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ARTICLE

"Communication 'Noise' at Sender and Receiver's End: Students Approach towards Schemes to Popularise Science in Delhi Schools"

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ABSTRACT

Science Education, Science Communication and Science Schemes for Science Popularisation cannot work in silos. They are interconnected like a spider web and demand better coordination to procure the desired results. In the recent past, several schemes like Knowledge and Awareness Mapping Platform (KAMP), Innovation in *Science* Pursuit for *Inspired* Research (INSPIRE), National Talent Search *Scheme (*NNTSE) among several others were launched by the science propagators to develop the scientific mindset in society through the senior school students. The study intends to explore the impact of several such schemes which have been launched to achieve this desired goal. A sincere effort has been made to identify those missing links and recommend suggestive changes. In the process, data from around 676 students in Delhi were collected to know their views on such schemes. The data collected were analyzed and accordingly interpreted. Prima facie, the study reveals the fact that science education is limited to rot learning and pass exams and not to internalise theoretical knowledge for practical usage. The young students in their tender age are receptive to the learnings imparted and are suited to be the right captive audience to take forward the message of science popularisation. Although a large sum of

money has been invested in institutions and programmes to promote science, there is still considerable scope to position and popularise science at the school level. The New Education Policy (NEP) and the New Science and Technology Innovation Policy (STIP) give an impetus for an effective intervention. Imparting Science Education to the students with an effective Students Behaviour Change Science Communication (SBCSC), linked to a Scientific Utility, will help in developing the desired Scientific Temper in society.

KEYWORDS: Scientific temper, Science schemes, Popularisation of Science, Social Behaviour Change Communication (SBCC), Students Behaviour Change Science Communication (SBCSC)

Introduction

Science education and science communication are two vital components for the effective implementation of science schemes. Their effectiveness can facilitate the researchers to identify vital findings and the policymakers to develop an efficient framework.

The study of science mainly includes two disciplines; Science Education (focusing specifically on science-specialised studies during senior and higher education) and Science Communication (focusing on interactions between the scientific community and the public) (Ayelet Baram-Tsabari, 2015).

Educational perspectives, such as argumentation or critical thinking, could be used more effectively to study science communication. Whereas the basic communication concepts, such as framing and presentation, could prove very useful for science education researchers, the contexts of problem-focused pedagogies, and enhancement of scientific knowledge will be beneficial for science communicators (Luis Fernando Santos, 2017).

The aim of this research study is to understand the gaps among science students to develop a scientific mindset leading them to an engagement of scientific application in their careers and for the betterment of society. The primary objective of this study is to identify the gaps at the sender and receiver' send in achieving the goal of effective communication and formulating possible solutions to address these gaps.

Review of Literature

Understanding the basic concepts of science helps in enhancing the content knowledge among students and teachers alike. While interacting with the teachers, there have been several instances, where they were found not to be clear about a particular science concept, and they tried to skip over or made the students mug up a particular phenomenon. Looking at the frequent changes in syllabus and science concepts, the experts have opined for orientation programmes for science teachers at different levels (Rajendra L Chavan, 2017).

According to several reports, among science information professionals, scientists and audiences, lack of effective science communication is one of the major causes of widespread science illiteracy (Michael F Weigold, 2011).

Enormous work is being carried out worldwide on science popularisation, but only a few are documented in scholarly journals. Scientific discoveries outnumber popularising these discoveries (Valenti Rull, 2014). In other words, the 'How and Why' of scientific discoveries are comparatively less reported. The need for non-scientific articles from scientific discoveries is of great concern. An all-out effort is needed by the policymakers, science communicators and educators to lessen the gap between scientific discovery and dissemination of that information. It will create a revolutionary change not only in the mindset of people but also benefit the economic policies of the government, literacy ratio, difference of opinion, political environment, &inflation and will bring in a paradigm shift towards scientific thinking (Wafia Masih, 2012).

The resource material on evidence-based teaching,'12 Core skills for effective science communication', deals at length with the ways and means of developing communication skills among teachers (Lucy Mercer-Mapstone &Louise Kuchel, 2015).

Several science communication models have also been presented by researchers for popularising science. The deficit model (Cathelijne M Reincke, *et al.*, 2020) emphasises the lack of scientific knowledge among the general public and could be addressed only through creating awareness. The contextual model stresses their own experiences, cultural environment and

personal situations to garner social and psychological knowledge leading to the information of science. The Lay expertise model (Baran, SJ and Davis, DK, 2012) gives weightage to the inherited scientific knowledge along with the scientists' outcomes. The Public Participation Model values the opinion of the general public and link it to science policies (Manish Mohan Gore, 2020)

ResearchMethodology

Several Government schemes like KAMP, INSPIRE, NTSE, etc. to popularise science at the school level were reviewed and first-hand information was collected about the schemes launched, and students engaged with them. Efforts of the Delhi Government to develop the scientific temper among the school children were also taken into account with the help of their website, officials and the science wing. After the preliminary research, literature review, and feedback, the respondents' viewpoints were collated based on a questionnaire developed to address the hypothesis that the schemes may or may not be making the desired impact.

1. Survey: The study was carried out using the multi-optional and short-response Survey Method.
2. Sampling Method: The sampling was done in two stages:
   Step I: *Selection of Schools:* For the present study, a mix of 100 Government and private schools along with the Kendriya Vidyalayas were selected. Out of the existing around 1200 (as per the Delhi Government records on edudel.nic.in) each Govt and private school and approximately 200 KVs functioning in Delhi, the schools were selected, using the incidental sampling method.
   Step II: *Selection of Students:* For the present study, over 2000 survey forms each to Government and private school science students and approximately 50 to the KV students were sent.
3. Data Collection Tool: For the present study, the 'Questionnaire' as a tool for data collection was used with the help of the Google Feedback form.

A questionnaire comprising multiple choices and open-ended questions was circulated among the students to understand their

viewpoints on the schemes to popularise science in schools. The Google feedback form was categorised into four sections; General Information about the respondent, Perception of Science in Schools, Knowledge about the Schemes and their utility, and suggestions to improve upon the quality and effectiveness. The general information was to categorise the students in various categories accordingly and for authentication purposes only. Perception about Science in schools covered the Level of Scientific Knowledge, Popularity of Science in School, Science Competitions & Activities, Weightage for Scientific Thinking, Availability of Subject Experts, etc.

Some of the points covered under the schemes' details included Students' engagement, Mode of getting such Information, Appropriateness of Information, School Initiatives to promote it and the utility of these Schemes. Under suggestions, the responses were sought on the missing link between the government science schemes and beneficiary students; school ambience, initiatives helping the students to develop scientific temper and ideas to improve the govt schemes on science.

The survey forms were circulated through the Department of Education, State Council of Educational Research and Training (SCERT), Science students' groups, Principals, personal contacts and other influencing persons. The feedback form was circulated to over 2000 science students. In all, over 4000 messages were sent out through phone calls, emails and Whats App. With the help of regular follow-ups and reminders, around 676 students responded. The feedback form was circulated during April and July and was collected till September first week of 2021.

Analysis

Out of the 676 student respondents, only 672 attempted all the questions successfully, and the rest of them attempted partially. The reason could be that some of them would not have been comfortable disclosing their age, or mail ID, or would not have understood the relevance of the question. They were a minimal number of hardly four students and did not make much difference. Since the response was attempted through Google Forms, the room for explanation or conviction was limited. Most of the participants were teenagers in the age group of 15 to 18 years.

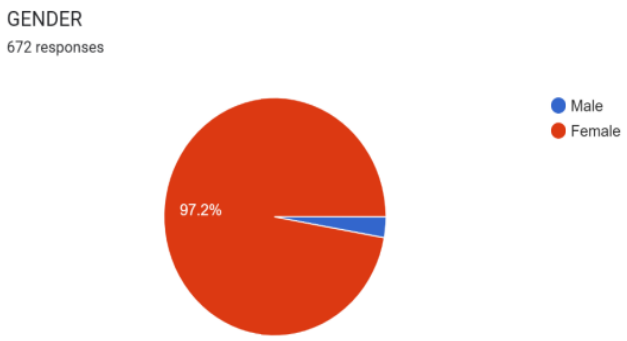

Figure 1: Ratio of Girls and Boys

Of those who responded, 97.2% were girls and only 2.8% were boys. This may attribute to more seriousness on the part of girls or that they are more vocal/prompt in responding or might be that the science subject is more preferred by girls.

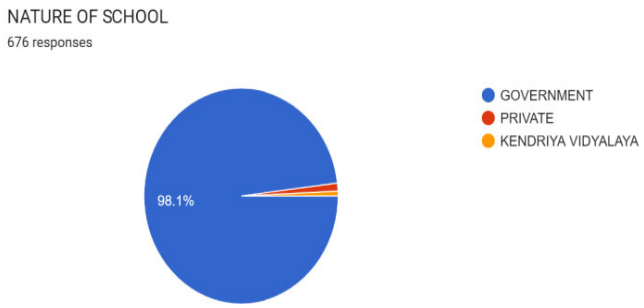

Figure 2: Ownership of School

Similarly, 98.1% were from government schools and only 1.9% from private schools. Private school teachers, students and management were a bit reluctant, and many preferred that the questionnaire may be routed through their principals and the school management. Also, they were found scared to respond while revealing the facts.

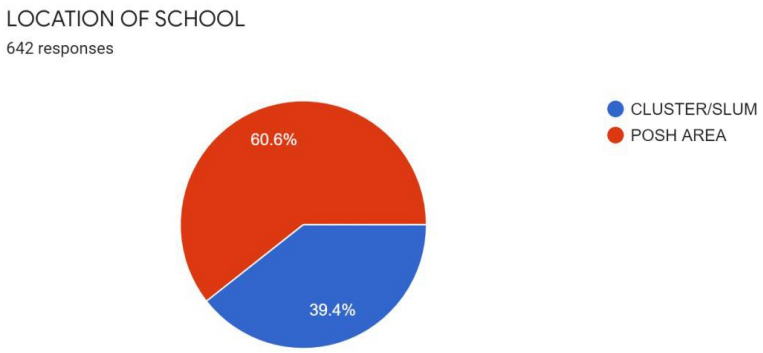

Figure 3: Locality of School

A good number of 389 respondents (60.6%) were from schools situated in posh areas and 253 (39.4%) were from clusters and slum areas. The reason could be that students staying in the posh area are well equipped with internet facilities and comfortable using Google Forms.

Some of the schemes responded to by the students to popularise science in schools included Vigyan Prasar Network of Science Clubs (VIPNET), Innovation in Science Pursuit for Inspired Research (INSPIRE), Augmenting Writing Skills for Articulating Research (AWSAR), Atal Tinkering Labs, Kishore Vaigyanik Protsaha Yojana (KVPY), National Talent Search Examination (NTSE), Vidyarthi Vigyan Manthan (VVM), Children Science Congress, STEM clubs, Science Olympiad, Inter School Science competition on exhibition, debates, painting, among others. This was an open-end question, so the answers were also manifold. Most of the participants responded to regional science centres, CSIR, Department of Science and Technology (DST), and SCERT among others as the government institutions promoting science.

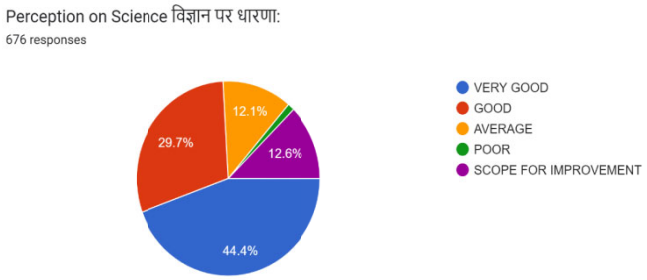

Figure 4: Students' perception on Science

Regarding the Perception about Science in schools, 44.4 % of students felt very good, around 30% as good and only 12% as average. Only eight of them considered it to be poor and around 13% opted for a scope for improvement. A large number of students terming the perception of science in schools to be good could also be because of the fear of management or for their own responsible failures.

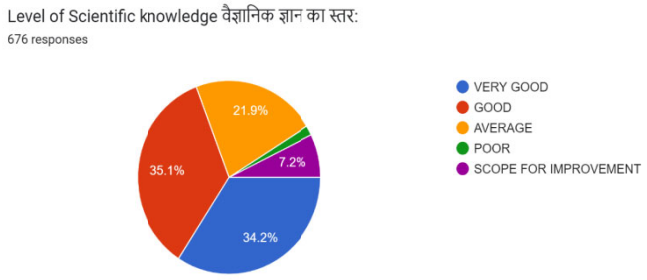

Figure 5: Students' level of knowledge of Science

Referring to the level of scientific knowledge, it was found that almost the same number of respondents 237 (35%) and 231 (34%) opted for the good and very good options on the school campus. Students who opted for scope for improvement were very less to the tune of only 7%. This shows that a wide range of students are acquainted with the happenings of science around.

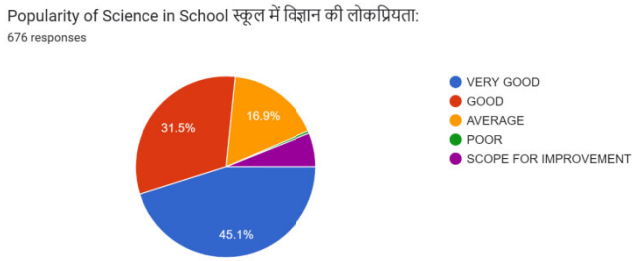

Figure 6: Popularity of Science in School

On the popularity of Science in schools, 31% responded to be good, 45% as very good and 17% was average. Only a mere 7 % of students referred to the scope of improvement.

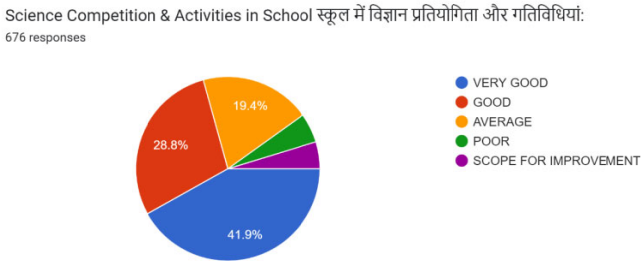

Figure 7: Science activities in the School

When it comes to organising science competitions & activities, 41.9% of students felt it to be very good, approximately 29% as good and 19.4% as average. This attributes to the fact that these days more emphasis is being given to science competitions and activities.

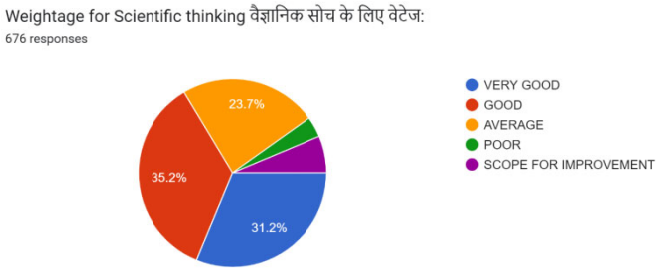

Figure 8: Preference for Scientific thinking

Almost 35% of students opined Weightage for scientific thinking to be good, 31% very good and 24% average. These days, students being asked to complete Science projects, assignments and experimental presentations could be the main reason for it.

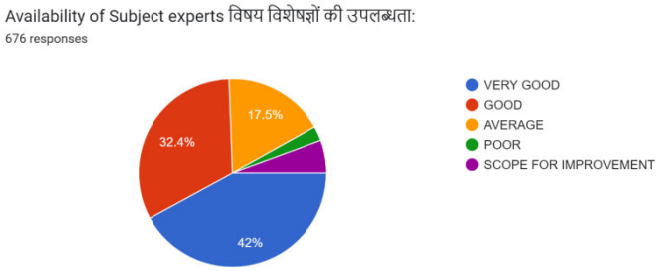

Figure 9: Presence of Science teachers in school

The availability of subject experts was considered to be good, very good and average by 32.4%, 42% and 17.5% respectively. These days, teachers are appointed as subject experts.

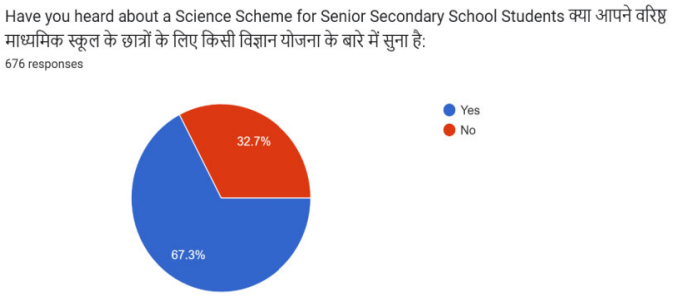

Figure 10: Testing of general knowledge of Science

A large number of students were found to be ignorant about several specific schemes launched for the popularisation of science. Out of the respondents, 455 (67%) students had heard about some science schemes for senior secondary school students, whereas 221 (33%) were ignorant.

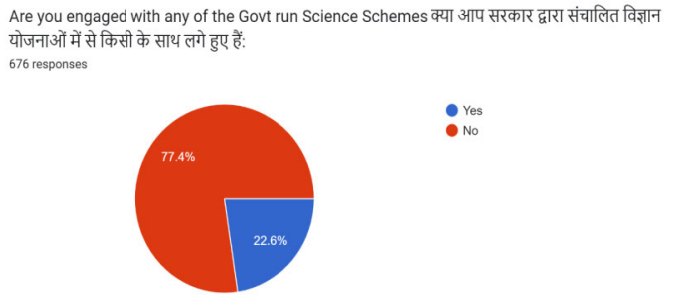

Figure 11: Engagement in any Science activity

Around 153 (23%) students were found to be engaged in some or the other science schemes and 523 (77%) had no engagement with any specific science assignments.

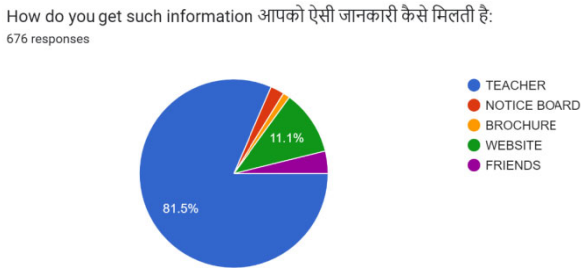

Figure 12: Testing the source of information for science schemes

For most of the students, 551 (82%) of them, the mode of getting such information was through the teachers and only 11% of them were dependent on the websites. In this digital era, the mode is well justified.

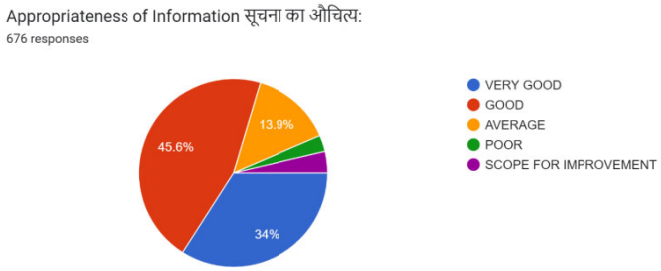

Figure 13: Credibility of Information

Appropriateness of information was found to be 34%, 46% and 14% as very good, good and average respectively.

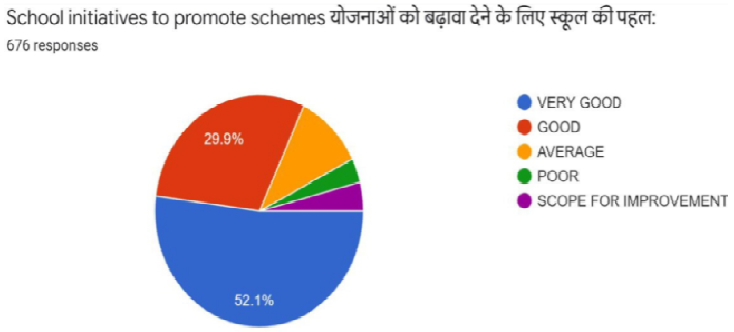

Figure 14: Contribution of school to promote schemes

School initiatives to promote science was found to be good by 52%, very good by 30% and average by 10%. Most of the school try to engage the students for schemes through some new form of initiatives.

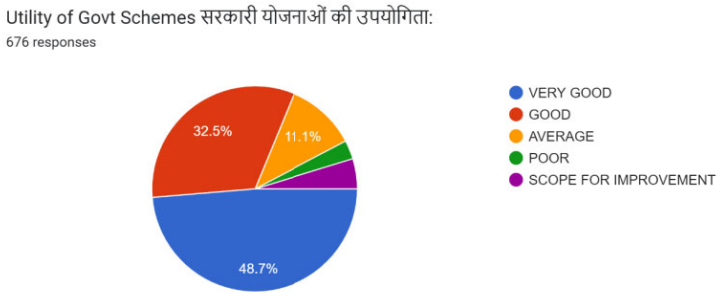

Figure 15: Contribution of schemes in practical life

Utility of these schemes was opted as very good by 52%, very good by 33% and average by 11%. Although the utility was not directly used by the students, their hope to do so was very positive.

Way Forward

Several of the schemes are known to be scientifically proven interventions to popularise science among school students. Many are national-level annual events focusing on identifying and

facilitating science talents in the form of incentives and awards. These schemes provide a platform for the young buddies to think, participate and express their innovative scientific thoughts.

A well-connected Science curriculum in schools will provoke students, resulting in imbibing the desired scientific thinking in society. Learning by doing and hands-on science models have shown good results in the past for promoting science. Scientific interventions to develop scientific think tanks with an approach of the Students Behaviour Change Science Communication (SBCSC) tool are the way forward. An enabling environment and an accepting public will enhance the quality of programmes to function effectively, and efficiently and enrich the society at large to develop the desired scientific temperament.

The changing role of science educators and emerging challenges mainly due to digitalisation/online learning modes need to be converted into opportunities. The online mode provides a better platform to evoke the thought-provoking process. It gives a whole lot of ambit to browse and look for new ideas and methods for learning and adaptability. Those novel ideas need to be converted into hands-on experience. The new Education Policy 2020 and STIP 2020 compliments the need for practical-oriented learning leading to societal benefits.

Conclusion

The study gives an insight into the impact of several schemes that were launched with the purpose to create scientific temper in society. But, were there any real takers, or beneficiaries, that can be decided only through a scientific study like this?

Some schools are trying to adopt a scientific approach to study through project-based learning but miss out when it comes to the time-bound syllabus as a priority. School ambience can help the students to develop a scientific temper through celebrating important science-related days, organising science fairs and exhibitions, correlating the concepts from their daily life, providing more hands-on experiments and allowing students to carry out activities of their own.

At the receiving end, many of the students were found to be focused on rot learning to clear their exams. In the domain of

research, it is considered to be a futile exercise. And, in terms of communication, it is considered as 'Noise'. The students in specific and society in general are unaware of the usage of scientific research in their lives.

Students also suggested proper timely notification and making things mandatory. The government schemes on Science need wide publicity through the media. Regular workshops for teachers are to be conducted so that they are well-equipped and students get the benefits of the scheme. Timely awareness is key to making the schemes effective. And the science students would be able to inculcate scientific temper in society along with science learning.

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