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RESEARCH ARTICLE

Innovation at Grass Root Level: A Key to Sustainable Development – A Pilot Study

RAJESH GROVER[1] & VISHAL SHARMA[2]

[1]Director, Pushpa Gujral Science City, Punjab, India
Email: rgrover99@gmail.com

[2]Sr. Research Fellow, Pushpa Gujral Science City, Punjab, India
Email: er.vishalsharma11@yahoo.in

ABSTRACT

A pilot study was undertaken by Pushpa Gujral Science City (PGSC) under the Government of India sanctioned project 'Regional Incubation Science Hub for Innovators' (RISHI) to promote innovativeness and develop a culture of innovation at the grass root level. In this study, 33 potential innovative ideas to solve societal problems pursued by students of various schools were analyzed. The finding of the study has revealed that there was significant impact in terms of nurturing innovativeness amongst school students given the suitable opportunity and platform to them. The study also pointed out that the young students are innovative and have potential to solve societal problems, and the same needs to be nurtured so as to contribute towards sustainable development.

KEYWORDS: Innovation, Scientific temper, Societal problems, Science activities, Young innovators

Introduction

To make significant advancements in various scientific fields, it is important to inculcate scientific temper, build a culture of innovation in the younger generation and encourage them to take up and pursue innovative ideas. Innovation stimulates economic growth and development of the nation (Peke *et al.*, 2015; Hall *et al.*, 2003; Spielman, 2005).

The word innovation means to make existing technology easy-to-use, more handy and cost effective. “Innovation” is seen as a most effective tool that provides solution to any problem. Every sector/organization and business is feeling the impact of globalization and technological revolutions. India is a developing country and its rank as an innovative country is 66th as per the

Global Innovation Index report (Dutta et al. 2016). Innovation is essential for sustainable growth. In order to establish a culture of innovation and creativity, it is imperative that the initiative is take at the grassroot level as the young generation may play a significant role in ensuring progressive growth.

Science City, Kapurthala is engaged in promoting scientific temperament and developing a culture of innovation among the masses especially for students through implementation of its various science programmes. It is popularizing science through the concept of 'edutainment'. In this regard, a pilot study was undertaken by PGSC under the GoI sanctioned project entitled 'Regional Incubation Science Hub for Innovators' (RISHI) to inculcate the culture of innovation at the grassroot level.

The present study intends to achieve the following objectives:

- Study and analyze the impact of Innovation Hub in inculcating culture of innovation amongst the young school students and
- Study the factors that may influence in building a culture of innovation for its successful replication in other regions.

Target Group(s)

The target group was broadly comprised of school students from class 9^{th} to 11^{th} Class.

Methodology

Innovative ideas to solve the community problems were invited through advertisement in national newspapers, distribution of pamphlets, as well as personal approaches to various schools of the region. Key information about the programme was also made available on the website of PGSC.

The innovative ideas thus received were shortlisted by a Screening Committee. Shortlisted innovators with potential ideas were asked to make a presentation before a panel of experts. The students selected with potential innovative proposals were asked to attend a three-week camp at PGSC for the fabrication of the working model of the proposed idea under the supervision of mentors.

A total of 33 young innovators from various schools were selected for the three-week internship camp organized in summer/winter vacations during the two years of the pilot stage. The data was collected pertaining to the field of innovative idea, its objective, background as well as gender of the student submitting the idea. The data thus collected was subjected to analysis.

The table below gives an account of the various innovative ideas received.

Table 1 — Innovative ideas received

S. No.	Innovative idea	Sex	Background of Student	Field related to	Purpose
1.	Water-lifter for irrigation	Boy	R	M	To develop a mechanical device to uplift water thereby solving irrigation problems
2.	Water-weighing machine	Girl	R	M	To develop cost effective weight measuring device having feature to calculate Body Mass Index
3.	All-weather godown	Boy	U	M	To develop a mechanical shielding system for the protection of food grains from spoilage
4.	Herbal weedicide for congress grass	Boy	U	C	To develop herbal weedicide for the eradication of congress grass
5.	Automatic anti-accidental system	Boy	R	E	To develop a simple electronic sensor based system to generate alarm signal at the unmanned railway crossing
6.	Pollution sequester	Boy	U	M	To develop a device to minimize the emission of harmful gases from vehicles

7.	Safe auto-rickshaws	Girl	U	E	To develop a sensor based electronic device that could stop the ignition of auto rickshaw when overloaded
8.	Multipurpose paddling machine	Boy	R	M	A mechanical paddling system
9.	Cow urine & dung powered batteries	Boy	U	B	To make use of waste product of cow in making batteries
10.	Modified multi-purpose cycle	Boy	R	M	To mitigate the irrigation problem and at the same time produce electricity to solve the energy problem
11.	Cycle operated washing machine	Boy	R	E	To develop a cost effective washing machine without any consumption of electricity
12.	Micro wind mills	Girl	R	E	To develop a system of micro wind mills installed at the road side to produce electricity from air pressure of the moving vehicle
13.	Air cooling system	Boy	R	E	To develop a low power consumption air cooling system
14.	Remote access of gadgets	Boy	U	E	To develop a cost effective electronic circuit for remote access of gadgets
15.	Killer sap for termites	Girl	U	C	To make a herbal sap to kill termites
16.	Thread from banana plant	Boy	U	B	To extract thread from banana plant
17.	Biogas from water hyacinth	Girl	R	B	To make use of water hyacinth for the production of biogas
18.	Energy saving gate	Boy	R	E	To develop a system coupled with main gate of the house that can save electricity when there is no one at home

19.	Total home security	Boy	R	E	To develop inexpensive electronic system that could protect home from all around
20.	Anti Theft System	Boy	R	E	To develop cost effective electronic circuit to control thefts
21.	Automatic motor tank controller	Boy	R	E	To make an electronic wireless system to control overflowing of water tanks
22.	Production of electricity through speed breakers	Boy	R	E	To develop a mechanical system linked with speed breaker that can produce electricity when any vehicle passes over it
23.	Illumination of buildings with glass rods	Boy	U	E	To make use of glass rods that can be used for illuminating the basement areas during the day time
24.	Reuse of waste paper	Girl	R	C	To make use of waste paper in making constructive things like glasses and bowls
25.	Hydrogen gas from urine	Boy	U	C	To develop a system by which hydrogen gas can be produced using waste product i.e. urine
26.	Innovative sand mining machine	Girl	R	M	To develop a mechanical system that can extract sand from rivers and help in conserving river banks
27.	Smart wheel chair	Boy	U	E	To make a wheel chair equipped with sensor for handicapped person
28.	Environment protection	Boy	U	M	To develop a mechanical device that can extract oil from sea or river water to save aquatic life

29.	Multipurpose machine	Girl	U	M	To develop a machine that can do churning and filtering process at the same time
30.	Stair climbing chair	Girl	R	M	To develop a mechanical system that could simultaneously lift heavy weight load and can climb the stairs
31.	Traffic lights control	Boy	U	E	To develop a sensor based system that can control traffic lights according to traffic
32.	Patient assistive device	Boy	R	E	To develop touch sensitive electronic device for paralyzed patients
33.	Height measuring instrument	Girl	R	Math	To make a device that can easily measure heights of tall building, towers, etc.

Note: R: Rural; U: Urban; M: Mechanical; E: Electronics; C: Chemistry; B: Biology

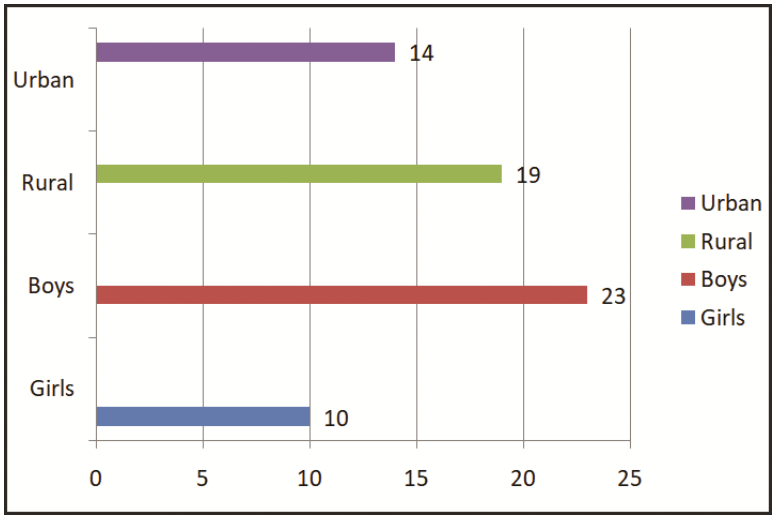

Fig. 1: Boys Vs Girls and Rural Vs Urban participants in the RISHI project

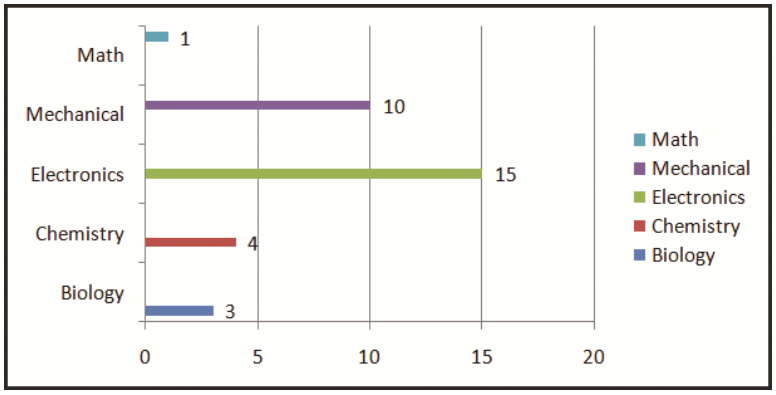

Fig. 2: Field specific participants under RISHI project

Observations

The quantitative studies have revealed that out of the total 33 young innovators, participation of girl students was 30.3% only, whereas boys' participation was around 69.9%. The study also highlighted the fact that rural student participation was better (57.5%) compared to urban students (42.42%) as depicted in Figure 1. Further, students participation with biology related innovative ideas was (9%) followed by (12.12%) in Chemistry, whereas for Electronics it was 45.45% and 30.30% of the students pursued innovative ideas in the field of Mechanical (Figure 2). The studies brought out the fact that all the young students had the potential to give effective solutions to the societal problems.

Discussions

It has been revealed from the findings that more students participated in this programme from rural areas rather than from big cities who were able to identify and address the problem in a cost effective way. This was attributed to the fact that the rural people suffer from poor infrastructure facilities, poor human resource development and poor accessibility of information and services (Maxwell, 2001). However, there is a remarkable contribution of the rural sector towards social as well as economic development of any nation, particularly in the developing countries (Chamber, 1983).

The findings depicted that most of the participated ideas pertained to electronics and mechanical field. Based on the studies, this was attributed to the fact that projects of electronics and mechanical fields fascinate students more as they find easy availability of facilities, technical help and tools. The main reason behind low participation of biology oriented ideas was attributed to the complexity of the subject, delayed results and requirement of well developed labs including expensive tools, and skilled expert advice all of which are not readily available. The study carried out by Atilla Cimer (2011) also supported our observation that nature of the topic and lack of resources are the reasons that make biology learning difficult.

The participation of girls in this programme was very low. The reason for low involvement of girls is due to parents' concern about security issue. There could also be other factors like the male dominating society exerting pressure on girls to be confined to household related activities. The low participation of girls is also attributed to the observations of the studies conducted by Dr. Rajeshwari M. Shettar (2015) that Indian women face discrimination and marginalization at every level of the society whether it is social participation, political participation or access to education. There are many constraints like professional and household inequality that check the process of women empowerment.

Conclusions and Recommendations

Young students are the reservoir of innovative ideas. The students are more creative and have potential to identify solutions to solve the societal problems in a cost effective manner. To tap the potential of young innovators, a suitable platform is required to nurture young minds as well as to develop a culture of innovation. Activities and programmes like RISHI enable young minds to stretch their imagination and think out of the box.

In pursuance of sustainable and inclusive development it is also important to give equal opportunities to girls.

An Innovation Club needs to be established in each and every school so as to provide room within their existing curriculum to discuss innovative ideas and thoughts to provide solutions to the societal problems posed to them. An Idea Box

can also be made available in schools or colleges wherein students can drop their innovative ideas in writing. The best innovative ideas may be selected and rewarded. Innovation Hubs equipped with all types of suitable facilities to pursue innovative ideas of the young students also needs to be set up in every state of the country.

Acknowledgement

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