

Students' Writing Regarding Choice of Subjects: A Perceptible Study Focusing on Student's Image about Science and Scientist

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Abstract- Students have different perception about science and scientist. How do students view science and scientists? And is this perception important to science educators in any way? Finding out answer to these questions would pave new insights in science education. This study tries to elucidate upon the choice of subjects students state when told to write about 'scientist at work' and 'me as a scientist.' Results indicate drift towards choice of astronomy and chemistry. The subjects mentioned rarely in the passages were ecology, earth-science, education, mathematics, sports, genetic engineering and the social sciences.

Index Terms- scientific work, science education

I. INTRODUCTION

Development of science has been the result of human's curiosity of puzzling natural phenomena and situations with a view to satisfy his innate curiosity. To move toward this objective man continues to strive for improvement and in this process moves forward in their scientific quest. Science and scientist has a major role in realization of this quest for knowledge.

With reference to science and scientists, Chambers (1983), states that in the eighteenth and nineteenth century, there were varied visual and verbal images of scientists which are rarely seen now. Though these images were stereotypic, their range was large. The evidence indicates that the various elements of the stereotype appear with greater frequency as students advance through the grades.

Sir Peter Medawar (1979) says in his *Advice to a Young Scientist* "There is no such person as the scientist.... Scientists are people of very dissimilar temperaments doing different things in very different ways."

The classic work by Margaret Mead and Rhoda Metraux (1957) with high school students in the United States showed that students view science as natural science and the scientist

as 'a man' who wears a white coat and works in the laboratory. He is elderly or middle aged and wears glasses (Chunawala, S. and Lagade, S., 1998).

Beardslee and O'Dowd (1961) explored college students' beliefs about scientists. After preliminary interviews students had been provided with a questionnaire in which students were asked to indicate the appropriateness of a series of terms. The terms were arranged on a two-ended seven point rating scale. This rating was done for 15 occupations including that of a scientist. A well-defined stereotype of a scientist emerged in the ratings of students. The scientist emerged as a highly intelligent individual devoted to his studies and research at the expense of interest in art, friends and family. No gender differences existed in the views of students.

Studies of the views of school teachers about science have also been conducted. Ramphal (1992) in a study of Indian school teachers reported that most teachers stated that they had never met a scientist, yet a large proportion of them felt that no formal qualifications were necessary to be a scientist, if the appropriate qualities of 'discovery' were present. Patience/commitment was stated to be a prominent characteristic of scientists, more often than creativity or logical thought. Most teachers held that scientists are truly objective and are not influenced by factors such as pressures from external sources or need for personal gain, they also felt that the scientific temperament was reflected in everything about the scientists. "More than half the teachers regarded scientists as unemotional. Scientists according to them do not even look like ordinary persons but appear 'serious and in thought' or 'brilliant but somewhat lost'. The last is indicating the stereotype of the absent-minded professor". (Student's Ideas about Science and Scientists, Sugra Chunawala and Sabita Lagade, 1998).

"The 'Draw-a-Scientist' task has been used in research for a long time in different formulations and with slight modifications. (Mead and Metraux 1957, Krajcovich and Smith 1982, Chambers 1983, Kahle 1987, Kjærnsli 1989, Matthews 1996)." (The SAS study, Svein Sjøberg, 1998)

"The purpose of this item is to elicit the image of scientists held by the learner. It may be argued that this item simply begs the stereotype to be presented; the respondents may concentrate on what distinguishes a "stereotype" of a researcher from other "normal" people. In the research, different approaches are used to counteract this". (The SAS study, Svein Sjøberg, 1998).

(Like drawing two scientists, or by sorting cards with drawings etc.), the pupils were asked to draw a scientist *at work*. This is a qualitatively oriented task and the phrase "at work" is deliberately added, to draw attention to the thing scientists actually do - and not only how they may look. In the

second part of this item, the pupil is invited to elaborate on the same aspect by writing something about it. This may be a story or just a list of key words.

II. OBJECTIVE OF THE STUDY

To study the perception students have in their mind regarding science and scientists through the choice of subjects.

III. METHODOLOGY AND DESIGN OF STUDY

The researcher modified and used excerpts from standardized tools on Students' idea about science and scientists by Jane Mulemwa from Uganda, Jayshree Mehta from India and Svein Sjøberg from Norway. The students were asked to write about 'scientist at work' and 'Me as a scientist'. This is a qualitative oriented task and the phrase 'at work' is deliberately added, to draw attention to the things scientists actually do and not only how they may look. After going through the writings, the choices of subjects stated were categorized.

IV. SAMPLE OF THE STUDY

The sample consisted of 220 students of class IX (mean age 14 years) from four schools of Mumbai. The schools selected were scholastically average.

V. ANALYSIS AND DISCUSSION

The subject written about most in the passages about 'scientist at work' was Chemistry and astronomy. It was followed by radio-physics, physics, biology, technology in that order. The subjects mentioned rarely in the passages were ecology, earth-science, education, mathematics, sports, genetic engineering and the social sciences. See table 1.1 for the various responses of students for the subjects mentioned for 'scientists at work'.

Table 1.1: Percentage responses of students for the subjects mentioned for 'Scientists at Work'

Subject written about 'scientist at work'	Percentage scores
astronomy	28
radio physics	11
biology	16
technology	15
Chemistry	18
Earth science	3
ecology	3
education	1
social science	2
sports	0
genetic engineering	2
mathematics	1
others	2

Regarding 'Me as a scientist', overall the subject medicine and radiophysics were seen mostly. The subjects which followed were biology, chemistry, technology and astronomy respectively. See table 1.2 for the various responses of students for the subjects mentioned for 'Me as a scientist'.

Table 1.2: Percentage responses of students for the subjects mentioned for 'Me as a Scientist'

Subject written about 'me as a scientist'	Percentage scores
astronomy	14
radio physics	19
medicine	23
biology	15
technology	11
Chemistry	14
Earth science	2

ecology	2
education	1
social science	1
sports	1
genetic engineering	0
mathematics	1
others	2

Some of the representative responses especially from the writings of students for “Me as a scientist’s” regarding various subjects are presented below:

Biology

- ❖ Field of biology (rather human biology)
- ❖ Old fossils, different types of organs in human body
- ❖ Killing of animals-concerned & like to stop it
- ❖ Hormones, DNA structure
- ❖ Nature and plants
- ❖ Human brain & cell, processes
- ❖ Dinosaurs and methods by which they can appear again
- ❖ Cure for Diseases like AIDS, HIV and cancer
- ❖ Clone of humans

Physics

- ❖ Make systems with highly developed electronics
- ❖ About time (go to the future or past)
- ❖ Electricity and current
- ❖ How we feel in space
- ❖ Physics-optics (optical fibers, protons)
- ❖ Nuclear power plant, bombs
- ❖ Invent something to save electricity
- ❖ Study magnetism, electricity, weight, laser
- ❖ Radioactivity

Chemistry

- ❖ Ozone layer
- ❖ Strong fertilizers
- ❖ Find a substance which alchemists couldn't
- ❖ Chemicals and their properties, make new chemicals

- ❖ Make chemistry interesting for teaching children
- ❖ I would like to prepare different useful chemicals

Astronomy

- ❖ Space & creation of atmosphere on moon for living
- ❖ Space ships, learn more about space
- ❖ Artificial atmosphere, spaceship with speed of light, parallel universe
- ❖ Creation of universe, its expansion
- ❖ Travel in space in search for new life
- ❖ Prove that Mars has life (seen by the student via telescope)

Medicine & Health

- ❖ Prepare more new medicines
- ❖ Remedies or operations for cancer and aids
- ❖ Medicine that will destroy the hunger of people
- ❖ Vaccines for all diseases to be given at birth
- ❖ Medicines that are not bitter, to be injected and not swallowed
- ❖ Medicine to make man immortal, energetic and powerful
- ❖ Cure for plague
- ❖ Medicines without side effect, medicine for eye disorders

Technology

- ❖ Mechanical equipment to make man's life more comfortable
- ❖ Cameras to record & analyze voice, shoes to make travel fast
- ❖ Vehicles-more power, comfort, less pollution, equipment for easy life
- ❖ House which can be run on remote
- ❖ Time machine-the future will be progressive phase of the country
- ❖ Modern weapons-do not kill or destroy the surroundings

- ❖ Gadget for car-check pollution by filtering smoke & giving fresh air
- ❖ Robot which will fight as soldiers or will go places where humans can't go
- ❖ Cheaper electricity and power

Environment

- ❖ Bio fuels
- ❖ Global warming
- ❖ Ozone layer depletion
- ❖ Reducing emission from vehicles

VI. CONCLUSION AND REVIEW

The results reveal limited choices regarding subjects written and a wide spectrum regarding writing about sub topics /branches in every subject. But an overall positive and enterprising role gets reflected regarding the choice of subjects suggesting a positive image towards science and scientist.

The study was conducted with ninth standard students who are approximately 14 year old. This is a crucial year for many reasons. In Mumbai where the data was collected, the weightage of science in terms of marks in schools increases this year. Practical sessions for students are also introduced in the syllabus around this time. Students are approaching the stage where they will have to make decisions about the future, in terms of continuing studies and the choice of specialization. These decisions will determine whether students continue in science or

not. At this stage of life image of a subject may play an important role in decision-making. The study was conducted in scholastically average schools. The results of the study are more specifically related to the Indian context.

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