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'Science as an Out of School Experience': Changed Perception Due to Impact of Developed Instructional Program in Science Vis a Vis Conventional Method

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Abstract:
Development of science has been the result of man's inquiry of puzzling natural phenomena and situations with a view to satisfy his innate curiosity and to subdue the environment for enhancing his physical comforts. For this purpose, he built up a body of scientific knowledge by utilising his intellect and applying his ability for engaging in thinking and reasoning. Science as an out of school experience aims towards finding out the impact of the developed instructional program in science on their scientific acumen and bring out the scientist within them. Results indicate noticeable change in their approach towards situation and look it things from a scientific perspective.

1. Introduction

National Policy on Education (1992) remarks that, "Science educators havethe role of providing such scientifically literate citizens to the nation. To fulfillits expectations, citizens should be scientifically literate, skilled in the processesof science, acquire scientific information in depth and cultivate an appreciation for science"

The National Policy on Education (NPE, 1986) which gives emphasis for a child-centered science curriculum stresses the need for an activity based learning of science especially in the primary stage. The curriculum is framed so as to develop process skills in children. The textbooks contain learning experiences which promote scientific inquiry. The skills of scientific inquiry or investigation have a general and transferable nature; individuals can use them in solving problems concerning other subject areas or problems that arise in real life. But, the reality that no process can exist without content and no process can be taught and developed in separation with content, should also be taken into account. Hence, the science education oriented to face the demands of tomorrow's unknown dimensions should have a harmonious blend of processes and products, with a special emphasis on the processes of science.

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, Krajkovich and Smith 1982, Chambers 1983, Kahle 1987, Kjærnsli 1989, Matthews 1996) .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 form other "normal" people. In the research, different approaches are used to counteract this. (Like drawing two scientists, or by sorting cards with drawings etc.), the pupils were asked to draw a scientist *at work.*

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.

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.

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.

2. Objective of the Study

- To develop instructional programme in science for secondary school students.
- To study the effect of developed Instructional Program in Science on the dimension 'science as an out of school experience' with respect to students' idea about science and scientist.

3. Research Question

What is the effect of developed Instructional Program in Science on the dimension 'science as an out of school experience' with respect to students' idea about science and scientist?

4. Methodology and Design of the Study

For the present study the researcher has selected the Experimental Method by keeping in mind the objectives of the study and the problem. In order to select a suitable research design for conducting the experiment and assign the subjects to different experimental treatments to measure the outcomes of experiment and assign the subjects to different experimental treatments to measure the outcomes of experiment, the researcher must be well acquainted with different types of experimental designs. t test was used for the present study. In the present study students were given a list of activities and were asked,whether they have done these activities outside school.

5. Sample of the Study

Sample for the present study includes 80 students of secondary school (CBSE Board) from class IX of two schools inMumbai, Maharashtra. 40 students formed the experimental group and 40 formed control group.

6. Analysis and Discussion

Sjoberg and Imsen (1988) have pointed out that children bring with them to school different types of experiences and by taking some experiences for granted and as a starting point for reaching we may be unintentionally favoring some groups of students. A large variety of culturally diverse activities are sampled and students are asked to describe if they have undertaken these activities or experienced them outside the school context. This task is an inventory of activities that may have bearing on the teaching and learning of science - and may inform teachers and curriculum planners to selectively include them in the curriculum. The study presented list of various activities and asked students to say if they had done these activities outside school, never, seldom or often. The responses were graded as 1 for never, 2 for seldom and 3 for often. A group of 80 activities were listed. Mean values for students' out of school experiences were calculated and are presented in table 1.1

Sr No.	**Have you done this outside school?**	**Experimental group**			**Control group**		
		pretest	posttest	t-values	pretest	posttest	t-values
1	Sewed	1.98	1.99	1.08	1.88	1.82	1.05
2	Knitted	1.16	1.22	1.52	1.34	1.25	1.34
3	Weaved	1.85	1.91	0.64	1.87	1.7	1.06
4	Made clothes	1.98	2.04	1.06	1.65	1.7	1.43
5	Used a saw	1.3	2.36	**3.62****	2.45	2.3	1
6	Used a screw driver	1.76	3.82	**5.65****	2.65	2.5	1.79
7	Used a hammer and nail	1.6	4.66	**6.79****	1.54	1.34	1.64
8	Used pulleys	2.12	2.56	2.05*	2.2	1.9	1.53
9	Used a hand pump	2.03	2.09	0.96	2.1	2.2	1.06
10	Climbed a tree	2.4	2.46	2.32*	2.35	2.4	1.88
11	Made toys	1.87	4.93	**8.56****	1.67	1.54	1.44
12	Made a kite	2.31	2.37	0.64	2.2	2.24	0.55
13	Building kits	1.07	5.13	**7.65****	1.99	2	1.43
14	Used a radio	1.88	1.94	2.96**	1.87	1.85	1.34
15	Used a tape recorder	1.37	1.43	2.88**	1.4	1.43	1.65
16	Used a video recorder	2.82	2.88	2.83**	2.87	2.65	1.85
17	Played video/computer games	1	2.06	**3.78****	1.85	1.88	1.63
18	Used a calculator	1.88	3.94	**6.93****	2.5	2.65	1.45
19	Used a personal computer	1.03	2.89	**2.96****	2.33	2.4	1.54
20	Played with lights/mirrors	1.32	2.38	**2.86****	2.1	2.2	1.72

21	Used a magnifying glass.	1.99	2.05	**2.8****	1.78	1.76	1.23
22	Used a microscope	2.56	2.62	2.78**	2.44	2.86	1.44
23	Used binoculars	2.18	2.24	2.7**	2	1.99	1.67
24	Used a camera	2.11	2.17	2.72**	2.1	1.92	1.64
25	Developed a processed films	1.87	1.93	2.64**	1.65	1.6	0.79
26	Used a wrist watch	1.33	1.39	2.77**	1.44	1.56	1.73
27	Used a stop watch	1.23	2.29	**3.95****	1.1	1.23	1.96
28	Used a measuring tape	2.42	2.48	2.96**	2.32	2.4	1.29
29	Read a thermometer	1.77	2.83	**3.73****	2.21	2.38	1.34
30	Used a kitchen scale	1.99	2.05	**2.79****	1.76	1.95	2.05*
31	Read a map/compass	1.21	2.27	**2.95****	2.2	2.14	1.45
32	Used toy gun	2.18	2.24	1.98*	2.2	2.12	0.977
33	Made bow and arrows/sling	1.53	1.59	0.39	1.43	1.43	1.43
34	Preserved food (salting etc.)	2.32	2.38	0.83	2.13	2.2	1.66
35	Made bread	1.9	1.96	0.2	1.85	1.76	1.03
36	Collected edible berries	2.21	2.27	0.66	2.11	2.19	0.76
37	Made jam	1.76	1.82	0.39	1.44	1.54	1.97
38	Planted seeds	1.76	2.82	**4.03****	1.66	1.87	1.54
39	Studied the life in a pond	1.56	1.62	0.11	1.1	1.13	0.87
40	Read about body functions	1.87	1.93	0.53	1.6	1.78	0.88
41	Made a compost	2.32	2.38	0.67	2.14	2.24	1.32
42	Made a sieve	2.11	2.17	0.72	2.05	1.95	0.89
43	Made a funnel	2.08	2.14	0.83	1.89	1.97	1.12
44	Put bandages on wounds	1.76	1.82	1.56	1.77	1.93	1.54
45	Watched a bird make nests	2.11	2.17	2.09*	2.07	2.05	1.76
46	Watched an egg hatching	2.09	2.15	2.56*	1.9	1.75	0.89
47	Watched animals feed their young	1.67	1.73	1.45	1.22	1.35	1.54
48	Cared for an animal	1.79	1.85	1.65	1.64	1.78	1.55
49	Milked a cow/goat	2.07	2.13	0.15	2	2.13	0.55
50	Made yogurt, butter etc.	2.06	2.12	2.67	1.85	2	1.32
51	Made chalk or candles	1.59	1.65	1.45	1.6	1.76	1.66
52	Had a pet animal	1.54	1.6	0.43	1.44	1.8	1.66
53	Chopped wood/collected firewood	1.99	2.88	**3.43**	2	2.5	1.32
54	Made charcoal	2.05	2.11	0.34	2	2.4	0.78
55	Made a fire	2.43	2.49	2.32*	2.21	2.45	1.78
56	Made colour dyes	1.88	1.94	2.67**	1.66	1.69	1.19
57	Put up a tent/shelter	1.77	2.83	**3.05****	1.5	1.77	1.56
58	Walked with a load on head	2.66	2.72	0.78	2.41	2.76	1.22
59	Played with magnets	1.54	2.89	**3.89****	2.2	2.345	1.38
60	Played with batteries	1.03	3.09	**4.67****	1.85	2	1.89
61	Used electric toys	1.17	2.98	**3.86****	2.07	2.15	1.65
62	Changed a fuse	2.44	2.5	2.43*	2.11	2.19	1.43
63	Studied the inside of TV, radio	1.76	2.82	2.23*	1.43	1.45	1.33
64	Rode a bicycle	1.95	2.01	1.83	1.57	1.6	1.78
65	Mended a bicycle tube	2.32	2.38	2.24	2.13	2.18	1.22
66	Used a car jack	2.16	2.22	1.56	1.87	1.95	1.86

67	Charged a car or other battery	1.99	2.05	**2.84****	1.51	1.75	1.77
68	Made a cart/wheel barrow	1.76	1.82	2.076*	1.35	1.53	1.765
69	Observed the Milky way	1.54	1.6	2.54*	1.24	1.56	1.65
70	Observed the phases of the moon	1.66	1.72	2.56*	1.6	1.86	1.23
71	Observed rainbow or clouds	1.82	1.88	2.08*	1.53	1.56	1.77
72	Studied fossils	2.25	2.31	0.34	2	2.2	0.88
73	Made anything from clay	1.53	2	2.54*	1.78	1.82	1.67
74	Made bricks	1.88	1.94	1.056	1.32	1.4	1.43
75	Made a flute	2.11	2.17	2.18	2.09	2.1	1.55
76	Collected stones or gems	1.86	1.92	1.443	1.56	1.63	1.56
77	Thrown stones to watch water ripples	2.09	2.15	0.752	2	2.09	0.75
78	Made a wind or water mill	1.23	2.99	**3.06****	2.1	2.21	1.78
79	Blown soap bubbles	2.44	2.5	2.75**	2.13	2.19	2.05
80	Participated in brewing beer	1.02	1.08	0.54	1.34	1.4	1.23

Table 1.1: Mean Values of 'Out of School Experiences for Experimental and Control Groups (N=40)
**indicates .05 level of significance **indicates .01 level significance*

The t values were significant for some of the activities like –used a saw (t value 3.62), used a screw driver (t value 5.56), used a hammer and nail (t value 6.79), made toys(t value 8.56), building kits (t value 7.65), Played video/computer games(t value 3.78), Used a calculator(t value 6.93), Used a personal computer(t value 2.96), Played with lights/mirrors(t value 2.86), Used a magnifying glass (t value 2.8), Used a stop watch(t value 3.95), Read a thermometer(t value 3.73), Used a kitchen scale(t value 2.79), Read a map/compass(t value 2.95), Planted seeds(t value 4.03), Chopped wood/collected firewood(t value 3.43) , Put up a tent/shelter(t value 3.05), Played with magnets(t value 3.89), Played with batteries(t value 4.67), Used electric toys(t value 3.86), Charged a car or other battery(t value 2.84), Made a wind or water mill(t value 3.06).

7. Conclusion and Review

In control group though increment were observed in many of the activities while comparing the pre-test and post test scores but the changes are not significant as the t values are less than critical values. The students during the intervention had to go through the very interesting milestones of exploring which helped them get a feel of the phenomena, exercising and investigating which helps them learn how to plan and conduct a systematic inquiry. During this process they had gained the interest, skill and attitude to carry out the above mentioned activities which in other words can be said as ways to think differently and being more scientific in their day to day household challenges.The reason for this increment is that, while performing the activities, students were involved in carrying out any or all of the above mentioned tasks.

Images can be powerful in forming beliefs and attitudes, and they can play a role in the construction of identities. Although images are frequently acquired through social transmission, they are also formed from experiences (Howard 1992, White 1988).While carrying out the activities the experimental group students had to move through all the stages through which a scientist normally passes. By moving through the phases of engagement, exploration, explaining, elaboration and evaluation the students constantly progressed towards realization about what a scientist do while researching. The change in viewpoint could also be due to the realization of the fact that performing the activities involved teamwork, lot of hard work, coordination among teammates, test of imagination etc.

8. References

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