

CORONA vs SCIENCE EDUCATION*

Karen Haydock

One day in April 2020 (not April 1st), the mainstream media reported that there were 184 cases of covid in Mumbai and 68 in Pune. They said that covid had not spread to rural areas, and that in Maharashtra it was mostly confined to these two cities.

We were getting social media messages such as: "Covid is just a common cold", "The coronavirus is bio-war started by China", "Muslims spread the virus", "If you gargle with this haldi concoction you will be immune", "We will be protected if we wash our hands and all fruits and vegetables with this anti-bacteria soap", "Masks will not help", "India will not be affected", "Masks will protect you", and "The pandemic will be over by the end of the month".

But did we ask how we know whether these things are really true? Who was being tested and who was not being tested? What is the difference between being infected with coronavirus and having the disease (covid)? Were contacts of known cases being traced, and if so, how? Who was collecting the data and how was it being communicated?

There has been very little testing - especially in rural areas where most people live - and even deaths from all causes have not been counted accurately. But without investigating these questions, some 'scientists' used the faulty data to start making graphs and models of how the virus was spreading. And they used their results to 'confirm' their hypotheses and predictions.

There were actually many important unanswered questions. But rather than asking questions and recognising their confusion, many people were sounding as if they knew the answers. Or, maybe people were not really believing the messages they were forwarding - maybe they had not even read the messages. Maybe people were just scrolling and clicking - using their Artificial Intelligence to



robotically create content for big business on the internet?

The internet could help us communicate, learn, ask questions, and do investigations. But does it? Most people do not have access. Internet is used mostly to spread advertisements, click, like, and forward.

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It is disturbing that people - including myself and others who call themselves scientists and science teachers - sometimes react in these ways to the pandemic. Rather than asking the necessary, difficult questions and investigating what the answers might be, we sometimes latch on to some ill-founded beliefs that are not supported by evidence and observations of what is actually occurring. And after latching, it is difficult to see data that contradict the conclusions.

Why does this happen?

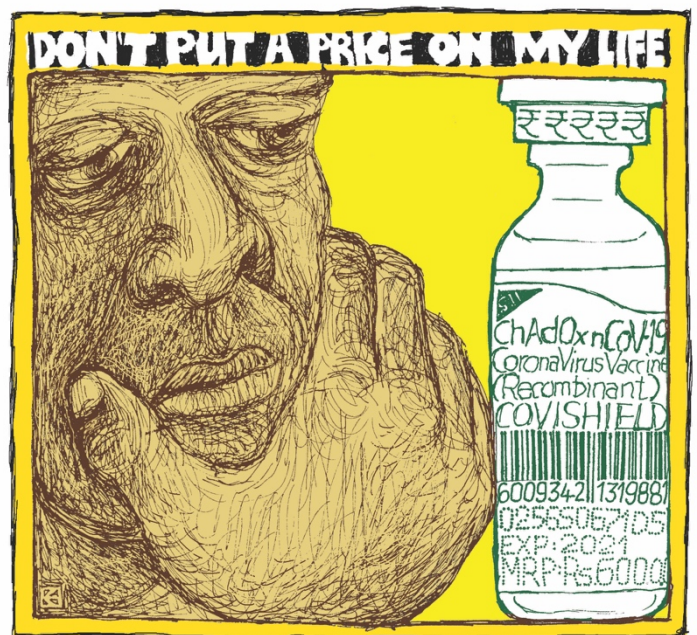
I lay much of the blame for this on us science educators. We have not succeeded in encouraging students to ask questions. We have instead spent most of our effort in teaching them to remember the lists of correct answers and word definitions that our textbooks are packed full of. Students learn not to question the answers.

Also, we have organised science as a separate discipline which is itself segregated into separate compartments. When students are studying the respiratory system, they do not consider questions of why poor people in cities do not have adequate food - or why

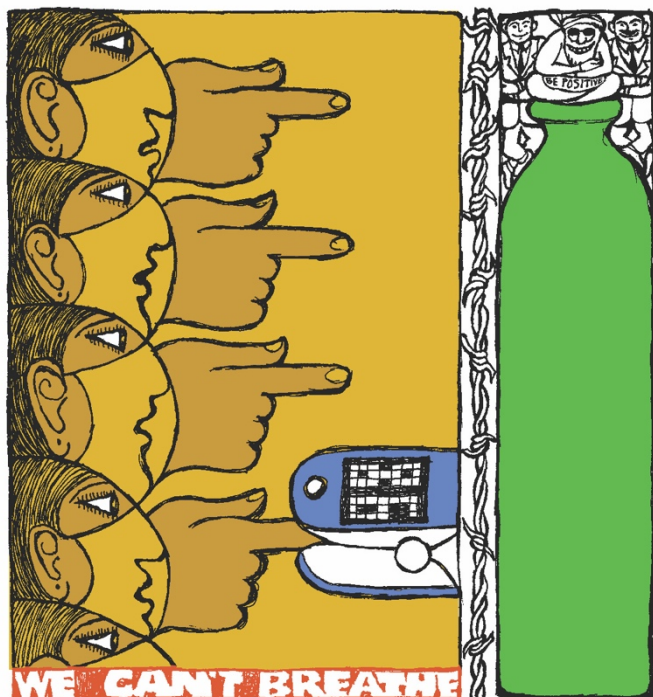
people in rural areas who grow the food do not have enough food - or why there are rich and poor. Students may not even consider such questions when they study the digestive system and nutrition.

So maybe it is not so surprising that when corona came, the government imposed a lockdown without thinking about how poor people would get adequate food, water, shelter, and salaries. Were such questions out of syllabus? Were we supposed to believe that it is impossible to let everyone have these basic needs? Don't we question why we work so hard to produce a few unimaginably and obscenely rich people, who profit even from a pandemic? Why were the empty mansions and towers the rich use as investments not used for housing and protecting those who built them? Why did the government decide to have private pharmaceutical companies make enormous profits by producing vaccines rather than allowing government institutes to do so? The pandemic magnified the failures of capitalism.

The problem is not just in the failure to consider complex questions involving interdependencies. It's not just that we believe the wrong answers, but that we expect to always find definite, unchanging, 100% correct answers. We have been conditioned to think that science *is* correct answers. We have been failing to teach students where all those answers come from. No wonder so many educated people expected immediate, fixed answers regarding a coronavirus that had never been seen before. They were not used to seeing scientists conduct experiments, find evidence, analyse, disagree and change their minds. Professional scientists work in their separate, elite world using language that ordinary people cannot understand. They use expensive equipment and publish research papers that are not freely distributed. So with corona, people hoped for - and were desperate to find - a quick-fix solution. When we hear a famous man in a



loud, authoritative voice proclaiming an answer on TV or whatsapp, we are quick to believe him - especially if it is the sort of answer we hope for.



As educators, we have failed to give students enough experience in using their own scientific temper to do science. We need to teach that science is not a fixed 'body of knowledge', but a practice of questioning, investigating, observing, and finding evidence.

When we do demonstrations and activities in class, they are usually done in order to prove something that is written in the textbook - not to search for an answer that is not given. Rather than trying to do dependable experiments that will give the desired results, why don't we let students do experiments that will lead to unknown and confusing results. This would encourage them to investigate further. They need to learn that in the real world, things are complex and probabilistic.

Even in higher education, students are often told to do research in order to confirm what is already known rather than figuring out which new questions need to be asked. The pandemic has shown us the need to ask relevant questions and look for new solutions.

Failing to do so has been deadly. We needed to ask where the virus was, who had covid, and how to find out. Before **saying** that people are not dying, we have to **ask** (and do relevant sample surveys). Before saying that one variant of the virus is more transmissible or less virulent, we have to do lengthy investigations.

It's even worse when powerful people declare the 'facts' when their 'facts' directly contradict evidence and observations. For example, rather than regulating medicine, we found the government allowing, and even supporting the use of some untested therapies and miracle cures and preventions for covid. Long after there was extensive evidence that hydroxychloroquine (HCQ) was useless in preventing or treating covid (and maybe even harmful), some doctors and government agencies were still distributing it. Could they not break their ties with the drug companies profiting from it? Is this question out of place in a science classroom? Is it anti-national to question any government or corporate policy? Or does a lack of questioning indicate a lack of scientific temper?

We need to stop teaching students to sit quietly and unquestioningly, trying to remember the lists of 'facts' reeled out by authorities. In teaching science, we need to emphasise the importance of not knowing, figuring out which questions to ask, getting surprising or disappointing results, complexity, probability, hard work, and mystery. Students need to be encouraged to be active participants in doing science in their own lives, questioning what is happening, and finding creative new solutions to a desperate pandemic situation.

