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Exploring Undergraduate Biology Students' Science Communication About COVID-19

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Effective science communication is important for mitigating the spread of COVID-19, but little is known about how college science students, who are the future of science, have communicated about COVID-19. In this study, we surveyed 538 biology students in the Southeastern United States about how they communicated about COVID-19 with others and how prepared they felt to communicate. We found that many students were communicating frequently but did not feel prepared to communicate accurately, particularly about vaccine safety and effectiveness. Students also wrote about their communication strategies, and many students reported using potentially ineffective communication. Finally, we explored student misconceptions about COVID-19 and found differences among religious, political, and racial/ethnic groups that could impact their communication to their communities about COVID-19. These results indicate a need for science communication education about COVID-19 among undergraduate scientists in training.

Keywords: COVID-19, science communication, biology education, undergraduate education, identity, religion, politics

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INTRODUCTION

To mitigate the impact of COVID-19, it is important that scientists are able to communicate effectively about COVID-19 mitigation measures, like vaccines and masks, to their communities and the broader public (Bavel et al., 2020). Undergraduate biology students include the next generation of scientists (Brownell et al., 2013), as well as students with different religious, political, and racial/ethnic identities (Henning et al., 2019; Barnes et al., 2020). Because of the diversity of identities, these students are potential boundary spanners who can act as conduits of accurate scientific information, or misinformation. However, research has not investigated how these biology students are communicating with others about COVID-19 and the extent to which they themselves may have misconceptions about COVID-19. The purpose of this study was to explore potential evidence for whether we need to establish science communication training about contentious biological topics, like COVID-19, among undergraduate students. In this exploratory study, we examine how often students report communicating with others, how prepared they feel to communicate accurately, and their reported strategies for communicating with non-scientists about COVID-19. Additionally, we explore the extent to which students have misconceptions

about COVID-19 commonly seen in the public and if religious, political, or racial/ethnic identity is associated with these misconceptions among students.

BACKGROUND

The beginning of the COVID-19 pandemic did not indicate that scientists would lose the approval and trust of the public (Agley, 2020), but agreement with scientists and medical professionals began shifting as people began viewing COVID-19 as a partisan topic (Funk et al., 2020; Sylvester, 2021). Early messaging from politicians and the media were highly politically polarized (Green et al., 2020; Hart et al., 2020), which likely contributed to the public's polarization about COVID-19 risk and mitigation. This growing partisan distrust in scientists reflected a shift from accuracy-oriented reasoning to motivated ideological reasoning and identity protective cognition, meaning individuals reasoned toward conclusions based on the goal of affirming their ideology or the ideology of their social groups rather than reasoning toward an accurate conclusion (Kahan et al., 2012; Kahan, 2017; Sylvester, 2021). Religious affiliation and political affiliation became associated with less adoption of effective COVID-19 mitigation strategies (Funk et al., 2020; Sylvester, 2021). Further, due to modern and historical racism, Black populations have developed a more prominent distrust of institutions in the United States than other groups (Balasuriya et al., 2021; Johnson and Funk, 2021), which may explain their increased hesitancy toward the COVID-19 vaccines compared to other racial/ethnic groups (Momplaisir et al., 2021). Undergraduate biology students include individuals from these political, religious, and racial/ethnic groups that may have higher resistance toward COVID-19 mitigation and could impact science communication on COVID-19.

Undergraduate biology students can serve as a conduit of either accurate or inaccurate information within their communities. Messaging from trusted group members can be effective for mitigating misinformation about contentious topics (Barnes et al., 2017; Scheitle and Ecklund, 2017; Chu et al., 2021; Sauer et al., 2021). Therefore, because undergraduate student populations are more diverse in terms of race/ethnicity, religious affiliation, and political affiliation than Ph.D./M.D. level scientists, they may have more potential to be boundary spanners for effective science communication across demographic groups. However, undergraduates may not be effective in their communication if they do not feel prepared to communicate accurately or are not educated on science communication about controversial topics. Also, these students could be equally likely to serve as conduits of *misinformation* if they themselves have adopted inaccurate beliefs that have not been addressed effectively in their biology education.

Although attitudes, knowledge, and behaviors about COVID-19 have been studied in the general US population (Geldsetzer, 2020; Hogan et al., 2020; McFadden et al., 2020), undergraduate biology students and their communication about COVID-19 have been studied very little. In addition to a general lack of research on undergraduate biology students' misconceptions (for exceptions see, Adkins-Jablonsky et al., 2021; Shumway et al., 2021), student communication about COVID-19 has not been researched at all, to our knowledge. Indeed, very little research exists on student communication habits about controversial topics in general (Shivni et al., 2021), which may cause instructors to be unsure about how to better prepare their students for these discussions. Therefore, we investigated variables related to biology undergraduate students' communication about COVID-19. Understanding communication habits could motivate instructors to incorporate science communication education into their curriculum, as well as illustrate a need for more communication education about controversial scientific topics in the classroom.

In addition to exploring students' communication and potential misconceptions, we wanted to know if any associations existed between student communication, knowledge of scientific studies, and their religious affiliation, political affiliation, or racial/ethnic identification. Since political conservatism and religious affiliation are related to attitudes and beliefs that can exacerbate the toll of COVID-19 on society, we wanted to know if this was also true among college biology students. Because Black populations tend to have more hesitancy toward medical professionals and the COVID-19 vaccines (Malik et al., 2020), we decided to explore differences based on race/ethnicity as well.

RESEARCH QUESTIONS

In March/April of 2021, when the vaccines were first becoming widely available to the public, we asked:

(1) To what extent did students have common misconceptions about the results from scientific studies on COVID-19 and COVID-19 mitigation?
(2) To what extent were college biology students communicating about COVID-19, how prepared did they feel to communicate accurate information, and what are common ways students reported that they would communicate about COVID-19 to others?
(3) To what extent did political affiliation, religious affiliation, and race/ethnicity predict student responses?

MATERIALS AND METHODS

The Southeastern United States has some of the lowest vaccination rates in the country and some of the highest rates of conservatism (Jones, 2019) and religious affiliation (Lipka and Wormald, 2016; Norman, 2018), and thus it could be particularly beneficial to understand COVID-19 communication and knowledge among students in this region. Thus, in March and April of 2021, during the first months that the COVID-19 vaccines were available to young adults, we surveyed 538 students across 19 undergraduate biology classes at a Ph.D. granting, research-intensive university in the Southeastern United States. The classes included introductory biology, human anatomy and physiology, endocrinology, immunology, microbiology, ethology, and genetics. Instructors forwarded the confidential

survey to students to complete in exchange for a small amount of extra credit in the course. All research was approved by Middle Tennessee State University Institutional Review Board, protocol #0003571.

At the time of this study, there was a lack of existing survey measures on student communication and knowledge about COVID-19 for us to use so we created items specifically for this study. We conducted a literature review of current studies on people's knowledge and perceptions of COVID-19 and COVID-19 mitigation to develop relevant survey items. Before administering our survey, we conducted cognitive interviews with all survey items used in analyses (Castillo-Díaz and Padilla, 2013) with nine undergraduate students to improve the items, if they were being misinterpreted or were unclear (American Educational Research Association et al., 2014). All survey items used in the analyses can be found in **Supplementary Material**.

Variables Collected

To determine how often students communicate about COVID-19 to their friends and family, we created two items in which we asked students to rate on a 4-point scale how frequently they discussed COVID-19 vaccines with others and what ought to be done about the spread of COVID-19. To determine students' self-evaluated preparedness to give accurate information to others about COVID-19, we developed four items in which we asked students to rate on a 4-pt scale the extent to which they felt prepared to communicate accurately about (1) the health consequences and risks of COVID-19, (2) how masks can slow the spread of COVID-19, (3) the safety of COVID-19 vaccines, and (4) the effectiveness of COVID-19 vaccines. Finally, to explore student communication tactics, we asked students to respond to four open-ended questions in which they described how they would respond to a friend or family member who was (1) not concerned about getting COVID-19, (2) not going to wear a mask to help slow the spread of COVID-19, (3) not going to get a COVID-19 vaccine when it became available to them, and (4) concerned that the COVID-19 vaccines are not safe or that they do not work.

To determine if students had common misconceptions found in the public about COVID-19 studies, we asked students to rate on a 5-pt scale the extent to which *scientific studies show* that (1) COVID-19 vaccines are effective, (2) COVID-19 vaccines were rushed, (3) masks slow the spread of COVID-19, and (4) the death rate of COVID-19 is the same as the seasonal flu (Enders et al., 2020; Tyson et al., 2020; Latkin et al., 2021). We collected information on students' race/ethnicity, religious affiliation, and political affiliation to explore these characteristics on students' communication and potential misconceptions. Although not the focus of this manuscript, we also collected information on gender, major, and career intentions since these may influence the results and may be of interest to the reader.

Analyses

To explore how often students were communicating about COVID-19, how prepared they felt to communicate accurately, and the extent to which students hold basic misconceptions about COVID-19, we present descriptive statistics. To explore students' communication strategies three researchers analyzed written responses in which students described how they would communicate with a friend or family member who was not concerned about COVID-19, did not intend to wear a mask, or did not want to receive a COVID-19 vaccine. The researchers (E.W., M.E.B., T.N.) used inductive qualitative analysis (Krippendorff, 2012; Cho and Lee, 2014) with constant comparison methods (Glaser and Strauss, 1967; Glesne and Peshkin, 1992) of student responses to determine themes arising in the data. Interrater reliability (IRR) among the three researchers of the resulting codebook was 70%, but once IRR was established all responses were coded to agreement by two researchers (E.W., T.N.).

To determine if there were differences in our variables based on student characteristics and identities, we ran regression models using the *MASS* (Venables and Ripley, 2002) and *ordinal* (Christensen, 2019) packages in R 4.0.2 (R Core Team, 2020). Because data was collected across different courses, we calculated the Kish design effect for each item to understand the potential clustering of data by course (Maas and Hox, 2005) using the *Hmisc* package (Harrell and Dupont, 2021). For items that had a design effect that was less than 2, indicating there was not a significant nesting effect by course, we conducted ordinal regressions using the function *polr* for ordinal responses (e.g., strongly agree, agree, disagree, strongly disagree) to analyze each single-item dependent variable. For items that had a design effect greater than or equal to 2, indicating a need to consider nesting effect by course, we conducted mixed-effect models with course having a random effect for each item. For the mixed-effect models, we fit generalized linear models using cumulative link mixed models *via* Laplace approximation using the *clmm* function for ordinal response items. Each model had the same predictor variables (politics, religion, race, gender, major, career). Students were categorized as non-liberal, declined to state, and liberal (reference group); religiously affiliated/not affiliated (reference group); Black, Asian, or another race (reference group); man/woman (reference group); biology major/not biology major (reference group); and pre-health/non-pre-health (reference group). We included students who declined to state their political affiliation as a group in our analyses because 25.7% of students chose this answer for their political affiliation. Further, the results for this group are very similar to those of non-liberal students which indicates that conservative students may have wished to conceal their identity in this context. In the body of the manuscript, we report coefficients from regressions and statistical significance of each coefficient of religion, politics, and race ($p < 0.05$). To account for multiple comparisons, we ran a Benjamini and Hochberg (1995) correction using the *p.adjust* function (R Core Team, 2020) to control for false discovery rate. Because we are testing several different hypotheses with our regressions, we chose to control for false discovery rate, instead of a family-wise error rate (e.g., Bonferroni correction), to increase power and keep a low false positive rate (Chen et al., 2017; Vickerstaff et al., 2019). We report full regression tables with coefficients, standard errors, and *p*-values for all variables in the analyses, as well as the reproducible code for analyses, in **Supplementary Material**.

LIMITATIONS

There are several limitations of this study worth noting. First, this study was conducted at one university, and although we collected a sizeable sample from a variety of 19 biology classes, our results may be unique to the local context of the study in the Southeastern United States and at a large research university. However, we saw this as an ideal place to begin studying students' communication habits since the Southeastern United States has some of the highest rates of vaccine hesitancy and misinformation about COVID-19 (CDC, 2021). It is also likely that results could vary depending on if and how instructors discussed COVID-19 and science communication in their class. We did explore potential individual course effects by running random effects models and did not find any substantial clustering effects. This could be because most instructors did not teach about COVID-19 and COVID-19 communication at the time of the survey or that instructors were not implementing instruction that impacted our measured outcomes. Finally, although we did use measures to gauge student misconceptions about basic COVID-19 studies, we did not use any measures to gauge student conceptual understanding of COVID-19 topics like the structure of SARS-CoV-2, how the virus spreads throughout populations and infects human cells, or the underlying processes that allow vaccines to confer immunity or reduced severity of COVID-19 disease. Student understanding of these topics may influence student communication habits. For instance, if a student has a higher conceptual understanding, they may feel more prepared to communicate accurately and thus feel more comfortable communicating more frequently. We did not have a measure of conceptual understanding to use for this study and hope to see one developed in the future. We see this study as a first step in exploring a potential need for science communication training about COVID-19 among undergraduate students. We look forward to future research in which we can implement a pre-post instruction study design to compare student outcomes based on instructional practices.

TABLE 1 | Demographics of study participants from a research-intensive university in the Southeast.

Demographic variables	% Students
Race/ethnicity	
Asian	12.3
Black	13.9
[a]Hispanic	5.0
[a]Indigenous/Pacific islander	0.6
[a]White	59.5
[a]Multiracial	5.6
[b]No answer	3.2
Gender	
Man	29.7
Woman	68.2
[b]Non-binary	0.7
[b]No answer	1.3
Major	
Biology	49.1
Non-biology	50.2
[b]No answer	0.8
Career goal	
Pre-health	56.7
Not pre-health	42.9
[b]No answer	0.4
Political Identity	
Liberal	34.1
Non-liberal	40.5
No answer	25.4
Religion	
[a]Affiliated—not Christian	8.4
[a]Affiliated—Christian	61.7
No religion	25.5
[b]No answer	4.5

n = 538.
[a]Combined as a single group in analyses due to sample size.
[b]Not included in regressions due to sample size.

RESULTS

Of the 1,222 students invited to the survey, 538 completed the survey (44% response rate). See **Table 1** for a breakdown of student demographics. To run the regression analyses, we removed responses with missing data, which left us with 478 responses. For our qualitative analysis, we had a total of 533 students who provided open ended responses.

Students Report Communicating About COVID-19 but Also Report That They Do Not Feel Prepared to Communicate Accurately

Students reported communicating about COVID-19 (**Figure 1A**) but also reported that they do not feel prepared to communicate accurately (**Figure 1B**). Students varied in their communication levels and their felt preparedness to communicate, indicating differences between students, but many students were communicating substantially with others about COVID-19 mitigation and COVID-19 vaccines; 39–53% of students reported that they were communicating "Often" or "Almost every day." In contrast, a substantial number of students felt ill-prepared to communicate accurately; 24–64% of students reported feeling "not at all" or only "a little" prepared to communicate accurately about different aspects of COVID-19. Students were particularly likely to report feeling unprepared to communicate about the safety and effectiveness of the COVID-19 vaccines.

Students Report Potential Strategies Communicating About COVID-19 to Others

We found themes in how students reported they would communicate about COVID-19 with others (see **Table 2** for descriptions of themes and student quotes). The most

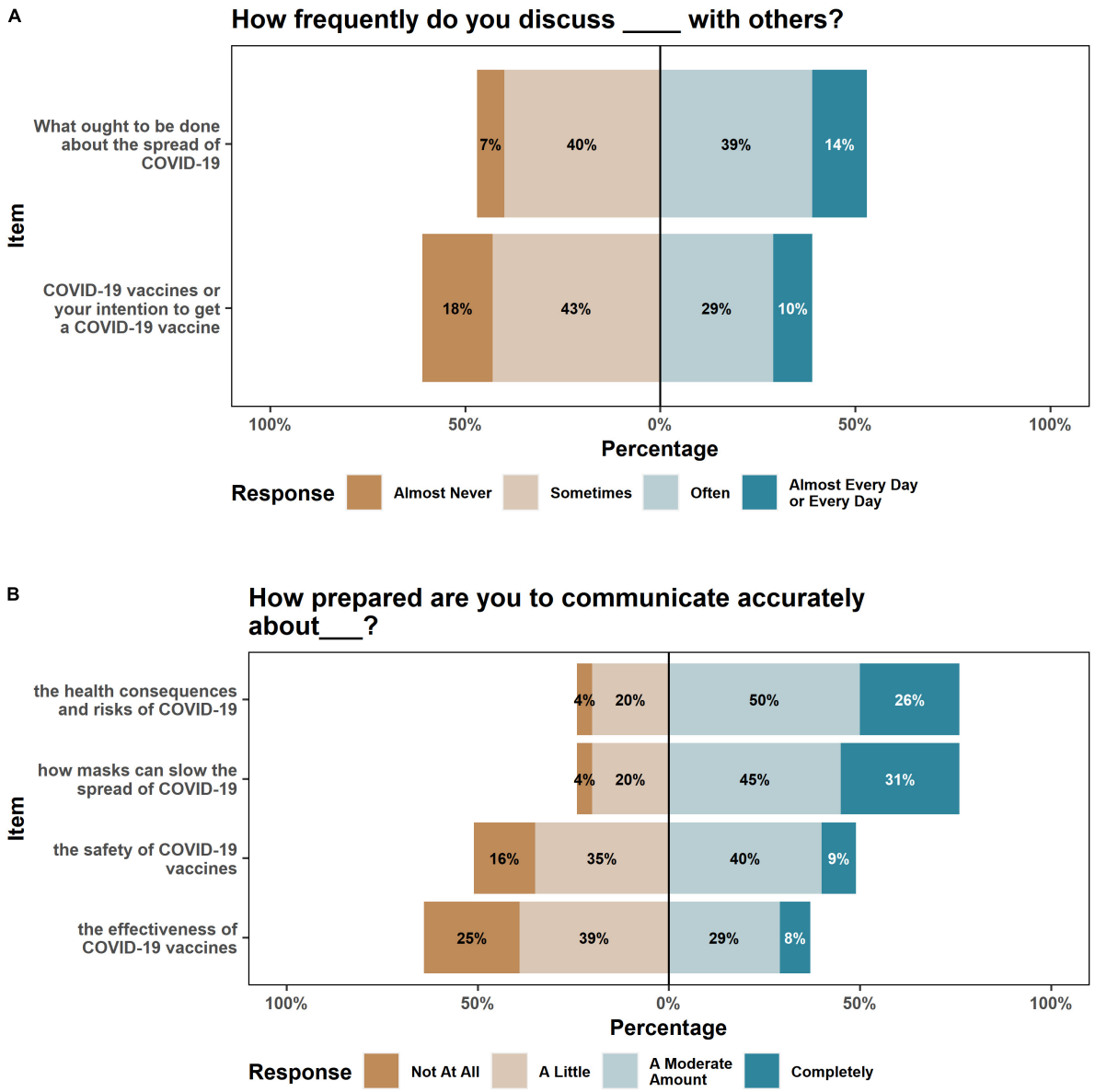

FIGURE 1 | Horizontal stacked bar graphs representing **(A)** how frequently students discuss COVID-19 with others and **(B)** how prepared students are to communicate about COVID-19 accurately. $n = 538$.

frequent strategies students were using was to impart relevant knowledge to the person about COVID-19 (68% of students) or to tell the person they needed to do something differently (64%). We also found that students may be using explicitly negative communication strategies, such as actively accusing the person with whom they are trying to communicate (22%), avoiding the person/conversation (9%), or becoming apathetic (31%). However, there were also instances of students using positive strategies such as being respectful in their communication (20%), sharing relevant personal stories (11%), listening to concerns and asking questions (16%), and emphasizing how our actions may affect others (61%).

There Are Differences in Communication About COVID-19 Based on Student Demographics

There were differences between groups of students as to the extent to which they had misconceptions about COVID-19 studies (**Table 3**). Religious and non-liberal students both were more likely than non-religious and liberal students to think it was true that studies show vaccines were rushed. They were also less likely to think it was true that studies show masks and vaccines are effective. Further, compared to students from other races, Black students were more likely to report the vaccines were rushed and less likely to think the vaccines are effective.

TABLE 2 | Themes in students' written responses when they were asked how they would communicate with a friend or family member who was not concerned about COVID-19, did not intend to wear a mask, or had hesitations or concerns about the COVID-19 vaccine.

Theme	Description of theme	%	Example student quote	Example student quote
Knowledge	Student presents information about COVID-19.	67.92	"Educate them about the benefits of the vaccine."	"The virus could potentially kill them."
Prescribe	Student tells the person they should do something different.	63.60	"I would tell them that they should be worried."	"They need to follow all social CDC protocols."
Social duty	Student tells the person they have a responsibility to protect others from COVID-19.	60.79	"[COVID mitigation] is not just about you."	"Have some respect for other people who might be high risk."
Apathetic	Student describes not being concerned about the view.	30.96	"I would mind my own business and focus on my own beliefs and health."	"Again, that is 100% their business and their decision."
Desire for normalcy	Student tells the person that they should participate in mitigation efforts to return to normalcy.	23.08	"The faster that the cases drop, the faster we could get back . . . to doing things as we did before."	"Receiving the COVID vaccine could help get us back to normal life sooner."
Accusatory	Student accuses person of doing something wrong.	22.14	"Are you stupid?"	"They're selfish and completely ignorant."
Respect	Student describes being respectful.	19.89	"That is your choice, and I respect it."	"I would respect their concerns."
Agreement	Student states that they share the same opinion as the person from the question.	13.70	"I would probably agree, I don't plan on getting [the vaccine]."	"I'm not going to convince them to take [the vaccine] because I don't want to take it."
Listening/Questions	Student describes listening or asking questions.	15.95	"I would ask them why they are not receiving the vaccine."	"I would ask for their reasoning and try to understand."
Personal stories	Student tells their own stories of having COVID-19 or getting a COVID-19 vaccine.	10.51	"I work at [a hospital], and I see young, healthy people die every day."	"We lost my husband's grandmother to COVID-19 in 2020."
Avoidance	Student describes avoiding/disengaging from the discussion/person.	8.80	"I would try to limit my time with them."	"I would not be talking to them anymore."

n = 533.

We found differences in student communication and preparedness based on student characteristics and identities (**Table 4**). Compared to liberal students, non-liberal students were less likely to communicate and feel prepared to communicate accurately across all variables we collected. Black students felt less prepared to communicate accurately about the efficacy of the vaccine compared to students from other races and ethnicities. Religious students, although they reported more misconceptions about COVID-19 across all knowledge variables, were just as likely to be communicating about COVID-19 and felt just as prepared to communicate across all variables except for the efficacy of masks.

TABLE 3 | Coefficients from models predicting students' knowledge about scientific studies regarding COVID-19.

	Race		Politics		Religion
	Black	**Asian**	**No answer**	**Non-liberal**	**Affiliated**
Knowledge					
Mask efficacy	0.18	**1.06***	**−1.26***	**−1.21***	**−0.72***
COVID/flu death rate	0.34	0.25	0.45	0.46	**0.64***
Vaccines rushed	**1.00***	−0.10	**0.92***	**1.00***	**0.80***
Vaccines effective	**−0.81***	0.27	**−1.21***	**−1.19***	**−0.60***

Each row is a predictor in those models. Each cell contains the coefficients for each of the predictor variables in the model. For race, the reference group is "other race", for politics "liberal", and for religion "unaffiliated". n = 478.
The ***p** < **0.05** is bold to indicate bold values are significant.*

DISCUSSION

Undergraduate students from this population reported communicating about COVID-19 and COVID-19 mitigation to others which highlights their potential as science communicators to the public, even before they have earned their bachelor's degree in science. These students in our classes have likely not yet become experts in biology, but they still may be seen as the "science person" in their friend and family groups. Thus, they may be trusted resources in their personal social networks, especially for first-generation college students, students in communities of color, communities that tend to have prominent distrust in science and scientists, or both (Hill, 2014; Balasuriya et al., 2021; Shah et al., 2022). These results indicate that if students are not receiving instruction on COVID-19 mitigation and how to communicate effectively, then we may be missing an opportunity to maximize effective science communication about COVID-19 mitigation.

In the United States, concerns about the safety and effectiveness of COVID-19 vaccines are some of the most cited reasons for why someone is hesitant to receive a COVID-19 vaccine (Dodd et al., 2021). Yet, our results indicate that most biology students in our sample felt particularly ill-prepared to discuss the safety and effectiveness of the COVID-19 vaccines. These results may indicate an opportunity for instructors to familiarize students with current research on the development of COVID-19 vaccines and their safety and effectiveness. Specifically, if instructors address the

TABLE 4 | Coefficients from models predicting students' COVID-19 communication frequency and their felt preparedness to communicate accurate information.

	Race		Politics		Religion
	Black	**Asian**	**No answer**	**Non-liberal**	**Affiliated**
Communication frequency					
COVID-19 mitigation	0.19	0.34	**−0.80***	**−1.07***	−0.24
COVID-19 vaccines	−0.46	−0.06	**−0.88***	**−1.07***	−0.24
Communication preparedness					
COVID-19 consequences	−0.47	0.05	**−0.80***	**−0.73***	0.06
Mask efficacy	−0.33	**0.61***	**−0.83***	**−0.75***	**−0.50***
Vaccine safety	−0.45	0.26	**−1.08***	**−0.80***	−0.11
Vaccine efficacy	**−0.63***	0.35	**−0.96***	**−0.83***	0.05

Each row represents a different outcome variable for a model. Each cell contains the coefficients for each of the predictor variables in the model. For race, the reference group is "other race", for politics "liberal", and for religion "unaffiliated". n = 478.
***p** < **0.05**.*

development, testing, and safety of the COVID-19 vaccines, this could present an opportunity for these students to increase their knowledge and felt-preparedness to communicate about COVID-19 vaccines accurately.

We also asked students to report their potential communication strategies to others who may have concerns about COVID-19 mitigation, and we found a mix of positive and negative strategies. The most frequently reported strategies, reported by the majority of students, was to give people more facts about COVID-19 and make prescriptions for how people should act or think differently. However, research shows that facts and prescriptions are not always the most effective communication strategy when discussing contentious topics (Kubin et al., 2021; Sauer et al., 2021). These students who gave these responses may hold a well-known misconception about science communication called the "deficit" or "scientific comprehension" approach, in which those within the scientific community believe they will change minds by presenting impartial facts to the public without addressing the emotions and values associated with the topic (Wynne, 2006; Kahan et al., 2012; Nadkarni et al., 2019). Only a minority of students mentioned strategies that are recommended by researchers to address emotions associated with the contentious topics, such as being respectful of the person, actively listening to their questions and concerns, and offering personal stories about their own relevant experiences with COVID-19 and the vaccines (Kubin et al., 2021; Lewandowsky et al., 2021). A majority of students did mention addressing shared values by emphasizing the social duty someone has in a community to protect others, which is potentially effective for communication (Dixon et al., 2017). Although, these responses often had a negative accusatory and hostile undertone which may only serve to exacerbate disagreement between those with diverging beliefs about contentious topics (Unsworth and Voas, 2021). Thus, instructors who would like to improve their students' communication may be able to succeed by emphasizing the importance of these positive communication strategies to their students and pointing out the potential impact of negative communication strategies.

Similar to research on the broader public's perceptions of COVID-19, we found differences in knowledge about COVID19 studies based on student identity. Non-liberal students (and those who declined to identify their political affiliation) had more misconceptions about the results of COVID-19 studies but also communicated less. Further, compared to non-religious students, religious students had more misconceptions about scientific studies but were just as likely to be communicating with others about COVID-19 vaccines and felt just as prepared to communicate for most variables. Finally, as is seen in the public, Black students were more likely to believe scientific studies show that the vaccines were rushed but were just as likely to be communicating to others. Because these students are potential conduits of scientific information to their communities, they may need more exposure to COVID-19 education and the importance of science communication in their communities to improve their role in COVID-19 mitigation.

There are steps instructors can take to mitigate these differences based on student identity. Instructors can use principles from science education, science communication, and social psychology. In science communication, one of the most often cited and endorsed principles by experts is to know the audience and construct your material to meet their needs while understanding the social and political context surrounding the issue being discussed (Bray et al., 2012; Mercer-Mapstone and Kuchel, 2017; Besley et al., 2018). Thus, instructors must first be aware of and then attend to these students' identities in the classroom. Recent research in science education and social psychology illustrates how exposing students to trusted social others who are experts that share the students' identity can improve student acceptance and trust in science (Barnes et al., 2017; Scheitle and Ecklund, 2017; Truong et al., 2018; Chu et al., 2021; Sauer et al., 2021). Instructors could discuss scientists like Francis Collins to their students, who was the director of The National Institutes of Health, a major proponent of the COVID-19 vaccines, and a self-identified Evangelical Christian who has worked to bridge scientific and Evangelical communities. A recent study found that messages from Dr. Collins endorsing the COVID-19 vaccines and highlighting his religious identity increased Christian participants' trust in medical experts and their intention to get vaccinated (Chu et al., 2021). Research also shows that those within Black and Latinx communities say that messengers they trust from their own communities are a key factor in helping them trust the COVID-19 vaccines (Balasuriya et al., 2021). For more information on ways to communicate about COVID-19 vaccines in an effective way, instructors can reference the COVID-19 communication handbook recently published by leaders in the fields of science education, misinformation, and science communication (Lewandowsky et al., 2021).

CONCLUSION

This paper represents a first step in recognizing the need to develop science communication training for undergraduate biology students about topics that are important in biology

but controversial in society, like COVID-19 mitigation. In this study, we document that in March and April of 2021, as the vaccines were first becoming widely available to the public, many students communicated about COVID-19 frequently with others, yet many did not feel prepared to communicate accurately. We found that during this critical time many students had basic misconceptions about the results of COVID-19 studies that they could be communicating to their communities. Finally, we revealed a need to account for students' social identities when teaching about COVID-19 and COVID-19 communication. Our research indicates that in order to prepare these students to be effective conduits of information, we may need to not only teach them how to communicate but also address common COVID-19 misconceptions in a way that is culturally competent for students across different religious, political, and racial/ethnic backgrounds.

DATA AVAILABILITY STATEMENT

The original contributions presented in this study are included in the article/**Supplementary Material**, further inquiries can be directed to the corresponding author.

ETHICS STATEMENT

The studies involving human participants were reviewed and approved by the Institutional Review Board at Middle Tennessee State University. The patients/participants provided their written informed consent to participate in this study.

AUTHOR CONTRIBUTIONS

BC helped with data analysis, creating visualizations, editing the manuscript, and addressing reviewers' comments. EW and TN helped with data collection, coding data, and writing the manuscript. MA helped with data collection, data analysis, coding data, and writing the manuscript. YJ helped with data analysis. CB helped with creating data visualizations. MB helped with developing the survey, collecting data, writing the manuscript, and is the principal investigator of the Social Perceptions of Science Lab. All authors contributed to the article and approved the submitted version.

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SUPPLEMENTARY MATERIAL

The Supplementary Material for this article can be found online at: https://www.frontiersin.org/articles/10.3389/feduc.2022.859945/full#supplementary-material

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