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ARTICLE

Science Popularisation during COVID-19 Pandemic: Participants Perspective on e-learning

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ABSTRACT

The COVID-19 pandemic has interrupted all facets of our daily lives. It has impacted the educational system as well, forcing the inclusion of technology tools to extend the outreach to the masses and to build scientific temper in the society. The present study is aimed to investigate the viewpoints of students, teachers, and the general public engaged in webinars, online workshops/camps conducted by Pushpa Gujral Science City, Kapurthala during COVID-19 pandemic in India. A nominal registration fee was charged for online workshops/camps, however, participation in webinars was free of cost. An online Feedback form with a questionnaire on participants' perspectives was developed and shared with participants after every event.

Feedback data comprising 634 webinar participants and 398 Online workshops/camps participants was analysed. Results indicated that E-learning has become quite popular among the students during restrictions imposed due to COVID 19 pandemic. Webinars and online workshops/camps helped to continue and extend the outreach of the Science Popularisation activities during lockdown. This paper presents the geographical, demographic, mobilization, usefulness and category wise analysis of the findings conducted during the study.

Keywords: E-Learning, Science camps, Workshops, Trainings, Scientific temper, COVID-19

Introduction

Pushpa Gujral Science City (PGSC) has been set up with the objective to inculcate scientific temper and promote the spirit of learning amongst students and the general public. PGSC has undertaken Science popularisation in mission mode to supplement formal science education through non-formal means. Science City has interactive exhibits, simulators, theatres and shows to simplify and explain complex scientific concepts to students and the general public. More than 45 lac visitors have experienced the journey of learning with an annual average clientele of about 3.5 lac/annum.

Lockdown due to the COVID-19 pandemic led to closures of schools, higher education facilities including Science centres/musea in most countries. This led teaching professionals/science communicators to think of alternative methods of teaching. E-learning is a concept that has been in existence since the 1960s but became widespread with the advent of the internet and the web[7]. Observing the growth of E-learning from the early 2000s, there has been increasing research on internet technology which is the bedrock of E-learning[10]. It has shown significant growth over the last decade, as the internet and education combine to provide people with the opportunity to gain new skills.

Since the COVID-19 outbreak, online learning has become more centric in people's lives. E-learning has been a key player in ensuring the continuation of teaching and learning during the COVID-19 outbreak[8]. Online learning also allows physically challenged students with more freedom to participate in learning in the virtual environment, requiring limited movement[6].

The current study was, therefore, undertaken to assess the participants' perspectives on e- learning during COVID-19. It is expected that the outcomes of this study will motivate other like-minded organisations to use online platform(s) to inculcate scientific temper amongst the masses and develop a skilled and knowledgeable society.

Objective

- To investigate the opportunities for scientific awareness using online platforms and assess their efficiency in science learning.
- To assess the degree of satisfaction of participants with the delivery and content of webinars, online workshops/science camps.

- To investigate the gender & age-based interest of participants towards webinars and paid online workshops/science camps.
- To compare the level of satisfaction between free and paid online programmes.

Methodology

This study was performed between April 2020 to January 2021. A total of 42 webinars and 72 online workshops/camps comprising 5113 & 654 participants respectively, were organised during this period. There was no registration fee for the webinars however, a nominal fee was charged for online workshops/ science camps.

School students of class 6 to 12, college students, teachers, and the general public participated in this study. Prominent resource persons with expertise in delivering popular talks were identified for the programmes. Each event was followed by question-answer session to take the queries of the participants. Attractive creatives were designed for each event to mobilise maximum participation. The creatives were uploaded on PGSC website for online registration. The creatives were also shared on PGSC social media handles *viz* Facebook, Twitter and Instagram for digital marketing of the events. Online video conferencing platforms like Zoom, Teams, Webex, etc. were used for organising the online events. Since there were restrictions on the maximum number of participants on most video conferencing platforms, therefore, all webinars were also live-streamed on PGSC YouTube channel.

The details of the participation of various categories of learners are given in table 1.

Table 1

Time period of the study	**April 2020 to January 2021**			
Category	**School Students**	**College Students**	**General public**	**Total**
Webinars	199	133	291	623
Online Workshops/Camps	308	49	41	398
Total	507	182	332	1021

Sample Size(n)

Random sampling technique was used to collect the sample data. Questionnaire-based approach was adopted and the questions designed by PGSC were shared with 8037 webinar participants from Punjab and neighbouring states and 633 online workshops/ camps participants, who were primarily from Punjab. Out of these about 12% (623) webinar participants and 63% (398) online workshops/camps participants responded. A total of 1021 participants participated in the survey.

Tool Used

Online Google feedback form was developed and used to collect the data by which studied the views and perspectives of the participants towards e-learning. The link to the feedback form was shared with the participants at the end of every online event. The questions in feedback form were evaluated using the Likert scale (1 (min) to 5 (max)), recording yes/no, nominal and qualitative responses. The data was collected online and analysed by using a graphical presentation.

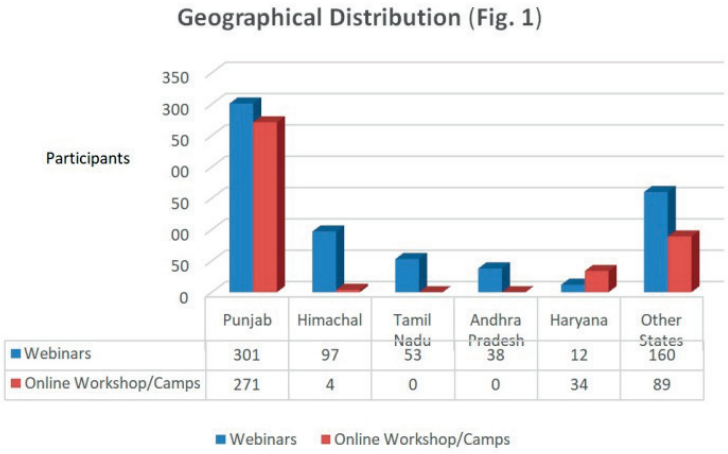
Results & Discussions

***Geographical Distribution*:** Geographical distribution of participants in webinars and workshops/science camps is indicated in Fig. 1. The analysis of data reveals that:

- During webinars, 48 % of participants were from Punjab, 15 % from Himachal Pradesh, 8% from Tamil Nadu, 6% from Andhra Pradesh, 4% from Uttrakhand and the rest from other states of India.
- During online workshops/science camps, 87% of participants were from Punjab, 8.5% from Haryana, and the rest from Delhi, Himachal Pradesh, and Uttrakhand.

It was observed that during webinars, there was no difference in participation from Punjab (48%) or other states (52%), however, in paid online workshops/science camps, participants from other states were found to be slightly hesitant. This could be attributed to the fact that participants from other states had never visited science city and were not aware of the activities conducted by PGSC and were, therefore, reluctant to participate

in paid programmes, whereas participants from Punjab were well versed with the activities of PGSC, hence, participated without any hesitancy in paid programmes.

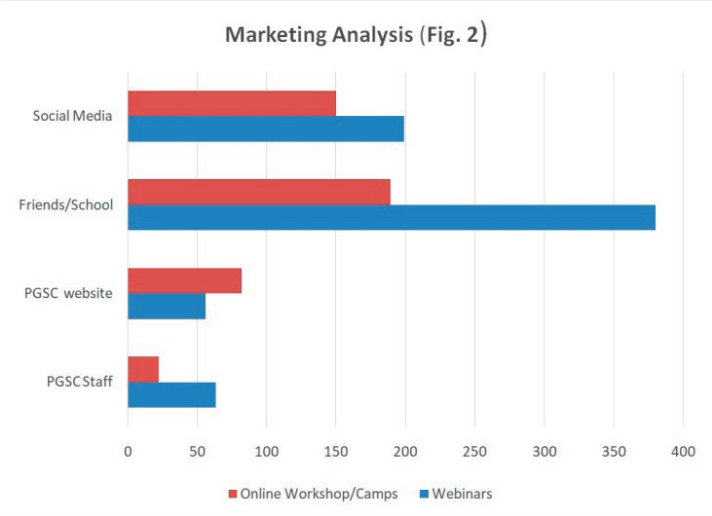


Furthermore, participation in free webinars over paid online workshops/science camps could be attributed to the mindset of people in developing countries that makes them reluctant to spend money frequently for accessing online courses. However, with the rapid increase in internet users all over the world, traditional teaching systems in schools and colleges are also changing. Students are now encouraged to refer to e-content available on the internet to clear their concepts. The outbreak of COVID-19 has further highlighted the need and advantages of e-learning programmes. The findings are also supported by a case study on Online Education: FREE vs Paid wherein, it has been revealed that paid courses are more effective with a view to learning new things[5].

***Participation Mobilisation*:** The different promotional methods used to mobilise participants towards participation in webinars and workshops/science camps have been given in Fig. 2. The data reveals that:

- During webinars, 61% of participants came to know about the event through friends/schools, 32% through social media, 10% through PGSC marketing staff and 9 % through the PGSC website.

- During online workshops/science camps, 48% of participants came to know about the event through friends/schools, 38% through social media, 20 % through PGSC website, and 5 % through PGSC marketing staff.

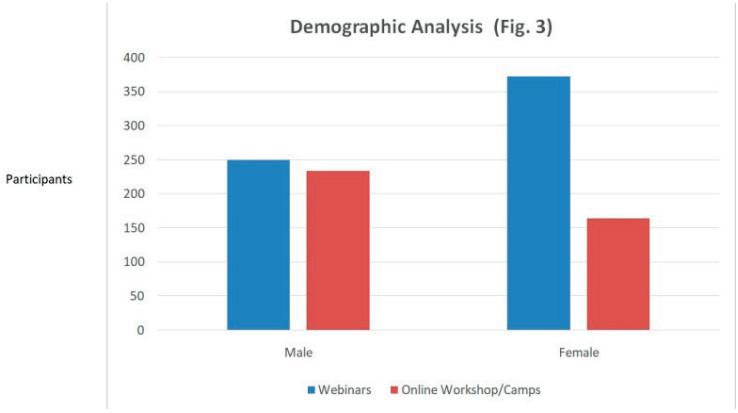


Social media platforms have become the main source of information surpassing print and other digital media platforms. Further, the current situation (COVID-19) has acted as a catalyst to the ever-increasing rise in social media adoption. More and more people are relying on Facebook, Whatsapp, Instagram, and Twitter, to stay up-to-date. This view is also supported by Andrew N Mason *et al.* in 2021 confirming that social media marketing has gained importance after the COVID-19 pandemic. The current study has also re-affirmed that social media platforms and web site have become major tools to mobilise participants for online events.

***Demographic Analysis*:** The demographic analysis of participants in webinars and workshops/science camps is indicated in Fig. 3. The analysis of data reveals that:

- During webinars, male participation was 40% and there was 60% female participation.
- During online workshops/science camps, male participation was 59% and there was 41% female participation.

It was observed that participation of females in online workshops/science camps were limited to trainings on IT-based topics like artificial intelligence, excel, coral draw and basic science trainings like fun science, science behind miracles, etc. whereas in skill-based trainings like basic electronics, house wiring, refrigeration, etc. their participation was negligible.

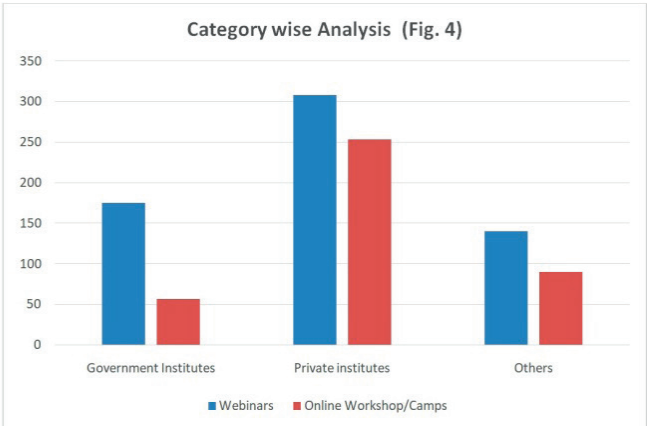


One of the reasons females not coming forward in large numbers to participate in skill-based trainings could be attributed to the general perception that these are male-dominated and that the skill training requires physical labour catering to the manufacturing sector only. The findings are supported by Ernst & Young LLP in 2020 conducted by the Ministry of Skill Development and Entrepreneurship through the Directorate General of Training to identify constraints on female participation in skills training and the labour market in India.

***Category wise Analysis*:** The category wise analysis of participants in webinars and workshops/science camps is indicated in Fig. 4. The data reveals that:

- 32 % of school students, 21% college students, and 47% general visitors participated in the webinars. Out of these, 49 % were from private institutions, 28% from Government institutions & 23% from others.
- 77% of school students, 12.5% college students, and 11 % general visitors participated in the online workshops/science camps. Out of these, 64 % were from private institutions, 14 % from Government institutions, and 22 % from others.

It was observed that participation of students from Government institutions was very less in online workshops/ science camps as compared to that from private institutions. This could be on account of the majority of the students in Government institutions belonging to economically weaker sections. This finding is supported by the study on the efficacy and accessibility of e-learning[3] reported by Azim Premji University. The study has revealed that more than 60% of the respondents who are enrolled in government schools could not access online education.

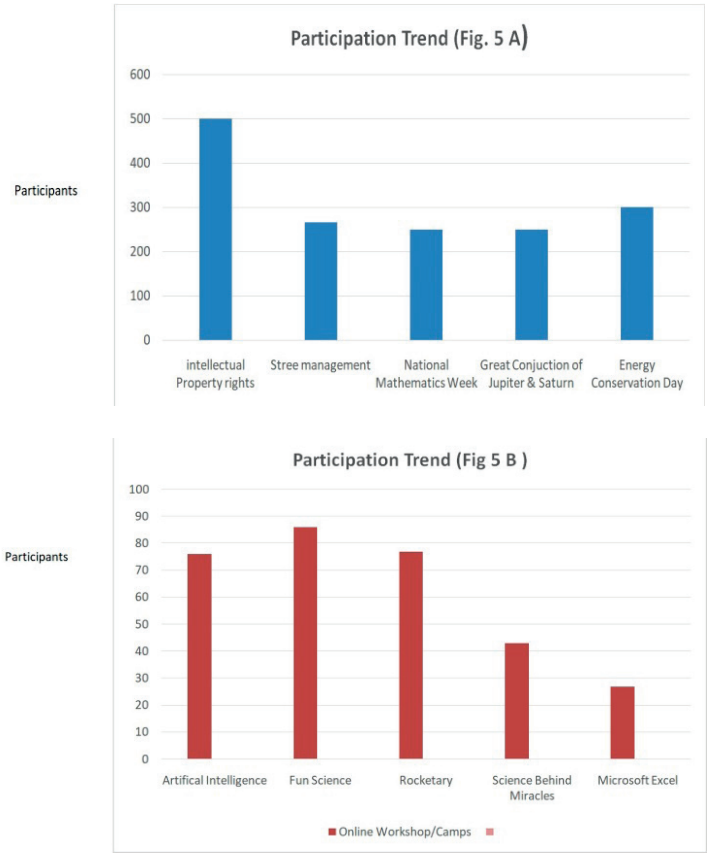


A welcome trend was observed during the studies as several general visitors far exceeded school/college students during free webinars as compared to paid trainings. It reveals that they are open to new learning opportunities that are provided free of cost. The study also indicates that it is easy to reach out to school students than college students. It could be because college students have other distractions whereas school students are more impacted by teachers and are serious about learning.

Participation Trend

- 42 topics were discussed during webinars, out of which major topics of interest were intellectual Property Rights, Stress Management, Mathematics Week, Great Conjunction of Jupiter and Saturn, etc. The participation trend of participants in these topics is indicated in Fig. 5A.
- During online workshops/science camps, 72 topics were covered out of which maximum participation was found in

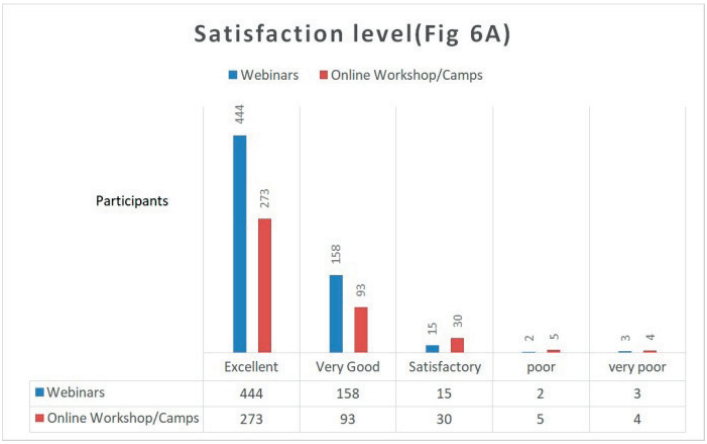
programmes based on demonstrations like artificial intelligence, fun science, rocketry and science behind miracles. The participation trend of participants in these camps is indicated in Fig. 5B.

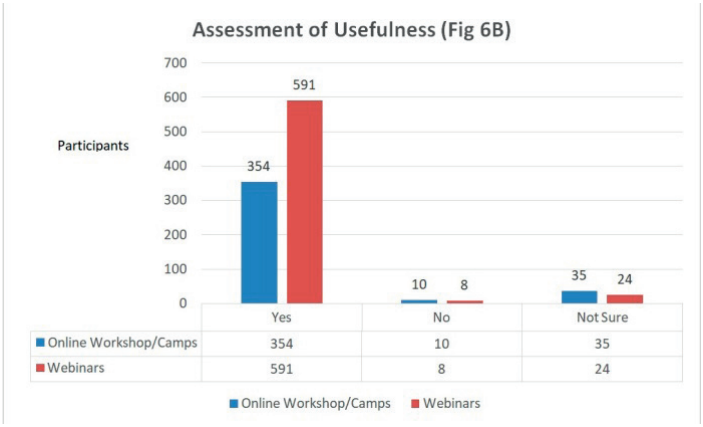


It was found that events based on popular topics as well those based on demonstrations attracted more participants, however, there was less participation in specific topics like microorganisms, automobile transmission, welding, etc. It was attributed to the fact that online programmes are very popular when the subject is of general interest and involves demonstrations and case studies, whenever the subject is more technical, people prefer integrated training instead of online. The analysis is supported by the studies conducted by Anna Fiorentino in 2021 confirming that

online STEM demonstrations not only can teach students more but can be just as effective as classroom teaching.

***Assessment of Usefulness/Satisfaction Level*:** The analysis of Satisfaction Level/Usefulness to the participants in webinars and workshops/science camps is indicated in Fig. 6 A and 6 B. The data reveals that:





During Webinars

- ✓ 97 % of participants responded to webinars very good/ excellent.
- ✓ 95 % of participants were interested in participating in more such online programmes.

- ✓ 91% of participants felt that the topics of the webinars were relevant.
- ✓ 99.8% of participants felt that the knowledge of resource person was very good/excellent.

During online workshops/science camps

- ✓ 91 % of participants responded with a satisfaction level of very good/excellent.
- ✓ 89% of participants were interested in participating in more such online programmes.
- ✓ 90 % of participants felt that the topics of the online workshops/science camps were relevant.
- ✓ 99.7 % of participants felt that the knowledge of resource person was very good/excellent.

The feedback from the participants suggested that the majority of the participants were satisfied and intended to attend more such webinars and online workshops/science camps. Over the last decade, e-Learning has grown exponentially. Previous studies have revealed that E-learning is an increasingly prevalent, viable, and fully recognised method for teaching and learning science[9]. Webinars are the future educational tool for higher education in India and are associated with gains in knowledge and skills[12]. Another study by Andreas & Christian in 2019 suggested that webinars were slightly more effective than control conditions like offline face-to-face classroom instructions, but the differences were trivial in size. The studies of the current survey thus confirm the earlier studies.

Conclusion

The current study reaffirmed that E-learning like webinars/online training/ workshops/summer camps is immensely helpful in Science Popularisation and enhancing skills & knowledge during and after COVID-19 era. The online method of learning is best suited for everyone. Depending on their availability and comfort, participants can choose to learn at a convenient time. The participants living in faraway districts of Punjab as well as other states of India were able to participate in scientific events online and were benefitted. The participants were satisfied with the

delivery and content offered to them during webinars and online workshops/science camps. The studies have concluded that e-learning programmes based on demonstrations and case studies are the preferred choice of participants as compared to programmes based on theoretical topics. One important observation that has come out of the study is that school students from private institutes took more interest in E-learning programmes as compared to college students. The findings from the data concluded that E-Learning programmes that are offered free are more favoured as compared to Paid programmes.

The studies recommended that various institutions of knowledge, henceforth, are required to impart hybrid mode (both online and offline) of learning to enhance skills/knowledge of various categories of learners to suit the comfort and convenience of everyone especially those living at far off places.

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