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Facial Masks and Student Engagement in Early Childhood and Exceptional Student Education Classrooms

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Abstract

During the advancement of COVID-19, many safety protocols, including facial masks, were incorporated into public settings. The Centers for Disease Control and Prevention (CDC) (2021), due to safety regulations, recommended wearing face masks when in close contact with other people in public environments, such as in a classroom, where social distancing was difficult. Many industries smoothly transitioned to daily use of traditional cloth masks, but other industries that served children sought masking alternatives. This study examined related research to explore whether wearing masks had any impact on student engagement, particularly in Early Childhood Education (ECE) and Education of Students with Exceptionalities (ESE) settings. The synthesis of research here suggested that masks influenced children's engagement, including intellectual, emotional, social, behavioral, and physical aspects, and recommended the use of transparent masks with young children and children with exceptionalities. The paper also provides recommendations for future research.

Keywords: early childhood education, COVID-19, exceptional students, face masks, student engagement

Introduction

Since Spring 2020, the influence of COVID-19 has been extensive for a variety of industries, but education was transformed in many ways. Education has been impacted far more than other industry due to the complex needs of its clientele: children (Asri et al., 2021). COVID-19 safety protocols were soon implemented that have modified people's lives and routines. For example, "stay-at-home mandates," remote work and instruction, and eventually in-person instruction with required face masks. Suddenly, children were not able to see facial expressions, including nonverbal contextual clues, such as the movement of lips and emotional expressions which are the core elements of the teaching/learning process. As Tremmel (2020) documented, young children, English as a Second Language (ESOL) students, academically at-risk children from low income areas, and children with developmental delays and exceptional needs were most affected by masks.

The Impact of COVID-19 on Education

COVID-19 impacted every element of education, from classes being instructed virtually to in-class instruction needing to be split with virtual modes which caused stress on teachers and students. Many of these elements were explored by Pressley (2021) with over 300 teachers to see the impact of COVID-19 on instruction based on all the new alternative methods of instruction created by school districts around the country. The results suggested that the highest instructional self-efficacy of the teachers regarding their own abilities in teaching was for in-person instruction, then hybrid instruction, and lastly fully online instruction. The study also illustrated some of the impacts that virtual instruction had on teachers' lack of confidence in implementing effective instruction. Many elements probably played a role in this, such as technical issues, high absences, and the difficulty of holding student engagement through the barrier of a screen in virtual instruction. Further, specific subjects were more difficult to teach with various COVID-19 restrictions (Tremmel et al., 2020). COVID-19 also greatly influenced teaching and learning in a variety of environments, including rural locations with limited resources and many places had to adapt to serve all their students effectively, including students with exceptionalities in Exceptional Student Education (ESE) programs. Tremmel et al. (2020) explored the impact that COVID-19 had on underprivileged ESE programs and compiled statistics and recommendations for advancing students to the next grade level.

Impact of COVID-19 on Individuals with Exceptionalities in Light of Face Masks

Lockdowns, increased use of virtual communication software, social distancing, and the use of face coverings kept people safe but also impacted their ability to connect, communicate, speak, and hear, especially for individuals with hearing impairments and other varied disabilities. Children with Specific Language Impairment (SLI) struggle with phonological perception that impacts literacy (McDowell, 2018). Students with SLI need access to the visual cue of their teacher's lips during the pronunciation of words (Ehri, 2020). The addition of visual language cues is a greater priority for those with SLI who need additional context clues to equate meaning

and understanding to a literacy lesson. This access to the additional visual language-based context clues can be blocked by the use of a traditional mask.

Children also need human engagement to develop effective language skills and to better learn and retain information. Adults may be inconvenienced by using masks in an educational or public setting, but children rely on the social and emotional components of language for the acquisition of proper language and literacy skills (Feldman, 2019). The social and emotional components of language are far more difficult to access for children with conditions related to social and emotional comprehension, such as children with Autism Spectrum Disorder (ASD). Children diagnosed with ASD may already have language and literacy acquisition challenges even without the additional barrier of face masks due to the impact on their perception of emotions (Matteson, 2014).

According to Atcherson et al. (2020), children and adults with hearing and language disabilities can experience visual barriers with traditional masks due to their dependence on nonverbal communication, such as facial cues. For educators, wearing a mask during instruction may potentially make it more difficult for children with exceptionalities to engage with lessons that include aspects of literacy. Relation to a high impact on engagement to literacy or literacy incorporated lessons could be linked to the added barriers of masks affecting the student's visual access to their teacher's mouth and lips articulating proper phonetic pronunciation of words (Ehri, 2020). Clearly, more research still needs to be done on the effects of masks on engagement in different environments with different communities. But a further understanding of what engagement is in practice is first needed before addressing the various types of masking.

Engagement

Many aspects of student engagement should be considered when developing an effective learning environment. Engagement is important to learning but may be difficult to gauge without understanding what categories are involved. For classroom environments, Great Schools Partnership (2016) defined engagement by focusing on separate constructs called Engagement Categories as indicated in Table 1.

Table 1

Engagement Categories

Engagement Categories:	Definition:	Examples:
Intellectual	Students' interest and desire to interact and problem solve within the coursework. Accuracy and dedication to pursuing accuracy during instruction.	Appropriately answering the questions in an effective way that shows their understanding of the material. Answering verbal questions, having questions of their own related to the topic, making time to focus on studying the material.

Emotional	Students react with positive emotions in a way that facilitates learning instead of distracting with negative behaviors.	Smiling, laughing when appropriate, providing positive verbal and non-verbal reactions to the topic.
Social	Social interaction and collaboration with other students and teachers related to the lesson.	Positive collaboration with instructors and peers using positive and productive conversations that facilitate instruction instead of distracting from it.
Behavioral	The use of consistent cues, routines, and reactions that foster behaviors more conducive to learning.	Students' willingness to participate in a classroom's set schedule, routine, rules, directions, expectations, and procedures, such as sitting in a designated location in a seat.
Physical	Participation in active physical movements, reactions, or routines to bring awareness to the lesson.	Eye contact with instructor or assignment, raising hand, dancing, playing, performing written assignments, manipulating related tools, objects, scissors, paper, calculators, etc.

Note. Table created was based on the Great Schools Partnership (2016).

Table 1 provides insights into these separate, positive constructs of the categories of engagement. However, engagement is not just simply positively represented or absent (not represented). Sometimes, engagement is negatively represented within an environment. In addition, diversity in engagement within a classroom could be linked to a set of environmental factors that can have a negative impact on a student's ability to engage behaviorally, emotionally, and socially (Hiver et al., 2021). With this new post-pandemic world in which we live, understanding that young students, especially students with exceptionalities, may harbor a great deal of life stressors which are brought into the classroom to demonstrate *negative engagement.* Examples of negative engagement within these Engagement Categories can be seen in Table 2.

Table 2

Examples of Negative Engagement

Engagements:	Negative Examples:
Physical	Infrequent, un-prolonged eye-contact Eye-contact and body positioned away from the instructor or lesson Not physically participating in lessons Not writing and following along

Emotional	Disruptive emotional outbursts (e.g., laughter, crying, whining, sighing loudly) Inappropriate facial reactions (e.g., frowns or pouting, making faces)
Social	Disruptive negative verbal reactions Talking out of turn Talking to other people besides the instructor when unprompted Talking off topic Asking questions unrelated to the lesson
Behavioral	Disruptive and distractible non-verbal behaviors Finger fidgeting, rocking, arm flapping, putting things in mouth, picking skin biting hands, etc. Not following routine and not using positive behaviors when expected, aka raising hand, etc.
Intellectual	Shown by lack of comprehension of the lesson Lack of dedication and focus on problem solving within the lesson Lack of accuracy and dedication to pursuing accuracy

Note. Answers will be looked at but engagement with questions will be the primary focus for testing Intellectual Engagement (Great Schools Partnership, 2016). Table created was based on the Great Schools Partnership (2016).

When looking at the Great Schools Partnership (2016) categories of engagement, it is important to understand the cues within the context of one's own classroom environment and the importance of conducting lessons that inspire a variety of engagement categories. However, not all engagement types hold equal representation within classroom lessons. Behavioral Engagement, Emotional Engagement and Social Engagement are more inclusive and present in Early Childhood Education (ECE) and Exceptional Student Education (ESE) classrooms than the other categories because of the learning characteristics of young children with special needs (Green et al., 2021).

Impact of Masks on Behavioral, Emotional, and Social Engagement in the Classroom

Some of the more salient categories of engagement for educators to consider are Behavioral Engagement, Emotional Engagement, and Social Engagement because children have a biological and neurological need to be exposed to an environment filled with effective behavioral, social, and emotional interactions (Great Schools Partnership, 2016). A young child's capacity to engage socially, emotionally, and behaviorally is heavily based on what they experience or observe when interacting with the adults around them in their learning environment. Within a socially supportive environment, children can start to form important social skills that will lead to competent engagement in future academics. Reading another's face is an important social skill for engaging with others because reading another's face helps the person to regulate their own social behavior (Green et al., 2021).

The reading of another's face and being aware of the other's emotions can help a child form an appropriate social response based on the other's emotional clues. From there, the child forms patterns of appropriate social skills performed as a task, some of which can be deemed specific behaviors (Gresham, 2000). Because of the needed social skills used in the forming of behaviors, such as reading emotions on another's face, Behavioral Engagement is an intersecting issue that correlates with Emotional Engagement and Social Engagement categories, all of which are learned through proper exposure to other people. To explain further, a child will only feel motivated to engage behaviorally in classroom routines, if they are also motivated to be socially and are emotionally engaged (Gresham, 2000).

A teacher can inspire students to be socially engaged with positive verbal interactions and motivate them to be emotionally engaged with positive facial expressions. These forms of motivation are why access to the instructor's face, mouth, and voice is so important when implementing engaging lessons. When looking for Emotional Engagement in a person, a teacher should start with looking for external identifiers and cues of emotions. Seeing as emotions are strictly internal factors, a teacher could look at any external visual or audible cues of a person's inner emotions and base any deductions off this (McCollow & Hoffman, 2019). These cues can be simply to identify if the student's face is not obscured by a mask. Identifying some of these cues includes looking at the person's audible emotional reactions unrelated to speech, such as sighing out loud; or a teacher can look at visual emotional reactions, such as facial expressions like frowning, and any emotional expressions unrelated to non-verbal communication, such as raising hands.

When looking to identify Social Engagement in students, teachers should look to primary language and communication-based interactions that show "positive" social interactions among student and teacher and student and classmates in relation to any academic lesson. When considering Social Engagement, a student's own interactions with a lesson can be directly influenced by any emotional disruptions or behavioral disruptions, too. All types of engagement are connected to each other, but also individually hold importance when being represented in a classroom setting. Facial masks can affect social interaction as facial masks can inhibit speech, audibility, and the visual cues of speech, such as perception of emotions and lipreading (Heikkilä, et al., 2017). These are directly related to Social Engagement and interaction, but also overlap with Physical Engagement due to the manual manipulation of one's face and voice. Behavioral Engagement relates to routine, Emotional Engagement relates to a person's internal emotions, and Social Engagement relates to interpersonal communication. All three engagement categories play large roles in the development of young children and their capacity to learn in a classroom environment. All these categories of engagement are impacted by the use of masks in the classroom and can directly impact young children's ability to engage with the content being taught to them.

Traditional face masks can directly impact a child's ability to learn in their environment and by extension affect the child's willingness and ability to engage in appropriate behaviors. Interacting with a teacher whose face is obscured has the potential for miscommunication and misunderstanding among students on what their behavioral expectations truly are. Masks can add a layer of misunderstanding to an environment that already has a plethora of distractions

impacting young students' engagement skills. Table 3 illustrates the various engagement skills as they relate to the Engagement Categories.

Table 3

Engagement Skills and Each Related Engagement Category

Engagement Skill Related to Masks:	Engagement Categories:
Comprehension	Behavioral, Emotional, Intellectual, Physical, Social
Lipreading	Intellectual, Physical
Perception of Emotions	Behavioral, Emotional, Social

Note. Table created was based on Heikkilä et al., (2017) and McCollow & Hoffman (2019).

When exploring these various categories of engagement in the ECE and ESE classroom, it is important to consider an added distraction which is environmental noise. Environmental noise can be a significant distraction due to its impact on auditory perception. Prior to the implementation of masks, students were able to fill in the gaps of their missing auditory information by observing their teacher's mouth and pronunciation. However, with the use of masks covering up those visual cues, students struggle even more in a disruptive classroom environment (Nobrega et al., 2020). These layers of distractions can cause a rise in stress for both the learner and the instructor and can inhibit a person's emotional wellbeing and motivation to engage. Schools also have additional regulations placed on the environment related to student and teacher goals and expectations, many of which correlate directly with Behavioral Engagement. During the pandemic, ECE and ESE teachers were expected to teach several content areas behind a mask, while giving instruction that is both educational and stimulating (McCollow & Hoffman, 2019). These regulations can cause stress among students and teachers during the enforcement of safety mask protocols and can interrupt a person's routine and extension of a student's ability to behaviorally engage and may even ignite Negative Behavioral Engagement (Great Schools Partnership, 2016).

In summary, children are still learning things like focus, self-control, self-motivation, comprehension, facial recognition, and social cues along with how, when, and in what ways they should react in different social settings (McCollow & Hoffman, 2019). These cues are not accessible to students when their instructors are wearing traditional cloth masks. Masks cover the instructor's mouth, so that a student cannot perceive specific facial cues and features of the mouth related to the instructor's expression of emotion that leads to engagement.

Impact of Masks on Engagement Skills in Lipreading and Literacy

To learn literacy and language, a child needs to focus on more than just sound but also how to properly pronounce these sounds with their own oral motor movements (Alcock, 2006). Oral motor movement is the functional movement of the different parts of the mouth, such as the tongue, jaw, cheeks, and lips, all of which play a large role in speech and other processes (Pedroza et al., 2015). Lipreading is the ability to pick up visual information from a speaker's mouth; lipreading is useful because watching a speaker's facial movements improves perception of speech. Lipreading could be a large contributing factor in obtaining necessary oral motor skills related to pronouncing certain words or understanding spoken language; these factors are concealed by traditional masks (Heikkilä et al., 2017).

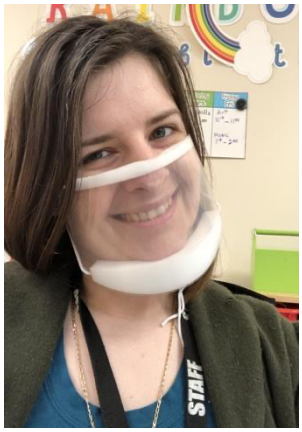
Lipreading is an important component for children developing language and other skills in relation to academic progress. Instructors wearing facial masks during and after the impact of COVID-19 and connections to lipreading could play an even bigger role than imagined, when it comes to student engagement and overall comprehension of any lesson, especially language and literacy. Students relying on reading lips is one additional route to obtaining information and comprehension. With masks, this visual information is not accessible to students. When instructing subjects such as literacy, teachers must consider how masks obscure lipreading and impede students' observation of the correlated oral-motor movements with their respective phonemes. Once effective pronunciation and students' discrimination of a sound is established, instructors can move on to connecting them to corresponding decoding and spelling skills (Ehri, 2020). Face masks may likely inhibit moving to these next steps.

Face Mask Alternatives

As an alternative, transparent face coverings include a variety of facial coverings such as shields and masks. Clear/transparent masks or cloths masks with a clear plastic panel were approved by the U.S. Food & Drug Administration (FDA) and considered to be helpful when interacting with people in special situations (CDC, 2022). They function in much the same way, but are instead made of transparent materials, such as plastic. Because of the concerns with engagement, transparent face masks and shields were introduced into the educational realm as indicated in Figure 1.

Figure 1

Three Types of Transparent Face Wear

		
(a.) Plastic face shield and cloth mask.	*(b.) Windowed mask.*	*(c.) ClearMask*

Note. Images taken by Lead Researcher.

As the figure indicates, these types of face coverings can be worn on the entire face or just around the mouth. Face shields can be worn at a distance, but during pandemic, the CDC recommended wearing a shield with a cloth mask for environments where people are closer than six feet apart. Other transparent masks are more similar to paper or cloth face masks, such as windowed masks, with fabric covering most of the nose, cheeks, and chin with a small transparent plastic portion in the middle revealing the mouth. Another transparent mask type includes fully transparent face masks that only cover the nose, mouth, and chin area, much like the traditional masks, but are made of different transparent plastics and materials.

Despite some transparent face masks becoming available to consumers, transparent face masks were and remain in limited supply, with only a few on the market (Atcherson et al., 2020). Some of these transparent or clear masks, however, may need to be paired with a personal Remote Microphone (RM) system to offset the impediment of sound that comes with clear plastics. Preliminary evidence suggested that RM systems helped alleviate some concerns regarding sound qualities when used with face coverings (Rudge et al., 2020). RM are wireless systems created to amplify sound and help listeners better hear and understand speech in different environments. Some RMs are used with hearing aids or ear buds, while others are used with speakers called “sound field systems.”

Conclusion and Implications

This piece explored how COVID-19 safety protocols impacted student engagement as identified by Great Schools Partnership (2016) by examining the various categories of engagement and how masks influence children’s engagement. As indicated above, traditional masks hindered children’s ability to observe and read teachers’ faces and lips, identify various social cues which influenced their intellectual, social, and emotional development. When the visual cues of communication are eliminated, intelligibility of speech can decrease to as low as 20% (Bankaitis, 2022). According to Hiver et al. (2021), the impact masks have on language and literacy

acquisition skills, such as the perception of emotions, lipreading, and comprehension is significant.

Since the use of transparent masks have shown to work during speech therapy sessions (Bankaitis, 2022), it is hoped that using transparent masks in ECE classrooms and/or with ESE students could also show similar benefits. Transparent masks, such as a face shield or windowed face masks paired with RM, implemented by an ESE instructor could break down any communication-related barriers related to the wearing of traditional cloth face masks. These barriers relate to the covering of the mouth affecting non vocal communication skills, like lipreading and interpreting emotions, and in extension comprehension. The other barrier caused by face masks includes impediment of vocal speech output. With the use of transparent face shields or windowed face masks paired with RMs these communication barriers are lessened, which gives way to students feeling more confident and competent when trying to engage with their classroom lessons (Rudge, et al., 2020).

Certainly, the young students who would benefit the most from the implementation of transparent face masks are those who either are still learning literacy, communication, and engagement skills, such as young children, or individuals who already struggle with literacy, communication, and engagement, such as children with learning disabilities or who are on the autism spectrum, along with other exceptionalities related to language skills (Feldman, 2019).

Recommendations for Future Research

Continuing to explore future research on the topics of masks and engagement would be highly beneficial, especially in relation to ESE and ECE programs, but also across disciplines, developmental and age levels, and diverse populations. When developing future research related to traditional and transparent masks' impact on student engagement, one might consider researching and measuring the engagement of children with specific language disorders. Furthermore, future researchers must consider the breadth of all safety measures and health risk factors of the population being studied. The field needs more research targeting transparent mask alternatives safely by having certified ECE and ESE instructors conduct language and literacy lessons while following CDC recommendations. Lessons could be conducted with four different conditions including instructors wearing two different types of masks with and without being paired with RM. Conditions are shown in Table 4.

Table 4

Possible Future Research Conditions Related to Face Mask and RM Pairing in a Classroom.

Conditions:	Instructor wears:	RM Pairing:
Condition 1: (mean norm) Cloth with no RM	Traditional cloth face mask	NO

Condition 2: Cloth with RM	Traditional cloth face mask	YES
Condition 3: Windowed with RM	Windowed face mask	YES
Condition 4: Windowed with no RM	Windowed face mask	NO

Note. Table was created based on Rudge et al. (2020).

To track engagement and engagement categories, future research might also consider the teacher or researcher recording the salient conditions and documenting behavior using a checklist of observable criteria exemplifying engagement based on Engagement Categories (Great Schools Partnership, 2016) as indicated in Figure 2.

Figure 2

Sample Engagement Category Checklist

Instructor: *Date:*		*Reading level:*
Group:	*ID#:* *Age:* *Init:* *Sex:*	*Exceptionality(s):*
	Examples:	
Engagements:	*Negative*	*Positive*
Physical		
Emotional		

Social		
Behavioral		
Intellectual		

Note. This framework was created based on the Engagement Categories (Great Schools Partnership (2016).

In addition, a study could take record of positive and negative examples of any engagement cues shown in observation, including language and literacy acquisition skills like perception of emotions, lipreading, and comprehension (see the example shown in Table 3). This suggestion for research would provide more solid, conclusive data on the effects masks have on ESE student engagement (Great Schools Partnership, 2016). Last, it becomes increasingly clear that the impact of masks on student engagement necessitates further investigation in future research and delve deeper into the broader factors influencing engagement in the classroom setting. Teachers' experiences, as highlighted by Li (2022) shed light on how COVID-19 safety measures such as mask-wearing and physical distancing have considerably affected their teaching methods, communication efficacy, and relationships with students. The discomfort from wearing traditional masks and the constant need for monitoring students' compliance with public health protocols were notable challenges that teachers faced, especially with younger students. These factors potentially act as a barrier to creating an engaging educational environment and may inadvertently impact students' overall learning experience. Furthermore, understanding the nuances of non-verbal cues, such as lip reading and emotion perception, can be significantly hampered by mask-wearing. These factors are particularly crucial in the context of students still developing literacy, communication, and engagement skills, or those who have learning disabilities or other language-related challenges. Future research must extend its scope to consider these aspects and the experiences of both students and educators. Only through a comprehensive understanding of these dynamics can we devise more effective strategies to enhance classroom engagement while upholding necessary health protocols. The exploration of

the impacts that masks and other COVID-19 safety protocols have on classroom engagement should continue to be a priority in educational research, with a focus on the benefit of all members of the educational environment.

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