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An Assessment of Science-Related Attitudes among Freshmen Students in a Philippine University

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Abstract

This study explored the freshmen students' attitudes toward science who were taking physical science course. There were one hundred and seventy-eight (178) respondents. The research instrument on "Science-Related Attitudes" by author in [4] was used and is designed to measure the following seven (7) distinct science-related attitude scales: Social Implications of Science (S); Normality of Scientists (N); Attitudes to Scientific Inquiry (I); Adoption of Scientific Attitudes (A); Enjoyment of Science Lessons (E); Leisure Interest in Science (L); and Career Interest in Science (C). The profile of each scale mean score was calculated, plotted and compared to the profile of the field-tested sample. It was found out that the science-related attitude scale on Normality of Scientists (N) has the least mean score while that of Adoption of Scientific Attitudes (A) and Enjoyment of Science Lessons (E) scale got the highest mean score.

Keywords: assessment; attitudes; science; students.

1. Introduction

One of the aims of science education in many countries is considering the promotion of favorable science-related attitudes. Attitudes are evaluated, as a psychological tendency, by a particular entity with some degree of favor or disfavor [3]. Attitudes toward science, scientists, and learning science have always been a concern for science educators. The feelings, beliefs, and values on an object that may endeavor science, school science, the impact of science and technology on society, or scientists are attitudes toward science. The desire to know and understand, questioning to all statements, search for data and their meaning, search for verification, and consideration of consequences is a scientific attitude [5]. Attitudes toward science and scientists influence views of science, future career awareness, and classroom participation. Students who have positive attitudes show increased attention to classroom instruction and participate more in science activities [7].

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It is important to develop student positive attitude toward science. When they have positive attitudes, the learning of scientific information and science process skills are enhanced. In addition, the authors in [10] argue that attitude contains a wide range of subconstructs, such as enjoyment, motivation, self-efficacy, and career aspirations. The interest aspect of science is represented by the emotions and feelings about learning science [14].

Most research indicates that students develop more negative attitudes toward studying science, toward their science classes, and toward their science teachers the longer they study typical school science. Students develop more negative attitudes towards science as they move through elementary school includes the following reasons: (1) Students are interested in several non-school activities when they get older; (2) Low achievement with schoolwork; (3) More emphasis on specific science facts; (4) More emphasis on test results; and (5) Not much opportunity for students to enjoy science [1].

Teachers realize the importance of how students feel about science subjects and courses; nevertheless, they place little emphasis on affective objectives. The affective domain is often neglected because teachers have difficulty designing strategies to develop positive attitudes among students and documenting their development. The seemingly arbitrary use of terms associated with the affective domain has further contributed to this neglect.

The development of positive attitudes toward science has long been viewed as a legitimate goal of science education. Science curriculum developers have for some time sought to improve students' attitudes toward science and scientists. Concern for student attitudes toward science has also risen about the possibility of increasing enrollment in elective science courses by improving attitudes toward science among adolescents.

This study determined the science-related attitudes among freshmen students in a Philippine University. Specifically, this study focused on the following science-related attitude scale: (a) Social Implications of Science (S); (b) Normality of Scientists (N); (c) Attitudes to Scientific Inquiry (I); (d) Adoption of Scientific Attitudes (A); (e) Enjoyment of Science Lessons (E); (f) Leisure Interest in Science (L); and (g) Career Interest in Science (C).

2. Literature Review

As it concerns attitudes toward science [6] defined them “as a learned predisposition to evaluate in certain ways objects, people, actions, situations, or propositions involved in learning science.” Attitudes toward science involve an attitude object such as “science” or “science lessons”, ”laboratory work” and so on [12].

Attitude toward science might be viewed “as a learned, positive, or negative feeling about science that serves as a convenient summary of a wide variety of beliefs about science” and stated that “it is important because it permits the prediction of science related behavior.” Statements such as “I like science,” or “I hate science,” are expressions of attitudes toward science because they denote a general positive or negative feeling toward the formal study of science or science as an area of research [8].

The attitudes of students toward science have been extensively studied. The general conclusions from the

research until 1998, as reviewed by [11], are as follows: (a) Science is considered to be difficult and not relevant to the lives of most people; (b) Science is supposed to cause social and environmental problems; (c) Science is more attractive to males than females; (d) The interest in science decreases over the years of secondary schooling; (e) The more negative views are associated with the physical sciences rather than biological sciences.

Extensive research has shown that a person's attitudes are learned, as opposed to being inherited. Many factors can influence a person's attitude, including previous experiences and social influences. Attitude toward science can be defined as, "favorable or unfavorable feelings about science as a school subject," [9], which is the definition used for this study. The type of science courses taken, previous science experiences, science teachers, and various other factors can influence these attitudes toward science [9]. The impact of a student's attitude toward science is incredibly important. Recent research has shown that nearly fifty percent of students may lose interest in science by the third grade [13]. Participation in science is also being affected, as the number of students preparing for a science-related career is on the decline [2].

3. Methods

This study utilizes the descriptive-survey method in assessing the different science-related attitudes among freshmen students.

3.1. Research Respondents

Respondents of this study include one hundred and seventy-eight (178) freshmen students enrolled in physical science in this university.

The instruments were administered to the participants personally by the researcher. Instructions were announced clearly, and any reasonable student queries were answered by the researcher. During the conduct of the test, it is necessary to check that students are answering as instructed.

Obtain the student's score for Scale S by adding the 10 scores for the individual item in this scale. Follow the same procedure in obtaining the total score for the other six attitude scale. To process and interpret results, calculate the mean score on each scale obtained. Plot the profile of scale mean scores and compare this profile with that obtained from the field-testing sample.

3.2. Research Instrument

The research instrument used was adopted from "Test of Science-Related Attitude" by Barry J. Fraser and can be used by teachers to obtain information about science-related attitudes of individual students or, preferably, whole classes. It is designed to measure seven distinct science-related attitude scales, namely: (1) Social Implications of Science (S); (2) Normality of Scientists (N); (3) Attitudes to Scientific Inquiry (I); (4) Adoption of Scientific Attitudes (A); (5) Enjoyment of Science Lessons (E); (6) Leisure Interest in and a Science (L); and (7) Career Interest in Science (C). This instrument has been carefully developed and was extensively field tested and shown to be highly reliable, Fraser 1981.

The 70 items were allocated to the seven different scales with positive (+) and negative (–) statements. Each scale has ten (10) items and involved a response format described by Likert (1932). The format required students to express their agreement with each statement on five-point scale responses as shown in Table 1.

Table 1a: Score for the Positive Response on the Given Statement

Positive (+) Statement	
Response	Score
Strongly Agree ***(SA)***	4.01 – 5.00
Agree ***(A)***	3.01 – 4.00
Not Sure ***(N)***	2.01 – 3.00
Disagree ***(D)***	1.01 – 2.00
Strongly Disagree ***(SD)***	0.01 – 1.00

Table 1b: Score for the Negative Response on the Given Statement

Negative (–) Statement	
Response	Score
Strongly Agree ***(SA)***	0.01 – 1.00
Agree ***(A)***	1.01 – 2.00
Not Sure ***(N)***	2.01 – 3.00
Disagree ***(D)***	3.01 – 4.00
Strongly Disagree ***(SD)***	4.01 – 5.00

Invalid or omitted items were given a score of 3. The seven separate scale scores were obtained by adding the scores in all items within a given scale. Since each scale contains 10 items, the minimum score is 10 and the maximum is 50. Scale scores, however, cannot be added to form a meaningful total score.

The table below shows the different science-related scales. Each item was indicated with a positive/negative sign which was the bases in score allocation.

Table 2: Science-Related Scales and Score Allocation in Each Item

S	***N***	***I***	***A***	***E***	***L***	***C***
1 (+)	2 (–)	3 (+)	4 (+)	5 (+)	6 (+)	7 (–)
8 (–)	9 (+)	10 (–)	11 (–)	12 (–)	13 (–)	14 (+)
15 (+)	16 (–)	17 (+)	18 (+)	19 (+)	20 (+)	21 (–)
22 (–)	23 (+)	24 (–)	25 (–)	26 (–)	27 (–)	28 (+)
29 (+)	30 (–)	31 (+)	32 (+)	33 (+)	34 (+)	35 (–)
36 (–)	37 (+)	38 (–)	39 (–)	40 (–)	41 (–)	42 (+)
43 (+)	44 (–)	45 (+)	46 (+)	47 (+)	48 (+)	49 (–)
50 (–)	51 (+)	52 (–)	53 (–)	54 (–)	55 (–)	56 (+)
57 (+)	58 (–)	59 (+)	60 (+)	61 (+)	62 (+)	63 (–)
64 (–)	65 (+)	66 (–)	67 (–)	68 (–)	69 (–)	70 (+)

4. Results and Discussion

The results and discussion are based on every science-related attitude scale consisting of 10-item statements. In every table, the first five items are the positive attitudes, and the second half are the negative attitudes.

4.1. Mean Score of Each Item on Science-Related Attitude Scale

The results and discussion on the findings of the different science-related attitude scales are tabulated. Each table contains the itemized positive and negative statements with its corresponding total mean score and interpretation.Table 3 shows the science-related attitude scale on Social Implications of Science (S) among freshmen students. It can be seen from the result that positive statements were agreed by the students, whereas, on the negative statements, the student's interpretation resulted to "Not Sure".

Table 3: Science-Related Attitude Scale on Social Implications of Science ***(S)*** among Freshmen Students

ITEM NO.	RESPONSES					TOTAL SCORE	MEAN	INTERPRETATION
	SA	A	N	D	SD			
1	1.15	2.25	0.51	0.08	0.00	3.98		Agree
15	0.56	1.51	1.45	0.03	0.01	3.55		Agree
29	0.96	1.69	0.84	0.19	0.01	3.67		Agree
43	2.28	1.48	0.44	0.03	0.01	4.23		Strongly Agree
57	2.11	1.24	0.69	0.07	1.00	4.10		Strongly Agree
8	0.02	0.08	0.57	1.89	1.38	2.56		Not Sure
22	0.02	0.45	1.18	1.08	0.42	2.73		Not Sure
36	0.02	0.42	1.50	0.92	0.17	2.86		Not Sure
50	0.02	0.11	1.57	1.24	0.51	2.94		Not Sure
64	0.02	0.01	0.51	2.11	1.46	2.65		Not Sure
					Overall Mean Score	33.28		

In Table 4, the results shown concerns about students' science-related attitude scale on Normality of Scientists (N). The students agree on the positive statements, as reflected on the table and most of them are not sure and some disagree on the negative statement given in this test.

Table 4: Science-Related Attitude Scale on Normality of Scientists (N) among Freshmen Students

ITEM NO.	RESPONSES					TOTAL SCORE	MEAN	INTERPRETATION
	SA	A	N	D	SD			
9	0.42	1.46	1.20	0.24	0.03	3.35		Agree
23	0.22	1.06	1.53	0.31	0.02	3.15		Agree
37	1.04	1.75	0.84	0.13	0.01	3.78		Agree
51	0.20	1.69	1.01	0.31	0.04	3.25		Agree
65	0.62	1.44	1.21	0.18	0.02	3.47		Agree
2	0.17	0.74	0.93	0.45	0.17	2.46		Not Sure
16	0.09	0.45	1.52	0.54	0.22	2.82		Not Sure
30	0.02	0.35	1.47	0.99	0.34	3.16		Disagree
44	0.03	0.20	0.99	1.53	0.79	3.54		Disagree
58	0.03	0.49	1.30	0.70	0.03	2.56		Not Sure
					Overall Mean Score	31.54		

Table 5 below reflects students' attitude scale on Scientific Inquiry. It can be deemed from the result that most

of the students agree, and some strongly agree, and some were not sure on the positive statements. On the other hand, all of the students disagree on the negative statements of this attitude scale.

Table 5: Science-Related Attitude Scale on Attitudes to Scientific Inquiry (I) among Freshmen Students

ITEM NO.	RESPONSES					TOTAL SCORE	MEAN	INTERPRETATION
	SA	A	N	D	SD			
3	2.33	1.64	0.32	0.02	0.01	4.32		Strongly Agree
17	1.12	2.11	0.37	0.24	0.01	3.85		Agree
31	0.34	1.08	0.71	0.74	0.06	2.92		Not Sure
45	0.76	2.09	0.39	0.36	0.02	3.61		Agree
59	0.73	2.00	0.83	0.16	0.00	3.71		Agree
10	0.02	0.17	0.69	1.93	0.90	3.71		Disagree
24	0.01	0.10	0.59	2.31	0.81	3.83		Disagree
38	0.08	0.42	0.71	1.71	0.25	3.16		Disagree
52	0.02	0.21	0.52	2.25	0.70	3.70		Disagree
66	0.04	0.49	0.71	1.55	0.45	3.24		Disagree
					Overall Mean Score	36.07		

Table 6 clearly reflected that most of the students agree with a total mean score of 3.37, 3.85 and 3.87 on Item No's. 4, 32 and 46, respectively and few strongly agree on the positive statements. Moreover, most of the students disagree and some strongly disagree on the negative statements on the Adoption of Scientific Attitudes Scale.

Table 6: Science-Related Attitude Scale on Adoption of Scientific Attitudes (A) among Freshmen Students

ITEM NO.	RESPONSES					TOTAL SCORE	MEAN	INTERPRETATION
	SA	A	N	D	SD			
4	0.79	1.64	0.62	0.39	0.03	3.47		Agree
18	2.75	1.48	0.05	0.12	0.00	4.41		Strongly Agree
32	0.90	2.45	0.30	0.19	0.01	3.85		Agree
46	1.01	2.09	0.64	0.12	0.00	3.87		Agree
60	0.65	1.96	0.93	0.15	0.00	3.67		Agree
11	0.01	0.36	0.54	2.02	0.62	3.55		Disagree
25	0.01	0.03	0.02	1.57	2.89	4.52		Strongly Disagree
39	0.02	0.04	0.17	2.22	1.74	4.20		Strongly Disagree
53	0.04	0.26	0.71	1.80	0.70	3.51		Disagree
67	0.01	0.16	0.40	2.09	1.29	3.95		Disagree
					Overall Mean Score	39.01		

Table 7 shows the result in science-related attitude scale on Enjoyment of Science Lesson (E). It is obvious that most of the students agree, and some strongly agree on the positive statements. Meanwhile, results on the negative statements showed that most of the students disagree and only few strongly disagree.

Table 7: Science-Related Attitude Scale on Enjoyment of Science Lessons (E) among Freshmen Students

ITEM NO.	RESPONSES					TOTAL SCORE	MEAN	INTERPRETATION
	SA	A	N	D	SD			
5	1.24	2.16	0.56	0.06	0.00	4.01		Strongly Agree
19	0.28	1.87	0.81	0.36	0.03	3.34		Agree
33	1.15	2.27	0.49	0.08	0.00	3.99		Agree
47	0.34	2.11	0.94	0.18	0.00	3.57		Agree
61	0.62	2.47	0.57	0.12	1.00	4.79		Strongly Agree
12	0.02	0.06	0.49	2.16	1.26	3.98		Disagree
26	0.01	0.13	0.47	2.25	1.04	3.90		Disagree
40	0.02	0.02	0.19	1.37	2.81	4.41		Strongly Disagree
54	0.02	0.03	0.40	2.61	0.90	3.96		Disagree
68	0.01	0.06	0.64	1.96	1.32	3.98		Disagree
					Overall Mean Score	39.93		

The result in Science-Related Attitude Scale on Leisure Interest in Science (L) among freshmen students is shown Table 8 below. It is evident that all of the students agree on the positive statement with a total mean score of 3.46, 3.79, 3.47, 3.33, and 3.98 on Item No.'s 6, 20, 34, 48 and 62, respectively. On the other hand, all the students disagree on all items with negative statements of this science-related attitude scale.

Table 8: Science-Related Attitude Scale on Leisure Interest in Science (L) among Freshmen Students

ITEM NO.	RESPONSES					TOTAL SCORE	MEAN	INTERPRETATION
	SA	A	N	D	SD			
6	0.59	1.33	1.31	0.22	0.00	3.46		Agree
20	0.87	2.09	0.69	0.12	0.01	3.79		Agree
34	0.37	1.96	0.81	0.34	0.00	3.47		Agree
48	0.28	1.42	1.37	0.26	0.01	3.33		Agree
62	1.32	2.04	0.51	0.10	0.01	3.98		Agree
13	0.02	0.11	0.29	2.36	1.21	3.98		Disagree
27	0.02	0.40	0.78	1.80	0.37	3.36		Disagree
41	0.01	0.09	0.51	2.13	1.21	3.95		Disagree
55	0.02	0.18	0.64	2.02	0.87	3.73		Disagree
69	0.01	0.07	0.69	2.18	0.93	3.87		Disagree
					Overall Mean Score	36.90		

Lastly, Table 9 showed the Science-Related Attitude Scale on Career Interest in Science (C) among freshmen students. Most of the students strongly agree and only few of them agree on the items with positive statements. In addition, all of the students disagree on the negative statement of all the items in this scale.

Table 9: Science-Related Attitude Scale on Career Interest in Science (C) among Freshmen Students

ITEM NO.	RESPONSES					TOTAL SCORE	MEAN	INTERPRETATION
	SA	A	N	D	SD			
14	1.20	1.71	0.89	0.26	0.01	4.07		Strongly Agree
28	2.30	1.78	0.67	0.13	0.01	4.89		Strongly Agree
42	1.00	1.17	1.42	0.21	0.02	3.81		Agree
56	1.85	2.07	0.71	0.07	0.01	4.70		Strongly Agree
70	0.60	0.97	1.37	0.36	0.06	3.35		Agree
7	0.02	0.40	0.88	1.73	0.28	3.31		Disagree
21	0.02	0.27	0.96	1.91	0.25	3.41		Disagree
35	0.02	0.06	0.61	2.13	1.07	3.89		Disagree
49	0.02	0.08	0.66	2.00	1.10	3.85		Disagree
63	0.02	0.31	1.20	1.28	0.51	3.32		Disagree
					Overall Mean Score	38.60		

Overall Mean Score of Each Science-Related Attitude Scale

In Table 10, the mean score of each of the science-related attitude scale is shown.

Table 10: The Mean Score of Each of the Science-Related Attitude Scale among Freshmen Students

SCALE	RESPONSES					TOTAL SCORE	MEAN	INTERPRETATION
	SA	A	N	D	SD			
S	3.63	4.69	4.71	3.89	2.03	3.79		Agree
N	1.45	4.90	6.27	2.74	0.85	3.24		Agree
I	2.77	5.25	2.97	5.73	1.64	3.67		Agree
A	3.14	5.33	2.23	5.43	3.74	3.97		Agree
E	1.88	5.69	2.83	5.66	6.73	3.97		Agree
L	1.78	4.93	3.86	5.87	2.35	3.76		Agree
C	2.04	4.48	4.76	5.13	1.68	3.62		Agree

It is evident that the total mean score of each scale varies but the interpretation is the same. All the students agree on all the scales in Table 10.

5. Conclusion

Based on the findings of this study, it is shown that the science-related attitudes among freshmen students vary in each of the seven (7) scales containing ten (10) items having both positive and negative statements.

6. Recommendations

It is recommended that further studies on the assessment of science-related attitudes will include not only the freshmen students but also the sophomores, juniors, and seniors will be conducted. In this way, there will be a holistic view on the science-related attitudes of the students in the university. In addition, it is recommended to

study the relationship between students' science-related attitudes and their academic performance in science. In line with this study, further research is needed on how gender groups may or may not differ on these related issues.

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