Science Laboratory Interest and Preferences of Teacher Education Students: Implications to Science Teaching

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Abstract *– One of the key components of effective Science education is the conduct of inquiry-based laboratory activities which support and reinforce concepts, theories and laws learned in the classroom. This descriptive-correlational study aimed to describe the Science laboratory interest and preferences of teacher education students and their implications to Science teaching via a questionnaire. Data gathered were analyzed using frequency, percentage, weighted means and t-test for correlated samples. Results showed that students have very high interest in laboratory activities. They revealed in the interview that doing laboratory activities make them work and discover things on their own, enhance their skills, don't limit their explorations, make them feel excited and very eager, let them discover a lot about things, and create in them a deeper sense of learning whenever they perform. Students generally prefer structured (steps are given) and actual (hands-on) lab activities using commercial and improvised materials and done collaboratively or by group. Besides strictly observing lab rules and guidelines, students highly prefer separate laboratory rooms per Science subject, a laboratory room with a laboratory assistant and complete with essential features. Teachers who are, above all, personally intelligent, buoyant, fair, approachable, innovative, and who technically facilitate during experiments, give well-planned activities, are organized and orderly are also preferred. Correlation tests showed that students' grade in Science is not significantly correlated to their interest in laboratory activities but it is significantly correlated to the type of laboratory activities. Students' interest in laboratory activities is significantly correlated to their laboratory teacher characteristics.*

Keywords *– Science Laboratory, Interest, Preferences, Performance, Teacher Education Students*

INTRODUCTION

Teaching Science as a subject has always been associated with experimentation or laboratory work.

One of the key components of effective Science education is the conduct of laboratory or lab activities which supports and reinforces concepts, theories and laws learned in the classroom [1]. Experiences of laboratory work; feel of apparatuses, materials and natural phenomena; events; and working with hands are essential and vital parts of Science education. In this context, laboratory experiences mean direct experiences with the natural and physical world using tools and apparatuses accompanied by engagement with process and inquiry skills in Science [2]. [3] defines laboratory work as experiences in school settings where students interact with materials to observe and understand the natural world. These hands-on and minds-on activities are inquiry-based.

Scientific inquiry refers to the diverse ways in which scientists study the natural world and propose explanations based on the evidence gathered. It also refers to activities of students in which they develop knowledge and understanding of scientific ideas, as well as an understanding of how scientists study the natural world. Learning Science content cannot be separated from development of inquiry skills [2]. In fact, the Science in the K to 12 Curriculum as a whole is inquiry-based, emphasizing the use of evidence in constructing explanations.

Some laboratory activities have been designed and conducted to engage students individually, while others have sought to engage students into small groups and in large-group demonstration settings. According to the National Association for Research in Science Teaching (NARST), Science educators have believed that the laboratory is an important means of instruction in Science since late 19th century.

In the past decades, the Science laboratory has been given a central and distinctive role in Science education and teachers have agreed that rich benefits in learning

accrue from using laboratory activities [1]. Laboratory work helps students to have meaningful understanding about scientific concepts and enhances students' motivation to learn Science [5].

The great philosopher Confucius once said "I hear and I forget. I see and I remember. I do and I understand." Bruner, in his book titled The Process of Learning likewise specifies that "it is the underlying premise of laboratory exercises that doing something helps one understand it [6]. These two quotes also show how essential laboratory work is in learning. It is then inarguable that laboratory activities in Science education are very essential. The consensus of its importance makes it imperative for Science educators, school administrators and curriculum makers to understand aspects that connect the Science laboratory and students who are the center of the teaching-learning process.

Studies show that students' interest is directly associated with one's attitudes. The role of attitudes that includes one's interest concerning an academic subject is of great importance to the understanding and acquisition of knowledge. Physics has topics that are hard to understand by the learners and this problem reflects on the low interest and low performance of the students [7]. That is why it is suggested that in order for the students to be more interested, the teacher should employ some innovations and include activities which are of great help in arousing the interest and attention of students. Laboratory investigations are one of these innovations.

Several studies exposed that hands-on experiments help students to develop their creativity in problem solving, promote student independence, and improve scientific attitudes and Science process skills (SPS) [8, as cited by 16]. In Science education literacy, Science process skills (SPS) refer to the following six actions, in no particular order: observation, communication, classification, measurement, inference, and prediction. [9] studied 241 elementary school students' level of success on SPS and Science attitudes and they found out that the use of inquiry based teaching methods significantly enhance their SPS and attitudes. In a similar study, [10] found out that students who experienced hands-on activities showed higher interest in these activities than non-experienced students. Eventually, they found that the performance of various hands-on activities could influence students' interest differently. They also indicated that the quality of hands-on experiences showed positive correlations with students' interest in hands-on activities.

Improvement of SPS is integrated in laboratory applications, because students learn considerably to use SPS with the laboratory experiments. Laboratories also contribute to improving students' scientific thinking, observation, creative thinking, interpretation of events, data collection and analysis, and problem solving [11 and 12, as cited by 16].

The first-hand experiences obtained through experimental work imprints a permanent impression on the mind of the learners. The kind of experiences provided by the laboratory work cannot be replaced by any other task. Well-planned laboratory experiences have great potential to attract our young generation into the Science courses [13, as cited by 2]. Creating learning environment that encourages inquiry; engages them with meaningful laboratory experiences is of paramount importance to arouse and sustain their interest in Science. Engaged with the laboratory work, prospective Science teachers should be given ample opportunities to inquire, participate and practice in a collaborative set up with their peers and teacher educators [2]

It is a fact that the teacher is responsible in translating the curriculum into concrete learning experiences for he is the one directly involved in the instructional process. When provided with activities where students are actually engaged, they gain knowledge and understanding, develop habits and skills and acquire attitudes, appreciation and values. In teaching the interactive Science curriculum, the ideal teacher must help the students to learn not only how to answer but how to reflect on, characterize and discuss problems, and how they, on their own initiative, can form or find valid answers. It is learning how and not just what, in order that the learners do the work themselves and thus, have an experience of genuine democracy, where people not only have rights but also have responsibilities [14].

The above findings lead to the notion that teacher's characteristics have also bearing on students' attitudes. It was cited that students' attitude towards laboratory work is significantly correlated with their perception of their teachers' performance and their personality characteristics such as curiosity, perseverance, inclination, interest and readiness to do the laboratory work [15].

Science laboratory facilities and resources are also of great significance to laboratory teaching. In the study of [16] about the influence of hands-on Physics experiments on Scientific Process Skills according to prospective teachers' experiences, they pointed out that Physics instructors, whenever they need, may prepare syllabuses for Physics laboratory courses that include low cost materials instead of laboratory equipment to enhance their students' scientific process skills. It was

also cited in the study of [16] the findings of Sinan and Usak in 2011 who conducted a study in a well-equipped Biochemistry laboratory with 27 prospective Biology teachers that there is a positive relationship between students' Science process skills which are highly integrated in laboratory activities and their course achievement grades.

Instruction, therefore, must provide experiences and information from which learners can build new knowledge. Instruction helps to focus those processes so that the resulting knowledge is both valid and powerful. It is valid since it describes the world well and powerful in its sense of being useful and reliable for those students in many diverse settings [17].

In view of the above facts, the researcher conceptualized that the Science laboratory preferences of the students in terms of activities, room set-up, teacher characteristics and extent of observance of laboratory rules and guidelines affect their laboratory interest; their preferences and interest affect their performance in Science as shown in Figure 1 below. The study is anchored on the Rational Choice theory and the Theories of Interest [18]. The Rational Choice Theory assumes that an individual has preferences among the available choice alternatives that allow them to state which option they prefer. Preference is the view that one course of action or choice is more desirable than another. The theory focuses on the determinants of the individual choices since its basic premise is that aggregate social behavior results from the behavior of individual actors, each of whom is making their individual decisions. The theory of interest, on the other hand, posits that interest in a certain topic, subject or domain, promotes a variety of desirable outcomes in children just like what it was found out that interest predicted deeper processing and better memory for texts [20] and level of learning [21].

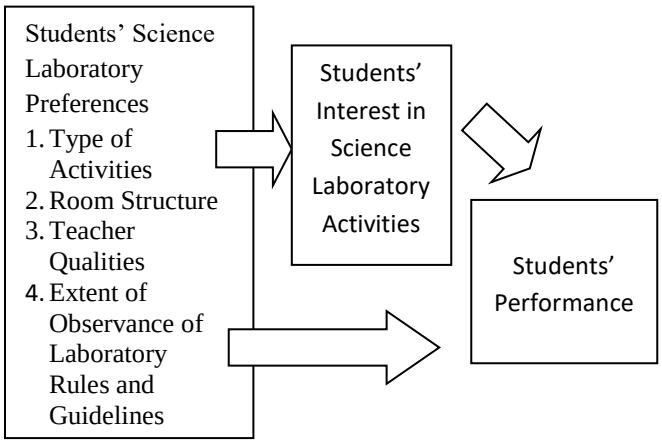

Figure 1. Conceptual Framework

Interest is divided into individual and situational interest. Individual interest refers to people's relatively long preference for a certain topic. It develops slowly and is associated with increased knowledge and value while situational interest is evoked by certain conditions in the environment. It represents a more immediate affective reaction that may or may not last. Both, individual interest and situational interest emerge from the interaction of a person with the environment [19].

With the innate concern for quality Science instruction and the desire to look into how laboratory activities in Science are affecting students' learning and how to address predetermined Science teachers' concerns regarding lab works in teaching, this study was conducted.

OBJECTIVES OF THE STUDY

This research work aimed to describe teacher education students' interest in Science laboratory activities, their lab preferences and the implications of these to Science teaching.

Specifically, it sought to determine the level of students' performance (grade) in Science, level of interest in laboratory activities and lab preferences (what type/s of Science laboratory activities and laboratory rooms do most students prefer, how they rated and ranked predetermined Science teacher characteristics, and the extent of their observance of Science laboratory rules and guidelines). It also sought to find out if there is a significant correlation between the students' interest in laboratory activities and their lab preferences; their performance in Science and their preferences; and their interest in lab activities and performance in Science. Implications of the results of the study to Science teaching were also drawn.

MATERIALS AND METHODS

This research work is descriptive-correlational in nature. A total of 132 Bachelor of Secondary Education major in Biological Science and Physical Science students of the Mariano Marcos State University College of Teacher Education, Laoag City, Philippines, who are purposively selected were involved in the study. At the Mariano Marcos State University College of Teacher Education, there are two Science programs under the Bachelor of Secondary Education (BSEd): BSEd major in Physical Science and BSEd major in Biological Science. Science subjects in these programs are taught with a combination of lecture and laboratory approaches.

A survey questionnaire was utilized as the main tool in gathering data followed by an informal interview to

supplement the data obtained in the survey. The questionnaire which was patterned from the one developed by [19] and checklists made by [22] and [1] was arranged and modified by the researcher to suit the need of this study and was internally validated by Science teachers. First part of the questionnaire is an agreement signed by the respondent signifying his/her willingness to be part of the study. It was also specified that all data shall be confidentially and generally analyzed and no result will bear one's individual identity.

Frequency counts, percentages, and the weighted means were the statistical tools used in analyzing the performance in Science of the students, their level of interest in lab activities and their preferences. In analyzing the correlations between the variables of the study, the Pearson's r and t-test for correlated samples were used. All data were processed using Microsoft Excel for Windows and the probabilities were facilitated by an online Free Statistics Calculator [23].

The computed means in the Interest Inventory scale were interpreted using the following range of interval point scores and their corresponding interpretations: 2.61 – 3.0 for Very High; 2.21 – 2.6 for High; 1.81 – 2.20 for Average; 1.41 – 1.80 for Low; and 1.00 – 1.40 for Very Low. The computed means in terms of the students' preference of types of laboratory activities and room were interpreted as follows: 2.35 – 3.00 for Agree/Highly Preferred; 1.68 – 2.34 for Undecided/Moderately Preferred; and 1.00 – 1.67 for Disagree/Not Preferred Lastly, the computed means in the laboratory rules and guidelines scale were interpreted as follows: 2.35 – 3.00 for Strictly Observed; 1.68 – 2.34 for Moderately Observed and 1.00 – 1.67 for Not Observed.

RESULTS AND DISCUSSION

Academic Performance of Teacher Education Students Major in Science

This study found out that out of 132 student respondents, most (41 or 31.06%) of them have a *very good* grade (1.75) followed by 2.00 or *good* (37 or 28.03%), and 1.50 or *outstanding* (26 or 19.70). One got a grade of 1.25 (*highly outstanding*) but no one got an *excellent* (1.00), *passed* (3.00), *conditional* (4.00) and *failure* (5.00) grades. There are three (2.27%) who got a *fair* grade (2.75). The average grade of 1.89 (rounded to 2.00) implies that the group of Science concentrators of the college is composed of students with good performance or level of academic achievement.

In an ocular inspection of the syllabi in Science subjects that the students have, the laboratory part of their performance ranges from 20% – 40% of their total grade which means that their overall laboratory performance has a considerable bearing in their final grade.

Table 1. Results of the survey on students' interest on laboratory activities. (N=132)

	Laboratory activities in Science	WM	Descriptive Interpretation
1	Are easy	1.92	Average
2	Are beneficial	2.88	Very High
3	Are exciting	2.76	Very High
4	Are simple	2.08	Average
5	Are clear	2.20	Average
6	Are good	2.80	Very High
7	Are satisfying	2.74	Very High
8	Are fun	2.63	Very High
9	Are easy to understand	2.32	Average
10	Are challenging	2.79	Very High
11	Are pleasant	2.67	Very High
12	Are interesting	2.87	Very High
13	Are attractive	2.70	Very High
14	Make me comfortable	2.47	High
15	Are useful	2.92	Very High
16	Involve work and play	2.41	High
17	Are organized	2.83	Very High
18	Are Safe	2.72	Very High
19	Made me relaxed	2.01	Average
20	Made me feel secure	2.39	Average
	Overall Mean	**2.66**	**Very High**

Generally, students have a *very high* level of interest towards laboratory activities as evidenced by the overall mean of 2.66 in Table 1. Most of the students revealed that laboratory activities in Science are beneficial, exciting, good, satisfying, fun, challenging, pleasant, interesting, attractive, useful, organized, safe, make them comfortable, and involve work and play. However, on an *average* level, they view the activities as neither hard nor easy, not simple but not complicated, comprehendible, clear but a bit confusing, sometimes relaxing and securing, but other times make them tensed and insecure. The activities are easy, clear and relaxing when the procedures are given and easy to follow. They are hard and a bit confusing when the procedures are hard to follow or when students are the ones making the experiment (make their own objectives, procedure and think of how they will present their data).

Further, one of the students remarked that she feels tensed every time she performs lab work with time limit and when she is not doing well an experiment. Another student said that she feels insecure every time she is confused and not doing an experiment right in the lab and when her classmates finish very fast while she is struggling in doing it.

Interview reveals that students found doing laboratory activities *very interesting* because these make them work and discover things on their own, enhance their skills and do not limit their explorations, excite and make them feel very eager specially in using or manipulating lab equipment and materials like chemicals, and let them discover a lot about things they pass by or ignore everyday which usually ordinary yet very useful. There is a creation of a deeper sense of learning among students whenever they perform such activities.

The findings above agree with the findings of [10] that students who experienced hands-on activities showed higher interest in these activities than non-experienced students.

In terms of the types of laboratory activities, Table 2 results reveal that the students do *not prefer* guided (no instructions given, just the problem) as evidenced by the mean of 1.16. Most of the students (100 or 75.8%) like to have structured activities because they said that with the steps given, experimenting is better, more organized and easy to understand. It is interesting to note the comments of two out of the five (3.79%) students who preferred guided activities wherein the problem to be investigated is the only one provided. They emphasized that this type of activities is better because it provides them a lot of possible things they could do to explore, triggers their interest, fosters their higher order thinking skills, more challenging since they modify and design procedure in order to achieve their own formulated objectives, learning is more learner-centered and inquiry-based.

Generally, the students *highly prefer* actual/non-virtual (hands-on/done using real materials) lab activities and done by group as indicated by the mean ratings of 2.35 and 2.36, respectively. It is notable however that most (65 or 49.2%) of the students would like to have a combination of virtual and non-virtual laboratory activities. They said that having both balances their experience. Virtual labs are done when there are no available materials in the school lab while non-virtual gives them hands-on experiences.

Meanwhile, 57 (43.2%) students would like to have actual or non-virtual activities because they pointed out that performing these personally gives a different effect, it gives experience and through experience, they can learn more - learning by doing. One of the nine (6.82%) students who prefer to have virtual activities said that for him, virtual labs are better because they can discover and learn things in the hi-tech instruction; while they manipulate a computer, at the same time, they learn.

Table 2. Students' preference on the type of laboratory activities.

	Types of Laboratory Activities	Mean	Descriptive Interpretation
I prefer laboratory activities which are			
1	Guided (no instructions given, just the problem)	1.16	Disagree/Not Preferred
2	Actual/Non-virtual (Hands-on/ Done using real materials)	2.35	Agree/Highly Preferred
3	Done by group (Execution and reporting is done by group)	2.36	Agree/Highly Preferred
4	Involve improvised equipment	2.10	Undecided/Moderately Preferred

During a laboratory activity, it is evident in Table 2 that generally, students have a *high preference* of doing experiment by group. There were 57 (43.2%) students who would like to do activities by group because they highlighted that when activities are done by group, generalizations are more valid and reliable because if data for a problem is analyzed, argued or debated by many, the interpretations are agreed with consensus of more heads and not only one. Besides, peer tutoring is very effective since more ideas and thoughts could be shared. One of the students said that in laboratory works that are done in groups, students' abilities are honed to collaborate effectively with others in carrying out complex tasks, to share their work, to assume different roles at different times, and to contribute and respond to ideas.

On the other hand, there were 65 (49.2%) students who want a mixed mode of doing an activity individually in one time and by group in other times. According to them, both individual and group activities undeniably address intra- and interpersonal intelligences. Further, if group labs promote cooperative or collaborative learning, individually done labs train students to be self-dependent and not to be dependent always to their group mates. Only ten (7.58%) students preferred to perform individually. They unanimously said that they can work and learn better that way.

The result above is supported by [2] that creating a learning environment that encourages inquiry; engages

students with meaningful laboratory experiences is of paramount importance to arouse and sustain their interest in Science. Engaged with the laboratory work, prospective Science teachers should be given ample opportunities to inquire, participate and practice in a collaborative set up with their peers and teacher educators. Likewise, [14] said that it teachers must promote learning how and not just what, in order that the learners do the work themselves and thus, have an experience of genuine democracy, where people not only have rights but also have responsibilities.

Moreover, students indicated a *middle preference* [mean=2.10] on the use of standardized/commercial equipment in the lab versus the improvised equipment/materials. They pointed out that learning must not only depend on the use of provided materials but also on recycled materials made by creative and scientifically minded students. Thirty-three (25%) students signified that they *prefer* experimenting with improvised equipment because according to them, this will address the problem of unavailability or scarcity of lab materials and enhances their critical thinking as well as creativity. Only 12 (9.09%) students say they like activities using standardized equipment better because they stressed that doing such will yield more accurate and reliable results.

Table 3. Results of the survey on students' preference of a Science laboratory room.

Types of Laboratory Room	Mean	Descriptive Interpretation
I prefer a		
1. Lecture room is separated from the laboratory room.	2.31	Moderately Preferred
2. Laboratory room is also the lecture room.	1.93	Moderately Preferred
3. Separate laboratory room for every Science subject (i.e. Biology, Chemistry, Physics, Earth & Space)	2.73	Highly Preferred
4. Laboratory room with a laboratory technician/assistant.	2.38	Highly Preferred
5. Laboratory room complete with essential features (first aid kit, prep room/area, safety floors, storage room/cabinet, teacher's work/demonstration area, students' work area)	2.37	Highly Preferred
6. Laboratory room equipped with ICT tools	2.19	Moderately Preferred

It is presented in Table 3 below that students *highly prefer* a separate lab room for every Science subject (Mean=2.73), a lab room with a lab technician/assistant (Mean=2.38), and a lab room complete with essential features (Mean = 2.37). They pointed out that, when the lecture and lab rooms are separate per subject, it will be more conducive for learning since students will be safer for they will not be smelling chemicals, materials/equipment are organized or in order and safe from being played at by students.

Students asserted that the presence of a lab technician also ensures maximum safety in the lab. Likewise, if the lab room is equipped or complete with essential features, it is neat to see besides being a safe and interesting place to be at when learning.

Table 4. Results of students' preferences (ratings and voted ranking) on predetermined Science teacher characteristics. (N=132)

I prefer a teacher who is	Mean	DI	Rank (Voted)
1. Buoyant (mentally alert & very imaginative)	2.89	HP	2
2. Intelligent	2.68	HP	1
3. Self-confident	2.86	HP	
4. Compassionate	2.83	HP	
5. Fair	2.94	HP	3
6. Emotionally stable	2.86	HP	
7. Innovative	2.81	HP	4
8. Reliable (holds anger when provoked & punctual in attendance)	2.80	HP	
9. Tolerant	2.28	MP	
10. Humorous	2.49	HP	
11. Democratic	2.51	HP	
12. Approachable	2.89	HP	5
13. Simple	1.86	MP	
Technical Skills			
14. Time conscious	2.77	HP	
15. Organized and orderly	2.94	HP	3
16. Gives well planned activities	2.82	HP	2
17. Explains experiments	2.84	HP	
18. Uses improvised materials	2.52	HP	
19. Supervises/Facilitates/Assists students during experiments	2.83	HP	1
20. Properly implements laboratory rules and procedure	2.87	HP	
Overall Mean	2.71	HP	

HP- Highly Preferred; MP- Moderately Preferred; DI – Descriptive Interpretation

In terms of students' preference (ratings and ranking) of pre-determined characteristics of their lab teachers, findings also reveal that students would like their Science laboratory teachers to be above all intelligent, buoyant, fair, approachable and innovative in personal qualities. In terms of technical skills, they prefer someone who facilitate during experiments, give well-planned activities, are organized and orderly.

They also *highly prefer* teachers who are self-confident, compassionate, emotionally stable, reliable, humorous, democratic, time conscious, explaining experiments, using improvised materials and properly implement lab rules and procedure. According to them, if you have a skilled and learned teacher, that teacher can give the best to the students in the cognitive, psychomotor and affective domains. They further revealed that they love a motivating teacher who is passionate, knowledgeable and practical in such a way that he/she contextualizes or incorporates lessons in the lives of students.

It is notable that the students *moderately prefer* a tolerant and simple teacher which means that they prefer their teacher to be tolerant but also strict at times, simple but also stylish or fashionable at times. Teachers should then observe such characteristics in moderation.

Table 5. Students' extent of observance of laboratory rules and guidelines. (N = 132)

No	Laboratory Guideline	Mean	Descriptive Interpretation
1	Read safety and fire alarm posters and follow the instructions during an emergency.	2.51	Strictly Observed
2	Know the location of the fire extinguisher, eye wash, and safety shower in your lab and know how to use them.	2.57	Strictly Observed
3	Check your glassware for cracks and chips each time you use it.	2.49	Strictly Observed
4	Know the building evacuation procedures.	2.36	Strictly Observed
5	Do not touch anything with which you are not completely familiar.	2.42	Strictly Observed
6	Never eat, drink, or smoke while working in the laboratory.	2.54	Strictly Observed
7	Read labels carefully.	2.61	Strictly Observed
8	When handling dangerous substances or working with hazardous materials and/or equipment, wear gloves, laboratory coats, and safety shield or glasses	2.61	Strictly Observed
9	Keep the work area clear of all materials except those needed for your work. Clean up your work area before leaving.	2.63	Strictly Observed
10	Properly dispose used materials.	2.62	Strictly Observed
11	Avoid ingesting, inhaling or touching any chemical. Treat every chemical as if it were hazardous.	2.67	Strictly Observed
12	Wash hands before leaving the lab and before eating.	2.61	Strictly Observed
13	Make sure all chemicals are clearly and currently labeled with the substance name, concentration, date, and name of the individual responsible.	2.49	Strictly Observed
14	Use volatile and flammable compounds only in a fume hood. Procedures that produce aerosols should be performed in a hood to prevent inhalation of hazardous material.	2.45	Strictly Observed
15	Clean up spills immediately.	2.37	Strictly Observed
16	Never do unauthorized experiments.	2.57	Strictly Observed
17	Never work alone in laboratory.	2.58	Strictly Observed
18	Do not leave an on-going experiment unattended.	2.56	Strictly Observed
19	Notify your instructor immediately in case of any injury, fire or explosion, spill, or equipment failure.	2.58	Strictly Observed
20	Never use open flames in laboratory unless instructed.	2.56	Strictly Observed
21	Maintain unobstructed access to all exits, fire extinguishers, electrical panels, emergency showers, and eye washes.	2.63	Strictly Observed
22	If leaving a lab unattended, turn off all ignition sources and lock the doors.	2.56	Strictly Observed
	Overall Mean	2.55	Strictly Observed

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As regards to observance of lab rules and guidelines, findings in Table 5 above show that students *strictly observe* all laboratory rules and guidelines. This could be explained by their high preference of a teacher who properly implements laboratory rules and procedures and a reflection of their feelings that they are secured whenever they do activities. This could also imply that their teachers in the lab really impose strict observance of lab rules and guidelines. This result is reflected in one of the students' remark stating that they really need to follow rules and guidelines in the labs because by strictly following all rules in the lab, safety is assured for all students especially in handling chemicals and complicated equipment resulting to a careful and meaningful (accurate and reliable) lab experience.

Correlation Between Variables of the Study

Results of the tests of correlations between the variables of the study are presented in Tables 6, 7 and 8 below.

It is evident in Table 6 that the only lab preference variable that is significantly correlated to the students' interest in lab activities are the characteristics of the Science lab teacher because the computed probability of 0.0049 of the t-value of 0.243 is lower than 0.01, therefore it is significant at 0.01 level of significance. This adheres to what was cited that students' attitude towards laboratory work is significantly correlated with their perception of their teachers' performance and their personality characteristics such as curiosity, perseverance, inclination, interest and readiness to do the laboratory work [11]. As pointed out, the teacher is responsible in translating the curriculum into concrete learning experiences for he is the one directly involved in the instructional process. In teaching the interactive Science curriculum, the ideal teacher must help the students to learn not only how to answer but how to reflect on, characterize and discuss problems, and how they, on their own initiative, can form or find valid answers [14].

Table 7, on the other hand, presents that the only lab preference variable that is significantly correlated to the performance (grade) of the students in Science is their preference in terms of the types of lab activities they perform because the computed probability of 0.0486 of the t-value of -0.172 is lower than 0.05, therefore it is significant at 0.05 level of significance.

The above finding agrees to what is pointed at by [14] that when students are provided with activities where they are actually engaged, they gain knowledge and understanding, develop habits and skills and acquire attitudes, appreciation and values. Further, [10] indicated that the quality of hands-on experiences showed positive correlations with students' interest in hands-on activities. Likewise, [13, as cited by 2] noted that first-hand experiences obtained through experimental work imprints a permanent impression on the mind of the learners and that well-planned laboratory experiences have great potential to attract our young generation into the Science courses.

Table 6. Coefficient of correlation (r_{xy}) between the students' interest in lab activities and each of the lab preference variables. (N = 132)

Lab Preference Variable	Dependent Variable: Interest in Lab Activities	Probability (two-tailed)
Type of Lab Activities	-0.007	0.9365
Type of Lab Rooms	0.065	0.4590
Lab Teacher's Characteristics	0.243**	0.0049
Extent of observing Lab Rules & Guidelines	0.128	0.144

***significant at the 0.01 probability level*
**significant at the 0.05 probability level*

Table 7. Coefficient of correlation (r_{xy}) between the students' performance (grade) and each of the lab preference variables. (N = 132)

Lab Preference Variable	Dependent Variable: Grade in science	Probability (two-tailed)
Type of Lab Activities	-0.172*	0.0486
Type of Lab Rooms	0.014	0.8734
Lab Teacher's Characteristics	-0.009	0.9180
Extent of observing Lab Rules & Guidelines	0.015	0.8640

***significant at the 0.01 probability level*
**significant at the 0.05 probability level*

Results of the test of correlation between the academic performance (grade) of the students and their interest in laboratory activities as presented in Table 8 reveal that the correlation is not significant at 0.05 level of significance because the computed probability of 0.3499 of the t-value of 0.082 is higher than 0.05. It must be noted, however that the relationship is not zero, meaning, the weak correlation signifies that laboratory interest has an effect on the performance (grades) of students in Science. According to [9], the use of inquiry-based teaching methods significantly enhanced students' Science Process Skills (SPS) and attitudes. Improvement of SPS is integrated in laboratory applications, because students learn considerably to use SPS with the

laboratory experiments. [11 and 12, as cited by 16] said that lab works contribute to improving students' scientific thinking, observation, creative thinking, interpretation of events, data collection and analysis, and problem solving. It must also be noted that students' grade in Science, as reflected in the syllabi the students have, has weight of 70 – 80% from lecture and 20 – 30% from laboratory portion.

Table 8. Coefficient of correlation (r_{xy}) between the students' academic performance (grade) in Science and their interest in laboratory activities (N = 132).

Independent Variable	Dependent Variable: Grade in science	Probability (two-tailed)
Interest in Lab Activities	0.082	0.3499

***significant at the 0.01 probability level*
**significant at the 0.05 probability level*

The foregoing findings about correlations of variables are supported by the gathered responses of students during the interview. One student pointed out that doing lab works do positive effects on her grades. Like for example, they we have a test about one certain topic and that certain topic was done or discovered by them in an experiment this serves as an advantage for her to get a high score because she can remember the concepts better when she experiences it. If the question is about process, she can easily answer the question.

Another student said that doing experiments is an effective way because you learn at the same time have fun. If the activity is hands-on, retention of concepts in their memory is better so that their intellect is honed better. This is because performing laboratory activity is an example of "learning by doing".

Last but not the least, another student said that their class in Science is cooler when laboratory activities are done because they can perform experiments that they never thought they can do in their entire life and it's so cool. This can catch their attention and be more interested in learning and these are signs that they have focus. Accordingly, she stressed that since they have that interest in learning, they have better grades.

CONCLUSION AND RECOMMENDATION

Teacher Education students consider the laboratory part of every Science subject very important and very interesting since these make them work and discover things on their own, enhance their skills and do not limit their explorations, excite and make them feel very eager specially in using or manipulating lab equipment and materials like chemicals, and let them discover a lot about things they pass by or ignore everyday which usually ordinary yet very useful. There is a creation of a deeper sense of learning among students whenever they perform such activities. These ideas confirm what is posited by the theory of interest that interest in a certain topic, subject or domain, promotes a variety of desirable outcomes in children.

In performing experiments, students highly prefer structured laboratory activities (steps are given and lower level of inquiry) over guided (no instructions given, just problem and higher level of inquiry) activities. They also prefer a separate lab room per Science subject, lab room with laboratory assistant and complete with essential features. They identified top five personal characteristics of a preferred lab teacher and these include being intelligent, buoyant, fair, approachable and innovative and the top three technical characteristics include facilitates during experiments, gives well-planned activities, organized and orderly. They observe strictly lab rules and guidelines. These findings show what the rational choice theory says that students have views that one course of action or choice is more desirable than another.

There is a significant correlation between students' performance in Science and the type of laboratory activities. Students' interest in lab activities is also significantly correlated to the characteristics of the Science lab teacher.

The findings above imply that Science teachers should conduct laboratory activities because students are highly interested with these. Students view experiments as worthwhile means of learning because they claim that they learn better when they explore by themselves or do hands-on with a collaborative group.

The study revealed that the type of laboratory activities correlates positively with students' grades, thus, this can be a very good avenue for researchers and educational experts to suggest programs or activities to enhance the teaching of Science.

The results of this study provide teachers a clear picture of how students find laboratory activities as an interesting avenue of learning and how their interest, lab preferences and performance (grade in Science) affect each other. Data shows that students' performance significantly correlates with the types of lab activities and that students generally prefer structured activities (steps are given) which are of the lower level of inquiry

rather than guided activities (no steps given, problems only) which are at a higher level of inquiry, but teachers must take note that there is a need to develop Science students who are critical and creative thinkers, hence, they need to think or devise materials and innovate techniques to enhance the level of inquiry of their learners by giving more guided and open inquiry activities without compromising students' interest towards doing lab activities.

The fact that students' interest in doing lab activities is significantly affected by their lab teacher's characteristics is indeed an eye opener for teachers. Every teacher is knowledgeable of the qualities of a good teacher but the result of this study for this aspect rings a bell. Teachers must take note of the results of this study and be informed of what characteristics to possess that motivate students to perform and learn better not only in the lab but also in the lecture portion of the Science subject they handle and be reminded to always implement strictly lab rules and guidelines.

In addition, the results of this study can give school administrators ideas on what must be done to improve Science instruction like making Science labs per Science subject separate, having separate lab room and lecture room which are equipped with essential features (i.e. preparation room, medicines, demonstration table, etc.), with lab assistant, and must be equipped with the needed Information and Communication Technology (ICT) tools. They can also encourage their teachers to attend trainings about inquiry-based Science teaching and lab management. Bottom line, students will be most benefitted for they will be provided a better hands-on and minds-on learning materials and environment (teachers and facilities).

In the light of the findings and implication to Science teaching mentioned above, it is highly recommended that Science teachers should take into consideration equipping themselves with the preferred characteristics by their students. They must not neglect or limit the conduct of variety laboratory activities in their Science classes and must always observe strict implementation of lab rules and guidelines. Researchers and educational experts must continue to suggest programs and activities and school administrators must continue to implement these as well as to initiate more ways to improve lab infrastructures and facilities as well as to address the training needs of their teachers that further ensure the delivery of a quality Science instruction.

Lastly, the results of the study could also stimulate other research enthusiasts to conduct comparative studies related to the Science laboratory. Future researchers may consider examining the correlation between students' level of inquiry as manifested in their lab activities and their performance in Science and in various learning contexts of which will continue to improve not only Science teaching practices, but other fields of education here and abroad.

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