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## Student and Faculty Perceptions of the Impact of Masks on Student Learning and Communication in the Classroom

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***Student and Faculty Perceptions of the Impact of Masks  
on Student Learning and Communication in the Classroom\****

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**ABSTRACT**

As a result of the COVID-19 pandemic, face mask requirements while indoors were implemented in colleges and universities, both in the United States and beyond. Empirical evidence has shown that such mandates improved the health and safety of students, faculty, staff, and administrators; however, the impacts of such precautions on student learning and communication have to date gone largely unexplored. The current study surveyed students and faculty at one regional midwestern institution to assess their perceptions of the impact of masks on student learning and communication in the classroom. Findings are included, followed by a discussion of their implications.

**KEY WORDS** Higher Education; Pandemic; Masks; Student Learning; Communication

Beginning in early 2020, the world's primary focus was to manage the COVID-19 pandemic. At the time of this writing—July 2023—nearly seven million individuals worldwide have died because of the disease (World Health Organization 2023). Because of the severity of this coronavirus, various preventative measures, ranging from physical distancing to vaccine mandates to entire economic and societal lockdowns, have been

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utilized by multiple governments around the world. At the time of COVID-19's proliferation, these measures were viewed as necessary to slow the spread of the disease. Although these strategies did achieve this goal to an extent (Chu et al. 2020), there were also negative consequences such as economic hardship (Asahi et al. 2021; Baber and Rao 2021), a decline in mental health (Evans et al. 2021; Ganesan et al. 2021), and educational challenges. The current study focuses on the perceived impact of COVID-19 response and prevention strategies used in higher education. Specifically, the study examines perceptions of faculty and undergraduate students about the impact of face masks on student learning.

At the beginning of the COVID-19 crisis in the United States in March 2020, colleges and universities moved to online (rather than face-to-face) courses. Many institutions resumed face-to-face classes in the fall of 2020 but required all faculty, students, and staff to wear face masks while on campus or at least while indoors. This requirement, like other preventative and response measures, had both intended and unintended consequences. This requirement was shown to be effective at reducing the spread of the virus (Chu et al. 2020); however, masks have also been shown to reduce voice clarity (Caniato, Marzi, and Gasparella 2021; Choi 2021; Giovanelli et al. 2021; Magee et al. 2020), verbal communication (Giovanelli et al. 2021; Marler and Ditton 2021; Truong, Beck, and Weber 2021), lip reading (Atcherson et al. 2017; Ten Hulzen and Fabry 2020), and understanding of emotional expressivity (Carbon 2020; Grahlow, Rupp, and Derntl 2022; Kastendieck, Zillmer, and Hess 2022) while also increasing anxiety (Campagne 2021; Spitzer 2020). It seems reasonable to expect that face mask requirements may affect student learning directly or indirectly through these or other means. To our knowledge, the perceived impact of face masks in the classroom on student learning has not been studied empirically. This study is a first step in examining this issue. Specifically, this research examines the perceived impact on student learning of face mask requirements in the classroom.

## LITERATURE REVIEW

Although no research of which we are aware examines the impact of face masks on learning specifically, there is extant research that has examined the effects of face masks on a number of issues that may directly or indirectly affect learning.

### *Speech Intelligibility*

The clarity of a speaker's voice is paramount if students are to be expected to hear, understand, and retain lecture material. Background noise, speaker voice clarity, and reverberation time of the room itself have all been shown to have an impact in educational settings (Lubman and Sutherland 1999; Miśkiewicz et al. 2012). Prior to the pandemic, however, little research had been conducted on how voice changes (caused by wearing a mask) impact the relationship of voice on room acoustics. Recently, Caniato et al. (2021) compared face masks and face shields and found that both negatively affected the projection of a speaker's voice. Interestingly, the study found that the effect is more

pronounced on male speakers than on female speakers. This effect does vary depending on the reverberation of the classroom, as some rooms provide better acoustic settings for voice communication than do others. Similarly, Choi (2021) found that surgical, N95, and KF94 masks significantly dampen speech. Researchers also discovered that distractions (background noise) further distort the signal and decrease the ability for a listener to properly interpret the speaker.

This impact on voice clarity can lead to a decrease in the listener accurately understanding what the speaker is saying. The healthcare field was motivated to investigate the impact of masks on communication before the pandemic, as physician communication is a key predictor of patient treatment adherence and is critical while performing surgery (Zolnieriek and DiMatteo 2009). Wittum, Feth, and Hoglund (2013) conducted a study in which sentences were recorded under three conditions: with no mask, with a surgical mask, and with a mask and blood shield. Researchers then measured the level of accuracy with which participants could repeat the phrases. They found that participants were more accurate when the speaker had no mask and were least accurate when the speaker wore a blood shield and mask. Other studies found a similar decrease in intelligibility comparing different types of masks to wearing no mask (Bottalico et al. 2020; Hampton et al. 2020). Rahne and colleagues (2021) compared surgical masks to N95 masks and found that both types significantly reduced speech perception, with the N95 masks' reduction being more severe. An additional insight from this work focuses on the interaction between factors that affect speech perception. This reduction in voice clarity caused increased listening effort (the cognitive effort required to understand a speaker), which was compounded by the lack of visual cues—specifically the inability to read lips.

The listening effort (LE) that an individual employs is key for both the comprehension of the words spoken and how long a listener can maintain attention. Communicating while the listener expends as little energy as possible to comprehend spoken words gives the individual more resources to encode those words into their memory (Ernestus, Baayen, and Schreuder 2002). This can result in better understanding as well as increase the amount of time an individual can effectively listen. Truong, Beck, and Weber (2021) used a recall test to examine the relationship between masks and LE. They found that participants recalled significantly fewer words when the speaker wore a mask than in the no-mask condition. This reduction was attributed to the decrease in voice clarity as well as an increase in LE. Giovanelli and colleagues (2021) conducted a similar examination using masks but included concurrent talkers to increase the amount of background noise. These participants also reported a perceived increase in effort needed to understand what was being said by the speaker when the speaker was wearing a mask; however, the amount of effort increased more sharply because of the presence of background noise (see also Bottalico et al. 2020).

One way to counteract the increase in LE when background noise is present is to attend to visual cues—i.e., to lip-read. Kratzke and colleagues (2021) tested the effect of a doctor's mouth being visible versus being obstructed by both standard surgical masks and transparent masks. Surgeons randomly wore one of either type of mask while communicating with new patients. The researchers found that the doctor wearing a clear mask (showing a larger portion of the doctor's face) resulted in an increase of patients'

ranking of the surgeons' communication, empathy, and trust—all critical attributes of a surgeon, but more so for a lecturer in the classroom. Atcherson et al. (2017) also found similar results, but, interestingly, Corey, Jones, and Singer (2020) found that transparent masks attenuate voice more severely than do surgical or cloth masks. This finding suggests that transparent masks may be ideal within small groups and at close distance, as the chief benefit gained is the ability to see the speaker's mouth, whereas cloth masks may have more benefits if the speaker's lips are too far to see (such as in a lecture).

In addition to lip reading, signal-to-noise ratio (SNR)—measured as the dynamic level of the message (signal) in relation to distracting sounds (noise)—also plays a factor in the relationship between masks and speech intelligibility. Previous works found that more noise relative to the signal resulted in the listener expending more energy to hear what was being said (Choi 2021; Giovanelli et al. 2021; Rahne et al. 2021). This increase in LE is due to the brain needing to “block out” or filter the noise from the signal in order to interpret the message accurately. The measurement of background noise is critical, as there are myriad distractions in a classroom. The noise can originate from sources outside of the classroom (e.g., maintenance on campus or students conversing while walking down the hallway) or inside (e.g., coughing, electronic devices, or the occasional snore). With the addition of masks to the classroom, these distractions' impacts may be exaggerated. While the amount of noise in the classroom may not have changed after the reopening of campuses, the volume of the lecturer's voice was reduced, decreasing clarity while also decreasing the listener's ability to mitigate that noise by reading the lecturer's lips. These relationships could be further compounded if the speaker has an accent unfamiliar to the listener (Wittman, Weber, and McQueen 2014). Combined, these factors could result in a significant impact on student engagement and learning.

One suggested strategy to mitigate the issue with SNR levels is to increase the signal—or for lecturers to speak louder/be amplified. Research has shown promise for amplification, especially lapel microphones (Corey et al. 2020); however, not all classrooms are enabled with such technology, leaving the lecturer to speak more loudly. In the short term, this is a plausible solution, but as Ribeiro and colleagues (2020) note, “[t]here is a greater perception of symptoms of vocal fatigue and discomfort, effort, difficulties in speech intelligibility, and coordination of speech and breathing in individuals who use the face masks for professional and essential activities” (p. 6). The perceived fatigue mentioned could also affect students speaking up in class, changing the dynamic of the classroom and affecting engagement with the material.

### *Classroom Engagement*

The consequences of masks' impacts in the classroom are not limited to only communication. Classroom engagement may have been affected as well. One of the best practices to have students learn course material is to have them engage with it (Abou-Khalil et al. 2021). By engaging—or being emotionally, behaviorally, and cognitively involved in academic activities—students are better able to internalize the material, thereby increasing retention and recall (Balwant 2018). Engagement can occur via multiple strategies, but many of these strategies—e.g., small group projects, classroom discussions,

service in the community—were hampered by masks and COVID-19 mitigation policies more broadly as the reduction of communication and reduced ability to read emotions limited many students in making connections with faculty and their peers. This limitation could have resulted in an increase of anxiety or feelings of isolation for at-risk students.

Campagne (2021) conducted a systematic review and found support for a relationship between wearing/seeing others wear masks and increased feelings of pandemic-related stress. The author hypothesized that the two key causes for this relationship were (1) a lack of consensus regarding the type of mask and/or the efficacy of masks to reduce the virus's spread and (2) the wearing of the mask itself, which added to situational and communication stress. Relevant to the current work, wearing a mask has been found to increase feelings of loneliness and isolation that can potentially lead to an increase in depression or suicidal ideation (Killgore et al. 2020; Spitzer 2020). Combined with outside stressors—e.g., job insecurity, fear of contracting the virus, caring for a loved one—this interaction could cause substantial distractions to students and faculty in the classroom, affecting their engagement or causing them to stop attending class altogether.

While an individual's stress level is a key component of classroom engagement, so is the teacher's ability to "read the room." Faculty can, to an extent, gauge students' understanding of course material by reading nonverbal cues. This can be a useful tool when some students do not feel comfortable speaking in front of others. Faculty can read this cue and give further explanation without making the student uncomfortable. This skill is partially hampered by the wearing of masks, however. Reading of facial expressions is decreased when the lower half of the face is covered (Grahlow et al. 2022), and interpersonal closeness can decrease (Kastendieck et al. 2022), which potentially lowers the ability of faculty to fully connect with students.

Taken together, the mandate to wear face masks has likely had an impact on the educational experience of students and faculty. Although that impact may be severe or subtle, the body of research has yet to address the *perception* of the impact of masks on learning in a classroom setting. This research aims to remedy that shortcoming.

## **METHODS**

The current research examines the perceptions of faculty and students as they relate to the impact of face mask requirements on student learning. As noted above, research has shown that the wearing of face masks can affect communication, understanding, and classroom engagement. Little is known about how face mask requirements affect learning or perceptions of learning. The present study addresses this gap in our knowledge by examining faculty and student perceptions of the effects of mask wearing in the classroom on student learning.

This study, conducted at a nonresidential regional midwestern university, utilizes a mixed-methods triangulation design (Hassan 2022) employing the use of both quantitative (closed-ended questions) and qualitative (open-ended questions) methods in two online surveys to gauge the perceived impact of masks on communication and learning from both the students' and instructors' perspectives. The use of this method provides the opportunity to collect both types of data in the same survey instrument so the results may be used to

validate and deepen our understanding of the perceptions of the respondents. Along with gathering demographic data, the surveys (one for students and one for instructors) employ a five-point Likert scale in an attempt to quantitatively assess the perceived impact of masks in the classroom for both groups. Respondents were asked to indicate their level of agreement with a series of statements, with a 1 coinciding with *strongly disagree* and a 5 representing *strongly agree*. According to research by Likert et al. (1934), the Likert scale is both easier to use and more reliable than the Thurstone Attitude Scale, which had previously served as the professional standard in attitudinal research. In addition, subsequent research has further validated and confirmed the effectiveness of the method (Clark and Watson 1995; Jebb et al. 2021).

In addition to the quantitative Likert-style questions, each survey includes an open-ended question to allow for rich qualitative feedback from respondents. Responses to these questions were evaluated using the grounded theory method. This methodology enables researchers to identify emerging themes in respondents' answers to questions, and to examine the common themes to gain a deeper understanding of them and the perspectives behind them (Glaser 1998; Glaser and Strauss 1967). Following the grounded theory method, all the answers to each question were compiled into a set so the researchers could read and analyze all responses to each question separately. That is, the responses were divided by question rather than by case so researchers could focus on each individual question. As the responses were analyzed, the themes emerged. The content of the responses was coded into the categories (or themes) as they emerged (open coding). Once the categories (or themes) were developed, the responses were reanalyzed to ensure that themes were not missed and that responses were coded into the correct themes. Next, the responses to all the questions were combined into one group and analyzed further to identify any additional or broader themes and to discern how the responses in the earlier-identified categories related to one another (axial coding). The initial qualitative analysis was conducted by the author who had previous experience with using the grounded theory method. To validate the results, the remaining authors analyzed the responses using the same method described above.

The two surveys (which share substantively similar questions but were designed to be answered through the lens of each audience) were developed during the Fall 2021 semester and e-mailed to potential respondents near the end of the semester. Rather than sampling each group, the authors opted to send the student survey to all currently enrolled (as of December 7, 2021) undergraduate students taking at least one face-to-face/in-person class. Similarly, the faculty survey was released to all instructors teaching at least one face-to-face/in-person class. The reasons for these decisions were twofold: to maximize the total number of responses and to minimize the potential of sampling error. Given the lack of previous research examining the perceived impact of masks on communication and learning in postsecondary institutions, the authors felt it was important to be as inclusive and exhaustive as possible in their attempts to gather data from the populations of interest. Surveys were administered through Qualtrics via a link included in the recruitment e-mails. A total of 1,984 students and 189 faculty were sent recruitment e-mails, and 364 students and 77 faculty completed the surveys, yielding response rates of 18.3% and 40.7% respectively. At the time of data collection, everyone on campus was required by university

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policy to wear face masks while indoors, including in the classroom. Neither faculty nor students were identifiable at the individual level. Questions regarding major were aggregated to the school level.

*Student Survey*

The demographic variables in the student survey include class, race/ethnic background, gender, and major (if declared). Students were also asked when they began taking college courses (excluding any taken in high school), whether they had taken any face-to-face classes on a college campus prior to the 2020 spring semester, and what (if any) additional types of courses they had taken prior to the 2020 spring semester (online, hybrid, and/or hyflex). Online classes are those taught 100% online; hybrid classes involve both face-to-face and online instruction; and hyflex classes are those that students may attend in person or via Zoom. Each hyflex class thus included students who were physically present and those who were virtually present. Given that students were able to choose their mode of attendance for each class, the number of students physically present or virtually present in the class changed regularly. Students were also asked how many of their college instructors wore/wear a mask when lecturing and leading discussions in their face-to-face classes since the spring of 2020 (all, most, some, or none).

As noted previously, five-point Likert scales were used to assess students' perceptions of the impact of masks in the classroom. The five statements that students were asked to indicate their level of agreement with were (1) "When my instructor wears a mask in class, it makes it difficult for him/her to communicate clearly with the class"; (2) "When students wear masks in class, it makes their communication with the instructor difficult"; (3) "When students wear masks in class, it makes their communication with other students difficult"; (4) "Wearing masks has not affected communication in the classroom"; and (5) "Wearing masks in the classroom affected learning in a negative way." In addition, students were asked the open-ended question "How, if at all, do you believe wearing masks affected your learning in the college classroom?"

*Instructor Survey*

At the start of the survey, instructors were asked questions regarding their teaching experience, including how long they had been an instructor of record for courses in higher education, whether they had taught face-to-face classes on a college campus prior to the 2020 spring semester, and what (if any) other types of classes they had taught prior to the 2020 spring semester (online, hybrid, and/or hyflex). They were also asked how frequently they wore a mask when lecturing and leading discussions in face-to-face classes since the spring of 2020 (all of the time, most of the time, some of the time, or not at all). In addition, they were asked to choose between three options to best describe their teaching style in face-to-face classes: lecture-based, discussion-based, or hands-on (e.g., lab-based).

Instructors were asked to indicate their level of agreement with six Likert scale statements, including (1) "When I wear a mask in class, it makes it difficult for me to communicate clearly with the class"; (2) "When students wear masks in class, it makes



their communication with me difficult”; (3) “When students wear masks in class, it makes their communication with other students difficult”; (4) “Wearing masks has not affected communication in the classroom”; (5) “Wearing masks in the classroom has not affected learning”; and (6) “Wearing masks in the classroom affected learning in a negative way.” Finally, instructors were asked the open-ended question “How, if at all, do you believe wearing masks affected student learning in the college classroom?”

## RESULTS

Tables 1 and 2 provide information on the sample characteristics for students and faculty, respectively. More than half the students (55.8%) attended college before Spring 2020. Almost two-thirds (62.9%) attended face-to-face classes prior to Spring 2020. Relatively few students had taken classes with an alternate mode of instruction: online (15.3%), hybrid (5.3%), and hyflex (2%). The students were roughly equally divided by class year. Freshmen made up 23.6% of the sample, sophomores 22.5%, juniors 27.5%, and seniors 26.4%. Students from Nursing and Allied Health made up the largest percentage of respondents (28.8%), with students from Humanities and Social Sciences a close second (27.4%). Students from Business, Education, the Sciences, General Studies, and Undecideds made up the rest of the respondents (43.9%). The student respondents were mostly female (75.5%) and White (87.1%).

The majority of faculty respondents had taught for more than 6 years (68.9%). Of these, more than half had taught for 11 or more years. Fewer than 10% of the faculty had taught for less than two years (7.8%). Prior to Spring 2020, the great majority (93.5%) of faculty respondents had taught face-to-face. Almost half (48.7%) of the faculty had taught face-to-face courses before Spring 2020, while 29.6% had taught online courses. Less than one fifth (19.7%) had taught hybrid courses, and only 2% had taught hyflex courses prior to Spring 2020. More than one half (53.2%) stated that their teaching style was lecture-based; 33.8% indicated that their teaching style was discussion-based; and 13% indicated that their teaching style was hands-on (e.g., lab-based). Approximately 40% of the faculty taught in the School of Humanities and Social Sciences, and 25% taught in the School of Sciences. The other third (34.7%) of the faculty respondents taught in Business, Education, or Nursing and Allied Health.

Just over 75% of the faculty stated that they wore masks all the time they were in the classroom. Thirteen percent said they wore their masks most of the time. Sixty-nine percent of students stated that their instructors wore their face masks all the time in the classroom. Almost one fourth (22.5%) of students stated that their instructors wore masks most of the time.

Tables 3 and 4 show the results of the Likert questions regarding student and faculty perceptions of the impact of mask wearing on learning. More than two thirds of students (69.3%) and more than half of faculty (54.6%) agreed or strongly agreed that instructors wearing masks made it difficult for the instructor to communicate clearly with the class. The majority of students (72.3%) and faculty (58.5%) agreed or strongly agreed that students wearing masks made communication with the instructor difficult. Notably, almost three fourths of students (73%) and less than half of faculty agreed or strongly agreed that

when students wore masks, it was difficult for the students to communicate with other students. When asked to state the degree to which they agreed or disagreed with the statement “Wearing masks in the classroom has not affected learning,” most students (71.1%) and faculty (50.7%) strongly disagreed or disagreed with the statement, indicating that most believed wearing masks in the classroom affected learning in some way. When asked the degree to which they agreed or disagreed with the statement “Wearing masks affected learning in a negative way,” 53% of students and 45.5% of faculty agreed or strongly agreed with the statement.

**Table 1. Student Sample Characteristics**

<b>Variable</b>	<b>Frequency</b>	<b>Valid Percent</b>
Began college		
Before Spring 2020	203	55.8
Spring 2020 or after	161	44.2
Face-to-face classes prior to Spring 2020		
Yes	229	62.9
No	135	37.1
Types of classes prior to Spring 2020		
Face-to-face	116	77.3
Online	23	15.3
Hybrid	8	5.3
Hyflex	3	2.0
School		
Business	55	15.4
Education	40	11.2
Humanities and Social Sciences	98	27.4
Nursing and Allied Health	103	28.8
Sciences	53	14.8
General Studies	4	1.1
Undecided	5	1.4
Class Year		
Freshman	86	23.6
Sophomore	82	22.5
Junior	100	27.5
Senior	96	26.4
Gender		
Male	81	22.3
Female	275	75.5
Nonbinary	8	2.2
Race		
White	317	87.1
Of color	47	12.9

**Table 2. Faculty Sample Characteristics**

<b>Variable</b>	<b>Frequency</b>	<b>Valid Percent</b>
Time teaching		
Less than 1 year	2	2.6
1–2 years	4	5.2
3–5 years	18	23.4
6–10 years	20	26.0
11+ years	33	42.9
Face-to-face teaching prior to Spring 2020		
No	5	6.5
Yes	72	93.5
Types of classes prior to Spring 2020		
Face-to-face	74	48.7
Online	45	29.6
Hybrid	30	19.7
Hyflex	3	2.0
School		
Business	8	11.1
Education	8	11.1
Humanities and Social Sciences	29	40.3
Nursing and Allied Health	9	12.5
Sciences	18	25.0
Teaching style in face-to-face classes		
Lecture-based	41	53.2
Discussion-based	26	33.8
Hands-on (e.g., lab)	10	13.0
Wears mask when teaching		
No, doesn't wear a mask	3	3.0
Yes, some of the time	6	7.8
Yes, most of the time	10	13.0
Yes, all of the time	58	75.3

Qualitative analysis of the open-ended question, “How, if at all, do you believe masks affected your [student] learning in the college classroom?” reveal support for the quantitative results: *Students and faculty believe that wearing masks in the classroom impedes learning*. Analysis of the student responses to this question revealed four main themes as they related to the negative impact of masks on student learning. First, masks interfere with communication in the classroom. According to the respondents, this happens in a number of ways through an increased difficulty in both hearing and understanding both faculty and students and an inability to read lips and facial expressions to help interpret what is being said. The inability to hear causes students to “miss information” and to misinterpret what was being communicated. Communication may be made more difficult depending on how soft-spoken others are, whether others speak with strong accents, the

**Table 3. Student Perceptions of Masks and Learning**

<b>Variable</b>	<b>Frequency</b>	<b>Valid Percent</b>
Instructors wearing masks		
None	11	3.0
Some	19	5.2
Most	82	22.5
All	252	69.2
Instructor masks—difficult to communicate with class		
Strongly disagree	58	15.9
Disagree	29	8.0
Neither agree nor disagree	25	6.9
Agree	112	30.8
Strongly agree	140	38.5
Student masks—difficult to communicate with instructor		
Strongly disagree	59	16.2
Disagree	24	6.6
Neither agree nor disagree	18	4.9
Agree	104	28.6
Strongly agree	159	43.7
Student masks—difficult to communicate with students		
Strongly disagree	66	18.1
Disagree	23	6.3
Neither agree nor disagree	9	2.5
Agree	101	27.7
Strongly agree	165	45.3
Wearing masks has not affected communication in classroom		
Strongly disagree	173	47.5
Disagree	86	23.6
Neither agree nor disagree	26	7.1
Agree	24	6.6
Strongly agree	55	15.1
Wearing masks has affected learning negatively		
Strongly disagree	79	21.7
Disagree	32	8.8
Neither agree nor disagree	60	16.5
Agree	74	20.3
Strongly agree	119	32.7

**Table 4. Faculty Perceptions of Masks and Learning**

<b>Variable</b>	<b>Frequency</b>	<b>Valid Percent</b>
Instructor masks—difficult to communicate with class		
Strongly disagree	19	24.7
Disagree	12	15.6
Neither agree nor disagree	4	5.2
Agree	22	28.6
Strongly agree	20	26.0
Student masks—difficult to communicate with instructor		
Strongly disagree	16	20.8
Disagree	11	14.3
Neither agree nor disagree	5	6.5
Agree	26	33.8
Strongly agree	19	24.7
Student masks—difficult to communicate with students		
Strongly disagree	17	22.1
Disagree	17	22.1
Neither agree nor disagree	5	6.5
Agree	25	32.5
Strongly agree	13	16.9
Wearing masks has not affected communication in classroom		
Strongly disagree	26	33.8
Disagree	21	27.3
Neither agree nor disagree	3	3.9
Agree	16	20.8
Strongly agree	11	14.3
Wearing masks has not affected learning		
Strongly disagree	18	23.4
Disagree	21	27.3
Neither agree nor disagree	5	6.5
Agree	8	10.4
Strongly agree	25	32.5
Wearing masks has affected learning negatively		
Strongly disagree	24	31.2
Disagree	10	13.0
Neither agree nor disagree	8	10.4
Agree	23	29.9
Strongly agree	12	15.6

size of the room, the number of students in the room, the placement of others in the room, the volume of an instructor's voice, and other concerns.

Second, mask wearing distracts students and professors from, as one student put it, "the actual reason we are there." Students were particularly vocal about the inability to focus on the course simply because the masks are so uncomfortable. The masks are "hot," "itchy," and "annoying." They lead to panic attacks, migraines, and difficulty breathing. Faculty often stop class to adjust their masks or to enforce proper wearing of masks by students in the room. Students spend time trying to make their masks more comfortable or stay in place. Others struggle with the masks fogging up their glasses. Each of these and similar concerns made the students focus more on the masks than on what was happening in the classroom, including teaching and learning activities. Many students were particularly concerned about the inability to focus during exams because of the issues surrounding the discomfort of the masks.

Third, masks make it difficult to make connections with faculty and other students. They impede the ability of students to build relationships. Students weren't able to meet new people and get to know other students and their professors. As one student put it, "Everybody is a stranger, nobody talks to one another." The mask requirement keeps students from campus and makes it extremely uncomfortable for many to engage with others. Students maintained that they felt isolated or hidden as a result of the mask. Another student said, "I feel like it cut off the relationship I had with the other teachers and students." The college experience was less personal because of the masks, which in turn affected learning in different ways. Students felt that they experienced little to no real human contact and were foreign to those around them. One student stated, "Masks make us shy of others and don't let people interact comfortably." Another said, "[Masks] are a visible barrier [that] makes people less approachable."

Finally, masks result in disengagement from the learning process beyond an inability to focus. Students believed that both faculty and students were less engaged in the classroom because of the masks. Students may hide behind masks and use them as a reason to not participate in the discussion. As one student said, "[M]asks made students keep to themselves instead of answering questions and being more involved in classes." Masks made them feel less confident about speaking in class and made it more difficult to participate, to be involved in the class discussions, and to ask questions.

Qualitative analysis of the faculty responses to the question revealed similar themes. Faculty believed that face masks impede communication in the classroom namely because it is difficult to hear and understand each other. Faculty also discussed the reduction in visual cues. Hidden facial expressions hide emotion and make it difficult for faculty to determine if students are understanding course material. Face masks make it more difficult for students and faculty to understand each other and make class more difficult. Concerns regarding communication also varied for faculty, as they did with students, depending on the first language of the speaker and the degree to which a person is naturally soft-spoken.

Faculty also believed that students were less engaged in their learning. Students were less likely to participate in class, had less confidence, and asked fewer questions. According to the faculty, masks are a distraction for students because the masks are

uncomfortable and because faculty must focus on mask compliance. Generally, they feel that masks create negative attitudes in the classroom. Faculty also generally agree that masks interfere with personal connections that can enhance learning, stating that it is difficult to build relationships with students and that students are having difficulty engaging with their classmates and others on campus.

The major finding from the qualitative data analyses is that masks impede learning and do so in a number of specific ways as discussed above. It should be noted, however, that two much smaller themes also emerged from the student data.<sup>1</sup> First, a very small subset of students did not believe that masks impeded their learning or believed that masks didn't impede their learning "much." Several faculty also believed that masks did not negatively affect learning "much." The addition of "much" in some of the faculty and student statements that masks did not negatively affect learning actually offers support that masks impeded learning at least in some small way. Second, many students, despite their concerns about masks and regardless of whether they believed masks impede learning, believed that masks should be worn to protect themselves and others from the virus. Faculty responses indicate that faculty agreed with the statements of the students that, at the time of the survey, masks kept people safe and there was a valid reason for keeping the policy.

## DISCUSSION

The results of the current study demonstrate clearly that faculty and students alike believe that masks negatively affect learning. Almost two thirds of the students had attended face-to-face classes before the COVID crisis shut down in-person learning in 2020. Nearly all (93.5%) of faculty respondents had taught face-to-face classes prior to Spring 2020. Thus, the respondents in this study have experience with learning without (and before) face masks. The results show that both faculty and students believe that masks in the classroom interfere with learning through many of the mechanisms identified in the extant literature.

The results in the current study support the findings of past research. The research shows that masks impede our ability to hear, communicate, and understand speech through distortions of the speaker's voice and through other factors such as the acoustics in the classroom, the reduction of speech volume, decreases in clarity, the inability to read lips, and the inability to read facial expressions (e.g., Atcherson et al. 2017; Caniato et al. 2021; Choi 2021; Giovanelli et al. 2021; Grahlow et al. 2022; Lubman and Sutherland 1999; Truong et al. 2021). Faculty and students in the current study both indicated that these concerns and others such as accents and speaker/listener location in the room interfered with their ability to hear and understand others in the classroom, which, in turn, negatively affected learning. A second finding of the current study that supports earlier research involves student disengagement from the classroom. Past research suggests that student engagement is a key to learning course material (e.g., Abou-Khalil et al. 2021; Balwant 2018). Students and faculty reported here that students are less engaged in the classroom when masks are required. They further stated that less engagement leads to less learning. Extant research also supports the current findings that mask wearing increases personal distress and decreases personal connections with others. Student respondents noted that

wearing masks increased their anxiety and made it very difficult to make friends and to get to know others on campus.

The current study provides additional clues to how mask mandates interfere with learning. For example, masks provide distractions in the classroom beyond those that lead to decreased engagement and increased anxiety. Student and faculty respondents both noted that masks detract from the learning that should be occurring in the classroom. Acting as “mask police” to ensure students are wearing masks and wearing them properly; the discomfort that comes from wearing a mask; and physical reactions to the masks including difficulty breathing, migraines, and panic attacks all interfere with learning in the classroom. This study, then, appears to confirm earlier research that identifies the means by which wearing masks in the classroom could create obstacles to learning. The results presented here confirm, through faculty and student perceptions of learning, that mask wearing impedes the learning process in myriad ways. This research attempts to fill a gap in our understanding of how masks interfere with learning. To date, the research has focused on the mechanics of communication, including speech intelligibility, without examining the potential impact that masks might have on learning specifically. This research examined the perceptions of faculty and students about the impact of mask requirements on learning and found that faculty and students alike agree that masks interfere with student learning in the classroom.

While this research is a first step in understanding the impact of face masks on student learning, there are some limitations to the study. First, the study focuses on perceptions of student learning and, while this provides us some insight to and understanding of these issues, the study did not examine the actual impact of face mask requirements on student learning. Second, while face masks in the classroom do present challenges, they also present opportunities. Face masks in the classroom may lead to less favorable perceptions than face-to-face courses where masks are not present as found in the current study; however, they may also allow for in-person classes to be offered when the alternative would be online-only courses. While the current study examined the perceived impact of face mask requirements in the classroom on communication and student learning relative to face-to-face courses without such requirements in place, future research should examine faculty and students’ perceptions of masks in the classroom relative to online-only classes. Third, the study was conducted at one small regional university campus. The results found here may not be generalizable to other campuses or to K–12 institutions. Fourth, it is possible that the wording or placement of some questions may have led to biased results. For example, the statement instructing respondents to respond to the Likert-type scale questions included the phrase “Please indicate your level of agreement with the following statements” rather than “Please indicate your level of agreement or disagreement with the following statements.” The authors believe that the original wording refers to a continuum of *strongly disagree* to *strongly agree*, given that these are the options on the Likert-type scale; however, it is possible that the wording led some respondents to believe they should agree with the statements rather than disagree. Another related potential limitation is that the open-ended questions followed the Likert-style questions, most of which described a negative perception of the impact of masks on learning, which may have led respondents to answer the open-ended questions more



negatively than they might have otherwise. Additional research may investigate this potential limitation more thoroughly. Fifth, the response rates were smaller than desired, particularly among students. Although greater response rates would have been preferred, it is not uncommon for electronic surveys to yield smaller response rates than other modes of survey administration (Shine and Dulisse 2012). Finally, this research was exploratory in nature and did not examine factors that might predict perceptions of the impact of wearing masks on student learning. For example, it is possible that individual and social factors such as demographics, academic factors, and others might influence perceptions of student learning and the impact of masks on learning.

## CONCLUSION

The COVID-19 pandemic changed the face of humanity, both literally and figuratively. In addition to moratoriums on in-person gatherings, enhanced safety protocols, including mask mandates, were implemented once face-to-face activities resumed. While such mandates reduced transmission of the coronavirus, they also presented unique challenges, including but not limited to interpersonal communication (Chu et al. 2020; Giovanelli et al. 2021). Although these challenges were felt across all sectors of society, the current study aimed to assess the perceived impact among one subgroup: students and faculty within higher education. The findings suggest that face masks are perceived to inhibit effective communication, engagement, and interpersonal connections, which in turn adversely affects student learning; however, these findings should not be interpreted or cited as opposition to face mask requirements, as such requirements allowed in-person classes to resume when they likely would not have otherwise. Rather, the results should be seen in context, recognizing that while such requirements led to challenges, they also created opportunities while simultaneously providing protection for students and faculty alike.

## ENDNOTE

1. The current data analysis revealed two themes that did not emerge as strongly as those mentioned above but emerged nonetheless. Their emergence was less robust, and thus it was determined that they should not be eliminated from the results but should be distinguished from the major themes that emerged strongly from the analysis of the data. The presence of these “minor” themes indicates that future research should be done to explore these issues more thoroughly.

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