What's in a name? The use of induced perspective taking to inform arguments about the appropriateness of the term "Chinavirus" when talking about COVID-19

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Abstract

As the coronavirus pandemic unfolded, the use of the term "Chinavirus" to refer to the virus that causes COVID-19 had societal consequences, resulting in discrimination against individuals of Asian descent. In this study of the language used when talking about COVID-19, we used an emergent thematic analysis to explore the potential for induced perspective taking to inform participants' development of arguments regarding the appropriateness of the term "Chinavirus." The following questions guided our inquiry: 1) What evidence do undergraduates draw on and reason about when prompted to argue for and against the appropriateness of the term "Chinavirus" when referring to the virus that causes COVID-19? and 2) How do undergraduates prompted to argue both sides of the "Chinavirus" controversy use these differing perspectives in formulating their own position statements on the controversy? The large majority of 43 participants (pre-service elementary teachers in a mid-sized university in the Southeastern United States) were able, having undertaken an asynchronous, on-line coronavirus-themed unit, to articulate arguments both for and against referring to the virus responsible for COVID-19 as the "Chinavirus" and to use various perspectives in articulating their own position on the issue. Arguments in favor of the appropriateness of the term "Chinavirus" tended to maintain that as China was the origin of the virus, "Chinavirus" is an appropriate term; a number of undergraduates went further and argued that China was, in one way or another, responsible for the origin of the virus, and that this makes the term "Chinavirus" appropriate. Arguments in favor of the inappropriateness of the term "Chinavirus" mostly maintained that this was discriminatory, even racist, and could be harmful to those of Asian descent. The majority of students ultimately addressed both perspectives in their position statements before arguing for their own standpoints, the overwhelming majority of which concluded that it is inappropriate to call the coronavirus "Chinavirus." We conclude that induced perspective taking has the potential for exposing evidence and reasoning employed by opposing sides of socioscientific issues. Furthermore, given that taking alternative perspectives requires effort that individuals aren't often willing to expend on their own, tasking students with taking alternative perspectives through induced perspective taking could aid their development of functional scientific literacy while increasing the likelihood that progressive dialogue ensues.

Keywords COVID-19 · perspective taking · Chinavirus · SSI · argumentation

Attempts to mitigate the COVID-19 pandemic have included governments making a number of controversial mandates. In particular, masks and social distancing have been recommended or made compulsory in a range of spaces, quarantining has been required for individuals who have contracted the virus or even, in some cases, been in close proximity to someone who has contracted the virus, and vaccination has not only been promoted since vaccines became available but is increasingly being required for a number of activities, such as international travel

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and entry to certain crowded places (such as hospitality venues) or, in a small number of countries, for all citizens.

Perspectives as to whether the various mandates were warranted have varied immensely. Importantly, as more information about the virus and its transmission became available, mandates have typically been informed, to a large extent, by science, though scientific recommendations, on their own, cannot entirely account for individual perspectives or the behaviors individuals exhibited. If they could, almost everyone over a certain age would be wearing masks, practicing socially distancing, and have got vaccinated, and, of course, this hasn't been the case.

The science informing the aforementioned mandates is increasingly becoming "settled" as our knowledge moves, as scientific knowledge generally does, from provisional to robust. However, one very different issue is what we should call the virus whose spread has been responsible for the pandemic. The specific issue, and focus for this article, is that whereas some find referring to the coronavirus as the "Chinavirus" (or similar) to be totally acceptable, on the grounds that China was where the virus was first discovered, was very likely where it originated, and bears some responsibility for its spread, others consider that name to be racist, sometimes pointing to acts of hate that have been perpetrated against individuals of Asian descent and which may have been enflamed by such rhetoric. There appears to be little common ground between the two camps.

It has been argued that science can act as a common ground, whereby individuals with diverse perspectives can gather around a shared base of knowledge that has been established by way of the systematic collection and analysis of data further bolstered by peer review (Owens, Sadler and Zeidler 2017). In the case at hand, science certainly informs decision making about the manner in which the coronavirus is named, but the crux of the arguments described above indicate ideas related to society, such as responsibility and social justice. These are the points around which common ground must be mustered – points that are not scientific in nature. Thus, exploring additional venues for finding common ground regarding socioscientific issues (SSI) is warranted, and drawing on social studies in addition to science ideas for attaining it holds promise.

In the case of COVID-19, perspectives related to responsibility and social justice as to the appropriateness of referring to it the "Chinavirus" are in opposition, so finding common ground through perspective taking has potential. Importantly, although perspective taking has been deemed a social emotional skill requisite for functional scientific literacy (Kahn and Zeidler 2019), individuals struggle to engage willingly in the taking of perspectives that differ from their own (Gehlbach 2017), thus making the attainment of common ground difficult. However, inducing perspective taking, that is, prompting individuals to take perspectives that are opposite or alternative to their own, has the potential to reduce the bias they exhibit when practicing social judgement (Lord et al. 1984). More specifically, developing arguments using the evidence and reasoning of those with alternative perspectives would be expected to expose the evidence and reasoning each individual employs to argue their perspective. Getting all the cards on the table, so to speak, would be expected to provide common ground from which individuals with diverse perspectives can make progress on issues, such as the "Chinavirus" moniker.

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In this study, we explore the potential for inducing perspective taking in undergraduates' development of arguments regarding the appropriateness of the term "Chinavirus" as a means for drawing out the evidence and reasoning they employed with the intention of holistically informing their perspectives toward the development of a more functional form of scientific literacy. The following questions guided our inquiry:

- What evidence do undergraduates draw on and reason about when induced to argue for and against the appropriateness of the term "Chinavirus" when referring to the virus that causes COVID-19?
- How do undergraduates induced to argue both sides of the "Chinavirus" controversy use these differing perspectives in formulating their own position statements on the controversy?

A brief history of COVID-19 nomenclature

Viruses are officially named by the International Committee on Taxonomy of Viruses (ICTV). On 11 February 2020, the Committee's name for the virus that causes COVID-19 (which is the official name of the *disease*, named by the World Health Organization (WHO), and also announced on 11 February 2020) was announced as severe acute respiratory syndrome coronavirus 2 (abbreviated to SARS-CoV-2) (World Health Organization 2021a). The ICTV name was chosen as the virus is manifestly a coronavirus in terms of its structure, and it is genetically closely related to the virus that causes SARS.

However, as the WHO put it:

> From a risk communications perspective, using the name SARS can have unintended consequences in terms of creating unnecessary fear for some populations, especially in Asia which was worst affected by the SARS outbreak in 2003.
>
> (World Health Organization 2021a)

Accordingly, the WHO and other organizations began referring to the virus as "the COVID-19 virus." Of course, viruses evolve and on 31 May 2021, the WHO, having consulted widely, announced a procedure for naming "Variants Under Monitoring" (variants with genetic changes that are suspected to affect virus characteristics with some indication that they may pose a future risk), "Variants of Interest" (variants with genetic changes that are predicted or known to affect virus characteristics such as transmissibility, disease severity, immune escape, diagnostic escape or therapeutic escape) and "Variants of Concern" (variants that pose a degree of global public health significance) (World Health Organization 2021b). At the time of writing (December 2021), the WHO identifies four Variants of Concern: Alpha (first identified in the UK in September 2020); Beta (first identified in South Africa in May 2020); Gamma (first identified in Brazil in November 2020); Delta (first identified in India in October 2020); and Omicron (first identified in multiple countries in November 2021).

Maria Van Kerkhove, the WHO's coronavirus lead, stated that the reason for using Greek letters was to simplify public discussion (the Alpha variant was previously known as B.1.1.7, and the Delta variant as B.1.617.2, for example), and to reduce sigma (for example, the Gamma variant was widely referred to as the Indian variant), also noting that "A country may be more willing to

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report it has found a new variant if it knows the new version of the virus will be identified as Rho or Sigma rather than with the country's name" (Branswell 2021).

The WHO policy for naming variants by using letters of the Greek alphabet – and whatever other non-place-based system replaces the Greek alphabet once it has run its course – may indeed succeed in reducing stigma. The 1918-1919 influenza pandemic is sometimes referred to as "Spanish flu," though this is not because it is or was thought to have originated in Spain – it probably arose in the United States, Europe or China (Taubenberger 2006) – but because Spain was one of the few European countries to be neutral in the First World War and so newspapers there were free to report on the pandemic. Wartime censors in other countries where it was present suppressed the news of the influenza, fearing its adverse effect on morale. Indeed, it is not unusual for countries to name diseases after other countries, in an attempt to deflect blame from those in power and to stigmatise foreigners (Reiss 2020). For example, and perhaps unsurprisingly, given that it is a sexually transmitted disease that has long been recognized, syphilis has had an abundance of such attributions:

> The French called it the 'Neapolitan disease', the 'disease of Naples' or the 'Spanish disease' … the English and Italians called it the 'French disease', the 'Gallic disease', the '*morbus Gallicus*', or the 'French pox', the Germans called it the 'French evil' … the Russians called it the 'Polish disease', the Polish and the Persians called it the 'Turkish disease', the Turkish called it the 'Christian disease', the Tahitians called it the 'British disease', in India it was called the 'Portuguese disease', in Japan it was called the 'Chinese pox', and there are some references to it being called the 'Persian fire'.
>
> (Frith 2012, p. 50)

In the case of COVID-19, early after the start of the pandemic, the then US President Donald Trump increasingly started to refer the causative virus as the "Chinese virus" (Rogers, Jakes and Swanson, 2020), the "Wuhan virus", the "China virus" or "Kung Flu" (Hall 2021). It has been argued that this led to a rise in the USA of xenophobic violence against Asian Americans, as a result of Asian Americans being blamed for the spread of the coronavirus (Benjamin 2021). This is an example of the more general phenomenon of a "geography of blame". This happened, for example, with the H1N1 epidemic which was widely labelled as "Mexican flu," with Mexican immigrants in the US being blamed as super-spreaders:

> Typically these geographies of blame involve the unequal attribution of disease threats to foreign countries or exoticized locales and bodies that are thereby abstracted representation- ally from the global economic, ecological and social interdependencies that create the conditions for disease emergence in the first place.
>
> (Sparke and Anguelov 2020)

However, diseases are sometimes named geographically. For instance, Ebola fever takes its name from the Ebola River in the Democratic Republic of Congo, one of the two places where the disease was first identified in 1976 (World Health Organization 2014). Furthermore, in studies undertaken in the US, Canada, and India, Theodore Masters-Waage, Nilotpal Jha and Jochen Reb (2020) were unable to find any evidence that using place-specific names associated with China (e.g., "Wuhan Virus" or "China virus") led to greater levels of Sinophobia, the negative stigmatization of Chinese individuals. On the other hand, it has been found that Implicit

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Americanness Bias – the subconscious belief that European American individuals are more "American" than are Asian American individuals – having declined steadily from 2007 through to early 2020 began to increase on March 8, following the large (800%) increase in stigmatizing language in conservative media outlets, initially as a result the use of the term "Chinese virus" by Mike Pompeo (the then US Secretary of State) on *Fox and Friends* (a daily morning news/talk program that airs on Fox News) and CNBC (Darling-Hammond et al. 2020). This trend reversal in bias was more pronounced among conservative individuals.

Theoretical framework and literature review

We take a sociocultural view of knowing, learning, and perspective taking, and lean on two sociocultural frameworks for this study in particular. First, all knowledge is situated in the social and physical contexts and cultures in which it is used and developed (Brown et al. 1989). As such, knowledge is built within particular communities of practice in which particular resources are available to those engaged in knowing that may be different for individuals engaged in knowing about similar phenomena in different communities of practice (Lave 1991). Thus, individuals from communities whose access to resources and experiences vary are expected to develop different perspectives. As such, all individuals' standpoints are informed by the social and political environments in which they have been developed (Haraway 1988). However, though individuals belonging to specific gender, ethnic, and socioeconomic groups may share similarities in terms of their viewpoints, individualized experiences position each individual's perspective within each group as unique (Harding 1992). Given that the "common" in "common ground" refers to all individuals (both dominant and marginalized) and is thus inclusive, we recognize that individuals from marginalized groups are able to contribute ideas from their own experiences that aid in making accounts of phenomena more balanced than accounts established by dominant groups on their own. From that standpoint, ensuring that all perspectives are exposed and valued by inducing perspective taking through argumentation and laying bare all evidence and reasoning being employed by the collective would be expected to provide common ground from which progressive dialogue can begin. This suggests that coming to a resolution as to whether "Chinavirus" is an appropriate way to refer to the COVID-19 virus should be aided by the consideration of all the evidence and reasoning that, together, informs the range of perspectives related to the issue.

Visions of functional scientific literacy

It is important to align our work with different conceptions of scientific literacy, and Douglas Roberts and Rodger Bybee's (2014) heuristic for framing scientific literacy via two visions can be helpful in starting to do so. The primary concern of Vision I scientific literacy, which is associated with traditional conceptions of science literacy, is the understanding and development of scientific knowledge, with the advancement of science as the end goal. Vision II, on the other hand, recognizes that all learners will not end up working in a career concerned with the advancement of science, but will be tasked with the responsibilities of participation in a democracy. Such participation includes understanding of the concepts and practices associated with the scientific enterprise (like Vision I), but employed in in the context of contemporary, real-world issues and in concert with ways of thinking, such as ethics and morality, that are not scientific in nature. A strong argument can be made that Vision II scientific literacy is more functional for the majority of learners, and that the use of SSI – those issues that are undergirded

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by science but that cannot be completely understood or effectively resolved without also considering ideas that are informed by ways of knowing that are not scientific – such as the "Chinavirus" naming issue, are positioned as ideal learning contexts for the development of functional scientific literacy. Indeed, what has been named as "Vision III scientific literacy" by Glen Aikenhead (2007) extends the thinking behind Vision II by placing a greater and more explicit emphasis on critical thinking and responsible action (Sjöström and Eilks 2018).

Variation in science practices implementation associated with Visions I, II and III

The distinction between the three visions of scientific literacy might also be perceived in the way the practices associated with various visions of scientific literacy are employed. Scientific argumentation as envisioned in Vision I might regard different perspectives regarding the way claims about phenomena are supported through the systematic collection and analysis of data (for example, to establish whether the Sun revolves around the Earth or vice versa). Vision II, on the other hand, would include situating science as a central perspective related to a contemporary issue and serve as a common ground types of people, among other culturally associated perspectives and ways of knowing that include ethical and moral frameworks. If students were trained in science to be functionally literate, they should learn science in the contexts in which it is being used, understand its role and potential for science practices to inform the resolution of contemporary issues, while situating science as a way of knowing in a milieu of perspectives that are not scientific but also need consideration in order for position statements and responses to the SSI to be informed and have a modicum of success. Vision III moves from the transmissive model of Vision I, through the democratic presumption of Vision II to a transformative perspective by its emphasis both on critical thinking and of the action that subsequently results from such thought. It has been argued that Vision III "should include both a broad conception of participation, which makes visible the invisible and informal acts performed by diverse groups to build society, and an alternative notion of emancipation committed to liberation" (Valladares 2021, p. 557).

Perspective taking in the context of argumentation

Whereas science can serve as a common ground for individuals from diverse backgrounds to understand phenomena, perspective taking can be a common ground practice effectively practiced in the context of argumentation about SSI in a science class just as feasibly as it could be in other subjects, such as in social studies (National Council for the Social Studies 2013) and English (National Governors Association Center for Best Practices & Council of Chief State School Officers 2010). Perspective taking, and the argumentation it informs, are particularly important practices across the sciences and in social studies, as their focus is on understanding and responding to science and societal aspects of contemporary issues. In considering the appropriateness of using the term "Chinavirus," an individual exhibiting Vision I scientific literacy (i.e., science for the sake of science) should be able to employ a science perspective to consider nomenclature associated with living and non-living things, generally, and viruses, specifically, and communicate their intentions to others. An individual exhibiting Vision II scientific literacy (i.e., science for participation in society) should be able to appreciate that the term "Chinavirus" would likely be heard differently by those of Asian descent compared to those not of Asian descent. An individual exhibiting Vision III scientific literacy (i.e., science for emancipation and liberation) would also need to be able to consider perspectives related to

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responsibility and social justice regarding understanding and responses to the "Chinavirus" issue, perspectives that science instruction has often left to social studies.

Importantly, seeing issues from a perspective that runs counter to one's own perspective, whether that perspective is scientific (need for social distancing, face covering, vaccination, etc.) or culturally derived, is challenging, requiring significant mental effort and, likely, some degree of conceptual change or at least acceptance of the views of others and empathy with them (Kahn and Zeidler 2019; Gehlbach 2017). Thus, the preparation of individuals to exhibit functional scientific literacy includes argumentation in the context of SSI as an essential practice (Laugksch 2000; Zeidler and Sadler 2010), where students develop arguments informed by consideration of and fluency with diverse and oft opposing perspectives (science and societal) to inform claims about SSI and their resolution.

Problem statement

Though perspective taking is cross-disciplinarily foundational and considered to be a pillar of socioscientific reasoning and the resolution of SSI, the unfortunate reality is that humans generally resist taking account of the perspectives of others, as doing so requires significant effort accompanied by cognitive dissonance, the motivation for which people often lack. One strategy that has proven effective at reducing undergraduates' bias when making judgements is induced perspective taking (Lord et al. 1984). In this study, participants are induced to take positions for and against the appropriateness of the term "Chinavirus" by developing arguments that must employ science and societal reasoning to have a modicum of success. The purpose of the empirical element of this study is therefore to explore the potential for induced perspective taking through argumentation to expose participants' evidence and reasoning for and against the issue, prior to developing a position statement regarding the argument. We then explore these position statements, in particular, to determine whether students were able to employ a range of perspectives in their statements. Given that the taking of diverse and often opposing perspectives is requisite to functional scientific literacy and informed decision-making with regard to SSI (Zeidler, Herman, and Sadler 2019), though the effort required to do so serves as an obstacle (Gehlbach 2017), the ability of students to address more than a single perspective prior to taking a stand on a particular position would serve as evidence that induced perspective taking can aid undergraduates' reasoning about SSI.

Methods

Study context

The study was conducted in an integrated life/earth science course for pre-service elementary teachers in a mid-sized university in the Southeastern United States. The course was designed as a content course in which important pedagogical aspects of teaching (e.g., active learning, 5E learning cycle, emphasis on science practice and making aspects of the nature of science explicit, etc.) were highlighted and modeled, such that pre-service elementary teachers would come away with mastery of the content as well as keen perspectives on teaching. The study was undertaken as part of online instruction over the course of three semesters, starting in the spring of 2020 when COVID-19 first arose and forced instruction online, and continued through the summer and fall course offerings that followed. Participants were 43 undergraduate pre-service elementary teachers enrolled in one of the three offerings of the course and provided informed

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consent. Though demographic data of the participants were not collected, the percentages of those undergraduates who were in the cohort taking this course during the spring, summer and fall semesters involved ranged in age from 19 to 51 years, with a mean of 21.8 years. 96% were female and 6% were military veterans. 69% identified as White, 20% as Black or African American, 6% as Hispanic and 5% as two or more races.

Data collection

Data were collected as part of a coronavirus-themed unit situated in a 5E module (Engage, Explore, Explain, Elaborate, Evaluate – see Rodger Bybee et al. 2006) focused on argumentation using the Claim-Evidence-Reasoning framework (McNeill and Krajcik 2011; see Owens, Sheridan, and Glaze in press for more on the 5E module in its entirety). For the purpose of this study, we will focus on the "Elaborate" portion of the 5E module wherein participants used their growing understanding of the coronavirus to consider its origin and the appropriateness of using "Chinavirus" in reference to it. Participants were asked to do the following:

1. Watch the following video and respond to the prompt that follows: https://www.youtube.com/watch?v=TPpoJGYlW54

   How are viral outbreaks like SARS of 2003 and the current Coronavirus pandemic related to Chinese law and culture? Refer to both (i.e., law and culture) in your response.

2. Read the NPR article [a link to Natalie Escobar 2020] and respond to the prompt that follows: How has the coronavirus outbreak affected individuals of Asian descent in public spaces?

3. Some have referred to the coronavirus as the Chinavirus, while others have been offended by this reference. In this section, you are going to take the perspective of both parties and use argumentation to support the claim of each party. To do so, where you see the claim (1), provide evidence (2) and a justification of the evidence (3). *the justification is how the evidence relates to and supports the claim.

   - CLAIM: It is appropriate to call the coronavirus the Chinese virus.
   - CLAIM: It is inappropriate to call the coronavirus the Chinese virus.

4. Having defended both claims, where do you stand in terms of whether it is appropriate to call the coronavirus the Chinavirus?

   State your position and in doing so, be sure to address both sides of this debate in your position statement.

Students worked individually for between three and six hours to complete the coronavirus-themed unit, of which typically about 40 minutes was spent on the above four tasks.

Data analysis

We used an emergent thematic analysis (Braun and Clarke 2012) to identify themes that emerged in the evidence and reasoning participants employed to support claims for and/or against the appropriateness of using the term 'Chinavirus' to refer to the virus that causes COVID-19 (Creswell and Poth 2018). We focused on the data obtained in Steps 3 and 4 above from the

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participating students. First, we distinguished (so far as we could – students not infrequently combined the two) between the evidence that the students cited and the reasoning they employed in Step 3, and used an emergent thematic analysis to identify the sources of evidence and the reasoning employed by participants when they developed C-E-R (Claim-Evidence-Reasoning) arguments to support each of the two claims. This analysis was undertaken independently by the first author and an undergraduate, where each read the students' responses, distinguished between the evidence and reasoning that composed each argument, and then assigned codes that best characterized each particular piece of evidence and reasoning identified. Any disagreements were resolved by discussion until a consensus was reached. Not all students produced codable responses to all questions and some students produced more than one codable response to a single question, so numbers below do not necessarily add to 43. Then, the two authors of this article examined the position statements the students produced in Step 4 to determine whether evidence and reasoning associated with both perspectives (for and against the appropriateness of using the term "Chinavirus" to refer to the virus that causes COVID-19) were accounted for in the position statements participants ultimately made after engagement in the induced perspective taking activity.

Findings

In this section, we report the findings of our thematic analysis. First, we present the evidence and reasoning that students employed in support of the claim that it is appropriate to call the coronavirus the "Chinavirus." Next, we present the evidence and reasoning that students employed in support of the claim that it is inappropriate to call the coronavirus the "Chinavirus." Finally, we provide findings related to participants' inclusion of evidence and reasoning associated with multiple perspectives when stating their position as to whether the use of "Chinavirus" in reference to the virus that causes COVID-19 was appropriate. Our findings highlight the potential for induced perspective taking to make clear the evidence and reasoning that opposing sides employ when arguing about SSI, such as the appropriateness of the term "Chinavirus."

The claim "It is appropriate to call the coronavirus the Chinese virus"

When asked to provide evidence in support of the claim "It is appropriate to call the coronavirus the Chinese virus," much the most common type of evidence (provided by 35 students) was coded as "Originated in China," with examples such as:

> It is appropriate to call coronavirus the Chinese virus because it originated in China.
>
> It originated from Wuhan, China and spread to other parts of the world infecting millions of people.

Eight students cited evidence that was coded as "Responsibility: Law and culture," with examples such as:

> due to the laws created for the wildlife industry which led to wet markets in China, the slaughtering of wildlife, and selling and interaction with these animals helped spread the virus to its people.
>
> Being the pre-acceptors of the coronavirus due to their culture efforts, it is therefore appropriate to call the coronavirus the Chinese virus.

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> If the Chinese law did not allow for the catching, breeding, and live selling of wildlife animals then coronavirus, and others, would not have been spread from animal to animal and then to humans.

One student cited evidence that was coded as "Responsibility: Slow reaction:"

> The virus first appeared in China back at the end of 2019 and due to their slow reaction, it has spread all around the world

One student cited evidence that was coded as "Responsibility: Travel and transmission:"

> Chinese citizens from this area travelled to other regions of the world and transmitted the Coronavirus.

One student cited evidence that was coded as "President says so:"

> American Mr. Trump refers to the Coronavirus as the Chinese virus in his press conferences on national television, so why would others feel that it is inappropriate to do the same?

Finally, one student cited evidence that was coded as "To enable harassment:"

> because people of Asian descent are being publicly harassed and no one is speaking out against these harassments, which can also lead to the assumption that since no one is speaking against the harassment claims, then Asian people must be of some blame for the current pandemic.

When asked to provide a justification of the evidence in support of the claim "It is appropriate to call the coronavirus the Chinese virus," a number of students either failed to provide a justification or did no more than repeat (often using very similar words) the evidence they had already provided. Where a justification could be identified, the most common type (provided by 24 students) was again to do with geography and was coded as "Origin-based," with examples such as:

> The first outbreak of this virus we saw was in China, so giving it the name is simply stating where it began.

> Just like we call people of Chinese descent "Chinese people" this virus descended from China, so it has the name Chinese virus to uphold the decent of it to remember and focus on research of where it came from.

Six students provided justifications that were coded as "Responsibility-based" with examples such as:

> the way they slaughter these animals, mainly the bats and pangolins who are known to carry the virus, and then proceed to touch them to sell them without any protection, which helps spread a virus among their people.

> So basically, is their fault and we should call it the chinses virus.

> The origin of the coronavirus is from China and the laws that are allowed in China; Therefore, it is appropriate to call this virus the Chinese Virus.

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The claim "It is inappropriate to call the coronavirus the Chinese virus"

When asked to provide evidence in support of the claim "It is inappropriate to call the coronavirus the Chinese virus," the most common type of evidence provided (by 29 students) was coded as "Discrimination," with examples such as:

> It promotes the belief that a certain race of people are inferior.
>
> we see associated racism, and we see associated prejudice,
>
> it's now discriminating against Asian descent of all ages making them feel paranoid and fearful of going into public places.

Eighteen students cited evidence that was coded as "Responsibility for virus," with examples such as:

> It can cause harm to those who are not the cause of this virus.
>
> It promotes the belief that a certain race of people … should be punished as they are the cause of the pandemic.
>
> We call this the Chinese virus solely because of where it came from and to find a place of blame.

Seven students cited evidence that was coded as "Doubtful of Chinese origin," with examples such as:

> Many scientists believe that is a natural occurring virus and that it could have started anywhere, China just happened to discover it first.
>
> The first outbreak may have been in China, but it cannot be proven that the virus originated in China.

Five students cited evidence that was coded as "COVID mostly affects Chinese individuals," with examples such as:

> I think this because then it puts the notion in others' heads that this is a virus that mainly affects Chinese people,

One student cited evidence that was coded as "Chinese economy:"

> It can limit China's economy

One student cited evidence that was coded as "Not scientifically named:"

> because that is not the proper, scientific name. Also, viruses are not named where they are alleged to have originated.

Finally, one student cited evidence that was coded as "Not shaped like a Chinese person:"

> We would call it the Chinese Virus if the virus was shaped like Chinese people … but it is not. It is shaped like crowns.

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When asked to provide a justification of the evidence in support of the claim "It is inappropriate to call the coronavirus the Chinese virus," there was again some repetition of evidence already provided. Where a justification could be identified, the most common type (provided by 14 students) was coded as "Avoiding discrimination," with examples such as:

> the way it encourages blame of Chinese and Asian for the Coronavirus.
>
> Labeling this virus to generalize all Chinese people to have it, is derogatory and unfair
>
> it allows people a justification to be xenophobic or racist towards Chinese people.

The next most frequent code was the closely related "Assigns blame to a country/group of people," with examples such as:

> The fault of this virus should not be generalized over all Chinese or Chinese-descent individuals.
>
> It is very inappropriate to call the coronavirus the Chinese virus because then you are blaming Chinese people everywhere for the mistakes of the few.
>
> it almost puts blame to EVERYONE in China that the virus began when that is not the case.

No other code was used more than once. One student provided a justification that was coded as "Scientific-based naming system:"

> get everyone on board with a more scientific process, and that's actually calling the virus by its actual scientific name, COVID-19.

Students' position statements

When it came to students responding to Step 4 above and producing their own position statements to clarify where they stood on whether the use of "Chinavirus" when referring to the virus that causes COVID-19 was appropriate using evidence and reasoning they had developed throughout the Coronavirus 5E unit, 38 students did so. Twenty eight of these students provided, as requested, arguments both for and against calling the coronavirus "Chinavirus." Of the ten who did not, eight thought it inappropriate to call the coronavirus "Chinavirus," and two thought it appropriate to do so. Overall, there was very strong agreement (36 of the 38 students who provided a position statement) that it is inappropriate to call the coronavirus "Chinavirus." In the vast majority of cases the reasons given were to do with the unfairness of this for people of Chinese descent, with examples such as:

> I believe fully that is rude and wrong to call the virus "Chinese Virus." All the research and evidence that shows the xenophobia and racism that has progressed towards Chinese people since this outbreak and referring to the virus as the Chinese Virus just makes it worse. I understand that the first outbreak w saw was in China, however that does not justify being a rude person and thinking that any Chinese person you see in AMERICA has the virus. This is not backed by evidence and in my own opinion is only an excuse to show your inner racism to anyone who looks different than you.

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> I stand with the claim that it is inappropriate to call it the Chinese virus but instead say that the virus has originated from China. Although the virus can be traced back to China and their systems of wet markets and the SARS virus, it still spread to the United States because of traveling internationally. The impact of calling it the Chinese virus has on Asian descents is a very terrible way to address the issue at hand which is the way to cure it. The claim puts a blame on people here in the US who have nothing to do with it at all. So, again I stil, stand with it being inappropriate no matter what the facts state.

One notable feature of this last example is that the student clearly feels that the ethical arguments against calling the virus the "Chinavirus" would prevail even if there were/are facts that justified if being so called.

In one case where a student argued that it was inappropriate to call the coronavirus the "Chinavirus" on the grounds of deference to the views of experts, their answer also included the argument that to do so would be unfair for people of Asian descent:

> In my opinion, I do not think it is appropriate to call the Coronavirus the China Virus because ultimately, it is incorrect. Experts have said numerous times that the proper name for the virus is COVID-19. I agree that by calling the virus the China Virus is wrong and can be dangerous because this is a global pandemic. During a time like this, I think it is best for people to come together and do what it takes to get past this disease and develop a vaccine. I think it is wrong for people of Asian descent to suffer without even having the virus.

One student, though concluding that it was inappropriate to call the coronavirus the "Chinavirus," argued that it would be appropriate to do so if only the general public were better informed:

> After defending both claims as to whether calling coronavirus the Chinese virus is appropriate or inappropriate, I stand that it is inappropriate. Although the coronavirus did originate from China, calling it the Chinese virus causes xenophobia. The nickname, Chinese virus, leads to prejudice towards individuals of Asian descent across the world, especially in the United States. Titling the coronavirus the Chinese virus creates a hostile work and public environment for all citizens in the United States, who may never have visited Asia. However, if the public could become more educated on the origins and not assume that all individuals of Asian descent carry the coronavirus then it would not be inappropriate. Considering the majority of the public will discriminate and say that all Asian descendants are carriers of the coronavirus, then it is inappropriate to call the virus the China virus.

A few students, though still thinking it better not to call the virus the "Chinavirus," produced more muted responses that lacked detail and did not explicitly cite issues to do with discrimination in their responses, for example:

> I feel it is better to call the virus the coronavirus or covid 19. That is the scientific name of the virus and that is what it should be called. But I do understand how some might think that they are just referring to the virus's origin by calling it the Chinese virus.

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The two students who thought it was appropriate to call the coronavirus the "Chinavirus," adduced the following arguments in support of their position:

> I think it is appropriate to call the coronavirus the China Virus because it originates from their and when it first was spotted in China they hesistated to report it to the world and lockdown their country. This hesitation allowed for the disease to be spread throughout the world and infect millions of people.
>
> I take the stand that the coronavirus is the China virus. They have poor and unsanitary places everywhere there. They domesticate and breed wildlife which are full of viruses already upon catching them. The warehouses from the Vox video show that these animals are just stacked on top of each other which causes feces, pee, pus and blood to fall to the animals below. The video shows people handling the slaughtered animals without any gloves on which then can cause them to catch it. Unknowingly, they will sell it to people and they will consume it which infects them. Before signs of sickness, it can already be spread to someone else. A virus can be spread very easily from contact or airborne. People from China come to the United States all the time and it would be so easy for them to bring it here, which then starts a whole new outbreak in a different country. This cycle then continues to other countries, until it turns into a global pandemic.

In sum, participants supported the claim "It is appropriate to call the coronavirus the Chinese virus" with evidence that it originated in China and that China was responsible for the virus thanks to its laws and culture, slow reaction to the coronavirus outbreak, and spread of the virus by citizens whose travel originated in China, as well as by pointing to the former U.S. President's use of the "Chinavirus". Participants justified this evidence to support their claim as to the appropriateness of the term "Chinavirus" by reasoning that naming a virus based on where it originated, or the country responsible for the pandemic that resulted, was sensible. To support that claim that "it is inappropriate to call the coronavirus the Chinese virus," participants provided evidence that this resulted in discrimination, that many people being harmed by the use of the term "Chinavirus" were not responsible for it, and that the virus does not solely affect Chinese people, as well as sparse reference to the use of the term adversely affecting the Chinese economy, to the virus not being shaped like a Chinese person, and to it not being a scientific name. Participants justified this evidence to support their claim as to the inappropriateness of the term "Chinavirus" by reasoning that naming systems should avoid discrimination or assigning blame, and that the naming system should be science-based (as opposed to geographically based). Analysis of the position statements that participants made after participating in the induced perspective taking activity indicated that the statements were generally informed by both perspectives (that use of the term "Chinavirus" is and is not appropriate). Whereas the vast majority of participants who deemed the term "Chinavirus" to be inappropriate did point to the potential for Chinese responsibility for the viral outbreak, they recognized that it was unfair and unethical to use the term as it promoted discrimination. The few participants who took a stand for the appropriateness of using the term "Chinavirus" pointed to the origin of the virus and China's responsibility for it, but failed to account for the perspectives of those negatively affected by it.

Importantly, participants often employed both science and moral reasoning in crafting their position statements regarding the appropriateness (or inappropriateness) of using the term

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"Chinavirus," and addressed opposing perspectives – indicative of functional scientific literacy (Topcu et al. 2010). In particular, that the majority of participants explicitly pointing toward discrimination and xenophobia as reasons to avoid the "Chinavirus" nomenclature is suggestive of Vision III scientific literacy. Additionally, though significant effort is required to take perspectives that are different from one's own, we found that after participation in the induced perspective taking activity, participants overwhelmingly addressed a range of perspectives in the positions they staked regarding the appropriateness of using the term "Chinavirus."

Discussion

Our study required participants to present both cases of an argument. The first question we posed in this study was "What evidence do undergraduates draw on and reason about when prompted to argue for and against the appropriateness of the term "Chinavirus" when referring to the virus that causes COVID-19?" As might be expected, arguments in favor of the appropriateness of the term "Chinavirus" tended simply to maintain that as China was the origin of the virus, "Chinavirus" is an appropriate term; a number of undergraduates went further and argued that China was, in one way or another, responsible for the origin of the virus, and that this makes the term "Chinavirus" appropriate. Arguments in favor of the inappropriateness of the term "Chinavirus" mostly maintained that this was discriminatory, even racist, and could be harmful to those of Asian descent. These arguments are based in moral philosophy or civics. A smaller number of arguments in favor of the inappropriateness of the term "Chinavirus" were scientific, maintaining that it could not be proved that the virus originated in China.

The second question we posed in this study was "How do undergraduates prompted to argue both sides of the "Chinavirus" controversy use these differing perspectives in formulating their own position statements on the controversy?" Given the circumstances (asynchronous on-line with no overt facility for discussion) under which this exercise was undertaken by the participants, as a result of COVID-19, we are encouraged that 28 of the 38 students who provided a position statement included, as requested, argument for both and against calling the coronavirus "Chinavirus." We are heartened by the response of one student who clearly understood part of the function of the exercise in writing:

> I do believe that it is inappropriate to call it the chinese virus and it can very easily be discriminated against Asian descendants. I personally didn't enjoy this activity because I felt like I was fighting myself but It was also good to look up both sides of the story to see how some people can resonate with their answer.

Given that the study was conducted in a science course for pre-service elementary teachers in a university in a State of the United States that is traditionally more Republican than Democrat, we are also encouraged that 36 of the 38 students who provided a position statement concluded that it is inappropriate to call the coronavirus "Chinavirus."

There have been widespread calls to stop the use of place-specific terms such as "Wuhan virus," "China virus," or "Chinese virus" when referring to COVID-19 (e.g., Su et al. 2020), but as far as we are aware, this is the first study that explicitly asks participants to produce arguments for and against such terms and then asks them to reach a conclusion in the light of both sides of the argument. More generally, induced perspective taking has the potential for exposing the evidence and reasoning employed by opposing sides of SSI from which progressive dialogue can

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commence. In this study, a diverse array of evidence and reasoning were provided in participants' arguments for and against the appropriateness of the term "Chinavirus" – evidence that ranged from science to ethics and which individuals exhibiting functional scientific literacy might be expected to employ when developing an informed position regarding the issue in question. Induced perspective taking forces students to put the cards from both hands on the table and grapple with social justice and other issues that are informed by science.

In common with other studies on student argumentation, such as Topcu, Sadler and Yilmaz-Tuzun (2010), there was considerable variability in the quality of the reasoning employed by the students. In their study, Topcu and colleagues found that although undergraduate preservice teachers' argumentation quality was consistent across different SSI scenarios (e.g., gene therapy, human cloning, and global warming), the variability in argumentation across the individual preservice teachers comprising the sample was remarkable. This finding – that informal reasoning about SSI varies greatly across individuals – is not restricted to preservice teachers and has been noted across high school (Kinslow, unpublished), undergraduate (Owens, Petitt, Lally, and Forbes 2020), and even in-service teacher (Owens, Herman, Oertli, Lannin, and Sadler 2019) populations.

As with our findings, those of Topcu et al. (2010) suggest that weaknesses in student reasoning may be exacerbated when they have to engage in multiple forms of reasoning, including but not limited to science reasoning. In the case that our study addresses, science has a key role to play in determining where and how the virus arose, what it is called, how we tackle COVID-19, and how we might reduce the likelihood of future zoonoses arising and spreading. At the same time, as with all SSI, other forms of reasoning, including ones to do with civics / moral philosophy, politics, and economics, are needed, as reasoning in these domains is crucial to understanding and responding to SSI (Owens, Sadler, Petitt, and Forbes 2022; Sadler and Zeidler 2003), where moral reasoning, in particular, has been associated with socioscientific argumentation quality (Sadler and Donnelly 2006).

More specific to perspective taking, is that nearly three-quarters of participants in our study were able to argue both for and against calling the coronavirus "Chinavirus" after engaging in the induced perspective taking activity. These findings are significant, given that little more than a third of pre-service teachers in the Topcu et al. (2010) study were able to reason beyond the justification of a claim, leading those authors to conclude that those pre-service teachers were unable to consider perspectives other than their own. Taken together, these findings support both Gehlbach's (2017) assertion that individuals struggle to take perspectives other than their own, and the potential for induced perspective taking to facilitate individuals' taking of a range of perspectives in the context of contentious SSI.

Finally, we note that the induced perspective-taking strategy employed in this study helps to ensure that a range of perspectives are acknowledged, recognized, and hopefully, addressed in proposed resolutions. We see this, along with approaches for teaching SSI, such as those based on pedagogy of difference (Owens et al. 2018) and the teaching of controversial issues (Reiss 2022), as contributing to functional scientific literacy and also increasing the likelihood that consensus can be attained and issues resolved. In this study, we found evidence that the induced perspective taking about the appropriateness of the term 'Chinavirus', as well as the position statement that participants ultimately produced, tapped into all three visions of functional

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scientific literacy: scientific nomenclature a) is important, even if only for the sake of clear communication amongst scientists (Vision I); b) has everyday relevance and importance for participation in a functional democracy with ethical, economic, and political ramifications (Vision II), and c) can limit and afford the potential for science to liberate individuals in society where injustice may be present (Vision III).

Implications

Functional scientific literacy that addresses the three Visions demands fluency with reasoning that is both scientific and moral, as well as the ability to take multiple, diverse, and oft-opposing perspectives. Teachers seeking to aid their students in their development of such scientific literacy can do so by framing science instruction in the context of SSI, which require concomitant reasoning about science content knowledge and moral implications of the issue, as well as taking multiple perspectives. Extant literature evidences the effectiveness of SSI as contexts for the development of science content knowledge (Sadler, Romine, and Topcu 2016; Venville and Dawson 2010) and practice skills (Zangori, Peel, Kinslow, Friedrichsen, and Sadler 2017; Peel, Zangori, Friedrichsen, Hayes, and Sadler 2019), as well as the ability to recognize when a situation contains a moral aspect (i.e., moral sensitivity; Fowler, Zeidler, and Sadler 2009). This study suggests that that induced perspective taking can be leveraged to aid students in their taking multiple perspectives and incorporating these when taking positions and supporting resolutions to contentious SSI.

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