Attitude towards Science Learning among Non-Science Majors

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Abstract

Science educators sometimes neglect the attitude of students towards science. Paying attention to the students' attitudes towards science plays a vital role in the teaching and learning process especially to non-science majors who sometimes dislike science as a subject. This paper examined the attitude towards science among 95 college students in the course on Environmental Science for Bachelor of Science in Hotel and Restaurant Technology (BS HRT). Three attitudinal variables were investigated using the Science Attitude Scale as modified from the Fennema-Sherman Attitude Scale. Results showed that students have moderately positive attitude towards science. In terms of gender, male has neutral attitude towards science while female has a moderately positive attitude towards science. There was no significant difference in the science attitude of male and female in every subcomponents: (1) Personal Confidence about Subject Matter: t (73.100) = 0.552, p = 0.583; (2) Usefulness of the Subject Content: t(77.571) = -0.838, p = 0.405; and (3) Perception of Teacher's Attitude: t(55.494) = 1.175, p = 0.245. There is no difference with regards to student's attitude towards science in terms of gender. On the other hand, there was a significant difference in the level of student's attitude in terms of usefulness of the subject content among students as determined by one-way ANOVA [F(2,92) = 4.265, p = 0.017]. Moreover, a Post Hoc Test of Multiple Comparison (Tukey HSD) was run and showed that there was a significant mean difference between BS HRT sections A and C which implies that students of these sections find science as a significant subject to learn and apply to their degree course. In conclusion, teachers need to devise a certain strategy to trigger the positive interest of the students to have a positive view of science that could improve the teaching-learning process in science education.

Keywords: Attitude in science; Academic performance; Environmental science; Interest; Motivation

Introduction

Attitude towards science plays a key role in students' learning. Attitudes towards learning science of non-science major students (e.g., the Bachelor of Science in Hotel and Restaurant Technology as referred in this study) is important to deepen their knowledge and skills to be applied in their course degree program and in real life situations. Having a positive attitude towards science enables students to develop an interest in scientific investigation and determine that science could even be a fun and enjoyable subject. In contrary, negative attitudes towards science affect the extent of scientific literacy and this is often a priority that science educators got to address. Scientific literacy is becoming more important in our day to day living. During the 2004 US Presidential election, as an example, it's possible that the

majority of the overall public didn't understand the controversial scientific issues that were debated, like heating and research project. Therefore, producing scientifically literate individuals would benefit society on many levels.

Concern and interest in science class is predicated on a somewhat simplistic notion that 'the best milk comes from contented cows' (Fraser, 1982). There are research studies which showed that attitude can affect academic performance in science. This is often best articulated by Shrigley (1990), who argued that attitude and skill scores are often expected to correlate moderately. Likewise, the measures utilized within the TIMSS study, albeit somewhat unsophisticated, have found a uniform relationship between attitude and achievement (Beaton et al., 1996). Weinburgh's (1995) meta-analysis of the research suggested that there's only a moderate correlation between attitude towards science and achievement, although this correlation is stronger for top and low ability girls indicating that, for these groups, 'doing well' in science is closely linked with 'liking science'. Similar findings have appeared within the most study conducted by Jovanic and King (1998) as well as by Osborne and Collins (2000). Piburn and Baker (1993) argued that logically low student's enrolment in science subjects could even be reversed by changing the negative attitude of scholars towards science using an appropriate attitude change model.

Rationale and Problem Statement

The investigation of students' attitudes towards studying science has been a substantive feature of the work of the science education research community (Osborne, Simon, & Collins, 2003). Evidence has shown a decline within the interest of kids in pursuing scientific careers (Smithers & Robinson, 1988). Scientific ignorance, recognition of the importance as well as economic utility of knowledge domain, the falling numbers choosing to pursue the study of science became a matter of societal concern and debate among science educators. One of the components of science education is that the promotion of a positive attitude towards learning science could even be a superb challenge for science educators.

The aspect of students' attitudes to science as aforementioned had rarely been investigated but had become more prominent recently from data collected on admissions to universities and teacher training analyzed by Taylor (1993) as well as Modood (1993). These showed that, compared with their white peers, Asian students have a clear preference to study for degrees in medicine-related studies, engineering, or mathematics. Moreover, a disproportionately low percentage of them applied to become teachers. In contrast, Afro-Caribbean students seemed to shy away from science preferring to pursue degrees in the social sciences. There are, however, no extant studies for non-science major in terms of their attitudes toward science literacy and lifelong learning. This gap in the knowledge base, along with the authors' teaching as well as research interests in science literacy and lifelong learning, is what prompted this study.

Research Aim/Purpose

This study aimed to determine the level of student's attitude towards Science especially in Environmental Science course among Bachelor of Science in Hotel and Restaurant Management (BSHRT) Second Year students at a State University in the Philippines in the Academic Year 2015-2016.

It sought to answer these questions:

1. What is the level of student's attitude towards Science among BSHRT students when:

   (a) taken as a whole?

   (b) grouped according to gender?

   (c) grouped according to their section?

2. Is there a significant difference in the level of student's attitude towards Science among BSHRT students when group according to their (a) gender; and (b) section?

Research Hypothesis

1. There is no significant difference in the level of attitude towards Science of BSHRT students when grouped according to gender.

2. There is no significant difference in the level of attitude towards Science of BSHRT students when grouped according to their section.

Literature Review

This section reviews related literature as guide for framework of this study.

Theoretical Framework

This study was anchored on the following theories: the Theory of Reasoned Action (Ajzen & Fishbein, 1980), the Theory of Planned Behavior (Ajzen, 1991), and the Expectancy-Value Theory (Wigfield & Eccles, 2000).

The Theory of Reasoned Action (Ajzen & Fishbein, 1980) assumed that most behaviors of social relevance (including attitude behavior towards science) are under volitional control, and that a person's intention to perform a behavior is both the immediate determinant and the single best predictor of that behavior. Intention is a function of two determinants: attitude towards behavior (the person's overall evaluation of performing the behavior) and subjective norm (the perceived expectations of important others regarding the individual performing the behavior in question). A person will have strong intentions to perform a given action if they evaluate it positively and if they believe that important others think they should perform it. The relative importance of the two factors may vary across behaviors, attitudes, and populations. In this study, the intentions of the students in learning science reflects their attitudes towards science either positive or negative.

The Theory of Planned Behaviors (Ajzen, 1991) was an extension of the theory of reasoned action to include behaviors that are not entirely under volitional control, for example giving up an activity in science because its difficulty or not using the intended materials for the activity. To accommodate such behaviors, a variable was added called 'perceived behavioral control' to the theory of reasoned action. It refers to the perceived ease or difficulty of performing the behavior and is assumed to reflect past experience as well as anticipated obstacles. According to Ajzen (1991), perceived behavioral control is a function of control beliefs in just the same way as subjective norm is a function of normative beliefs. It is assumed to have a direct influence on intention. For desirable behaviors, greater perceived behavioral control should

lead to stronger intentions. Perceived behavioral control may also have a direct predictive effect on behavior, through two different mechanisms. First, holding intention constant, an individual with higher perceived behavioral control is likely to try harder and to persevere for longer than an individual who has lower perceived control. Second, people may have accurate perceptions of the amount of actual control they have over the behavior.

According to Wigfield and Eccles (2000), the Expectancy-Value Theory which states the individual's choice, persistence and performance are often explained by his/her beliefs about how well he/she will do on the activity and therefore the extent to which he/she value the activity. Expectancy-value theory has been one among the foremost important views on the character of accomplishment motivation, beginning with Atkinson (1957). To characterize the idea very broadly, theorists adopting this attitude posit that individuals' expectancies for fulfillment and therefore the value they need for succeeding are important determinants of their motivation to perform different achievement tasks (Wigfield, 1994).

Conceptual Framework

In this study, the conceptual framework (Figure 1) shows the level of students' attitude towards science as dependent variable and BS HRT as the independent variable wherein the students are grouped according to their gender/section. The level of students' attitude towards science is compared based on gender or section.

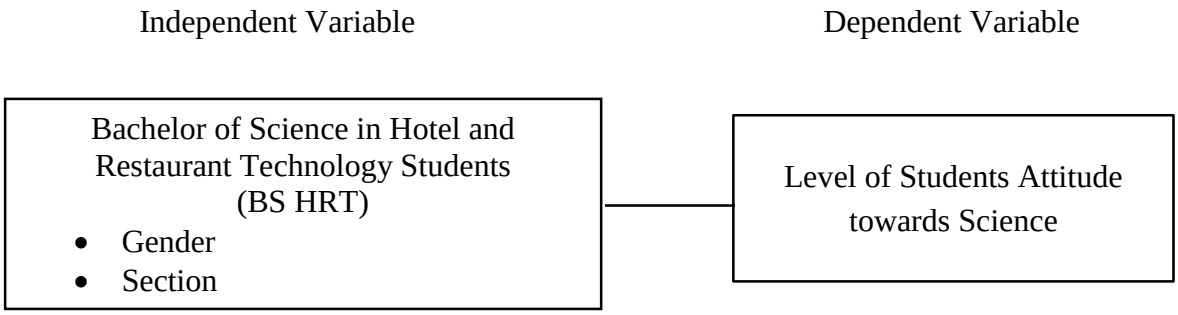

Figure 1. Paradigm of the study.

Methodology of the Research

Research Design

This study utilized the descriptive research design involving both descriptive and inferential statistics. Descriptive research is also known as a statistical research that describes data and characteristics about the population or phenomenon being studied. In this type of research, the research hypotheses often will exist, but they may be tentative and speculative (Burns, 2008). Moreover, this descriptive research takes the form of closed-ended questions which limits its ability to provide unique insights. A survey questionnaire was administered with three (3) attitudinal variables investigated using the Science Attitude Scale as modified from the Fennema-Sherman Attitude Scale (Fennema & Sherman, 1976).

Sampling Technique

The study was conducted at a State University in Western Visayas, Philippines using random sampling technique (De Belen & Feliciano, 2015).

The respondents of this study were the 95 out of the 196 second year students attending Bachelor of Science in Hotel and Restaurant Technology (BS HRT) course at a State University in the Philippines in the Academic Year 2015-2016 who were selected randomly comprising 3 out of 6 sections in the BS HRT. These sections were BS HRT 2-A with 33 students, BSHRT 2-C with 31 students, and BSHRT 2-D with 31 students selected. The sections differ in terms of their behavior during science class wherein the teacher encountered problems during activities as well as lesson discussions that students tend not to listen and not performing well in the performance tasks given to them. The teacher observed that 45% of the students in BS HRT 2-A, 53% in the BS HRT 2-C, and 39% in BS HRT 2-D were participating during class discussion and activities based on the teacher's class record. This enabled the researchers to investigate the attitude of the students towards science as one of the factors of the low performance in science.

Materials and Instrumentation

Attitudes have been measured using questionnaires that commonly consist of Likert-scale items. The research instrument that was used in the collection of data in this study is Science Attitude Scale (SAS) as modified from the Fennema-Sherman Attitude Scale (Fennema & Sherman, 1976). The modification done to the Fennema-Sherman Attitude scale by focusing on the Science Attitude. The reliability analysis result of the modified SAS was 0.75 which is acceptable. The questionnaire designed for this study contained two parts:

Part I includes the personal data of the respondents. This contained information regarding their name (optional) and gender.

Part II includes 40 questions that will determine the science attitude of the respondents. The answers of the respondents will be categorized to the following scoring directions:

Each item is a component in a summated rating scale that consists of several opinion statements reflecting either a favorable or unfavorable attitude to the object being studied. The subject is then normally offered a five-point choice consisting of the following to indicate the feelings of respondents.

A- Strongly Agree
B- Fairly Agree
C- Agree
D- Rarely Disagree
E- Disagree

Such items have normally been derived from the free response answers generated by students, which is the major justification for their validity. These open responses are then reduced to a set of usable and reliable items that have been piloted and further refined by statistical analysis to remove those that fail to discriminate.

Research Activities and Data Analysis

Data Gathering Procedure

To gather the data, the researchers secured permit from the administrator to make necessary schedule arrangements for the researchers to facilitate the distribution of questionnaire. The questionnaires were handed personally by the researchers. Directions in the questionnaire were clearly stated to the respondents. Enough time was given to the respondents to answer the questionnaire. All of the choices were indicated at the other side of the questions. The respondents were assured that the questionnaires were used for the study only and all info. were kept confidential.

Data Processing Techniques

The data gathered were processed using the SPSS Statistics version 23. The following are the different statistical tools that were employed:

1. For descriptive data analysis, mean and standard deviation were used to describe the level of attitude of the respondents towards science when taken as a whole, group according to gender, group according to section, and the subcomponent of attitudinal variables influence the positive attitude towards science of BSHRT students.

2. For inferential analysis, the researchers used T-Test for Independent Samples to test the significant difference of the level of attitude towards science of BSHRT students when group according to their gender while One-Way Analysis of Variance (ANOVA) test was used to test the significance of the difference in the mean level of attitude towards science when grouped according to their section.

Results and Discussion

Analysis of Descriptive Statistics

For descriptive analysis, mean and standard deviation were utilized to describe the level of attitude towards science of BS HRT second year students at a State University in the Philippines.

Table 1 shows the mean attitude towards science scores of the respondents and the subcomponents which are the personal confidence about subject matter, usefulness of the subject's content, and the perception of teacher's attitude.

Table 1
Mean Attitude towards Science

Variable	Mean	SD	Description
As a whole	2.54	0.69	Moderately Positive
Gender			
Male	2.47	0.65	Neutral
Female	2.54	0.70	Moderately Positive
Section			
BSHRT 2-A	2.61	0.65	Moderately Positive
BSHRT 2-C	2.50	0.68	Neutral
BSHRT 2-D	2.51	0.73	Moderately Positive
Subcomponents			
Personal confidence about subject matter	2.44	0.61	Neutral
Usefulness of the subject's Content	2.62	0.74	Moderately Positive
Perception of teacher's attitude	2.56	0.70	Moderately Positive

Based on the table above, the level of student's attitude towards science was based on the mean of each variable and when taken as a whole, it has a mean of 2.54 which is described as Moderately Positive. Non-science major has quite a positive outlook towards science subject. According to Rizkallah (2017), the change of the means of how students and how teachers perceived students' achievement was statistically significant and it is coupled with students' conceptual understanding.

On the other hand, when group according to gender, the mean of male student's attitude towards science is 2.47 which described as Neutral while the mean of female student's attitude towards science is 2.54 which was described as Moderately Positive. Female has quite a positive attitude towards science compared to Male among non-science major college students. This result is supported by Alexander (2012) saying that females were significantly more anxious toward improvisation than males, and the results of the attitude comparisons were inconclusive. The higher confidence level of females in the current study may have resulted from the different populations studied, maturation/history effects, or exposure to a curriculum specifically designed to build confidence and allay fears toward improvisation. Moreover, when group according to their section, BSHRT 2-A has a mean of 2.61 which was described as Moderately Positive, BSHRT 2-B has a mean of 2.50 which was described as Neutral, and BSHRT 2-C has a mean of 2.51 which was described as Moderately Positive. This shows that BSHRT 2-A and 2-C has a moderate positive attitude towards science even though it is not their major subject while BSHRT 2-B has a neutral level of attitude towards science which they perceived that science is just a part of their requirements for their degree.

The results also showed that the mean level of each subcomponent namely Personal Confidence about Subject Matter has a mean of 2.44 that was described as Neutral while the Usefulness of

Subject's Content has a mean of 2.62 which was described as Moderately Positive and the Perception of Teacher's Attitude has a mean of 2.56 that was described as Moderately Positive. Student's personal confidence about subject matter was neutral because some students find it easy while others find it difficult. On the other hand, the usefulness of the subject's content and the perception of teacher's attitude was Moderately Positive because they found the subject as useful for their course as well a perceived the attitude of instructor to be competent and efficient in teaching the course subject.

Analysis of Inferential Statistics

Inspection of Q-Q Plots on Figures 2 and Figure 3 revealed that the level of attitude towards science of BSHRT students when grouped according to gender was normally distributed for both groups.

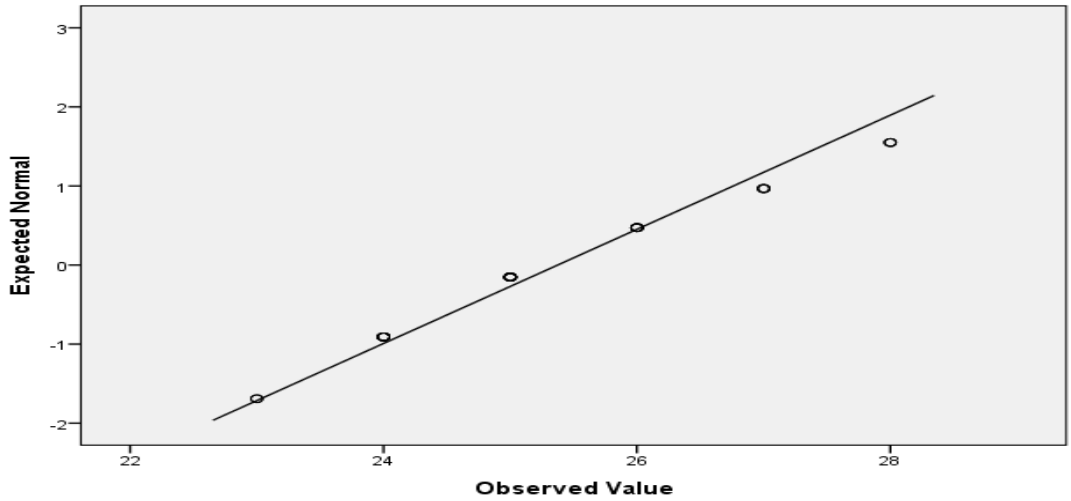

Figure 2. Normal Q-Q plot of the level of attitude towards science for male.

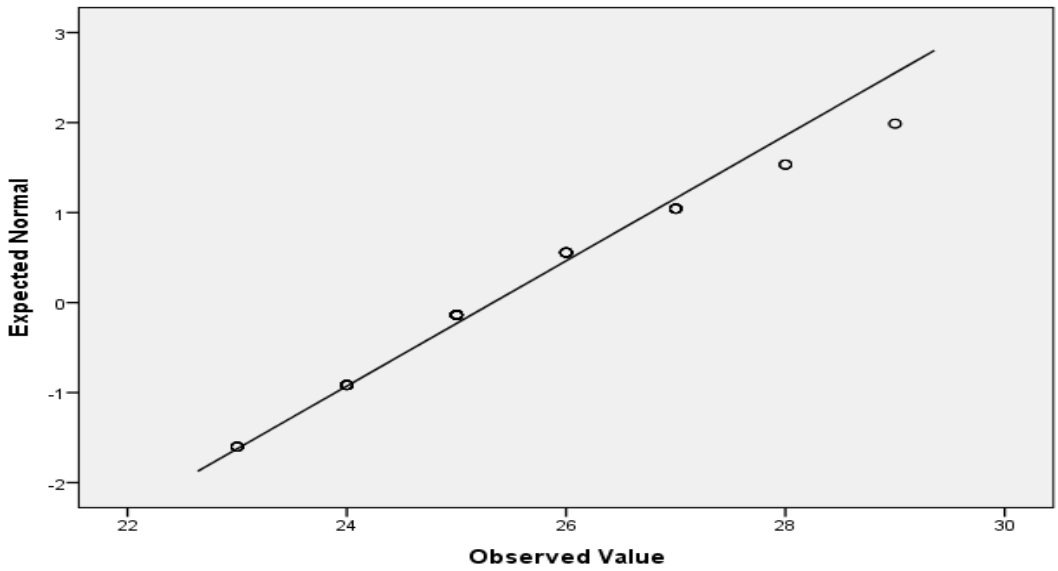

Figure 3. Normal Q-Q plot of the level of attitude towards science for female.

There was homogeneity of variance as assessed by Levene's Test for Equality of Variances as shown in Table 2.

Table 2
Levene's Test for Equality of Variance

Levene's Test for Equality of Variances		Personal Confidence about Subject Matter	Usefulness of Subject's Content	Perception of Teacher's Attitude
	F	1.058	2.605	1.033
	Sig.	0.306	0.110	0.312

Therefore, the researchers decided to use an independent sample t-test to run the data with a 95% confidence interval (CI) for the mean difference as shown in Table 3.

Table 3
Independent Samples Test

		t-test for Equality of Means						
		T	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	95% Confidence Interval of the Difference	
Personal Confidence about Subject Matter	Equal variances assumed	.521	93	.604	.25992	.49935	-.73169	1.25153
Usefulness of the Subject Content	Equal variances assumed	-.772	93	.442	-.44296	.57347	-1.58175	.69584
Perception of Teachers Attitude	Equal variances assumed	1.228	93	.222	.58780	.47848	-.36236	1.53796

Based on the Table 3, it was found out that there is no significant difference in the level of attitude towards science of BSHRT students when group according to their gender in each subcomponent [*Personal Confidence about Subject Matter: t (73.100) = 0.552, p = 0.583; Usefulness of the Subject Content: t (77.571) = -0.838, p = 0.405; Perception of Teachers Attitude: t (55.494) = 1.175, p = 0.245.*]

On the other hand, One-Way Analysis of Variance (ANOVA) was used to get the significant difference in the level of student's attitude towards Science among BSHRT students when group according to their section. The following Table 4 shows the result of the analysis using SPSS statistical tool.

Table 4
ANOVA Test

		Sum of Squares	df	Mean Square	F	Sig.
Personal Confidence about Subject Matter	Between Groups	20.745	2	10.373	2.018	0.139
	Within Groups	472.792	92	5.139		
	Total	493.537	94			
Usefulness of the Subject Content	Between Groups	55.427	2	27.713	4.265	*.017
	Within Groups	597.773	92	6.498		
	Total	653.200	94			
Perception of Teachers Attitude	Between Groups	5.656	2	2.828	.574	.565
	Within Groups	453.501	92	4.929		
	Total	459.158	94			

*. The mean difference is significant at 0.05 level.

Table 4 shows that there is a significant difference in the level of student's attitude in terms of Usefulness of the Subject Content among BSHRT students when group according to their section. To further investigate the significant difference between three sections, the researchers used a Post Hoc Test of Multiple Comparison specifically the Tukey HSD. Table 5 below shows the result of the Post Hoc Test.

Table 5
Post Hoc Test – Multiple Comparisons using Tukey HSD

Dependent Variable	(I) BSHRT Sections	(J) BSHRT Sections	Mean Difference (I-J)	Std. Error	Sig.	95% Confidence Level	
						Lower Bound	Upper Bound
Usefulness of the Subject	A	C	1.79277*	0.63757	0.016	0.2739	3.3116
		D	1.30890	0.63757	0.106	-0.2099	2.8277
	C	A	-1.79277*	0.63757	0.016	-3.3116	-0.2739
		D	-0.48387	0.64745	0.736	-2.0263	1.0585
	D	A	-1.30890	0.63757	0.106	-2.8277	0.2099
		C	0.48387	0.64745	0.736	-1.0585	2.0263

*. The mean difference is significant at the 0.05 level.

Table 5 showed a clear comparison between sections in terms of Usefulness of the Subject Content. There is a significant mean difference between sections A and C. Students find science as a useful tool in their career. In addition, non-science majors find the content useful in their major subjects in terms of hotel management or restaurant management as they apply the concepts that they had learned from science just like environmental conservation, proper recycling and solid waste management, they see science as a tool to help preserve Mother

Nature. At the same time, they realized that science could be applied not only in their career as a BSHRT student but also in their day to day lives wherein the concepts of science can be applied.

Conclusion

1) This paper showed that the level of student's attitude towards Science among non-science major students when taken as a whole proved to be moderately positive which has a mean of 2.5 and a standard deviation of 0.69. This implies that students' interest of the subject matter and its usefulness to their course. Science plays an important role in their career as Hotel and Restaurant Management students, it will help them learn the different ways of waste segregation, proper handling of food, sanitation, and others. Science concepts are present in those activities. Aside from that, science concepts are also present in their day to day living which they could apply what they have learned from their science subject.

2) In terms of gender, male has a neutral level of attitude towards science with a mean of 2.47 and a standard deviation of 0.65 while female has a moderately positive level of attitude towards science with a mean of 2.54 and a standard deviation of 0.70 among non-science major students. Some males find science not quite interesting but others find it interesting. On the other hand, females find it interesting and perceived it in a positive way that science concepts could greatly contribute to their career.

3) The level of student's attitude towards science when group according to their sections showed that BSHRT 2-A has a mean of 2.61 and a standard deviation of 0.65 which was interpreted as moderately positive, BSHRT 2-C has a mean of 2.50 and a standard deviation of 0.68 which was interpreted as neutral, and BSHRT 2-D has a mean of 2.51 as well as a standard deviation of 0.73 which was interpreted as moderately positive. The first and third section showed a quite positive outlook about having science in their course while the second section showed a neutral view of science as beneficial to their course. Overall, they find science as an interesting subject and beneficial to their course.

4) The subcomponents of attitudinal variables that influence great to the positive attitude of non-science major students towards science were the usefulness of the subject's content which has a mean of 2.62 and a standard deviation of 0.74 which was interpreted as moderately positive and perception of teacher's attitude which has a mean of 2.56 and a standard deviation of 0.70 which was interpreted as moderately positive. This simply shows that non-science majors find science concepts as useful to their course and they have a positive view of their science instructor on the way he/she taught them. On the other hand, personal confidence of the subject which has a mean of 2.44 and a standard deviation of 0.61 that was interpreted as neutral which implies that some of the students are not confident about what they have learned from science in their previous experiences that triggers them not to be confident in answering questions during class discussion in science.

5) The significant difference in the level of attitude towards science among BSHRT students when group according to their gender in each subcomponents were Personal Confidence about Subject Matter: *t(73.100) = 0.552, p = 0.583* which shows no significant difference between gender, Usefulness of the Subject Content: *t(77.571) = -0.838, p = 0.405* which shows no significant difference between gender, and Perception of Teacher's Attitude: *t(55.494) = 1.175, p = 0.245* which also show no significant difference between gender. There was no difference with regards to student's attitude towards science in terms of gender.

6) When students were grouped according to their sections, there was a significant difference in the level of student's attitude in terms of Usefulness of the Subject Content among BSHRT students as determined by one-way ANOVA [$F(2,92) = 4.265$, $p = 0.017$]. A Post Hoc Test of Multiple Comparison specifically the Tukey HSD was run to determine which among the sections made a significant difference. The results showed that there was a significant mean difference between sections A and C which implies that these sections find science as a significant subject to learn and apply to their course. It is believed that usefulness of the science content could give an edge in the industry for students grouped according to sections.

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