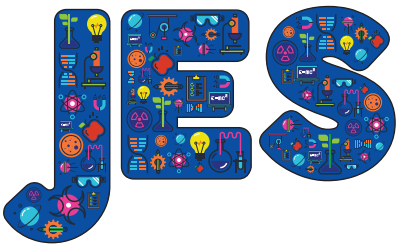
Editorial



Suzanne Gatt

The first cases of Coronavirus (COVID-19) were reported in Wuhan, China in December 2019, and it then spread at growing speed to different countries, reaching a global pandemic in March 2020. These events have made life in the past few months strange for us all, as the world fights a pandemic, which, despite being forewarned that it could occur, no one across the world had believed could ever really happen.

As COVID-19 has spread all over the world and infected people indiscriminately, we have all found ourselves listening to daily briefings from both politicians and scientists. Overnight, the role of scientists in the public community changed dramatically. Politicians started asking science research experts to provide evidence upon which to base their decisions about whether, and to what degree, to close down economic and social activities. Citizens felt insecure as they struggled to understand what this new virus was and how dangerous it could be. They needed scientific advice to learn about how best to protect themselves from COVID-19, and whether an effective vaccine could be developed swiftly. The media dedicated great attention to the pandemic, catapulting many scientists and public health officials into the public sphere, where they ended up on television and social networks on a daily basis (Cinti, 2020). Never before had the human race relied so much on science and scientists to find ways of controlling the pandemic and eventually beating it, and this still remains our hope. Alas, while a lot of hope was vested in science and the work of scientists, the general public were also exposed to the realities of the nature of science. While many, reflecting the positivist view of science, expected scientists to give clear and quick answers to their concerns, they were instead faced with conflicting opinions, and knowledge that kept changing almost on a daily basis as scientists learned more about COVID-19.

Many citizens were not prepared for the uncertainties that normally surround scientific enterprise (Chow, 2020). Not only this, they were also faced with some politicians, with no scientific background, taking advantage of this uncertainty and imposing their personal opinions as 'more informed', using citizens' fears about economic uncertainty to promise economic stability. Never before has the expertise of scientists been under attack as much as in these past few months.

What does all this imply to us science educators? It has to be acknowledged that it is not the scientists who have failed society, even if, at times, some have not communicated as well as they could, in simple language that can be understood by a lay citizen, the problems and difficulties that they face in learning about a new virus within such a very short time frame. It also highlighted how the education system has, to a degree, failed many, as they clearly did not understand that, however rigorous science may be, it always operates within a fair degree of uncertainty. They did not understand that science can still provide a good level of understanding based on a fair amount of evidence, compared to politicians, who tend to base their opinions and decisions more on hunches and are more prone to economic pressures.

Scientists need to learn how to communicate and explain the processes of science in a way that is understandable to the public, but is still scientifically robust (Provenzi & Barello, 2020) – this is why public engagement initiatives such as those led and funded by the Royal Society are so important. Science communication should also become less one-sided, where scientists provide information and citizens receive it passively, to an

active two-way engagement in which citizens can share concerns as well as query claims made by scientists. As science citizens, the public can also play a role in supporting scientists, if possible, by providing data that scientists can analyse for the benefit of all.

Science education, more than ever before, needs to focus on helping learners from a young age to understand scientific enterprise and the uncertainty within which it operates. This can be achieved through simple scientific enquiries that children can carry out themselves. Simple investigations can easily highlight how science never gives clear-cut answers but nonetheless provides good insights into how the world works. For example, in a simple investigation where a dozen snails are given different food to test their preferences, one will never get a clear-cut result with all snails choosing the same food. It also creates the opportunity to discuss what further investigations would make our knowledge about snails' food preferences more robust. Young children can understand that, if the investigation is done with more snails and subsequently tests involving more food options, the knowledge gained via outcomes and analysis of the data will be deeper and based on more robust evidence.

It is thus our role as teachers to engage children from a young age in discussions and reflections about how sure we can be with our, and also scientists', scientific conclusions. Such reflections can prepare children better to deal with current events in the world, where science can provide answers, but where complete certainty is not an option – building resilience and a deeper understanding of the nature and processes of science.

During these past few months, teachers have also faced the challenge of teaching students remotely, as schools closed but learning needed to continue. Teaching science, being a hands-on subject, presented additional challenges to that of covering content as in other subject areas. How can one replicate virtually the excitement and effective pedagogy that children experience when carrying out investigation in a group, taking turns, discussing observations and sharing their opinion? Many children all over the world have missed a good part of this scholastic year. We will only know later on what impact this has had on children's education overall, and particularly in science.

This edition of *JES* was prepared in the midst of the pandemic, and includes contributions submitted mainly before the crisis. It does, however, include a paper by my colleague, Amanda McCrory, on examples of good practice in science regarding how teachers have managed to teach science against all odds. Her paper ***What a Coronacoaster!*** provides insights from interviews with EYFS and primary teachers about how they have been coping with the situation during April and May, and how they navigated their way around existing limitations to deliver science curricular activities to the best of their abilities.

The article by **Harrison *et al*** focuses on how primary children can investigate atmospheric pollution using Defra's Air Quality Archive. It provides examples of existing data and how teachers can use these data for science investigations. While written prior to the pandemic, it provides some inspiration on which science activities primary teachers can provide remotely.

MacAogain focuses on barriers to creativity in primary science lessons. He reports on results from a small-scale study with primary school teachers from rural Irish schools about their experiences with creativity and teaching science. It highlights the tension between creativity and teaching for assessment, and the perceived constraints by the curriculum that is to be covered.

The paper by **Rupali *et al*** tackles enquiry-based science on the topic of food chains and webs, and how worksheets promote classroom engagement and discussion among students and their ideas about the environment in the context of Indian classrooms.

We finally present two **book reviews,** and a related article by **Amy Broemmel and Kristin Rearden,** which is topical, considering how scientists' work in science and engineering can be brought to life through picture books, engaging children in the nature of science. On the other hand, the review of the book by Kirsty Bertenshaw highlights many examples of tried and tested simple experiments that can be organised in class. Since many use

simple everyday materials, they also have potential for use in remote learning, as children can try things out themselves at home. The book by Sue Dale Tunnicliffe examines how children develop as emerging biologists, with a focus on play and effective talk illuminating this well.

It is hoped that this issue will be interesting reading for educators, who can reflect on their practice, as well as on how important it has become to help children to understand scientific enterprise, which, despite its uncertainty, can still be considered as the most trusted source of information during these times.

References

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Suzanne Gatt is Co-Editor of the *Journal of Emergent Science.*

Note:

ASE would like to thank Suzanne Gatt and Amanda McCrory for whom this is their last issue as Co-Editors of *JES*. For the past few years, they have worked tirelessly to ensure that the high quality of articles for those involved in teaching the 0-11 age range has been maintained. We are very grateful to Suzanne and Amanda and wish them well for the future.