected to apply scientific knowledge and skills in identifying and solving problems pertaining to health and sanitation; nutrition; food production, preparation and storage; environment and the conservation of its resources; and evolving better ways and means of doing things.

On the other hand, the Bureau of Secondary Education (1998) has summarized the aim of the Secondary Science Education Programme and that is to develop understanding of concepts and key principles of science, science processes, skills and desirable values to make the students scientifically literate, productive and effective citizens.

III. SCIENCE CURRICULUM IN THE PHILIPPINES

High school Science looks at complex scientific concepts that may become tedious to study with the wrong approach. The curriculum must be detailed, while finding creative ways to illustrate the subject matter. Just like in the Chemistry curriculum, the course begins with the concept of the atoms as the building blocks and show how these become molecules, compounds and elements and interact with each other forming the various materials that people are enjoying in the world.

In high school Science subjects, it is essential to incorporate laboratory time that allows students to participate in hands-on experiments that illustrate concepts learned in the classroom. Relevant laboratory experiments can usually be found in the Science textbook. The curriculum according to Monet (2007) also requires the use of handouts, movies, practice quizzes, group projects, art projects, visual presentations and games to make the process of learning the difficult concepts in Science more enjoyable.

In its most general sense, the aim of Science education according to Gayon (2010) is to enable students to acquire the means to understand, explain, predict and control nature. Specifically, chemistry education goals are set to give direction to chemistry instruction, the curriculum, instructional materials and evaluations, and to the goals which are to be achieved in the future.

IV. MULTI-MODAL STRATEGIES

In framing the discussions on multi-modal representation Lemke (1998) has stated “Science is not done, is not communicated, through verbal language alone. It cannot be.” He also added that scientists “combine, interconnect, and integrate verbal text with mathematical expressions, quantitative graphs, information tables, abstract diagrams, maps, drawings, photographs, and a host of unique specialized visual genres seen nowhere else”. Moreover, Kozma (2003) concurs and emphasizes this concept in suggesting that “scientists co-ordinate features within and across multiple representations to reason about their research and negotiate shared understanding based on underlying entities and processes.”

“No one else processes information in exactly the same way you do. If you discover how you process information best, you learn things both more efficiently and in less time. By applying strategies that address your learning style, you can study faster and better (*Practicing* College Learning Strategies, p. 154, Carolyn H. Hooper). Indeed, students in the classroom display a variety of needs, interest, mental abilities and learning style. This accords with one of the principles of learning that “students are simply unique and has complex system of thinking and learning. Effective teachers keep on trying out strategies that would address this diversity among learners realizing that “cookie – cutter education” spells disaster for many of the learners. Solutions might best be found by combining the best teaching models we know instead of a one-size-fits-all approach. Successful brain-based models, such as cooperative learning, memory, and direct instruction are three such models that when implemented in combination can produce success that is greater than the sum of its parts.

ISSN- 2394-5125 VOL 7, ISSUE 11, 2020

Multi – modal teaching is a teaching style in which students learn the material through a number of different sensory modalities. For example, a teacher will make the lesson in which students learn through auditory and visual methods, or methods of visual and tactile. Teachers can use a combination of learning modalities or even multimodal teaching strategies where teachers utilize more than one teaching style that successfully implemented many strategies to ensure students understanding and retention of information (learning-strategiesfor-all-students.aspx). According to the VARK learning styles theory pioneered by Neil Fleming (1987), every individual is predisposed to a preferred learning style, instinctively favoring one of the four styles that the theory describes. Some students process information most effectively by using a visual learning style, just as others rely more heavily on either an auditory style, read/write learning style or kinesthetic style of learning.

V. OBJECTIVES OF THE STUDY

This study determined multi-modal proficiency as perceived by the coordinators, students and teachers in science. Specifically, it sought to answer the following:

1. What is the profile of the respondents according to:

a. sex;

b. age;

c. highest educational attainment;

d. bachelor's degree and major;

e. type of school graduated from;

f. masteral degree and major

g. type of school graduated from:

1.8. number of years teaching Science

1.9. number of seminars/trainings attended along pedagogy

2. What is the level of proficiency of the Science teachers in developing multi – modal strategies as perceived by the coordinators, students, and teachers themselves along:

2.1. visual study strategy;

2.2. aural study strategy;

2.3. read/write study strategy; and

2.4. kinesthetic body strategy.

3. Is there significant difference in the multi-modal level of proficiency among coordinators, students, and teachers when grouped according to their (teachers) profile variables?

Hypothesis:

There is no significant difference in the multi-modal proficiency level of teachers as perceived by the coordinators, students, and teachers themselves.

VI. METHODOLOGY

Research Design

The study made use of descriptive – comparative research design. The descriptive design was used since the study described the information on the profile variables of the respondents together with the perceived level of proficiency of Chemistry teachers in developing multi – modal strategies along visual, aural, read/write and kinesthetic study strategy in teaching Science.

The descriptive – comparative research design was used in the study to ascertain the difference in the perceived level of proficiency of teachers in the use of multi – modal strategy when respondents are grouped according to students, teachers and Science coordinators and according to their profile variables.

ISSN- 2394-5125 VOL 7, ISSUE 11, 2020

Locale of the Study

This study was conducted in selected high schools in Tuguegarao City, Cagayan. These schools were selected as respondents of the study because of some reasons. First, these schools are just near the area where the researcher is employed; hence, there is easy access of data to be gathered. Second, these schools are the provider of students of the university where the researcher is employed, thus, result of this research would serve as feedback for the university Science teachers on the strategies to be used during Science instruction. Lastly, these schools have different population size and offer different curricula which add to diversity which were thought by the researcher as an advantage in terms of the quality of data to be gathered.

Respondents and Sampling Procedure

The respondents of the study were the Science teachers, Science Coordinators and students from the public secondary schools of Tuguegarao City. Total enumeration of Science teachers and Science Coordinators was used, and Slovin's formula was used to determine the sample size of student respondents by school.

Research Instrument

The research study made use of the questionnaire as the main tool in gathering data. The questionnaire consisted of four (2) parts. Part 1 of the questionnaire elicited information on the profile variables of the respondents. Part 2 of the questionnaire consisted of items that elicited information on the perceived level of proficiency of teachers in the use of multi – modal strategies along visual, aural, read/write and kinesthetic study strategy in teaching Chemistry. The items were based on the Principles and Strategies of Teaching by Acero (2007). The questionnaire was validated by the Science experts of the Cagayan State University, Andrews Campus, Tuguegarao City

VII. DATA ANALYSIS

Descriptive statistics like percentages and mean were used to describe the profile variables, and the problems encountered by the respondents in developing multi – modal strategy.

The perceived level of proficiency in developing a multi – modal strategy was determined using the 4 – Point Likert Scale. The computed weighted mean was used to indicate the level of proficiency in developing multi – modal strategy. The computed weighted mean was further converted to a descriptive value in order to describe the level of proficiency of Science teachers. Likewise, the level of efficiency in developing multi – modal strategy was determined using computed weighted mean. The following show the ranges and the adjectival description used in describing the level of proficiency.

Mean Range	Descriptive Value
3.45-4.00	Highly proficient
2.50-3.44	Proficient
1.75-2.49	Basic
1.00-1.74	Below Basic

The difference in the perceived level of proficiency in developing multi – modal strategy when respondents are grouped according to science coordinators, teachers, and Profile were determined using one – way Analysis of Variance (ANOVA).

VIII. RESULTS AND DISCUSSIONS Profile of the Respondents

ISSN- 2394-5125 VOL 7, ISSUE 11, 2020

Table 1. Distribution of teachers according to profile variables.

Category	f	%
Sex		
Male	11	20.4
Female	43	79.6
Age		
25 & below	3	5.6
26 – 30	9	16.7
30 – 35	9	16.7
36 – 40	10	18.5
41 – 45	10	18.5
46 – 50	6	11.1
51 & above	7	13.0
Mean = 39.15 SD = 9.78		
Highest Educational Attainment		
AB/BS/AB-BSE/BSE	20	37.0
MA/MS/MST	31	57.4
Ph.D.	3	5.6
BS Degree		
BS	8	14.8
AB - BSE	4	7.4
BSE	42	77.8
Major/Area of Specialization		
General Science	18	33.3
Biology	14	25.9
Chemistry	8	14.8
Physics	9	16.7
Physical Therapy	3	5.6
Math	2	3.7
School Graduated for BS degree		
Public	25	46.3
Private	28	51.9
No response	1	1.9
MA Degree		
MA	8	14.8

ISSN- 2394-5125 VOL 7, ISSUE 11, 2020

MS	8	14.8
MST	18	33.3
Not Applicable	20	37.0

MA Specialization		
General Science	5	9.3
Biology	7	13.0
Chemistry	10	18.5
Physics	4	7.4
Science	1	1.9
Educational Management	7	13.0
Not applicable	20	37.0
School Graduated with MA		
Public	23	42.59
Private	11	20.37
Not applicable	20	37.04
Number of years in teaching		
1 – 10	20	37.0
11 – 20	15	27.8
21 – 30	13	24.1
31 – 40	6	11.1
Mean = 16.50 SD = 10.39		
Number of trainings attended		
1 – 5	17	31.5
6 – 10	14	25.9
11 – 15	5	9.3
16 – 20	8	14.8
None	10	18.5
Mean = 9.00 SD = 6.31		

The frequency and percentage distribution of the teacher-respondents as to their sex, age, highest educational attainment, BS degree, area of specialization, school graduate from for BS degree , master's degree and the area of specialization, school graduated from for MA degree, number of years in teaching, and the number of trainings attended are shown on Table 1.

As seen on the table, out of 54 teacher respondents, 79.6 percent of the science teachers in the public secondary schools in Tuguegarao City are female. This finding implies that teaching is a female dominated profession and is

found to be fitted with the characteristics of female individuals which are essential requirements in the teaching profession.

In terms of the age of the teacher respondents, ages within the ranges 36-40 years and 41 – 45 years have the highest percentage over the other age groups while age group 25 and below have the least number of teachers teaching Science. The obtained mean age of 39.15 is an indication that most of the Science teachers belong to the middle age group of Professional Teachers.

On the other hand, in terms of Highest Educational Attainment, 31 or 57.4 percent of Science teachers have finished their Master's Degree, while 20 or 37 percent are not holders of Master's Degree but records obtained by the researcher from the Science Coordinators of their school show that these teachers have finished some units in their Master's degree. Meanwhile, 3 or 5.6 percent of the Science teachers have finished Ph. D. in their field of specialization. In terms of the Bachelor's degree of the respondents, 42 or 77.8 percent of the teachers have finished Bachelor of Secondary Education, 8 or 14.8 have graduated BS course and 4 or 7.4 percent have finished AB – BSE course.

As regards the field of specialization of the respondents, almost all of the Science teachers have undertaken specialized area in sciences which include General Science, Biology, Chemistry and Physics with a percentage of 33.3, 25.9, 14.8 and 16.7 respectively. This is advantageous on the part of the teachers because they are teaching their field of specialization.

As to the type of school where the teacher respondents finished their BS degree course, it came out that 28 or 51.9 percent of the Science teachers finished their undergraduate course in the private school 25 or 46.3 percent have graduated in the public school.

As regards the Master's degree earned by the Science teachers, 18 out of 34 Science Teachers have obtained MST (Master of Science in Teaching), while 8 of them took MA (Master of Arts) and 8 of them gained MS (Master of Science) in their Master's Degree.

As regards the field of specialization they took in their Master's degree, most of the teachers (10 out of 34) took Chemistry Education as their field of specialization, followed by Biology Education (7 out of 34) and General Science (5 out 34). Meanwhile, 7 of the Science teachers took Educational Management in their Master's Degree which is not related to what they have finished in their Undergraduate Course and to what they are teaching. In terms of the school where these Science teachers obtained their Master's Degree, 23 out of 34 graduated in the public school in their Master's Degree while 11 out of 34 finished their Master's Degree in the private school.

As to the length of years of teaching Science, 20 or 37 percent of the Science teachers fall within the range 1-10 years of teaching experience while 15 or 27.8 percent fall within the range 11 – 20 years of experience teaching Science, 13 or 24.1 percent of the teacher respondents have rendered teaching services falling within the range 21 – 30 years and there are also 6 or 11.1 percent of teachers who have taught science falling within the range 31 – 40 years. The mean of 16.50 obtained on the number of years teaching Science implies that Science teachers are already classified professional teachers in the teaching profession.

Furthermore, 17 or 31.5 percent of the Science teachers have attended trainings within the range 1 -5, 14 of the teachers have attended 6 – 10 trainings, 5 teachers have attended 11 – 15 trainings and 8 teachers have attended 16 to 20 trainings in the duration of their teaching career. Meanwhile, 10 of the Science teachers haven't attended any training along pedagogy despite their number of years teaching in the Public School.

Multi-Modal Level of Proficiency of Teachers As Perceived by Coordinators, Students, And Teachers

Table 2. Perceived level of proficiency of the Science teachers in developing multi – modal strategies along visual strategy.

Items	Coordinators		Students		Teachers	
	Weighted Mean	Description	Weighted Mean	Description	Weighted Mean	Description
A. Visual						

1. My teacher uses pictures and comic strips to illustrate science concepts.	3.44	Highly Proficient	3.28	Highly Proficient	3.54	Highly Proficient
2. My teacher uses film strips, video clips and motion pictures as springboard in discussing abstract science concepts.	3.30	Highly Proficient	3.34	Highly Proficient	3.41	Highly Proficient
3. My teacher uses graphs and diagrams to demonstrate different science processes and relationship among variables.	3.54	Highly Proficient	3.50	Highly Proficient	3.65	Highly Proficient
4. My teacher uses symbols and hand gestures to simulate abstract science concepts.	3.54	Highly Proficient	3.42	Highly Proficient	3.65	Highly Proficient
5. My teacher uses mock – ups, specimen and models to identify parts and describe characteristics of organisms.	3.35	Highly Proficient	3.37	Highly Proficient	3.48	Highly Proficient
Weighted Mean	3.43	Highly Proficient	3.38	Highly Proficient	3.54	Highly Proficient

The assessment of Science coordinators, students and teachers on the perceived level of proficiency of Science teachers in developing multi – modal strategy along visual strategy is shown on Table 2. Results show that the Science teachers are perceived by the three groups of respondents as Highly Proficient in all areas concerning visual strategy.

Among the different areas along visual strategy, it came out that the use of film strips, video clips and motion pictures as springboard in discussing abstract science concepts were rated lowest by both the Science coordinators and the science teachers. This finding is explained by the finding of Seda Hilal Sengul and Gulcan Cetin, Hulya Gur (2008) theorizing that teachers encounter difficulty in preparing different course materials like posters, graphs, overhead projectors, and VCD. On the other hand, the use of graphs and diagrams to demonstrate different science processes and relationships among variables and uses of symbols and hand gestures to simulate abstract science concepts were rated highest by the three groups of respondents. Student respondents on the other hand, who comprised the bulk of the respondents, rated the use of pictures and comic strips to illustrate science concepts as the lowest. This suggests that teachers should give more emphasis on the use of pictures and comic strips in illustrating science concepts. This implies further that Science teachers should consider the use of pictures and comic strips in illustrating science concepts because as pointed out by Mayer (2005), people learn better from words and pictures than from words alone. This is supported by Sweller (2005) when he stated that both words and pictures let the brain process more information in working memory.

As to the weighted mean obtained from the three groups of respondents, it came out that the assessment by the student group obtained the lowest weighted mean of 3.38 though it was still interpreted as highly proficient. This suggests that teachers still need to use more of the instructional materials under the visual strategy to satisfy the needs of the learners.

Table 3. Perceived level of proficiency of the Science teachers in developing multi – modal strategies along Aural Study Strategy.

ISSN- 2394-5125 VOL 7, ISSUE 11, 2020

Items	Coordinators		Students		Teachers	
	Weighted Mean	Description	Weighted Mean	Description	Weighted Mean	Description
A. Auditory						
1. My teacher has flexible and wellmodulated voice during the delivery of the lesson.	3.61	Highly Proficient	3.74	Highly Proficient	3.72	Highly Proficient
2. My teacher uses different audio materials or audio recordings to facilitate learning of the science concepts.	3.26	Highly Proficient	3.25	Highly Proficient	3.52	Highly Proficient
3. My teacher uses question and answer technique in discussing science concepts.	3.65	Highly Proficient	3.68	Highly Proficient	3.65	Highly Proficient
4. My teacher uses songs, role plays, panel discussions and debate in presenting science concepts.	3.11	Proficient	2.92	Proficient	3.35	Highly Proficient
5. My teacher invites resource speaker from various agencies to lecture on subject content that are highly technical.	2.61	Proficient	2.62	Proficient	2.89	Proficient
Category Weighted Mean	3.25	Highly Proficient	3.24	Proficient	3.43	Highly Proficient

On the other hand, Table 3 presents the assessment of teachers, coordinators and students on the perceived level of proficiency of the Science teachers in developing multi – modal strategies along aural study strategy. It can be gleaned from the table that during the delivery of Science instruction, Science teachers are perceived by the three groups of respondents to be highly proficient in developing auditory strategies like having a flexible and well-modulated voice, using different audio recordings and the use of questioning technique. Nevertheless, both Science coordinators and student respondents rated the Science teachers proficient only in the use of songs, role plays, panel discussion and debate in presenting science concepts. Moreover, the three groups of respondents rated the Science teachers proficient only in inviting resource speakers from the different agencies to lecture on highly technical subject matter in Science. This implies that Science teachers should establish a stronger link with the other sectors of the community who can be tapped resource speakers on subject matter which they found beyond their acquired expertise.

On the comparison of the weighted mean obtained among the three groups of respondents, it is revealed that student respondents assessed their Science teachers proficient only in developing auditory strategies with a weighted mean of 3.24. Just along the borderline between proficient and highly proficient is the weighted mean obtained for the assessment of science coordinator respondents. These suggest that the effort of the Science

ISSN- 2394-5125 VOL 7, ISSUE 11, 2020

teachers in using some of the aural strategies in teaching science concepts is not enough to satiate the necessities especially of the aural learners to maximize their learning.

Table 4. Perceived level of proficiency of the Science teachers in developing multi – modal strategies along Read/Write Strategy.

Items	Coordinators		Students		Teachers	
	Weighted Mean	Description	Weighted Mean	Description	Weighted Mean	Description
C. Reading/Writing						
1. My teacher makes use of essays, stories, dialogues and the like in teaching subject content in science.	3.13	Proficient	3.21	Proficient	3.22	Proficient
2. My teacher provides handout of the topic which can facilitate understanding (Table 4 continued) of the lesson.	3.46	Highly Proficient	3.45	Highly Proficient	3.61	Highly Proficient
3. My teacher requires students to read manuals and textbooks to foster independent learning.	3.67	Highly Proficient	3.53	Highly Proficient	3.76	Highly Proficient
4. My teacher requires students to read in front of the class written observations during an experiment.	3.59	Highly Proficient	3.47	Highly Proficient	3.61	Highly Proficient
5. My teacher requires students to read interpretation of symbols and pictures in front of the class.	3.56	Highly Proficient	3.28	Highly Proficient	3.65	Highly Proficient
6. My teacher requires students to write comic strip to illustrate abstract concept in science.	3.22	Proficient	2.87	Proficient	3.41	Highly Proficient
7. My teacher requires students to write reflective journals and reaction papers after an activity.	3.31	Highly Proficient	3.13	Proficient	3.48	Highly Proficient
8. My teacher requires students to write their observation obtained from an activity.	3.69	Highly Proficient	3.53	Highly Proficient	3.80	Highly Proficient

9. My teacher requires students to write in their notebook the answer of the questions given in the assignment.	3.59	Highly Proficient	3.63	Highly Proficient	3.72	Highly Proficient
10. My teacher requires students to answer activity sheets by writing using essays, dialogues, stories, news articles and the like.	3.46	Highly Proficient	3.27	Highly Proficient	3.52	Highly Proficient
Category Weighted Mean	3.46	Highly Proficient	3.33	Highly Proficient	3.57	Highly Proficient

As reflected on Table 4, student respondents have assessed the proficiency of teachers in letting students write reflective journals and reaction papers after an activity as proficient only. This implies that teachers are not consistent in requiring students to write reflective journals and reaction papers as an output during an activity. Furthermore, both science coordinators and student respondents perceived science teachers to be just proficient in the requiring students to write comic strips to illustrate science concepts as output after the conduct of an activity. Nonetheless, the three groups of respondents have rated the items "My teacher makes use of essays, stories, dialogues and the like in teaching subject content in science" as proficient. This implies that the science teachers do not manifest to a certain degree the necessary skill in using essays, stories and dialogues as springboard in teaching science concept.

Most of the items under the read/write strategy were rated highly proficient by the three groups of respondents which mean that the Science teachers display appreciable level of skill in developing read/write strategies during science instruction. This is also manifested from the weighted mean obtained from the assessment of the three groups of respondents which came out to be highly proficient.

Table 5. Perceived level of proficiency of the Science teachers in developing multi – modal strategies along kinesthetic strategy.

Items	Coordinators		Students		Teachers	
	Weighted Mean	Description	Weighted Mean	Description	Weighted Mean	Description
D. Kinesthetic						
1. My teacher allows students to conduct laboratory activities to prove science concepts.	3.63	Highly Proficient	3.32	Highly Proficient	3.78	Highly Proficient
2. My teacher allows students to interpret science concepts through songs and dances.	3.19	Proficient	2.90	Proficient	3.39	Highly Proficient
3. My teacher requires students to role play and simulate science concepts or processes.	3.19	Proficient	2.92	Proficient	3.50	Highly Proficient
4. My teacher requires students to construct		Highly Proficient	3.26	Highly Proficient	3.72	Highly Proficient

rojects (Table 5 ontinuedto concretize) cience concepts.	3.59					
5. My teacher gives students hands – on activities to give them better understanding of science concepts.	3.76	Highly Proficient	3.56	Highly Proficient	3.78	Highly Proficient
Weighted Mean	3.47	Highly Proficient	3.19	Proficient	3.63	Highly Proficient

As presented on Table 5, both Science coordinators and student respondents rated the items "My teacher allows students to interpret science concepts through songs and dance" and "My teacher requires students to role play and simulate science concepts or processes" as Proficient. The weighted mean also reveals that student respondents obtained only a mean of 3.19 which is interpreted as proficient only compared with the weighted mean obtained from the assessment of science coordinators and science teachers (3.47 and 3.63, respectively) which are interpreted as highly proficient. This implies that the science teachers are not highly skillful in using kinesthetic strategy as perceived by their students.

Table 6. Comparison on the assessment of the teachers, coordinators, and students on the perceived level of proficiency of the Science teachers in developing multi – modal strategies.

Variables	Group Means			F-ratio	Probability	Statistical Inference
	Teachers	Coordinators	Students			
Visual	17.72	17.17	16.92	3.012	.050	Reject Ho
Aural	17.13	16.24	16.21	2.428	.089	Accept Ho
Read/Write	35.78	34.69	33.37	8.181	.000	Reject Ho
Kinesthetic	18.17	17.35	15.96	14.640	.000	Reject Ho

The data presented on table 11 show that there is significant difference on the perceived level of proficiency of Science teachers in developing multi – modal strategies along visual; read/write and kinesthetic strategies with p – value of 0.050, 0.000 and 0.000, respectively all measured at 0.05 level of significance. Among the three groups of respondents, comparison of means in all types of the multi – modal strategies show that teachers obtained the highest mean while the students obtained the lowest mean.

The very high proficiency in developing multi – modal strategies by science teachers is explained by the expertise acquired by the science teachers in their undergraduate course wherein one of the subjects they finished is Principles and Methods of Teaching. Practice Teaching has helped the would be teachers to apply the theories of teaching and learning to reality which gave them the experience in selecting the appropriate strategies for every subject content based on the needs, interest and intelligence of the students (Acero, 2007). The expertise acquired by the teachers is enhanced when teachers are already occupying teaching positions when their exposure to different conditions of teaching and learning is increased which is an articulation of the principle "learning by doing" by John Dewey (Salandanan, 2000). Furthermore, science teachers were able to enhance the development of their skills in developing multi – modal strategy by attending seminars along pedagogy and finishing their master's and doctor's degrees which are parts of the professional attributes of a teacher (Acero, 2000). On motivational aspect, the science teachers maintain a certain level of competency in the use of different instructional materials which are necessary in carrying out the different multi – modal strategies to keep the rating of students

and supervisors very satisfactory or even higher during evaluation of their teaching performance for the purpose of promotion and incentive based on performance rating.

The science coordinators are the immediate superiors of the science teachers. They take responsibility of conducting regular classroom observations to maintain quality science instruction by the science teachers. Furthermore, they take responsibility of checking weekly plans which contain the different strategies and instructional devises of the teacher as basis of rating teachers' performance.

Students are the end users of all the activities planned and implemented by the teachers during science instruction. Their performance in every teaching – learning process undertaken inside the classroom is an indication of the effectiveness of the teacher. In the study of Wilkerson, et al. (2000), he found out that student ratings were significantly more accurate in predicting student achievement than teacher's self-ratings, principal ratings, and principal summative ratings. This suggests that of all the means obtained from the three groups of respondents, the mean obtained from the students is the most accurate in describing the proficiency level of teachers in developing multi – modal strategy specifically along visual, read/write and kinesthetic strategy. Students are the best evaluators of the level of proficiency of teachers because they are the direct users of the strategy and they can evaluate better whether the material used by the science teacher has facilitated their learning or not.

On the context of difference on the perceived level of proficiency, teachers select by matching the appropriateness of subject content with the instructional materials based on the needs, interest and intelligence of the students. Teachers perceived that they manifest a higher level of skill in developing multimodal strategies along visual, read/write and kinesthetic strategy but science coordinators and students have different perceptions. They believe that teachers can still do better in improving their skill in developing visual, read/write and kinesthetic strategy by constantly practicing because as everyone knows, constant practice is a way of achieving perfection which is an articulation of the law of exercise by Edward Thorndike (Acero, 2007).

Table 12. Comparison on the perceived level of proficiency of Science teachers in developing multi – modal strategy when grouped according to profile variables.

Variable	Critical Value	p- value	Statistical Inference
A. Age	2.2990	0.7067	Accept Ho
B. Sex	2.0930	0.1872	Accept Ho
C. Highest Educational Attainment	3.1788	0.8635	Accept Ho
D. Degree (Undergrad)	3.1788	0.9528	Accept Ho
E. Major (Undergrad)	2.4085	0.4993	Accept Ho
F. School Grad	2.0076	0.3060	Accept Ho
G. Degree (Masters)	3.3048	0.8637	Accept Ho
H. Major	2.5581	0.3063	Accept Ho
I. School Graduate	2.0796	0.0624	Accept Ho
J. Number of years of teaching	2.7900	0.7798	Accept Ho
K. Number of trainings attended	2.5611	0.9765	Accept Ho

Every teacher manifests characteristics that are different from other teachers. These characteristics are considered correlates of their proficiency level in developing multi – modal strategy in teaching science concepts. Table 12

shows that the teacher respondents did not show any difference in their perception as regards their level of proficiency in developing multi – modal strategy considering the profile variables of the respondents.

This finding implies that both male and female teachers regardless of their age group and length of teaching experience manifest similarities in their skill in developing multi – modal strategy in teaching science.

On the other hand, undergraduate course, major and the type of school where the teachers graduated haven't caused any difference in the perceived level of proficiency of the science teachers in developing multi – modal strategy. The curriculum offered in the same course regardless of the type of school is the same so that these teachers have acquired similarities in their academic and professional preparations.

Furthermore, attaining a post graduate degree will not give science teachers an edge over teachers with just a Baccalaureate degree in terms of skills in developing multi – modal strategy. The skills acquired in developing multi – modal strategy during the college life of the teachers are honed in the classroom when teachers apply these skills in their daily teaching.

The number of trainings of the teachers along pedagogy did not give any difference in the perceived level of proficiency among teachers in developing multi – modal strategy. Teachers with much training along pedagogy showed same level of adeptness with teachers who have minimal or no training at all in developing multi – modal strategy. It has been a school policy that teachers who have attended seminars will undertake an "echo seminar" for their co – teachers to share the expertise gained from the training. This finding is supported by the findings of Harris, Douglas N and Sass, Tim R. (2007) that "teacher training generally has little influence on productivity" in their study on "Teacher Training, Teacher Quality and Student Achievement"

IX. CONCLUSIONS

In the light of the discussions and findings of the study, the following conclusions can be drawn:

The teaching of Science is female dominated. The Science teachers belong to the middle age group of professional teachers and continue to acquire professional competence by finishing appropriate post graduate course and by teaching their chosen field of specialization. Science teachers follow the scheme verticalization in their post graduate course. Science teachers are professional teachers based on the number of years rendered. Not all science teachers have undergone seminars and trainings along pedagogy.

Moreover, Science teachers perceive themselves highly proficient in developing multi – modal strategies along visual, aural, read/write and kinesthetic study strategy. There is significant difference in the perception of teachers, students, and science coordinators on the level of proficiency of science teachers in developing multi – modal strategies along visual, read/write and kinesthetic study strategy except in their aural study strategy. Regardless of their profile, science teachers perceive themselves highly proficient in developing multi – modal strategies in teaching science along visual, aural, read/write and kinesthetic study strategy.

X. RECOMMENDATIONS

1. The school heads should provide equal opportunities for teachers to attend seminars/training along pedagogy either in the local, national or international level to enhance the acquired skills of teachers in teaching their field of specialization.

2. The school heads should grant scholarship among their teachers to encourage them to pursue post graduate course along their fields of specialization to strengthen the faculty profile of their school.

3. Science teachers should invite resource speakers from various sectors of the community who can share their expertise along their fields of specialization especially on subject contents which are found to be highly technical by the teacher.

4. The principal or Science coordinators should conduct regular classroom visitation to maintain quality instruction and to validate the perceived level of proficiency in developing multi – modal strategies of Science teachers which they described as highly proficient.

ISSN- 2394-5125 VOL 7, ISSUE 11, 2020

5. The Science coordinator should recommend female teachers in science to undertake in – service trainings or possibly attend seminars and trainings that are deemed necessary to improve better their efficiency in developing multi – modal strategies along visual, read/write and kinesthetic study strategy to cope with the efficiency level of the male science teachers.

9. Parallel study should be conducted focused on the validation of the perceived level of proficiency of Science teachers in the use of multi – modal strategies.

XI. REFERENCES

[1] Acero, Victorina et.al. 2007. Principles of Teaching 1. Rex Book Store Inc.

[2] Adesoji, F. A. and S. M. Olatunbosun. 2008. Student, Teacher and School Environmental Factors as Determinants of Achievement in Senior Secondary School Chemistry in Oyo State, Nigeria. The Journal Of International Social. Research Volume 1/2 Winter.

[3] Kozma, R. B., & Russell, J. (1997). Multimedia and understanding: Expert and novice responses to different representations of chemical phenomena. *Journal of Research in Science Teaching*, *34*(9), 949968.

[4] Mayer, R. E. (2005). Principles of multimedia learning based on social cues: personalization, voice, and image principles. In R. E. Mayer, (Ed.) *The Cambridge Handbook of Multimedia Learning.* New York: Cambridge University Press.

[5] Salandana, Gloria G. 2000. Teaching Approaches and Strategies. Quezon City: Katha Publishing Co., Inc.

[6] Seda Hilal Sengul and Gulcan Cetin, Hulya Gur. 2008. The Primary School Science Teachers' Problems in Science Teaching**.** Journal of Turkish Science Education. Volume 5, Issue 3.

[7] Taber, K. S., (2002). Alternative Conceptions In Chemistry: Prevention, Diagnosis

[8] Tizo, Maribel S. Academic Performance of Chemistry Majors in Selected Chemistry Courses: Input for the Licensure Examination Preparation International Peer Reviewed Journal

[9] Treagust, D. F., Chittleborough, G., and Mamiala, T. L., (2003). The Role of Submicroscopic and Symbolic Representations in Chemical Explanations. *International Journal of Science Education* 25: 1353–1368.