### APPENDIX – I

#### (I) Publications:

<table>
<thead>
<tr>
<th>Sl. No.</th>
<th>Title of the Paper</th>
<th>Name of Author(s)</th>
<th>Name of Journal/Edited Book and Publisher</th>
<th>Status</th>
</tr>
</thead>
<tbody>
<tr>
<td>2.</td>
<td>Upper Primary Students Perception Towards Scientists: A Case Study in Cachar District of Assam</td>
<td>Tahmina Khatun and Nityanand Pandey</td>
<td>Psycho-Lingua, (ISSN: 0377-3132)</td>
<td>Accepted for Publication (July, 2015)</td>
</tr>
</tbody>
</table>

#### (II) Participation in Seminars:

<table>
<thead>
<tr>
<th>Sl. No.</th>
<th>Name</th>
<th>Venue</th>
<th>Date</th>
<th>Participant/Presenter</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>National Seminar on Indian Higher Education in the 21st Century: Constraints and Possibilities</td>
<td>University of Science and Technology, Meghalaya</td>
<td>22nd &amp; 23rd March 2013</td>
<td>Participant</td>
</tr>
</tbody>
</table>
### (III) Participation in Workshops:

<table>
<thead>
<tr>
<th>Sl. No.</th>
<th>Workshop on</th>
<th>Venue</th>
<th>Date</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>ICSSR sponsored Ten Days Training Course on Research Methodology and Computer applications in Social Science Research</td>
<td>Department of Education, Assam University, Silchar-780011</td>
<td>31&lt;sup&gt;st&lt;/sup&gt; Dec. 2012 to 9&lt;sup&gt;th&lt;/sup&gt; January 2013</td>
</tr>
<tr>
<td>2.</td>
<td>UGC Sponsored National Workshop on ICT in Higher Education</td>
<td>P. B. College Gauripur, Assam</td>
<td>28&lt;sup&gt;th&lt;/sup&gt; and 29&lt;sup&gt;th&lt;/sup&gt; Sep. 2009</td>
</tr>
</tbody>
</table>
APPENDIX-II

GROUP-A

Draw-A-Scientist Test

Background information of students:

1. Name: ________________________________________________________
2. Class: _________________________    3. Sex: Male / Female (Tick: ✓)
4. Name of the school/College: _____________________________________
5. Fathers Educational Qualification: _________________________________
6. Mothers Educational Qualification: _________________________________

7. Close your eyes and imagine a scientist at work. In the space below, draw what you imagined.
GROUP-B

CHECKLIST FOR PERCEPTION TOWARDS SCIENTIST

Imagine a Scientist and on the basis of your imagination please put a tick mark against one option under each item of which you find appropriate:

I. Physical qualities:

1. (a) Male (b) Female (c) May be Male/ Female
2. (a) Tall (b) Short (c) Normal
3. (a) White (b) Black (c) May be white/ black
4. (a) Long haired (b) Short haired (c) Wild haired (d) Bald
5. (a) Beard (b) Mustache (c) Abnormally long Sideburns
6. (a) Young (b) Middle-aged (c) Old-aged

II. Personal quality:

7. (a) More Friendly (b) Less Friendly (c) Unfriendly
8. (a) More Intelligent (b) Less Intelligent (c) Dull
9. (a) More Busy (b) Less Busy (c) Lazy
10. (a) More Patient (b) Less Patient (c) Impatient
11. (a) More Talkative (b) Less Talkative (c) Silent
12. (a) More Smiling  (b) Less Smiling  (c) Frown  
13. (a) More Creative  (b) Less Creative  (c) Non Creative  
14. (a) More Open minded  (b) Less Open minded  (c) Conservative  
15. (a) More Religious  (b) Less Religious  (c) Irreligious  
16. (a) More Responsible (b) Less Responsible (c) Irresponsible  
17. Marriage:  
   (a) Wants to marry  (b) Doesn’t want to marry  

III. Work atmosphere: (more than one option can be chosen)  
18. Scientist Working  
   (a) Indoor  (b) Outdoor (c) unable to express  
19. Dress item  
   (a) Lab. coat (b) Formal dress (c) Casual dress  
20. Wearing  
   (a) Eyeglasses (b) Gloves (c) Tie  
   (d) Has something in coat pocket (e) Head Phones  
21. Always doing  
   (a) Reading (b) Writing (c) Working in the lab.  
   (d) Idle  
22. Working with  
   (a) Microscope (b) Test tubes (c) Machinery  
   (d) Plants (e) Experimental animals
23. Symbols of Knowledge

(a) Books  
(b) Filing Cabinets  
(c) Clipboards  
(d) Pens in pocket  

24. Types of Technology

(a) Television  
(b) Telephones  
(c) Missiles  
(d) Computer  

25. Relevant Captions

(a) Formulae  
(b) Taxonomic classification  
(c) Equations  

26. Indications of Secrecy (signs or warnings that read)

(a) “Private”  
(b) “Keep Out”  
(c) “Do Not Enter”  
(d) “Go Away”  
(e) “Top Secret”  

27. Educational Qualification

(a) B. Sc.  
(b) M. Sc.  
(c) Ph. D.  
(d) Engineer  
(e) M.B.B.S.  
(f) No Education  
(g) Qualification does not matter
GROUP-C

(A) For the scientist you imagined and drew, which of the following affected you most? (more than one option can be ticked)

(a) Life Stories of Scientists ❑ (b) Text books ❑ (c) Movies ❑
(d) Cartoons ❑ (e) T.V. Serials ❑ (Name…………………………………)
(f) Museum Visits ❑ (g) Internet ❑
(h) Others ❑ (Describe ……………………………………………………………)

(B) Who do you see around as a scientist? Explain why. (If you don’t choose anyone, then write “Nobody” and explain why.)

Who ……………………………………………………………………………………
Why………………………………………………………………………………………
……………………………………………………………………………………………

(C) Would you like to select a scientist profession?

(a) Yes ❑ (b) No ❑
If “Yes”,

From whom you have got encouragement/ inspiration?

(a) Parents ❑ (b) Teachers ❑ (c) Others ❑
if “No”,

“Would it be hard?” and “Why”
 ………………………………………………………………………………………………
……………………………………………………………………………………………

(D) Do you have anything more to describe a scientist? Explain.

 ………………………………………………………………………………………………
……………………………………………………………………………………………
APPENDIX – III

DAST Drawings Drawn by the High School Students
DAST drawings Drawn by Junior College Students
UPPER PRIMARY STUDENTS PERCEPTION TOWARDS SCIENTISTS: A CASE STUDY IN CACHAR DISTRICT OF ASSAM

MRS. TAHMINA KHATUN
Research Scholar
Department of Education
Assam University, Silchar

Abstract:

Students’ views of science and scientists have been widely studied. The image of scientists is an essential part of science. The present study basically concentrated on the middle school students’ perception of scientists in Silchar Town of Cachar district of Assam. The main objectives of the present study are to explore and obtain the perception of the students’ in general about scientists and whether the students’ perceptions are affected by the common stereotype prevailing about scientists. The sample consider for the present study is 108 students of middle school, particularly class-VI. The data has been collected from five English schools of Silchar town. As a tool of data collection Draw-A-Scientist Test (DAST) (Chambers, 1983) and the Draw A-Scientist Checklist (DAST-C) originally developed by Finson, Beaver, and Cramond (1995), modified by the researcher especially for the present study are used and for the data analysis percentage method is used in this study.

The data presented and analysis in the present study so far clearly shows that there prevail various types of stereotypical images of scientists among the students as male, white, working in laboratory using test-tubes, computer etc. Though some characters like hair, height etc. are found to be different from the previous studies but these also do not give a realistic perception towards scientists.

Key Words: perception, scientists, middle school
Introduction:

“The scientist is a man who wears a white coat and works in a laboratory. He is elderly or middle aged and wears glasses. He is small, sometimes small and stout, or tall and thin. He may be bald. He may wear a beard, may be unshaven and unkempt. He may be stooped and tired. He is surrounded by equipment: test tubes, Bunsen burners, flasks and bottles, a jungle gym of blown glass tubes and weird machines with dials. The sparkling white laboratory is full of sounds: the bubbling of liquids in test tubes and flasks, the squeaks and squeals of laboratory animals, and the muttering voice of the scientist. He spends his days doing experiments. He pours chemicals from one test tube into another. He peers raptly through microscopes. He scans the heavens through a telescope, or a microscope. He experiments with plants and animals, cutting them apart, injecting serum into animals. He writes neatly in black notebooks”. (Mead & Metraux; 1957).

The above cited statement generalizes a stereotypic image of the people towards scientists. It is universally accepted that development of science and technology is the root of every development of a nation and for the development of science and technology good scientists are required. It is the scientists with their tools that are up to the challenge and can ensure that we all safely move with time (V.I. Keilias-Borok-2004). Jawaharlal Nehru also believed that science is the strongest and fruitful profession to make a social change and remove inequality from society. The contribution of the scientists has a great role in the development of a country. Therefore we need more scientists to make our country more developed.

The image of scientists is an essential part for popularization of science and scientist profession. And the image is created among the students from their perception of scientists. People’s actions,
emotions, thoughts and feelings are triggered by perception of their surroundings. Perceptions is the intellectual process by which a person acquires the information from the environment, organize it and obtain the meaning from its (Begum, A. J. and Indra, G.; 2012).

It is seen that most of the people have a stereotypical image about scientists that they cannot live a normal life, rather they live like some mythical creature. And this type of image of scientists prevents the students as well as guidance to select a carrier as scientist for them. One statement given by a scientist of ‘Stanford Linear Accelerator Centre’, USA, named Martin M. Perl, as “the popular image of a scientist and how one does science is very distorted and that is what drives many young people away from career in science” Since today’s students are the future resource of a nation, therefore it is necessary to motivate the students having potentiality to become scientist in future to select scientist profession.

Although many students would say that they have never met a scientist, they are able to describe their own images of scientists’ appearance, personalities and works in many ways. The stereotype image may lead potential requisites to believe that a successful scientist must be a genius, enjoy working alone and have a limited kind of social life. It also implies that scientists’ lifestyles will be greatly constrained by their work. If that perception do not fit with the students’ beliefs about themselves or their aspirations for the future, they are not likely to pursue a scientific career (Gardner & Manson et. al 1991).

The Researcher interested to conduct a study on middle school students perception towards scientists, whether their perception towards scientist are stereotypic or not. If stereotypic, then it is necessary to develop a positive image of scientists among the students by removing those stereotypic images which are preventing for students to select a scientist profession.
From an extensive review of related literature the researcher found that though studies on perception of scientists of students are available they are conducted mostly in abroad. Studies conducted in India on this area are found to be negligible. Though there were some studies conducted on primary students and high school students but there were few studies conducted to find out perception of middle school students about scientists. And the stage of middle school students is also an important stage of development. Therefore, it is a matter of great interest to examine the present image of scientists among the students in Silchar.

The current study is conducted on Silchar, District Headquarter of Cachar district of Assam in India. The state, Assam can be classified into two natural region- (i) Brahmaputra valley (ii) Barak Valley depending upon the two big rivers The Brahmaputra and The Barak. In Assam there are 27 districts out of which 3 districts constitute the Barak valley, except two hill districts other 22 districts are in the Brahmaputra valley.

**Objectives:**

To explore if the students’ perception are affected by the common stereotype prevailing about scientists regarding the following

(i) Physical qualities like-gender, age, complexion, facial hair, hair, health, height, wearing eye glass.

(ii) Personal qualities like, manner, intelligence, talkativeness, busyness.

(iii) Work atmosphere-place of working, symbol of research, symbol of technology, type of working.
Methodology:

The present study is basically qualitative in nature as it concern with qualitative aspects of student’s perception towards scientist’s various qualities and work atmosphere. In this study projective technique is used to derive perception. “In projective techniques the respondent is supplying information tends unconsciously to project his own attitudes or feeling on the subject under study.” (C.R. Kothari, 2007)

Population:

The population of the present study consists of all the students of the Middle Schools under SEBA of the Silchar town of Cachar district of Assam. The individual students of middle schools are the units of the present study. In the present study among the three classes of middle school (Class: V, VI and VII; 2009), class: VI is selected as representative class of the students of middle school standard.

Sample:

Out of number of English medium schools twenty schools (only private schools) have been purposively selected as data shows more batter result in private schools than provicialised or government schools. However, out of twenty schools, 25% (i.e. 5 schools) have been selected at random. From these schools all total 108 students have been found present at the time of collection of data. Therefore, data have been collected from 108 students of sixth standard.

Tool used:

In the present study the researcher has used the Draw–A-Scientist Test (DAST) which was originally developed by David Wade Chambers in 1983 by surveying 4807 school children in three countries between 1966 and 1977. Its main purpose was to know at what age the well known stereotypic image of the scientist first appeared in the students. He only asked simply to ‘Draw a Scientist’. The drawings were then analyzed for seven standard indicators: lab coat,
eyeglasses, facial hair, symbol of research, symbol of knowledge, products of science, and relevant captions. In this study the researcher have considered the DAST as Group-A of the tool used to obtain the student’s perception towards scientists.

As it is difficult to derive their perceptions only through their drawing, a modified checklist is also used. This was originally developed by Finson, Beaver, and Cramond (1995) as the Draw A-Scientist Checklist (DAST-C) and modified by the researcher with the consultation of supervisor and different experts in relevance to the present study. Through the use of the tools; DAST and the DAST-C the researcher tried to gain insight into students' perceptions towards scientists.

For the data analysis purpose percentage method is used in the present study.

**Analysis:**

In the present study the researcher has used percentage method for the analysis of data and the different percentages of data regarding perception of the students towards scientists are presented in the following tables.

**Table: 1 Students Perception of Physical Qualities of Scientists**

<table>
<thead>
<tr>
<th>Gender</th>
<th>Height</th>
<th>Health</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>2</td>
<td>2</td>
<td>2</td>
</tr>
<tr>
<td>3</td>
<td>3</td>
<td>3</td>
</tr>
<tr>
<td>1</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>4</td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>3</td>
<td>2</td>
<td>3</td>
</tr>
</tbody>
</table>

Legend: Gender- 1= Male,  2= Female,  3= May be Male/ Female  
Height- 1=Tall,  2= Short,  3= Normal  
Health- 1= Thin,  2= Fat,  3= Normal
In the previous studies, general opinion would readily find a scientist depicted as a white male, middle aged or older, wearing a lab-coat and glasses (Barman 1996-97-1999; Bodzin and Gehringer, 2001; Chambers, 1983; Finson 2002-2003; Finson, Pedresen and Thomas, 2006; Flick, 1990; Fort and Varney 1989; Finson, Beaver and Cramond 1995; Fung 2002; Hurber and Burton 1995; Song and Kim, 1999; Thomas, Pederson and Finson, 2001).

The present study gives similar stereotype result with previous studies regarding gender of scientists. In this study 83.3% student have perceived scientists as a male and only 7.41% have perceived scientists as female. But it is very interesting that, all the students (100%) of them who have drawn scientist as a female are girls (Table: 1).

On the other hand, some images regarding physical qualities of scientists has been interestingly found opposite of former studies, such as normal height(49.07%), normal health(56.48%), short haired (60.19%) (Table-2). Whereas in previous studies is viewed as tall, thin and long haired.

**Table: 2 Students Perception of Physical Qualities of Scientists**

<table>
<thead>
<tr>
<th>Age</th>
<th>Colour</th>
<th>Hair</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>42.59</td>
<td>37.96</td>
<td>19.44</td>
</tr>
<tr>
<td>1</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>63.89%</td>
<td>12.96%</td>
<td>23.15%</td>
</tr>
<tr>
<td>1</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>28.70%</td>
<td>60.19%</td>
<td>4.63%</td>
</tr>
<tr>
<td>4</td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>6.48%</td>
<td>1= Can’t Tell</td>
<td></td>
</tr>
</tbody>
</table>

Legend: Colour- 1= White, 2= Black, 3= Can’t Tell

Hair- 1= Long haired, 2= Short haired, 3= Wild haired, 4= Bald

Age-Young age=1, Middle age=2, Old age=3

But they perceived scientist as a white person (91.67%) like other studies. Regarding age of the scientist maximum responses got either for young age(42.59%) or middle age(37.96%) whereas in previous studies it was either middle age or old age. This image may be taken place due to the influence of some media or some movies. In the recent past of the present study one movie has
been released (2009), named as ‘Three Idiots’ where the hero of the film Amir Khan becomes a
scientist. In this film Amir Khan had short hair and since he is not so tall, fat and not an old aged
person, so the students also have imagined a scientist like him (as explained by some of the
students, in an informal talk with them)

Table: 3 Students perception of some physical qualities of scientist

<table>
<thead>
<tr>
<th>Facial hair</th>
<th>Wearing eye glass</th>
<th>Wearing lab coat</th>
</tr>
</thead>
<tbody>
<tr>
<td>Yes</td>
<td>No</td>
<td>Yes</td>
</tr>
<tr>
<td>50.93%</td>
<td>49.07%</td>
<td>57.41%</td>
</tr>
<tr>
<td>No</td>
<td>Yes</td>
<td>No</td>
</tr>
<tr>
<td>42.59%</td>
<td>75%</td>
<td>25%</td>
</tr>
</tbody>
</table>

In the Table: 3 it is seen that in case of facial hair 50.93 percent of the respondent have given that
there is facial hair of the scientists and 49.07 percent have given that there is no facial hair
similarly in case of eye glass 57.41 percent have drawn eye glass and remaining 42.59 percent
have not drawn, on the contrary regarding lab coat 75 percent of the respondent have agreed that
the scientists wear lab coats and only 25 percent have perceived that the scientists do not wear
labcoat.

Table: 4 Students’ Perception of Personal Qualities of Scientist

<table>
<thead>
<tr>
<th>Manner</th>
<th>Intelligence</th>
<th>Busyness</th>
<th>Talketiveness</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>2</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>80.56%</td>
<td>7.40%</td>
<td>12.04%</td>
<td></td>
</tr>
<tr>
<td>88.89%</td>
<td>0%</td>
<td>11.11%</td>
<td></td>
</tr>
<tr>
<td>91.67%</td>
<td>1.85%</td>
<td>6.48%</td>
<td></td>
</tr>
<tr>
<td>68.51%</td>
<td>12.04%</td>
<td>19.45%</td>
<td></td>
</tr>
</tbody>
</table>

Legend: Manner- 1= Friendly, 2= Unfriendly, 3= Can’t Tell

Intelligence- 1= Intelligence, 2= Dull, 3= Normal
Busy ness - 1= Busy, 2= Lazy, 3= Can’t Tell

Patience - 1= Patient, 2= Impatient, 3= Can’t Tell

Talking - 1= Silent, 2= Talkative, 3= Can’t Tell

The Table: 4 summarizes the perception about personal quality of scientist. In case of personal qualities all the results in the current study are almost similar to the previous studies. Nearby 89% students have perceived scientists as intelligent, 91.67% have perceived as scientists always remain busy, 70.37% have stated that scientists have patience, 68.51% have viewed that scientists keep silence, they are not talkative. But not a single student has perceived scientists as dull. These characteristics are almost similar to the findings of the other studies conducted by other researchers in other locations (Talsma V. L 1997; Turkman ,H. 2008). But 80.56% students think that scientists have friendly behavior which is opposite from the other studies. When they were asked, regarding this behavior they told that they know Abdul Kalam as a scientist and he loves children and he is a friendly behavior man. Though they never meet Abdul Kalam but saw through the media.

Table: 5 Students’ Perception of Work Atmosphere of Scientist

<table>
<thead>
<tr>
<th>Place of working</th>
<th>Symbol of research</th>
<th>Symbol of technology</th>
<th>Type of working</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>1 2 3 4</td>
<td>1 2 3 4</td>
<td>1 2 3 4</td>
</tr>
<tr>
<td></td>
<td>66.67 18.52 9.3 5.56</td>
<td>78.7 13.9 2.78 4.62</td>
<td>0 7.4 81.5 11.11</td>
</tr>
</tbody>
</table>

Place of working: 1= indoor, 2= outdoor, 3= both, 4= cannot tell

Symbol of research: 1= test tube/ biker, etc., 2= machinery, 3= animal/plants, 4= microscope

Symbol of technology: 1= television, 2= telephone, 3= computer, 4= missile
Type of working: 1= reading, 2= writing, 3= working in lab, 4= teaching

Another important observation in this study is work atmosphere of scientist. In the present study majority of students 66.67% have drawn a scientists working alone in indoor wearing lab-coat. And 18.52% students perceive scientist working in a outdoor places. But it is amazing that all the students who have drawn outdoor places are boys. Some symbols of research also have been drawn by the students (78.7%) like laboratory equipment including test-tubes, various types of flasks, beakers and burners with flames; shelves etc. are almost similar to previous studies (Barman 1996-97-1999; Bodzin and Gehringer, 2001; Finson 2002-2003; Flick, 1990; Fung 2002; Hurber and Burton 1995; Song and Kim, 1999; Thomas, Pederson and Finson, 2001). Another interesting feature is the presence of computers in their drawings. 81.5% students perceive computer as symbol of technology. This reflects increasing usages of computer in every kind of work. Most of the drawings (74.07%) shows that scientist is chemical scientist working with some test tube in a laboratory and only two students (1.85%) perceive scientists as giving lectures.

**Major Findings:**

(i) Like previous studies the present study also reveal some stereotypic images of scientists like scientists as a male, white, intelligent, silent, busy in works, having patience etc. regarding physical and personal qualities.

(ii) Some findings regarding physical qualities of scientists has been found opposite to former studies such as normal height, normal health, short haired, friendly behaviour, young or middle aged. Whereas in previous studies it is viewed as tall, thin, long haired, unfriendly behavior and middle or old aged.
But it is clear from their view that seeing scientist and their working, it is possible to remove those stereotype images towards scientist which are harmful or preventive for them to select a scientist profession.

In the present study it is also found that majority of students perceive the scientists working alone indoor, work with test-tubes, computers, wearing lab-coat which is also similar with previous studies.

It is also found from their view that media has an important role in formulating their perception regarding scientists.

**Conclusion:**

From the above findings the researcher has come to a conclusion that students’ perception about scientists are filled with stereotypic images with the previous studies, though most of the available studies were conducted abroad. It shows that the culture does not have any effect on the students’ perception of scientists.

It is essential responsibility for teachers, science educators and curriculum developers involved in developing science curriculum materials to know what students’ perception is about science and scientists all over India and change their stereotypic beliefs if any among the students.

Both boys and girls should encourage becoming a scientist who have potentialities.

Every school should have a well equipped laboratory. Students should have given opportunity to visit research centers, meet scientists to increase their interest toward scientist profession. Flick, L. (1990) also found that Scientist in residence program improving children's image of science and scientists.
Media should be free from those stereotypic images which are preventive for students to select a scientist’s profession, when showing films, cartoons, serials, stories etc regarding scientist.
References:


