

# USING THE COVID-19 PANDEMIC AS A SOCIOSCIENTIFIC ISSUE TO SUPPORT THE SCIENTIFIC HABITS OF MIND

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The COVID-19 pandemic has affected all people without discriminating any border, country, race, ethnicity and so forth (Arroio, 2020). Thus, it has acted as a new playmaker in recognizing the importance of education and social justice. As stated by Usak et al. (2020), we, as educators, should pay more attention to the development of students' awareness and scientific attitudes. Thus, they are able to think, understand, decide and make an action about any urgent event or "forced" transition, i.e., the pandemic process (Rodríguez et al., 2021). Unfortunately, the COVID-19 pandemic seems to have generated a climate of fear for scientific advances and mass vaccination as well as regulations on lockdown, socialization, and hygiene.

Given the foregoing features, the COVID-19 pandemic typically involves debate among scientists, politicians, and citizens when decision making about the use of science and regulations (Çalık & Wiyarsi, 2021). Phrased differently, the COVID-19 pandemic incorporates the related classification features of socio-scientific issues (e.g., holding different key beliefs/views/values, and lack of a scientific consensus) (Çalık & Coll, 2012). Further, it possesses a contentious dilemma, which is an ill-structured, open-ended, and complex problem. Because it consists of such multiple dimensions as economic, political, technological, scientific, and environmental, it has challenged our memorized content knowledge and regular habits. Therefore, we can recruit it to stimulate the scientific habits of mind (SHOM) suggested by Gauld (1982).

The SHOM is not only a useful way to characterize how scientists think (Gauld, 1982) but also improves the scientific attitude. Gauld (1982, p.110) explains the importance of the SHOM with the following quotation: "*No idea, conclusion, decision or solution is accepted just because a particular person makes a claim but is treated skeptically and critically until its soundness can be judged according to the weight of evidence, which is relevant to it.*" As a matter of fact, some leaders' speeches on the COVID-19 pandemic also indicate why the SHOM is necessary for all. For example, ex-President Donald Trump, who routinely referred to the COVID-19 as "the China virus," "the Wuhan virus" and "Kung Flu," claimed that it had come from a Wuhan lab. But anybody with the SHOM wonders whether there is enough evidence that the China has misled the global community over the COVID-19. Similarly, President Jair Bolsonaro and President Aleksandr Lukashenko omitted the COVID-19 pandemic and rejected strict measures against it. In a similar vein, Prime Minister Boris Johnson showed the fastest government U-turn after infected with the COVID-19. These specific cases reveal that the SHOM helps us ask critical questions before making a decision. Therefore, in this paper, I will illustrate seven components (*mistrust of arguments from authority, open-mindedness, skepticism, rationality, objectivity, suspension of belief and curiosity*) of the SHOM using the information on the COVID-19 pandemic and key features.

### *Mistrust of Arguments from Authority*

*Information:* Although there is no effective therapy for the COVID-19, hydroxychloroquine (HCQ) and chloroquine (CQ) have been used for its treatment. But their safety and efficacy remain uncertain. For this reason, authorities have two different ideas:

*Idea 1:* The use of HCQ and CQ is effective at decreasing the mortality rate during the COVID-19

*Idea 2:* The use of HCQ and CQ is ineffective at reducing the mortality rate during the COVID-19.

*Key features:* Two different ideas in which experts have fallen into disagreement; a comparison or evaluation of their trustworthiness (Çalik & Coll, 2012, p. 1921).

Given this information and the key features, we can ask provocative questions (e.g., which of these ideas is trustable for you? Please explain your reason(s); please compare and evaluate these ideas with each other in terms of their trustworthiness) to stimulate the “mistrust of arguments from authority” component.

### *Open-mindedness*

*Information:* During the COVID-19 pandemic, such vaccines as Sinovac, Pfizer-BioNTech are used. Of these vaccines, Sinovac, which is an inactive vaccine, employs traditional procedures. The others exploit a new approach called mRNA Technologies.

*Key features:* Existence of a problem to stimulate; an issue or problem is not simply overlooked or dismissed; being willing to consider the possibility that something is true; changing his/her ideas in the light of the evidence (Çalik & Coll, 2012, p. 1921)

Given this information and the key features, we can ask the following questions to activate the “open-mindedness” component:

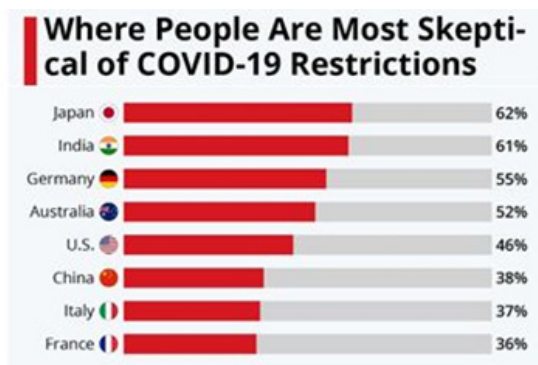
- If possible, which of the mass vaccines do you prefer? Please defend your reason(s)
- If there is more evidence on new mRNA technologies, are you willing to consider the possibility of getting a new shot, e.g., Pfizer-BioNTech?
- Do you change your ideas in the light of the evidence?

### *Skepticism*

*Information:* A study by Buchholz (2020) showed that respondents selected from different countries had skeptical views of the COVID-19 restrictions (see Figure 1).

**Figure 1**

*The Results of a Survey on the COVID-19 Restrictions*



Note: Adopted from Buchholz, 2020

*Key features:* A provisional approach to claims to clarify the extent to which it might be true (real); involving critically questioning the claim(s) thereby, the certainty though scientific or logical observation is aimed to acquire (Çalik & Coll, 2012, p. 1921).

Given Figure 1 and key features, we can use provocative questions (e.g., which of the countries shows a provisional approach to the travel restrictions during the COVID-19? Do you think they ask critically questions about the COVID-19 restrictions? Are the COVID-19 restrictions enough to overcome the virus?) to arouse the “skepticism” component.

### Rationality

*Information:* To treat the COVID-19, scientific community has developed several vaccines, whose types, efficacy levels, storage conditions and costs are varied (see Table 1).

**Table 1**  
*A Summary of Several Vaccines Used for Treating the COVID-19*

Vaccines	Type	Country	Efficacy in preventing COVID-19 (%)	Storage conditions	Cost (USD)
Oxford / Astra Zeneca	Viral vector	UK	70	6 months at +4°C	3
Sinovac	Inactivated	China	50	3 years at +2-8°C	60
Biontech / Pfizer	m-RNA	Germany	95	6 months at -70°C	20
Moderna	m-RNA	USA	95	6 months at -20°C	25
Sputnik V	Viral vector	Russia	91	6 months at +4°C	10

*Note:* Adapted from Terry, 2021

*Key features:* A need for good reasons and logical argument by which to link ideas, evidence, and reasons together in an appropriate way; a need to revise ideas or beliefs in the light of evidence and argument (Çalik & Coll, 2012, p. 1921).

Given Table 1 and key features, we can exploit the subsequent questions to trigger the ‘rationality’ component: (a) If you were a minister of health, which vaccine would you select for your country in regard to Table 1? Please explain your reason(s). (b) What good reasons and logical arguments convince you about the type of vaccine?

### Objectivity

*Information:* Clinical trials for the COVID-19 vaccines consist of several phases and cover different research designs with volunteers from various countries (see Table 2).

**Table 2***A Summary of Clinical Trials for the COVID-19 Vaccine*

Candidate	Phase	Study design	Volunteer	Country
Moderna mRNA-1273	3	Double-blind randomized	30000	USA
Sinovac CoronaVac	3	Double-blind randomized	13,060	Brazil
Oxford ChAdOx1-S	3	Double-blind randomized	40,051	USA, Chile, Peru
BioNTech BNT162	2/3	Dose-finding, double-blind randomized	43,998	USA, Argentina, Brazil, others
Novavax NVX-CoV2373	2	Single-blind randomized	4,400	South Africa
KBP-COVID-19	1/2	Observer-blind, dose-finding randomized	180	Not Provided

Note: Adopted from Haidere et al., 2021, p. 4-5

*Key features:* Evidence, bias and scrutiny (Çalik & Coll, 2012, p. 1921-1922)

Given Table 2 and the key features, we can ask the following questions to stimulate the ‘objectivity’ component: (a) Why do the COVID-19 studies follow double-blinded or single-blinded randomization? (b) Why do they carry out their studies in different countries? (c) Why do they follow different phases (pre-clinical, phase I, phase II, phase III) before licensing? (d) How do these procedures reflect features of the objectivity? (e) What happens if any clinical research is published without peer review or double-blinded review?

### *Suspension of Belief*

*Information:* Aljazeera published the news about AstraZeneca’s COVID-19 vaccine to report which countries have stopped using this vaccine. An excerpt from the news is as follows:

More than a dozen countries, mostly in Europe, have suspended the use of AstraZeneca’s COVID-19 vaccine over fears the shot may have caused some recipients to develop blood clots. Sweden and Latvia on Tuesday became the latest nations to halt the rollout, following moves by Germany, Italy, France, Spain, Denmark, Norway, and The Netherlands, among others.

The World Health Organization (WHO) is meeting on Tuesday to review the available safety data on the vaccine, although it has repeatedly expressed confidence in its safety; WHO chief Tedros Adhanom Ghebreyesus has said there was no evidence of a link so far.

The European Medicines Agency (EMA) reiterated its stance on Tuesday, that the vaccine is safe, and its benefits outweigh any risks as coronavirus infections and deaths continue. The regulator will release results of its investigation into incidents of bleeding, blood clots and low platelet counts in recipients on Thursday (Adopted from Aljazeera, 2021).

*Key features:* A procedure of holding in abeyance; if there is insufficient evidence to make a decision, one should not rush in too quickly in support of some particular idea or theory (Çalik & Coll, 2012, p. 1922)

Given the news and key features, we can utilize the following questions to activate the “suspension of belief” component: (a) Why did these countries suspend the use of AstraZeneca’s COVID-19 vaccine? (b) After research on any link between blood clots and AstraZeneca’s COVID-19 vaccine, do you think to get a shot for this vaccine? Please defend your reason(s) (c) Even though the WHO has said that there is no evidence of a link between the blood clot and vaccine, why do people hesitate to make a decision?

### Curiosity

*Information:* Handwashing with soap kills the COVID-19 in that soap molecules disrupt its fatty layer. Hence, this process not only inactivates its function but also prevents spread of the virus.

*Key features:* A desire to learn; a need to arouse inquisitiveness for exploration and discovery (Çalik & Coll, 2012, p. 1922)

Given this information and the key features, we can ask the following questions to pose the ‘curiosity’ component: (a) what science concepts do this information include? (b) How do soap molecules dissolve the fatty layer? (c) How can you explain this process via intermolecular forces?

Even though the foregoing tasks/activities have not been tested yet, this paper illustrates how to use the COVID-19 pandemic as a socio-scientific issue to support the SHOM. Hence, relevant tasks/activities promote the participants to improve their scientific attitudes and enable them to capture how scientists produce scientific knowledge. Further, the participants are able to learn that scientific knowledge construction requires strong argumentation, reasoning and communication skills as well as the experiments, observations and evidence (Bağ & Çalık, 2017). Therefore, let’s conduct much more research on the integration of the SHOM into science learning and share the results with the stakeholders.

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