Under the Covid-19 Pandemic: How the Public Overcome the Challenges From the Discourse of Science Mistrust

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Abstract: The COVID-19 pandemic has not only brought about significant health and societal challenges but has also exacerbated a deep-seated mistrust of science among certain segments of the population. This paper explores the dynamics of science mistrust in the context of the pandemic and examines its implications for public health and societal response. Drawing on a range of sources and studies, it delves into the various factors contributing to science mistrust, including political ideologies, social media dynamics, and leadership responses. The paper argues that overcoming science mistrust necessitates a multifaceted approach, with science education playing a crucial role. By equipping students with critical thinking skills and promoting effective science communication, educators can help cultivate a generation of informed citizens capable of navigating complex scientific information and releasing the spread of misinformation. Through an exploration of pedagogical strategies and educational frameworks such as the Next Generation Science Standards, the paper highlights the importance of fostering a culture of scientific literacy and engagement. Ultimately, addressing science mistrust is essential not only for mitigating the current pandemic but also for building resilience against future public health crises.

Keywords: COVID-19 pandemic, science mistrust, science communication

Introduction

The COVID-19 pandemic that began in 2020 brought with it stay-at-home orders, loss of life, and a social perpetuation of a mistrust of science. As the Covid-19 pandemic persists, the public continue to be inundated with messages reinforcing the importance of social distance, hand-washing and effectiveness of masks to slow the spread of the corona-virus. Despite most of citizens seriously responded to these recommendations with compliance, there remained subcultures of the public determined to resist these recommendations and engage in a discourse rooted in a mistrust of science. For example, in the United States, Ben Charoenwong, Alan Kwan, and VESA Pursiainen describe such subcultures as those including populations with low-level education, higher share of Donald Trump voters, and climate change deniers in 2020. While in China, which owns a huge population, the government had blocked the city Wu Han immediately when the Covid-19 pandemic has been proved as highly infectious. Despite some people claim that there is no need to obey the order of isolation, but with huge pressure of new public health policy and promotion of social media, such subcultures show less obviousness. "However, subcultures in the United States believe that Covid-19 has been exaggerated to be considered as the threat to damage President Trump", said by Joanne Miller[11] (2020), and "such virus was created

and spread with purpose". As the result of the political conspiracy theories perpetuated in these subcultures, ignoring or disobeying public health recommendations such as the use of masks and hand-washing to slow the spread of Covid-19, become a partisan statement. In fact, these beliefs receive further spread among subgroups as their beliefs, values, and norms ultimately denied the recommendations associated with the public health insurance. After following compliance generally with initial isolation orders, the government officials face the pressure for reopen business industries, public services, and social activities. Similar with those who disbelieved scientific advice to keep the doors shut urged a return to normal. Due to such pressure, the government develop new reopen policy instead of keep stay-in-home orders. Following that, the number of Covid-19 cases and deaths increased, as a result, the Covid-19 pandemic put the public into an uncontrollable state of vulnerability to disease. In this essay, recommendation that science educators can provide learning experience which will challenge misconceptions about science while also equipping students with the science skills they need to obtain, evaluate, and communicate scientific information.

According to Philip Ball and Amy Maxmen[2] (2020), the widespread of Covid-19 misinformation contributed significantly to the premature reopen plans. Researchers claim that the public is openly in favor of disregarding scientific advice for public health insurance due to a deep mistrust of scientists' motivation and reliability. With the increasing number of cases and deaths, it becomes obvious that any other crisis in the future requiring scientific management will fail if the mistrust is not adequately resolved. Rather than considering scientists with suspicion, several measurements should be taken to ensure that the general public views scientists as credible scholars whose contributions to public safety are based on individual's well-being. Wendy Parmet and Jeremy Paul[12] (2020) point that changing beliefs rooted in science mistrust is difficult, especially for those beliefs in mind of the public which have been unchallenged for quite a long time.

To be noticed that some subgroups' beliefs and values ultimately go beyond the public health concern, leading to a rise in scientific suspicion. For example, people who are not willing to take vaccination, and disregard masks, such phenomenon indicate that the subcuntural groups' values forming the foundation of dangerous public health behaviors due to the underlying distrust of science. Anti-VAXes will find it difficult to overcome their beliefs about the Covid-19 vaccine, according to John Ashton[1] (2021) in 2021, although the vaccine being a huge step forward to against Covid-19. A common belief to view vaccination as "it is an infringement of personal liberty, and that it is one part of a more general suspicion of medical science". And such belief is one of Anti-VAXes main arguments against the effectiveness and using of a Covid-19 vaccine. It is clear that more difficulty to overcome such belief especially if they are based on a mistrust of social motivation, and a mistrust of science as well.

1. The mistrust of science during the Covid-19 pandemic

1.1 Social media

The Covid-19 pandemic was unlike any other during recent history in terms of sociocultural impact. The Covid-19 marked a significant shift in how citizens consumed and shared information, from isolating stay-in-home orders to civil rights demonstrations, and to continued media attention to grim statistics. According to Najmul Islam[8] (2020), more people face the challenge of building social connection with their peers during the period when following the stay-in-home orders, and due to this, a lot of people transfer their attention to social media to get in touch with others. Such as Facebook, Instagram, and Twitter etc.., people can share and exchange latest information with others, even that these virtual social space provide opportunities for people to take part in the discussion about the mistrust of science. From memes to tweets, social media play an essential role of communication for those who choose to promote discourses of science mistrust, and encourage those who are determined to disregard scientific experts' recommendations in favor of practices and behaviors that are not conducive to public safety. To be noticed that several social media posts emerged that the words about scientific mistrust, and a hoax is designed to indicate that the Covid-19 is created to violate the fundamental rights of citizens. In addition to this, according to Angus Bridgman[4] (2020), comparing with those people who use other information sources, people who prefer to use social media for information discussion and exchange are easier to be misguided in terms of updated news about Covid-19.

One of obvious topics of those posts is that the measures proposed by scientists to control the Covid-19 widespread are actually designed to restrict individual freedom, and finally it is a system to monitor citizens' movement. For instance, nearly most of public areas put a sign to ask people that only wear a mask can entry, and this behavior can be considered as instilling fear of mask compliance. Because of this, it will ultimately lead to grater compliance with policies designed to restrict individual freedom and personal privacy. Additionally, the notice that wearing a mask will inevitably lead to the suppression of individual freedom contradicts scientific belief made by Steffens Eikenberry[6] (2020), which is that wearing a mask is an effective way to slow the spread of Covid-19.

1.2 Government leadership

Sherman Lee[10] (2020) said that the Covid-19 pandemic caused widespread public anxiety, as a result of that civilians look to leaders who are at all levels of the government for direction, guidance and comfort. To be noticed that, in the United States, it caught lots of attention during this Covid-19 persists, and the president position of Donald Trump faces the most challenging test of his leadership. Because the leading of president should ensure the safety of the public during during the Covid-19 crisis. The public expect there should have a leader to take the country in the fight against the Covid-19, and to contain its spread, but also to provide complete personal protective equipment for medical individuals and develop a useful plan to help the people win. However, for instance, the United States is lead by a president whose leadership style prioritized disseminating wrong information, and limiting the public to get access to credible scientific information, or even openly dismissing top-level scientists in disease infection. To be noticed that, same situation in China, while the chairman of the People's Republic China and leading groups send top disease infection scientists to the front line to investigate and call on the public to follow the government's suggestions on epidemic prevention via social media. Although the public speeches made by the chairman which emphasis the seriousness of the Covid-19 cause the panic among the public, it does provide help in preventing the Covid-19 spread.

Several reports on the Union of Concerned Scientists which is consist of over 100,000 scientists across the world to give advice and suggestions for preventing the science misusing linking Donald Trump's presidency to attack on science during the crisis of the Covid-19 pandemic. There was a blog entitled with "Trump Administration Ignores CDC Scientists on Covid-19 Temperature Screenings", representatives from the Centers for Disease Control (CDC) describe how their efforts to present the facts about the scientifically proven ineffectiveness of temperature checks to screen spoiler for the Covid-19 were ignored by the White House. Although being presented with scientific evidence, the Trump group choose to ignore the scientific efforts openly, and enhance the public mistrust to science especially among those people who support the current government.

Addition to this, there was another post named "Federal Scientists are Restricted in What They can Say to the Public" indicate that all of scientists and medical officers must cooperate with the White House to develop the public speech about the Covid-19 pandemic. In fact, such behaviors will censor the ways which allow the public to get access credible scientific information, and thereby the White House is allowed to spread potentially misleading information and to indicate implicitly that the government do not trust science, and the government can not educate and guide the public to take appropriate measurements for the Covid-19 defense.

2.Overcoming the discourse of science mistrust via science education

2.1 Developing competent consumers of scientific information

The spread of inaccurate scientific information, as well as the perpetuation of the discourse of science mistrust, is aided by social media and the leadership of government. Identifying cases of science mistrust discourse in the context of the Covid-19 pandemic reveals that all science educators must work together to help against this discourse. However, to be noticed that, science education plays an essential role of overcoming such discourse, it is not enough to change the subgroups who based on science mistrust beliefs. Instead of that, science education can be considered as "a starting point" to solve the problem which that is the discourse of the future citizens and scientific information consumers' mistrust to

science. In addiction to this, students' learning experience in scientific classrooms only take few parts of their daily routines. Due to this reason, a consideration should be made by scientific educators is that any of these students may become one of the subgroups, and their beliefs, norms, and values may be rooted in the discourse of science mistrust. In this essay, the pedagogical strategies presented which can mean a challenge to the students' subcutural beliefs, and promote critical thinking to overcome such discourse of science mistrust.

The beginning of overcoming the discourse of science mistrust comes from science classrooms, and opportunities for science students to obtain, evaluate, and communicate scientific information can be provided. Sihanouk Xiao and William Sandoval[15] (2020) described that such chances for science communicating are considered as advantages for overcoming the discourse of science mistrust. Because of "…curiosity about science, self-confidence about dealing with science, and expectations regarding the value of scientific knowledge in society are key attitudinal elements in critically evaluating information in science-related news reports." These learning opportunities should emphasis a mind of critical thinking under the scientific information background, and the Next Generation Science Standards which also called NGSS gives science educators with a means to promote such meaningful learning opportunities.

According to NGSS, students not only learn the content of science subjects, but also explore common topics of all the science fields. And except that, students also need to engage in construction of authentic scientific knowledge by applying eight science and engineering practices which also named with "the eight SEPs" in 2013. The eight SEPs are included in N.G.S.S. as it can be considered as a promotion to develop science literates of students, as a result of this, students can understand the how scientific information is produced fundamentally. Among this eight SEPs, acquiring, evaluating, and communicating science information occupy an essential part of the development of scientific knowledge, because these practices are based on the ability of scientists to evaluate the validity and reliability of science information. Therefore, it plays an important role in the learning and thinking of science educators who want to help students to overcome the discourse of science mistrust.

The NGSS indicate that science students' behaviors of obtaining, evaluating, and communicating science information are allowed. Additionally, it asks students to "read and synthesize information from multiple appropriate sources and assess the credibility, accuracy, and possible bias of each publications."[13] And actually, according to Shawn Stover and Michelle Mabry[14] (2013), opportunities for students to evaluate the credibility of science information during the class will transfer a mind to students, and which is that before students evaluate the reliability and accuracy or possible bias of the content of text books, they should always have a mind of doubt to the information presented. For instance, necessity of the peer review, not all of students know the process of review. Thus, to ask whether a publication has been reviewed by peers can help students understand that inaccurate science information may come from mainly those publications without appropriate peer review. Just as plenty of information about the Covid-19 pandemic presented under the eyesight of the public, maybe only few of them can be seen as credible or accurate, and such information had been used to perpetuate the discourse of science mistrust.

An approach called "two-tier approach " used by Karenann Jurecki and Matthew Wander[9] (2012) to help their students to evaluate science information emphasis the importance and value to use peer-reviewed articles. According to two-tier approach, a set of criteria for evaluating scientific literature that can be applied in traditional and non-traditional learning environments is included. And the first of the two-tiers asks students to confirm whether the scientific information come from original scientific research and published in authentic resources. Then the second tier is that educators should encourage students to focus on the quality of information itself instead of the quality of resources only during the reading of scientific materials. To conclude that, science educators should put more effort on credibility of peer-reviewed articles and where can students to find such kind of information due to these information come from both original production and authentic resources. And students must understand that how to evaluate accessible information and determine whether they have possible bias or if the conclusion provided is based on reasonable scientific principles. According to the second tier of such approach, it asks students to think in critical way, and this is also an expected goal of science education under the NGSS background.

The SEPs requires students not only have ability to evaluate the credibility and accuracy of information sources, but also evaluate its potential bias. In 2005, according to Dale Benos[3] (2005), several ethical breaches in science journals are existed and one of these is that the interest conflict. The interest conflict is described as a situation which the author of scientific information has potential motivations connected to "political affiliation, religious conviction, and personal relationships" which can be considered as a threat to the objectivity and ability for scientists to provide honest scientific information. Normally when scientists hold such position of interest conflict, information presented to the public or science fields may be distorted and devastated potentially. Therefor, it is necessary for science educators to emphasis that students need to consider the potential interest conflict or possible bias when do evaluating information.

For example, an obvious shift made in the research community during the Covid-19 pandemic, a lot of studies were done for better understand to corona-virus, the spread of such virus, and how patients can recover due to former infection. An research conducted in Stanford University to monitor the prevalence of people with Covid-19 antibodies in Santa Clara, California. According to the findings, antibody prevalence is more widespread than previous thinking which present that the Covid-19 is not as serious deadly as social media described. For this reason, the community begin to run again same with that before the Covid-19 pandemic. However, according to Gabby Landsverk[7] (2020), this research is funded by an entrepreneur called John Ioannidis who created JetBlue Air Company, he presented his desire for industries can return to normal running. Actually, John Ioannidis had a significant interest conflict during this study, and his primary interest was in the profitability of his company rather than the public safety. This example indicates that science educators should help their students to understand the mechanism of potential interest conflict, and learn how to evaluate information sources' credibility and accuracy by the knowledge and understanding of interest conflict.

2.2 Promoting effective science communicating

Obtaining and evaluating information is an essential skill to cultivate during science lessons as science educators put effort to produce competent consumers for scientific information. However, except that obtaining and evaluating information skill, experience and skills related to science information communicating are needed for science students, thus the discourse of science mistrust can be overcame through the effective science communication of credible and reliable information. Throughout the Covid-19 pandemic, the public's attention was surrounded by huge amount of corona-virus spread information presented by social media, and the figure for the death due to corona-virus. And scientific reports linking the Covid-19 pandemic's future development to the following of healthy and safety measurements appropriately. To be noticed that, an interesting connection between journalists and scientists had appeared during the Covid-19 pandemic.

In 2007, "science-journalism collaboration" presented by Penelope Canan and Melanie Hartman[5] (2007), as they described it as a "respected pillar within democratic societies because the products of their enterprise are appreciated as contributing to social life." Actually the reason for the importance of the linking between science and news is that most of the information the public acquired come from journalists who are from print and broadcast media, and especially during the public health crisis. With this in consideration, the critical nature of the role of science communicating should be emphasized especially such science information aim to be spread by journalists and to be consumed by the public. Additionally, despite the significance of science-journalism collaboration can not be ignored, there are still barriers existed between scientists and journalists. And such barriers bring disadvantages to product effective communication between scientists and journalists, and thus cause influences on the quality of science information. In fact, communicating barriers between scientists and journalists normally come from the huge difference of professional knowledge background. The difference of culture, structure, and experience may build walls for both of groups to communicate successfully, and therefore ultimately leading to the dissemination of science information is not always easily to be consumed by the subgroups among the society.

Overcoming such barriers become one part of science classrooms' exploration as it can cultivate the future citizens who can have effective communicate with science information, and they can also help to overcome the discourse of science

mistrust. There was a broadcast project called "common skills project" for science students to understand the internal relationship between science and news. It described that science students must analyze the comment on science made by the public, the public's knowledge of science, the role of broadcast in helping the public to understand science questions, the position of scientists, and the source of professional information among the media publications related to science. In fact, science students are provided opportunities to explore how that science and news help the public to understand science questions, and therefore promote the spreading of the factual and understandable science information to the public. Misunderstanding of science broadcast due to the public's lack of an understanding to the process of science exploration and findings, and normally the lack of these two areas leading to the science mistrust.

"Common skill project" ask students to evaluate publications with specific scientific phenomena purposely, to think about how each article to support their ideas by using data, and to know how the author express the explanation for data. The group of broadcast is divided in three kinds, large newspapers targeting an elite audience, middle-market materials include those publications that cater to readers from the general public, and tabloid sources provide panic information to the public and mainly for entertainment.

Finally, in order to help students to understand effectively how science communicating related to the relationship between science and news. Science educators can ask students to "translate" scientific journals to the public publications via three kinds of broadcast sources. Therefore, as an effective learning experience, science educators may link the evaluation of science broadcast to the evaluation of potential bias and primary interest conflicts, to ensure students can acquire better skills for obtaining, evaluating, and communicating of science information.

3.Conclusion

The Covid-19 pandemic bring new cultural phenomenon, due to the stay-in-home orders, the public tend to rely on other forms of socialization. Face to face communication was replaced by both posts on virtual space and the news broadcast which covering the progression of the pandemic. The public's sudden reliance on social media and news outlines for pandemic-related information resulted in the formation of personal opinions that were now always based on science as a body of knowledge whose primary aim is help the public's understanding of the world around, instead of a discourse of science mistrust.

As an obvious result of such science mistrust, the amount of patient and death increased among the society. And undoubtedly science educators should make more effort to help future students to overcome the discourse of science mistrust. By the exploration of the eight SEPs for obtaining, evaluating, and communicating science information, science educators should provide their students opportunities to evaluate the credibility and accuracy of the information sources, to explore the complex relationship between science and news, and also how they promote science information effectively to let the public believe in. Not only can help students to evaluate information effectively during the Covid-19 pandemic, and but also challenge the belief, value, and principles of those students who are belong to subgroups. Therefore, encouraging students to obtain, evaluate, and communicate science information during science classrooms improve the future citizens can read, explain, and critique science information to overcome the discourse of science mistrust.

Conflicts of interest

The author declares no conflicts of interest regarding the publication of this paper.

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