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Article

Learning Styles and Science Achievement of the Pilot and SPJ G-9 Students: Basis for Developing Differentiated Learning Instructions

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Abstract

The primary objective of this study is to the determine and analyze the learning styles and achievement in Science of the Pilot and SPJ Grade 9 students of Casimiro A. Ynares Sr. Memorial National High School in the Taytay, Rizal. This study employed two adopted research in gathering the information regarding the characteristics of learners. Sixty-two Grade 9 students served as participants of the study. Purposive sampling method was used in selecting the participants of the study from the existing school population. After administering the Grasha-Riechman Learning Style Instrument to the participants, it was revealed that 21 or 34% of the student respondents are dependent learners, 20 or 32% are collaborative learners, ten or 16% of the learners are independent, six or 9% of the class are competitive, five or 8% are participant and none of the of the respondents are avoidant learners. The second instrument administered to the students respondents was the VARK questionnaire, after the tabulating the results of the survey it was revealed that 42 or 68% of the respondents are kinesthetic learners, 15 or 24% are audio leaners, 3 or 5% prefer learning through reading and writing and the remaining 2 or 3% are visual learners. Results indicates that there is a significant difference between the achievement of learners when grouped based on the Grasha-Riechmann learning style. On the other hand, there is no significant difference among the achievement of learners when grouped based on the VARK learning modalities. In the light of the findings of this research, it is recommended that teachers should assess the learning styles and modalities of their students to be able to create a teaching-learning plan that best suit their needs and must consider that learning acquisition varies, instructions, activities, and learning materials to learners must be differentiated.

Keywords: achievement, differentiated instruction, learning styles, learning modalities, Science

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I. INTRODUCTION

A constant struggle for teachers in all disciplines of education is to ensure that students not only understand the concepts and skills that they are taught, but also that they can analyse and apply those learning into different situations that arise in their lives. Education is a continually changing discipline, new researches are constantly considering new methods to improve student gains in the classroom and increase overall knowledge retention. In order for students to be successful in school and in life, teachers need to constantly revise their teaching practices based on new methods that are introduced in order to ensure that students are engaging, investing and increasing their academic achievements (Lamina, 2020).

The ways in which an individual characteristically acquires, retains, and retrieves information are collectively termed the individual's learning style. Learning styles are collections of personal characteristics, strengths, and preferences, describing how individuals acquire, store, and process information. Learning style factors include information processing modes, environmental and instructional preferences, cognitive capabilities, and personality features. Individuals may demonstrate a balance among the dimensions of a learning style, or they may show strengths and weaknesses. Strengths and weaknesses may have implications for course success, and eventually for career choice.

Students learn in many ways—by seeing and hearing; reflecting and acting; reasoning logically and intuitively; memorizing and visualizing. Teaching methods also vary, every teacher has their own teaching style depending on the nature of their clientele. Some instructors lecture, others demonstrate or discuss, some focus on rules and others on examples, some emphasize memory and others understanding. Mismatches often occur between the learning styles of students in a classroom and the teaching style of teachers, with unfortunate effects on the quality of the students' learning and on their attitudes toward the class and the subject. How much a given student learn in a class is governed in part by that student's native ability and prior preparation but also by the compatibility of his or her characteristic approach to learning and the teachers characteristic approach to teaching.

Serious mismatches may occur between the learning styles of students in a class and the teaching style with unfortunate potential consequences. The students tend to be bored and inattentive in class, do poorly on tests, get discouraged about the course, and may conclude that they are no good at the subject of the course and give up. Teachers, confronted by low test grades, unresponsive or hostile classes, poor attendance, and dropouts, may become overly critical of their students (making things even worse) or begin to question their own competence as teachers (Felder & Henriques, 1995).

By recognizing and understanding the learning styles of students, teachers can use techniques better suited for the students. This improves the speed and quality of learning. Many people have argued that style is important in teaching. Teaching style represents those enduring personal qualities and behaviours that appear in how teachers conduct classes. It is something that defines guides and directs the instructional processes, and that has effects on students and their ability to learn (Amin & Rajaei, 2013).

Research Questions

The main purpose of this study is to determine and analyze the learning styles of the Grade 9 Pilot and SPJ students of Casimiro A. Ynares Sr. Memorial National High School specifically it sought find answer to the questions:

1. What is the learning style of the respondents as revealed by:
    a. Grasha-Riechmann Student Learning Style Inventory
    b. VARK Learning Modalities
2. What is the achievement in Science:
    a. of the independent, avoidant, collaborative, competitive and participant learners?
    b. of the visual, auditory, reading/writing and kinesthetic learners?
3. Is there any significant difference between the achievement of learners when group according to:
    a. Grasha-Riechmann Student Learning Style Inventory
    b. VARK Learning Modalities

Research Hypotheses

Based on the formulated specific statements of the problem, a null hypothesis was formulated:

1. There is no significant difference in the achievement of learners based on Grasha-Riechmann Student Learning Style Inventory and VARK Learning Modalities.

II. METHODOLOGY

Research Design

The study was exploratory in nature. A descriptive survey was adopted using the correlational-comparative research design. Information on the learning style and the achievement in Science were gathered in a natural classroom setting. This design is the most appropriate design for the study considering the objective of the research is to describe the learning style characteristics of the students and look for the relationship and difference in their achievement.

The study is expected to provide information to guide any intended intervention to restrain the explored learner characteristics to improve student achievement upon finding that the variables studied are associated.

Descriptive research is used to describe characteristics of a population or phenomenon being studied. It does not answer questions about how/when/why the characteristics occurred. Rather it addresses the "what" question (what are the characteristics of the population or situation being studied?). The characteristics used to describe the situation or population is usually some kind of categorical scheme also known as descriptive categories. The principal aim of the method is to

determine the nature of the situation of the problem as it exist at the time of the study in a systematic manner and to explore the cause and effect of the particular circumstances underlying in the problem.

Conceptual Paradigm

Based upon the theories that were considered by the researcher, a conceptual paradigm was adapted, which involves two elements, the independent and dependent variables. Factors 1 and 2 are the independent variables and the achievement or the final grade in science of students is the dependent variable. The independent variable are the variables that affects (or is presumed to affect) the dependent variable under study and is included in the research design so that its effect can be determined; sometimes called the experimental or treatment variable. The dependent variable is a variable that is affected or expected to be affected by the independent variable; also called criterion or outcome variable.

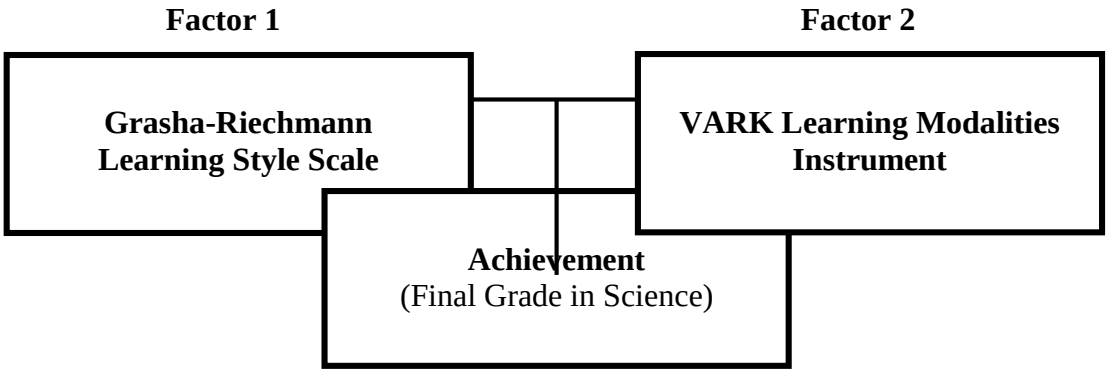

***Figure* 1.** The Conceptual Paradigm of the Study

The Research Participants

The students that participated in this study are Grade 9 students of Casimiro A. Ynares Sr. Memorial National High School (CAYSMNHS), a public junior high school located at the municipality of Taytay in the province of Rizal. Purposive sampling method, a non-probability sampling technique was used in selecting the participants of the study from the existing school population.

For school year 2019-2020, Casimiro A. Ynares Sr. Memorial National High School has 14 sections in the Grade 9 level which are: Acacia, Aguho, Apitong, Banaba, Dao, Ipil-ipil, Kamagong, Lauan, Mahogany, Molave, Mulawin, Narra, Talisay and Yakal. Twelve out the fourteen sections are heterogenous, one section (Aguho) is under the special program for journalism while the other one is the pilot section (Acacia). Sections Acacia and Aguho served as the participants of this study, the researcher handled both sections at the time the study is being conducted. A total of 62 students participated in the study which is composed of 27 male students and 35 female students. The study was conducted in the second quarter of the specified school year. The demographic characteristics of the respondents are resented in the table below.

Table 1. The Demographic Characteristics of the Research Participants

Characteristics N=62	**Frequency**	**Percentage (%)**
Section		
Acacia (Pilot Class)	36	58.00
Aguho (SPJ Class)	26	42.00
Sex		
Male	27	44.00
Female	35	56.00

Research Instrument

In the conduct of the study, the researcher used two research instruments: (1) Grasha-Riechman Learning Style Scale and the (2) VARK Model Instrument. Both research instruments were outsourced from online sources and adopted for the study.

Grasha-Riechman Learning Style Instrument

The instrument was developed by Anthony F. Grasha and Sheryl W. Riechmann in 1974. It is a 60 item, five-point scale, self-assessment tool that was used to evaluate the learning style of students. The students responded to the instrument by checking one of the five categories ranging from Strongly Agree (5), Agree (4), Undecided (3), Strongly Disagree (2) and Disagree (1). According to Grasha and Riechman there are six learning styles that defines a student based on how they perform in school and the way they perceived learning these are independent, avoidant, collaborative, dependent, competitive and participant. According to the research conducted by Baneshi, Karamdoust, and Hakimzadeh (2014) the reliability of each subscale with a Cronbach alpha coefficient ranging from 0.58 to 0.80, was at an acceptable level.

VARK Learning Modalities

The acronym VARK is used to describe four modalities of student learning that were described in a 1992 study by Neil D. Fleming and Collen E. Mills. These learning styles; visual, auditory, reading/writing and kinesthetics were identified after thousands of hours of classroom observations. The simplified VARK learning style questionnaire (younger version) was used in this study, it is composed of a 15 multiple choice question where the students could encircle more than one of the options if a single answer does not completely match their perception. Based on the study conducted by Wong and Chin (2018) the VARK learning style questionnaire has an acceptable level of reliability with a Cronbach alpha coefficient ranging from 0.69-0.84 on each subscale.

Data Analysis

The gathered data were grouped, tabled and carefully organized and interpreted by the researcher for the drawing of conclusions. Frequency, percentage and ranking are all reflected in tabular and graphical forms. Gathered raw data were statistically processed and analyzed using MS EXCEL software. Descriptive and inferential statistics were used to treat the data for the basis of interpretation. The Analysis of Variance (ANOVA) was used to compare the achievement in science of the student respondents across the VARK learning modalities and Grasha-Riechman Learning Style. All test of relationships and differences were evaluated at 0.05 level of confidence.

III. RESULTS and DISCUSSION

Learning Style of the Respondents Based on the Grasha-Riechman Learning Style Instrument

After administering the Grasha-Riechman Learning Style Instrument to the two Grade 9 sections it was revealed that 21 or 34% of the student respondents are dependent learners that shows a little intellectual curiosity towards the lesson and who learn only what is required to them, they also view their teachers and peers as sources of structure and support and look to authority figures for specific guidelines on what to do. Meanwhile, 20 or 32% are collaborative learners or typical students who feel they can learn by sharing ideas and talents, they cooperate with teachers and like to work with other students. Ten or 16% of the learners are independent students who like to think for themselves and are confident in their learning abilities, they prefer to learn the content that they feel is important and would prefer to work alone on course projects than with other students. Furthermore, 6 or 9% of the class are competitive students who learn material in order to perform better than the others in the class, they believe that they must compete with other students in a course for the rewards that are offered. Finally, 5 or 8% are participant who enjoys going to class and take part in as much of the class activities as possible. On the other hand, none of the of the respondents are avoidant learner or not enthusiastic about attending classes and do not participate with other students and teachers in school. The distribution is presented on the figure below:

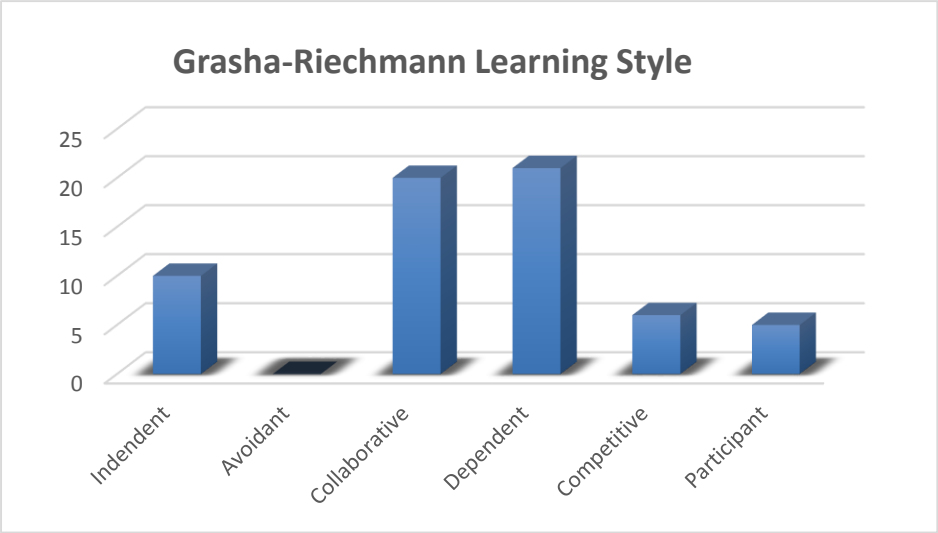

***Figure* 2**. The Learning Style of Respondents

Leaning Modalities of Respondents based on the VARK Questionnaire

The second instrument administered to the students respondents was the VARK questionnaire, after the tabulating the results of the survey it was revealed that 42 or 68% of the respondents are kinesthetic learners that learns through their sense of touch as well as through physically doing things or by watching demonstration or movements. Meanwhile 15 or 24% are audio leaners, they learn best through listening and speaking. On the other hand, 3 or 5% prefer learning through reading and writing. The remaining 2 or 3% are visual learners that learns best when information is presented visually in a picture or design format.

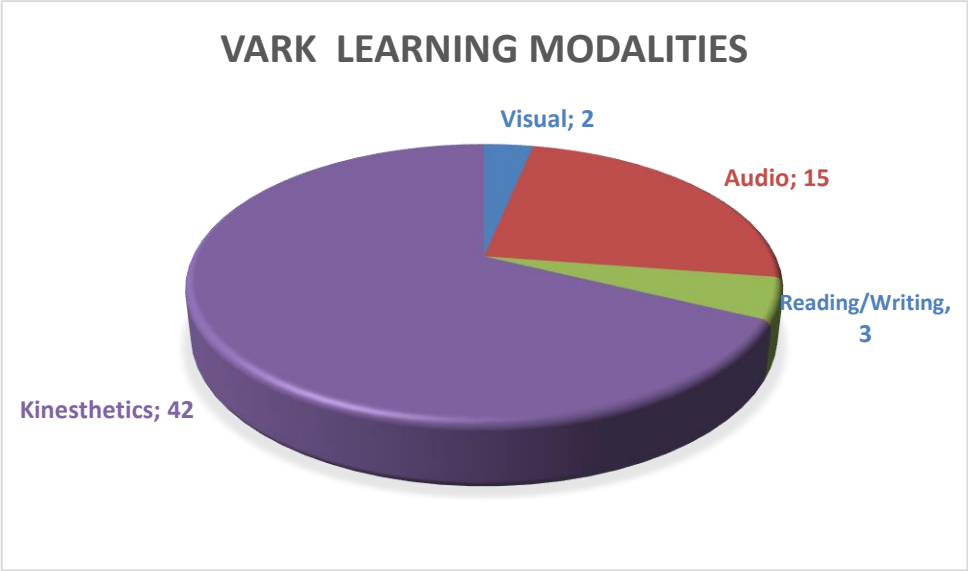

***Figure* 3.** The Distribution of Learning Modalities of the Respondents

Learners' Achievement with Respect to Learning Style and Modalities

Table 2 presents the frequency counts of the students based on Grasha-Riechmann learning style inventory, the highest and lowest final grade in science and some descriptive statistics. As shown in the table the highest grade in the class was obtained by a collaborative student and the lowest grade obtained was from a dependent student. The overall mean grade of the respondents is 94.39 and the standard deviation is 1.43.

Table 2. Final Grade in Science and with Respect to Learning Style

Learning Style	N	Achievement		Mean	Standard Deviation
		Minimum	Maximum		
Independent	10	93	96	94.70	1.16
Avoidant	0	0	0	0.000	0.00
Collaborative	20	92	97	95.05	1.15
Dependent	21	90	95	93.86	1.53
Competitive	6	91	94	93.17	1.33
Participant	5	93	96	95.00	1.22
Overall	62	90	97	94.39	1.43

The data shown on Table 3 is the frequency counts of the students based on VARK learning modalities, the highest and lowest final grade in science and some descriptive statistics. As presented in the table the highest grade in the class was obtained by an auditory student and the lowest grade obtained was from a kinesthetic student.

Table 3. Final Grade in Science and with Respect to Learning Modalities

Learning Modality	N	Achievement		Mean	Standard Deviation
		Minimum	Maximum		
Visual	2	95	95	95.00	0.00
Auditory	15	93	97	94.93	1.07
Reading	3	92	95	93.33	1.53
Kinesthetic	42	90	96	94.24	1.51
Overall	62	90	97	94.39	1.43

Table 4 shows the summary of statistics for the one-way analysis of variance to determine if there is significant difference across the learning style of students and their achievement in Grade 9 science. As shown in Table 4, the computed f-value is 3.01 with a probability of 2.38. which is less than the F-critical of a = 0.05. This clearly indicates that there is a significant difference between the achievement of learners when grouped based on the Grasha-Riechmann learning style. This implies that the learning style of students have an effect on their achievement.

Table 5 presents the summary of statistics for the one-way analysis of variance to determine if there is significant difference across the learning modalities of students and their achievement in Grade 9 science. As shown in Table 5, the computed f-value is 1.80 with a probability of 2.76. which is less than the F-critical of $a = 0.05$. This indicates that there is no significant difference among the achievement of learners when grouped based on the VARK learning modalities. This implies that the learning modality of the learners have no effect on their achievement on science.

Table 4. One Way Analysis of Variance (ANOVA) of Students' Achievement with Respect to Learning Style

ANOVA						
Source of Variation	***SS***	***df***	***MS***	$F_{computed}$	***p-value***	***a = 0.05*** F_{crit}
Between Groups	26.46	5.0	5.29	3.01	0.01	2.38
Within Groups	98.45	56	1.76			
Total	124.92	61				

Table 5. One Way Analysis of Variance (ANOVA) of Students' Achievement with Respect to Learning Modalities

ANOVA						
Source of Variation	***SS***	***df***	***MS***	$F_{computed}$	***p-value***	***a = 0.05*** F_{crit}
Between Groups	10.630	3	3.54	1.80	0.16	2.76
Within Groups	114.29	58	1.97			
Total	124.92	61				

IV. CONCLUSION and RECOMMENDATIONS

Conclusions

Based from the summary of findings the corresponding conclusions were drawn.

1. There is a significant difference between the performance of the student respondents when group according to their learning style, this is revealed by the test conducted to them.
2. Collaborative students performed better compared to the other group of students as revealed by the tabulation of their achievement in science.
3. The learning modalities of students as revealed by the VARK questionnaire has no effect on the student's achievement in science because they did not perform significantly different among each other as revealed by the test conducted.

Recommendations

Based on the findings of the study and conclusions drawn, the following recommendations are hereby recommended:

1. Additional research needs to be conducted to confirm the findings of this study. Other learner characteristics should be included aside from those included in this study.
2. Teachers should assess the learning styles and modalities of their students to be able to create a teaching-learning plan that best suit the needs of learners.
3. Teachers must consider that learning acquisition varies. So, giving instructions, activities, and learning materials to learners must be differentiated.
4. Teachers should understand and know their students deeply. In order to plan how to teach the students or ways to present a subject in an interesting manner, a teacher needs to know what motivates and how the students learn, what background the students are bringing to the classroom, as well as the students interests and study habits.

REFERENCES

Abidin, M. J. (2012). Learning styles and overall academic achievement in specific educational system. Kuala Lumpur: University Sains Malaysia.

Amin K. & Rajaei, M. (2013). Impact of students' style of learning on their preferred style of learning. *Journal of Educational Psychology.*

Baykul, Y. (2010). A validity and reliability study of Grasha-Riechmann student learning style. Istanbul: University of Yeditepe.

Bostrom, R. P., Olfman, L., & Sein, M. K. (1990). Th e importance of learning style in end-user training. *MIS Quarterly*.

Bonham, L. A. (1988). Learning style use: In need of perspective. *Lifelong Learning.*

Department of Education (2013). K to 12 Curriculum Guide in Science. Pasig City:DepEd.

Department of Education (2014). Science Module Grade 9. Pasig City: DepEd.

Department of Education (2016). DepEd Order 42 series 2016. Pasig City: DepEd.

Dunn, R. (2011). Learning style/teaching style should they, can they be matched? New York: Educational Leadership.

Ferrier, M. A. (2007). The effects of differentiated instruction on academic achievement in a second-grade science classroom.

Flemming, N. (2001). Visual, auditory and kinesthetic (VAK) learning style model. Retrieved from https://martimurphy.com/pdf/VAK_Learning_Style_Model.pdf.

Felder, R. M & Henriques, E. R. (1995). Learning and teaching styles in foreign and second language education. *Foreign Language Annals.*

Fisher B. & Fisher L. (2011). Styles in teaching and learning. Colorado: Colorado Department of Education.

Fleming, N.D. and Mills, C. (1992). VARK a guide to learning styles. Available at: www.vark-learn.com/English/index.asp

Grasha, A.F. (1996). Teaching with style: A practical guide to enhancing learning by understanding teaching and learning style. Pittsburgh: Alliance publishers.

Grasha A. F, Riechmann S.W. (1989). A rational to developing and assessing the construct validity of a student learning styles scale instrument. *Journal of Psychology*.

Izadi S. & Mohammadzadeh R.A. (2008). Investigating the relationship between learning styles, characteristics and performance students, Daneshvar; 14(27), 15-30

Khalid, R. (2013). *Learning styles and academic achievements among arts and sciences students*. Kuala Lumpur: Universiti Utara Malaysia.

Lamina, O. G. (2020). Peer-led team learning (PLTL), student engagement and achievement in science. *Social Science Research Network.*

Logan, K., & Tomas P. (2002). Learning Style of Distant Education Learning. United Kingdom: UK Open University.

Uzuntiryaki, E. (2007). Learning styles and High School Students' Chemistry Achievement. Turkey: Middle East Technical University.