J. Indian Inst. Sci.
A Multidisciplinary Reviews Journal
ISSN: 0970-4140 Coden-JIISAD

Editor's Desk

G. K. Ananthasuresh[*]

Our lifestyle has changed unimaginably over the past year and half. Working professionals, from accountants to zookeepers, have had to find new ways to do their business and sustain it. This is also true for those of us in the education sector. Students from pre-kindergarten to the post-graduate levels have had to get used to the online modes of learning. It has not been easy for teachers either. It was perhaps exciting initially to use the new tools of online meetings, but it has become unwieldy and complex as we are drawn deep into it.

Just before the pandemic struck, I was looking for ways to offer a course to engineering college teachers and students across the country. I tried hard to find facilities that could live-stream my lectures as well as have intelligible video recordings for later use. And then, the lockdown started. Out of nowhere came Zoom, Teams, Google Meet, Webex, GoToMeeting, and other online meeting platforms. This technology, which might have otherwise taken many years to evolve, has brought teaching to our doorstep in just a few months.

While this is remarkable, students have had to deal with several issues in this new normal: power outages, internet connectivity issues, the lack of affordability to own gadgets, and so on. But these are not the only problems. Listening to a lecture online is hard for students due to the fast pace at which the information flows when the teacher is not writing on a board but is showing prepared material. There is limited interaction between teachers and students. Most importantly, students have little opportunity to have discussions with one another, both within and outside the class.

There are problems on the teaching end too. Teachers have had to put in extra effort to prepare the material. They have had to get comfortable with new hardware and software. Hand gestures are absent to drive home a subtle point. Pacing around in the classroom to observe and catch students' attention is out of question. Not being able to make the eye contact with the students is a big drawback for the teacher. And then there is the problem of invigilating examinations administered online. Overall, teaching has become mostly a one-way street. These and other effects of online learning on teachers and students are being talked about a lot and some research has also begun to understand them.

A friend of mine from the Indian Institute of Technology, Delhi, Prof. P. V. Madhusudan Rao, in a discussion on how to improve teaching methods in general, recalled a sloka from *Shanti Parva* of *Mahabharata*: "A student gets one quarter of his or her knowledge from the teacher (*pedagogical learning*), and another quarter from using one's own intelligence and experience (*experiential learning*); a third quarter is acquired from interaction with other students (*collaborative learning*), and a fourth quarter is acquired from real-world experiences and over a period of time (*social learning*)". Thus, we can see that more than half of learning experience has been made difficult during the pandemic. It is, therefore, imperative to improve online learning.

The problems are even more acute when it comes to learning hands-on skills in online education. Online laboratory classes mostly involve watching experiments being done by others or looking at colourful simulations of experiments. Virtual laboratories being attempted remain what they are—*virtual*. What we need now is a way to do real experiments from a distance. Can a student remotely control an experimental setup in a school or a college using a smartphone? Imagine turning a knob or switching something on or off using a smartphone app and making that happen physically in the real experimental setup. The students not just see the experiment being performed by them, but also get the data directly to their smartphones. It is possible to do this to some extent. But a lot of work needs to be done to make this viable at large even if the technological feasibility is demonstrated. Current technology enables students to see and hear an experiment that is progress and is controlled by them. But what about the sense of touch and smell (or taste if it is culinary class)? Such capabilities might also come in ways that we cannot imagine today. If our lifestyle could change in unimaginable way in a short period, we should be prepared for more unthinkable transformations in the not-too-distant future.

[1] *Indian Institute of Science, Bengaluru, India.*
**suresh@iisc.ac.in*

Springer IISc PRESS

The education system, with its origins in ancient cultures, has gradually transformed into what looked like a steady state. Massive open online courses (MOOCs) began to disturb that equilibrium. The COVID-19 pandemic necessitated online education causing a substantive perturbation. Only when the pandemic subsides, we will be able to understand the consequences of this perturbation on the complex system of teaching and learning.

Much like the education system, there are other complex systems that have attracted the attention of researchers from different fields. In this issue, diligently guest-edited by S. S. Ravi, Anil Kumar Vullikanti, and Abhijin Adiga, we learn about how complex systems are modeled and understood. Many accomplished mathematicians and computer scientists have contributed articles to this issue by surveying a topic, providing an overview, and in some cases reporting original research. I thank the guest editors and all the authors for their time and effort.

Publisher's Note

Published online: 19 August 2021