

## Scientific Attitude of Under Graduate Students in Relation to Gender and Stream of Study

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### Abstract

The progress, welfare and prosperity of nation depend on rapid, planned and sustained growth in both the quality and extent of education and research in science and technology. Development of scientific attitude is one among the most important outcomes of science education. The main purpose of this paper is to measure the scientific attitude of under graduate students and to investigate how it is related to gender and stream of study. The data were drawn from Ravenshaw university of Cuttack, India. Total samples of 90 students were drawn randomly. The instrument was consisted of student questionnaire. The questionnaire contains six main attributes of scientific attitude which are: curiosity, open-mindedness, suspend judgment, critical mindedness, objectivity and ability to verify. It is found that there exists significant difference in scientific attitude with respect to stream of study. It is suggested that the institution should provide opportunity to think, read and discuss, individual library work, freedom to explore new ideas, project work, discussion on seminars, and adaptation of educational technology.

**KEYWORDS:** Scientific attitude, under graduate students, Stream of study

### INTRODUCTION

Science has brought about revolutionary changes in every walk of life. Its impact is visible everywhere and in every aspect of our existence i.e. vocational, social, economic, political and cultural. Nowadays human being entirely depend on science for domestic amenities, industrial production, communication, agriculture, medicine, transport, defence and others.

The progress, welfare and prosperity of nation depends on rapid, planned and sustained growth in both the quality and extent of education and research in science and technology (Education commission 1964-66). Right now science becomes a priority area in the education both at the compulsory as well as at the level of specialization. Development of scientific attitude is one among the most important outcomes of science education (Carin, 1997). The people possessing positive attitude would get the benefit of science much as compared to those who lacked it. In modern times the chief aim of education is to enable a citizen to develop a scientific attitude of mind to think objectively and base his conclusion on tested data. Scientific temper describes an attitude which involves the application of logic and the avoidance of bias and preconceived notions. Discussion, argument and analysis are vital parts of scientific temper. The mental attitude behind the method of acquiring reliable and practical knowledge may be called as "Scientific Temper". This phrase has been used in India first time by our first Prime Minister, Pt. Jawaharlal Nehru. He has emphasized on scientific temperament in his book *Discovery of India* (p. 512).

### Meaning and Concept of Scientific Attitude:

Scientific attitude refers to an individual's outlook towards life. It is the combination of many qualities and virtues, which is reflected through the behaviour

and action of the person. These persons are open-minded, experiment oriented, systematic in approach, possess love for knowledge, intellectually honest, unbiased, truthful, and possess scientific temper' and the expectations that the solution of the problem will come through the use of verified knowledge.

The major contribution of science lies in the inculcation of scientific attitude among its learners through its study. However, the credit of development of such attitude through the study of science goes to scientific method adopted by science both in the development and in the application. The student should be trained to adopt scientific method of thinking and solving the problems. In general, the students should begin to develop scientific attitude characterized as, Open- Mindedness, Curiosity, Tolerance, Honest ,Respect for another's point of view, Critical observation and thought, Freedom from superstitions ,Judgment made on scientific facts ,Faith in cause and effect relationship and a planned procedure in solving problems. This is considered important to develop the scientific attitude; scientific values fulfil the aims and objectives of science education for the students.

Scientific attitudes are attributes of individual who not only behave outwardly in desirable way towards any scientific endeavour but also understand why they act as they do so. In this study scientific attitude and attitude in science both are interrelated.

#### **Conceptual Definition:**

According to C.V. Good Dictionary of Education (1973) Scientific attitude comprises of a set of emotionally toned ideas about science & scientific method & related directly or indirectly to a course of action in the literature of science education , the term implies such qualities of mind as intellectual curiosity , passion for truth , respect for evidence & an appreciation of the necessity for free commutation of science.

Opong explained that scientific attitude is a comprehensive term and apart from acquiring scientific skills, scientists should develop certain attitudes in order to use the processes or methods. It is the possession of the skills and attitudes necessary for the usage of the scientific process and the possession of the knowledge acquired through the process that make a person a scientist.

These attitudes, according to James (1995), include honesty, open-mindedness, patience, curiosity, humility and skepticism.

#### **Significance of the Study:-**

National policy on education emphasise on Higher education to provide people with an opportunity to reflect on the critical social, economic, cultural, moral and spiritual issues facing humanity. It contributes to national development through dissemination of specialised knowledge and skills. It is therefore a crucial factor for survival. Being at the apex of the educational pyramid, it has also a key role in producing teachers for the education system. In the context of the unprecedented explosion of knowledge, higher education has to become dynamic as never before, constantly entering uncharted areas. Development of right kind of attitude should therefore be given due importance in the transaction of teaching learning process in various stages of education. There is a felt need for developing right sort of attitudes to avoid any mental conflicts. These attitudes can be developed among the students through the study of various subject and learning activities in their curriculum. Science education, by the virtue of the fact that it provides more vocational opportunities and develops the scientific attitude required of an individual in the modern society is likely to be associated with the educational aspiration of the students. This piece of work carried out to find out the level of possession of scientific

attitude of under graduate students of different stream which comprises male and female students.

**Objectives of Study:-**

The objectives of study were as follows-

- (i) To examine the scientific attitude of Science, Arts and Commerce students studying at under graduate level, so as to explore the impact of streams of study on scientific attitude.
- (ii) To find out the extent to which individual components of scientific attitude are associated with genders so as to relate gender with specific attribute encompassing scientific attitude.
- (iii) To find out the extent to which the components of scientific attitude are associated with different streams of study so as to relate streams of study with specific attributes of scientific attitude.

**Hypotheses:-**

H<sub>01</sub>-There will be no significant difference in the scientific attitude of under graduate boys and girls.

H<sub>02</sub>-There will be no significant difference in scientific attitude of undergraduate students of Science, Arts and Commerce.

H<sub>03</sub>-There will be no significant interaction effect of gender and streams of study on the scientific attitude of under graduate students.

**Scope of the Study:**

The scope of the study was to assess the science attitude of under graduate students in relation to gender and streams of study. The present study was delimited in terms of scope area, sample and variables as follows:

1. The present study was confined to the Ravenshaw University only.
2. The study involves under graduate students from Science, Arts and Commerce streams.
3. For the present study the investigator has taken six attributes of scientific attitude i.e. curiosity, open-mindedness, critical mindedness, ability to verify, objectivity and suspended judgement.
4. The investigator has collected data from ninety boys and girls that is from Science, Arts and Commerce under graduate students thirty from each stream.

**Methodology:**

**Design of the Study:**

This is a piece of descriptive study. Stream of study and gender are independent variables. These cannot be manipulated as these are pre determined. Scientific attitude is a dependent variable.

On the basis of back ground variables subjects were classified as follows:

**Stream of study:** On the basis of stream of study students were classified as Science, Arts and Commerce.

**Gender:** On the basis of gender subjects were classified as boys and girls.

The major focus of the study was laid on to find out the level of scientific attitude of under graduates in relation to gender and subject of study.

**Participants:**

The Participants for the present study were drawn from Ravenshaw University under graduate students. Altogether 90 students were taken for the present study.30 students from each stream i.e. from Science, Arts and Commerce.

**Tool used**

The researcher has developed an attitude scale for under graduate students. Various attributes are there to measure scientific attitude out of it six attributes were chosen which are essential for the study and can best measure scientific attitude of under graduates. Six attributes such as: Curiosity, Open-mindedness, Suspended judgement, Critical mindedness, Ability to verify and Objectivity.

**Analysis of the Data**

To find the meaningful interpretation of the raw scores, the data is analyzed using mean, S.D, and F- ratio. In order to achieve the objectives formulated for the present study, the data collected has been tabulated as under. Table 1 shows Mean and S.D. of Science, Arts and Commerce Students on six attributes-curiosity(v<sub>1</sub>),open mindedness(v<sub>2</sub>),suspended judgement(v<sub>3</sub>),critical mindedness(v<sub>4</sub>),ability to verify(v<sub>5</sub>),objectivity(v<sub>6</sub>).By analysing the data counterparts of same stream.

It was found that stream of study has significant effect on critical mindedness and ability to verify attributes of scientific attitude and Commerce female students possess positive attitude than their counterparts. However scientific attitude on curiosity, open mindedness, suspended judgement and objectivity attributes has no significant effect on streams of study. Study also revealed that stream of study makes a difference in scientific attitude of under graduates.

Table-1

**Table showing Mean and S.D. of Scientific Attitude of Science, Arts and Commerce Students on attributes- curiosity(v<sub>1</sub>),open mindedness(v<sub>2</sub>),suspended judgement(v<sub>3</sub>),critical mindedness(v<sub>4</sub>),ability to verify(v<sub>5</sub>),objectivity(v<sub>6</sub>)**

gender	Stream of study	V <sub>1</sub>	V <sub>2</sub>	V <sub>3</sub>	V <sub>4</sub>	V <sub>5</sub>	V <sub>6</sub>	total		
Boy	Arts	Mean	15.40	15.20	15.60	16.33	15.87	15.07	93.47	
		Std. Deviation	3.180	2.007	2.971	2.664	2.232	2.939	7.328	
	Science	Mean	16.88	16.50	16.69	16.88	16.25	16.50	99.69	
		Std. Deviation	1.408	1.713	1.991	1.708	1.528	1.414	4.895	
	Commerce	Mean	15.75	15.81	15.38	17.19	17.44	16.75	98.31	
		Std. Deviation	1.770	1.834	1.893	1.424	1.548	2.145	4.527	
	Total	Mean	16.02	15.85	15.89	16.81	16.53	16.13	97.23	
		Std. Deviation	2.270	1.888	2.343	1.974	1.875	2.309	6.162	
	Girl	Arts	Mean	15.53	15.47	14.87	15.73	15.33	16.60	93.53
			Std. Deviation	2.850	2.532	3.021	2.154	2.380	2.444	8.140
		Science	Mean	16.71	16.64	15.86	16.64	16.79	17.14	99.79
			Std. Deviation	1.490	1.823	1.657	1.823	1.968	.949	3.984
Commerce		Mean	16.79	16.50	16.29	17.36	16.93	16.57	100.43	

		Std. Deviation	1.578	1.951	1.684	1.336	1.639	1.651	2.954
		Mean	16.33	16.19	15.65	16.56	16.33	16.77	97.81
	Total	Std. Deviation	2.124	2.152	2.267	1.894	2.113	1.784	6.310
		Mean	15.47	15.33	15.23	16.03	15.60	15.83	93.50
	Arts	Std. Deviation	2.968	2.249	2.967	2.399	2.283	2.768	7.610
		Mean	16.80	16.57	16.30	16.77	16.50	16.80	99.73
	Total Science	Std. Deviation	1.424	1.736	1.860	1.736	1.737	1.243	4.417
		Mean	16.23	16.13	15.80	17.27	17.20	16.67	99.30
	Commerce	Std. Deviation	1.736	1.889	1.827	1.363	1.584	1.900	3.958

Total	Total	Mean	16.17	16.01	15.78	16.69	16.43	16.43	97.51
		Std. Deviation	2.194	2.014	2.297	1.929	1.983	2.088	6.205

Table 2 reveals that the main effect of gender on different attributes of scientific attitude is not significant [F, (2, 84) = .409, P > .05].

The interaction effect (stream of study X gender) on different attributes of scientific attitude is also not significant [F, (1, 84) = .325, P > .05].

The results revealed that the scientific attitude differ significantly in relation to stream of study of Under graduates [F (2, 84) = 11.560, P < .05]. The results also revealed that the effect of gender is not significant [F, (1,84) = .409, P > .05].

**Table- 2**  
**Summary of ANOVA showing Scientific Attitude of Undergraduate Students from Different Streams in Relation to Gender**

Source	Sum of Squares	df	Mean Square	F	Sig.
Stream of study	733.827	2	366.913	11.560	.000
Gender	12.968	1	12.968	.409	.524
Stream of study X gender	20.606	2	10.303	.325	.724
Error	2666.127	84	31.740		
<b>Corrected Total</b>	<b>3426.489</b>	<b>89</b>			

Therefore the null hypothesis  $H_{O1}$  that there will be no significant difference in scientific attitude of undergraduate boys and Girls is retained. The null hypothesis  $H_{O2}$  that there will be no significant difference in scientific attitude of undergraduate students of Science, Arts and Commerce student is retained similarly the null hypothesis  $H_{O3}$  that there will be no significant interaction effect of gender and stream of study of under graduate student is retained.

**Findings:**

Major findings of the study related to objectives framed are presented as follows:

- (1) There exists significant difference in scientific attitude with respect to stream of study. It was found that Science students' possess better scientific attitude than Arts and Commerce students. The study revealed that choice of stream has significant effect on the scientific attitude of under-graduate students.
- (2) There does not exist significant difference in scientific attitude with respect to gender.
  - (I)Female students of Commerce stream have more favourable scientific attitude than their counterparts of same stream.
  - (II)Female students of Commerce stream possess more favourable attitude on critical mindedness attribute of scientific attitude than male students.
  - (III)Female students of Science stream possess more favourable attitude on objectivity attribute of scientific attitude than male students.
- (3) There exists significant difference in scientific attitude on stream of study with respect to different components of scientific attitude.
  - (I)It was found that Commerce students possess more favourable attitude on critical mindedness and ability to verify attributes of scientific attitude than Science and Arts students.
  - (II)The study revealed that scientific attitude on curiosity, open mindedness, suspended judgement and objectivity attributes has no significant effect on stream of study.

#### **Educational Implications of the Study:**

The present study revealed that not only science students but also commerce and arts students also possess scientific attitude. This piece of work carries implications for the students, teaching faculties, policy makers and managers, curriculum framers and the organizations responsible to impart quality education.

- Students have to develop the habit of self study, independent study and reflection.
- The institution should provide opportunity to think, read and discuss, individual library work, freedom to explore new ideas, project work, discussion on seminars, and adaptation of educational technology
- Teachers have to plan their work properly to develop scientific attitude among students. Institutions should give opportunity to think, read, study and discuss. Individual library work, project work, discussion on seminars, adaptation to educational technology to explore knowledge should form an integral part of the professional training.
- They must reorient their attitude by attending training programmes to foster scientific attitude.
- Laboratory works help in forming and practicing good attitudes.
- In service training programmes for development of scientific attitude and right kind of attitudes irrespective of stream must be organised.
- Curriculum framers to revise, update the under graduate curriculum in congruence with the ideas envisaged in the NCF 2005. Curriculum instead of being theoretical, it should create space for adequate reflection. Attitudinal

components should be integrated with the curriculum so as to develop positive attitude among students.

- Policy and practice changes are process condition by the socio-political and educational environment. This piece of work will put the policy makers and managers in an advantageous position in improving the quality of education at graduate level. Financial resource crunch affects the qualitative aspects of an institution.

#### **Suggestions for further Research:**

The following suggestions are recommended for further improvement

- Another study may be conducted on taking other attributes into consideration. Instead of six attributes taken for the study other attributes may be taken into consideration.
- Another study may be conducted on to find out scientific attitude among teachers.
- Further research can be done on teachers or faculty members so as to measure scientific attitude for individual teacher.
- Interaction between components and components of scientific attitude may be taken into account while conducting further research study.
- Factor analytical study may be conducted for further research. Study on correlates of scientific attitude taking various attributes into consideration may be taken into account for further research.

#### **Conclusion**

In this research, the investigator has studied about the scientific attitude of under graduate students. The results showed that Science students' possess better scientific attitude than Arts and Commerce students. The study revealed that choice of stream has significant effect on the scientific attitude of students at under graduate level. Gender has no significant effect on the scientific attitude of under-graduate students belonging to Science, Arts and Commerce stream. Therefore, it can be concluded that gender does not contribute a lot as far as the scientific attitude of under-graduates is concerned. Female under-graduates of Commerce stream have more favourable scientific attitude than their counterparts of same stream. It was found that stream of study has significant effect on critical mindedness and ability to verify attributes of scientific attitude and Commerce female students possess positive attitude than their counterparts. Teacher is perhaps mainly responsible for developing scientific attitude among the students. They should provide adequate opportunities to study the biography of scientists, to do simple experiments and laboratory work and to develop problem solving ability. The government and management also cooperate with the teachers to develop scientific attitude.

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