# 6. Online Vigyan Pratibha Teachers' Discussion Sessions during the Covid-19 Pandemic - Pedagogical Efforts and Adaptations

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## I. Introduction and motivation

School education took a backseat during the Covid-19 pandemic, owing to closure of schools for a significant duration. The online mode of imparting lessons helped at least the more fortunate students to continue learning, though sufficient guidance, training, and resources for this mode remains a challenge. According to the constructivist approach, learning occurs by building on the foundation of an unbarred student-teacher interaction, which is often perceived as challenging to achieve in an online mode as compared to a physical classroom setting. The onus then, is on the teacher to actively engage the virtual classroom, and especially so, such that students have similar interactional and learning opportunities. The teacher may have to use different methodologies to achieve this. In this paper authors share their experiential journey of learning resource development and training, and provide some insights for teachers to better navigate in these challenging times.

The Vigyan Pratibha program of the Homi Bhabha Centre for Science Education aims to encourage an inquiry-based pedagogy in science and mathematics education [1]. Several regional and pan India workshops are conducted for students through this program where students engage with learning resources specially designed for i) nurturing students' interest in science and maths and ii) cultivate STEM habits. Similarly, training sessions for teachers are designed for a pedagogical orientation. The temporary stop put by the pandemic to these activities was revived by beginning online discussion sessions with teachers. Weekly webinars (two sessions, one hour each) were begun in late August; these were called Vigyan Pratibha Discussion Seminars, with participant teachers from across India. Most sessions were based on the already existing resources of the Vigyan Pratibha 'learning units' and some were new topics. The topics were

related to but not a direct part of the curriculum. Many required experimentation and observation, though all required thinking, analysis and reflection. An important goal of these seminars was to allow the teachers to experience an inquiry-based pedagogy, which would aid them in conducting similar sessions with their students in the online mode.

**II. Design and conduct of discussion sessions**

From an organizational viewpoint, the content and manner of conduction of these discussion sessions were both important aspects to be worked upon. It was imperative that the sessions be organized such that they encouraged active participation in the time available. The choice of topics was crucial and was based on - (i) feasibility of being conducted from homes, (ii) covering different types of topics, so that teachers of varied interests could attend and get benefited.

**Session on wood ash unit**

One topic undertaken was on wood ash, an existing learning unit of Vigyan Pratibha, in chemistry, but also touching upon biology. It is based on experimentation using ash obtained from burning of wood. There were two important stages for the online session–

**(a) The preparatory phase**

The topic included experiments which were easily doable in a basic laboratory; but appeared to be difficult to do at home. Hence, the apparatus was tweaked to incorporate simple kitchen items available in all households – eg: glass or steel utensils instead of laboratory glassware, a tea strainer instead of a funnel, and tissue paper instead of filter paper. Video demonstrations were included to guide teachers about suitable ways of using these alternatives during actual sessions with students. The starting material for experimentation was also made flexible. Though the unit mentioned ash obtained from wood, we explored the use of incense sticks as a source of ash, as they are easy to obtain at or near homes and also safe to burn at home. Pilot experiments showed that this starting material gave results similar to wood ash.

Choice of an easily available starting material is key to encouraging the participants to try the experiment themselves. Of course, the participants were free to use other material too (eg., leaves, paper or wood), but incense sticks were an important addition and many teachers who performed the experiment did use this material. The tweak may appear trivial but sets a premise for indicating that science experiments can be managed with affordance available to us in our everyday environment.

**(b) Conducting the session**

The session was conducted in a reasoning-based format. A few questions were posed in the beginning in the form of a 'guessing game', where participants had to choose an answer out of the multiple choices provided, through a chat message in the webinar application. The aim of the game was to facilitate the teachers to arrive at the focal point of the topic by themselves. Use of chat messages helped in time management and probably also allowed teachers with certain inhibitions, to participate without speaking directly. Some questions were left unanswered at the end of the first session on purpose, to be answered after performing the experiment.

The experimental setup and process were explained using schematics as well as demonstration videos created by us. Care was taken to not give away the outcome of the experiment, to preserve the excitement and drive the teachers to perform it themselves.

After a break of two days, the second session was conducted wherein teachers were encouraged to speak directly about their experimental results. We played the role of facilitators, occasionally prodding or asking for clarifications. Some visual experimental observations were also projected in the form of photographs on the screen, so that teachers who could not find the time to perform the experiment could still attempt to interpret the results. Some teachers described their observations, while some used experimental observations as well as their prior knowledge on related topics to reach a conclusion.

The difference between these two was teased out by us, to exemplify the role of a facilitator in helping students to appreciate the process of 'synthesis' in research. Certain aspects crucial for performing research (eg: use of experimental controls), which may be obvious to the teachers but not to students, were also emphasized during the discussions.

**Session on PhET simulations**

Parallel to tweaking existing learning units to make engaging online sessions, we also included sessions on new topics to suit the needs of students and teachers due to school closures. The interactive simulations have been around for a while but pandemic and subsequent school closures have revived its use rigorously amongst the teachers community who are adjusting to the newer modalities of online teaching. In another Vigyan Pratibha session, we introduced teachers to some interactive PhET simulations, a free educational resource developed by University of Colorado, Boulder, USA [2].

**(a) The preparatory phase**

The inherent nature of interactive PhET simulation is to provide users with a flexibility of varying parameters in an open-style play area in order to explore the scientific phenomenon. It was retained as a central idea for the design of discussion sessions. We prepared simulation-based activities which necessitated teachers to write a list of variables in the given simulation and come with a format to study their inter-relations collaboratively. Additionally, prediction exercises were planned before every simulation activity so that teachers could be potentially engaged in testing and evaluating their own predictions after running simulation. Overall, the session was designed as a drill for a flipped classroom experience for teachers as peers.

**(b) Conducting the session**

During the session, teachers were posed with prediction questions time to time and were encouraged to reason their predictions. The simulations were practiced by teachers to get familiarity with the interface, followed by a freestyle data collection in response to our activity. Teachers were also encouraged to test their predictions against their collected data and formulate a mathematical representation of relation between the tested variables. A reflection exercise on teaching (with simulation) demonstration was included for conducting extended discussions with teachers on pedagogic adaptations.

**III. Discussion and conclusion remarks**

Both the sessions were highly interactive. The wood ash session attempted to use a pedagogy focusing on the process of conducting science - asking questions, discussing and coming to a conclusion in the light of experimental results; the experimental design merely set on the affordances available in our everyday environment. During this session, we got a few suggestions on experimental aspects suggesting that the teacher engagement was high. PhET simulation on the other hand, emphasized the importance of prediction exercises when a virtual technology-based setup with a flexibility of manipulating different variables is readily available. Teachers experienced a flipped environment themselves by engaging in the practices of making predictions, data collection and analysis to formulate theories with simulation-based experiments.

In this paper we do not intend to contrast the above mentioned two sessions but rather present these exemplar sessions simultaneously to demonstrate how pedagogical adaptations were considered carefully in the design and conduct of each of this session. Given the

possibilities that schools have to prepare themselves in the current pandemic to serve for students varying educational needs, the larger education community further bears a responsibility to share their pedagogic initiatives, and openly discuss what worked, what did not, and why. Our paper makes a similar attempt.

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**References**

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