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You Don't Need to Speak to be Heard: The Effects of Using American Sign Language with Hearing Lower Elementary Montessori Children

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The Effects of Using Sign Language with Elementary Children

“You Don’t Need to Speak to be Heard: The Effects of Using American Sign Language
with Hearing Lower Elementary Montessori Children”

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in fulfillment of final requirements for the MAED degree

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Abstract

Our research introduced the use of ASL signs with hearing elementary children and examined if this intervention affected the noise level produced in the classroom. The project was performed in two Montessori lower elementary classrooms (1st-3rd grade); one at a Maine private Montessori school, with 28 hearing children, and one at a Wisconsin public Montessori school, with 34 hearing children. In Wisconsin the researcher was a teacher in the classroom, in Maine the researcher was not. Data was measured using four tools: a decibel measuring app, observation form, tally sheet, and a structured discussion. In both classrooms, the change in noise level was minimal, decreasing by 2% overall. Qualitative results, however, indicate the project was worthwhile. The children responded positively to instructions given using ASL and their enthusiasm of learning signs justified the intervention. The intervention granted the children opportunities to discuss exceptionalities. We recognized the importance in such conversations and encouraged this dialogue.

Keywords: Montessori, American Sign Language, noise level

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In a harmonious and high-functioning Montessori elementary classroom, a buzzing or humming sound coincides with the children's chosen learning activities. The children have the freedom to work together, and they do so naturally, gravitating towards each other in small groups. They are also free to communicate with one another. Spoken language is an integral facet of the curriculum, as the children gain and refine their communication skills. In *Creative Development in the Child*, Dr. Montessori describes, "Little noises that the children make when they walk or run can be heard. It is like the buzzing of bees hovering around their beehive" (1998, p. 83).

Through lively discussions, debates, and conversations amongst the children, the Montessori elementary classroom can become legitimately loud at times. Groups of working children unwittingly compete with the noise reverberating from other groups in the environment. Little by little, the children's voices get louder in order for them to hear themselves and be heard by others (Klatte, Hellbruck, Seidel, & Leistner, 2010). During the work period, high noise levels can impede concentration and productivity.

With the freedom to speak comes two essential limitations: one is not to disturb others; the other is the responsibility for the children to use their time productively. The teacher (commonly referred to as the guide) must decide when the "buzz" is productive for the children's development, and when it is not. When the noise level in the classroom becomes too loud, it is the guide's duty to reign in the children's focus on their work. Doing so is imperative because conduciveness to concentration is a cornerstone of the Montessori prepared environment.

When a learning environment is unproductively noisy, it has adverse effects on child development (Dockrell & Shield, 2004). Noise takes a significant toll on a child's cognitive processing, memory retention, reading comprehension, and overall academic performance, as

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well as motivation to learn (Dockrell & Shield, 2004). Not to mention, children with learning exceptionalities or communication impairments could be disadvantaged differentially in comparison to normally-developing hearing children (Dockrell & Shield, 2004, p. 513; Klatte et al., 2010). Children who have heightened sensory needs may become overstimulated by excessive sound.

Loud volume levels are distracting and annoying to both children and educators (Dockrell & Shield, 2004). In louder classrooms, teachers are tempted to raise their voices, required to repeat directions, and must interrupt instructions to combat the noise on a more frequent basis (Klatte et al., 2010). Still, it is the children who are more vulnerable to the detrimental effects of noise. They become easily distracted by indiscriminate sounds and background noise and are therefore less likely to be able to focus on a task (Klatte et al., 2010).

There are several strategies for controlling the volume in the Montessori classroom. For example, grace and courtesy lessons and voice modulation activities can help individual children control their voice levels. Presentations that directly inform children about how to regulate voice levels address the root of the problem. When teachers find themselves in the spur of the moment, they may rely on more Band-aid style approaches. Examples of a Band-aid style approach may include simply assigning new seats to children who are considered too loud when working together, requesting a child to work alone, or removing a louder child from the classroom environment altogether. The term “Band-aid” approach is an appropriate term in this case because this refers to a temporary solution, or a quick-fix, that does not necessarily address the root cause of the problem. For whole-class management, the guide will often ring a bell to call the children's attention to the noise. An announcement, which accompanies the ring, is made to request quiet voices. However, the long-term effectiveness of these techniques is debatable, and

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the strategies themselves can be disruptive. Ringing the bell breaks the concentration of all the children, regardless of whether some of the children's volume was at an acceptable level. It also contradictorily involves the use of noise (the bell) to ask for a reduction in noise.

In addition to numerous general benefits, teaching elementary children several simple and relevant ASL (American Sign Language) signs has the potential to reduce noise in the classroom in a positive manner. In one study investigating the feasibility of teaching signs in early childhood, researchers found that sign language is a "valuable tool" for behavior regulation because educators can redirect behaviors without vocalization (Brereton, 2010, p. 94). Sign language can have a calming effect on the environment, as children come to see that one does not "want or need to raise [their] voice to be heard" (Dennis & Azpiri, 2005, p. 13).

We conducted our study in two separate Montessori lower elementary environments. The lower elementary Montessori classroom typically consists of children ages six to nine, commonly known as first through third grade. One lower elementary Montessori classroom was composed of 34 hearing children, ages six to nine, in a Wisconsin public Montessori school. The other setting consisted of 28 hearing children, ages six to nine, in a lower elementary classroom belonging to a private Montessori school in Maine.

The two environments of the elementary children (six to nine years of age) were observed experiencing difficulty maintaining an appropriate noise level, one which allowed for concentration and productivity, during the morning three-hour work period. Factors contributing to this occurrence included the knowledge that children of this age exhibit the characteristic of working in small groups. The freedom to communicate is vital to their ability to work together successfully and is a crucial feature of the Montessori environment. Therefore, our action research question, is as follows: Will the introduction and the use of simple American Sign

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Language signs with hearing children in the Montessori lower elementary environment impact the noise level produced in the classroom while remaining respectful of the children's need to work in small groups and communicate freely?

Theoretical Framework

The four planes of development and second plane characteristics

According to Constructivist theories, learning occurs through the building of the human personality and by adapting to the environment, rather than simply absorbing knowledge. Dr. Montessori's philosophy of education is inherently Constructivist; education is viewed as an aid to life, and self-construction is the task of the child. Dr. Montessori argued that intellectual growth was not linear; she viewed it more as *Planes of Development*. What she witnessed through observation is that in each plane of development, children share certain characteristics of growth which define that plane.

Each plane of development has its own set of characteristics, and if the conditions are right, the children will grow to their fullest potential in accordance with the laws of nature. The correct conditions, according to Dr. Montessori, include an appropriately prepared environment which includes a nurturing adult. If the conditions are not favorable, the desire for development is still there. However, the desire may turn into deviations within the children, which impedes healthy human development.

Montessorians view child development as occurring in four distinct stages, also known as the *Four Planes of Development*. Each Plane of Development lasts approximately six years. It is the successful completion of the previous plane that allows the children to flourish in the next plane. The characteristics of the children change in each plane even if the experience of the previous plane was not optimal. (Montessori, 1973).

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The Four Planes of Development are as follows: 0-6 years of age, 6-12 years of age, 12-18 years of age, and 18-24 years of age. The Four Planes may also vary slightly from individual to individual. The Montessori classroom naturally groups students by the six-year age groups, according to their Planes of Development. Each plane has a partnering parallel plane. For example, the First and Third Planes both exhibit turbulent and rapid physical growth. Because the body is so focused of physical growth, there is less room for intellectual growth. The Second and Fourth Planes of Development display stability, strong intellect, and long periods of good health.

An illustrative example to examine in considering the Four Planes of Development can be found in the way humans acquire language. A child who learns a language during the First Plane of Development will likely be able to speak that language fluently, with the accent and ability of a “native speaker”. However, if an English-speaking child of the Third Plane of Development, of the middle school or high school age, attempts to learn and study the Spanish language, they may be able to acquire some Spanish language skills, but it is extremely unlikely they will ever adopt the perfect accent.

Our study will focus on children of the elementary age, who fall under the *Second Plane of Development*. The Second Plane children use reasoning and the power of imagination to self-construct. The children desire to take greater risks, climb higher, and carry heavy things. A great intellectual growth occurs, as we witness repetition and collaboration among peers. Big work requiring maximum effort takes place at this stage. The reasoning mind seeks to discover the “how” and “why” of things, as the children search for the reasons behind the facts. Second-plane children are able to display empathy for humans they have never met. The children of this plane are very concerned with fairness and justice, for they are exploring morality, sorting right from

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wrong. The children will want to work in small groups and develop secret codes. (Montessori, 2004).

Affinity for secret codes, group work, and the need to communicate

As children seek independence, they begin to take interest in secret codes and languages that adults are not a part of. A common observation in the Montessori elementary classroom is the children's experimentation with building their own languages and codes. It is a part of their drive to distance themselves from adults, and a way they start to build their own society.

The children's affinity for secret codes relates to learning ASL signs. In the case of this action research, the adults will be privy to the signs being used. While ASL is not a secret language, it is likely to connect with the children's second plane desire to communicate in new and different ways.

The children of the second plane of development are naturally drawn to working in groups. Through group work, they learn they must work with others within the group to accomplish goals, through collaboration and cooperation. These small groups are formed by the children themselves, rather than adult imposition, based on the innate personalities in the class. They often admire the people in their chosen work group, as loyalty and admiration are characteristics they share at this stage of development. When we allow the children to form their own groups, they will consistently want to work towards the betterment of the community by helping one another. Educators can take advantage of what Montessori refers to as the *herd mentality* of second plane children by fostering small group work and small group lessons. The children of the second plane begin to feel a responsibility to the values of the group, an essential developmental step as this will later lead them to believe in the values of the greater society.

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In the Montessori elementary environment, the children have the opportunity to discuss and debate. They are encouraged to work through their ideas together, thinking and speaking critically. They discuss amongst themselves, using reason to support their arguments, and learn to become persuasive in their speech. The children of the Montessori classroom also find that they are responsible for the words that they use to communicate.

As the children have the freedom to choose their own work peers, we notice that some small groups inevitably become louder than others. The danger in this is that the work and excitement of a louder group of children can stifle the ability of other groups to concentrate. The introduction and use of simple ASL signs has the potential to allow groups of children in the Montessori elementary classroom to continue to function without the need for the adult to dismantle louder, more boisterous groups altogether, or assign work groups themselves. A simple, agreed upon ASL sign from the adult can signal to the children when the noise has reached a perceived disruptive or unproductive volume. The children can then respond accordingly. The guide and the children have a mutual understanding of the sign used, a shared and agreed upon meaning. The guide then eliminates the need to contribute to the rising noise level with constant verbal reminders. The non-verbal cue from the adult also lessens the likelihood of other children in the classroom averting their attention from their work in order to witness disciplinary actions.

Definitions

For purposes of clarification throughout this paper, some important terms must be defined, including: communication and nonverbal communication, sign languages, ASL, and noise.

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Dr. Montessori considers communication to be one of the eight human tendencies.

Montessori studied the nature of human beings, and discovered what she called universal human tendencies, natural inclinations that make us behave a certain way. She deemed these tendencies to be inherent in every human being, to act in a certain way toward certain behavior. Hereditary, unchanging, and interrelated, these human tendencies are with us from birth and throughout our life, allow us to meet our fundamental needs, and allow us to survive. Tendencies have been present in humans since the beginning of time and still operate today. They are the driving force behind our work as human beings. As adults we can assist the human tendencies, or block them in our children. The eight human tendencies are as follows: the tendency to order, to orient, to work, to repeat, to perfect, to explore, to abstract, and to communicate.

Communication and language, however, are not one and the same. In addition to verbal communication or language, humans communicate non-verbally, with facial and body expressions (Stoll Lillard, 2017). Nonverbal communication involves sending messages through wordless visual cues and/or gestures. Sign languages are a form of nonverbal communication. Sign languages are not spoken but instead rely on hand and body movements and facial expressions to convey thoughts, ideas, and feelings (Dennis & Azpiri, 2005). There are many sign languages all over the world. ASL, or American Sign Language, is the sign language created by and for deaf people in the United States (Dennis & Azpiri, 2005). ASL expresses visual concepts through the shape and motion of the hand with facial expressions (Dennis & Azpiri, 2005).

When “noise” is referred to in the discussion of this study, it means the overall level of sound or volume produced by the children while they work in the classroom. This type of noise, then, is either vocal, as in the children talking to each other, or environmental, such as the sounds

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children make by moving through space. These noises are intentional and unintentional. In this paper, noise is not referring to other environmental or architectural sounds, like airplane or traffic noise pollution, loud HVAC systems, or poor structural acoustics affecting the classroom.

Noise can be measured in decibels (dB). The decibel is a logarithmic unit, meaning the doubling of sound energy results in the increase in noise level (Dockrell & Shield, 2006, p. 511).

Literature Review

Connection to Montessori

Dr. Montessori considered language to be an achievement of the human being, and related language to the human tendency to explore. Early humans needed to explore for food, and upon finding a source of nutrients, had to relate their discovery to others. Therefore, there had to be some form of communication. Montessori also recognized there are different ways we can communicate without using speech. A gesture can be made, or a look can be given, yet this conveys only a part of the message. We come to interpret that look or that gesture with some form of language. The gesture (or look) then represents an agreed upon meaning, established by people using language. It can be determined that language had to develop very early on in the history of human beings. Language is an expression of the human spirit.

Children are the makers of language. Dr. Montessori suspected long ago what linguists and neuroscientists have since confirmed: that young children have a predisposition, or as she called it a “sensitive period” for acquiring language (Montessori, 1966, p. 37). A child’s brain absorbs the native languages surrounding them like sponges, but only for so long. Language acquisition diminishes dramatically after early childhood, the first six years of human life. “It is as if the language organ, having done its work energetically in early childhood, is now spent”

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(Fox, 2007, p. 126). That is why language-richness is crucial in the Montessori prepared environment.

Our approach to language enrichment at the Montessori elementary level is very different than our approach in the primary classroom of children ages three to six years old. Our methods as Montessori guides contrast the practice of our primary counterparts because our children are now of a distinctly different developmental stage. Children after the age of six years old no longer have what Dr. Montessori called “the absorbent mind,” referring to the mind’s ability from the ages of zero to six years old to absorb information and sensations (including language) from the surrounding environment effortlessly. Dr. Montessori believed that after this formative stage, the elementary children transition to possess a reasoning mind. Elementary children seek reasons and are not interested in the facts alone anymore. They wish to discover the “why” and the “how” of the world around them. Children of this age must also rely on their will to learn, as opposed to the absorbent mind which once worked in their favor almost as a sponge.

Implementing the use of simple ASL signs in the elementary environment has the possibility to serve as yet another avenue to spark our older children’s interest in language and language studies. Our elementary children are building their intellect through language. Therefore, it becomes crucial that we, as Montessori guides, support their continued development of language skills despite their passing of the sensitive period for language acquisition.

Dr. Montessori also believed we should offer our children freedom, and one of the most important freedoms we offer is the freedom to speak. Children come to use language as a tool for self-expression. Dr. Montessori had a vision to create a nurturing environment in which children could interact and build relationships with one another. Her vision was one of a buzz of activity, because the children would be interested in their work and want to share their discoveries with

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others. Therefore, conversation is essential in the Montessori environment, as it helps the children develop and build community. Through this freedom, the children learn to respect one another, care for each other, consider differences among one another, and consider each other's work. They are further practicing spoken language when they express these differences of opinion. In turn, they can use spoken language to resolve problems and come to an agreement. At the elementary level, the children continue to develop vocabulary and self-esteem through use of spoken language. In addition, they are working to strengthen their ability to reason, to think logically, and to develop a rational argument.

For these reasons, spoken language and the ability to practice the free use of spoken language holds an important place in our Montessori educational environments. Yet, with spoken language comes great responsibility, as it is fairly easy to misspeak or to be misunderstood. The children practice respect when they carefully choose their words so as not to hurt someone's feelings. They also practice respect when they consider their tone of voice, and the volume of that voice.

In relation to our study of the effects of ASL use with elementary children on the overall classroom noise level of a Montessori elementary environment, the above overview of the role of spoken language in the Montessori classroom as essential to the work of the children is important to distinguish. As outlined, spoken language and the freedom the children have to debate and discuss is a strong feature and focal point of Montessori education. Therefore, the goal of our study is not to diminish the freedom of the children's speech, nor discourage the children from engagement in lively discussion. The intervention suggested is intended to support the children in their need to communicate with both adults and peers, yet provide an avenue through which the children can do so while respecting the shared work space with others.

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The Relevance of the Hand

Along with noting the significance language plays in the normal development of the children, in *The Secret of Childhood* Dr. Montessori also highlights the importance of the hand, and the connection between the two. “The two bodily movements most intimately connected with man’s intelligence are those of the tongue, which he uses for speaking, and those of his hands, which he employs for work” (Montessori, 1966, p. 80).

Dr. Montessori wrote in abundance about the vital role the work of the hand has played in the development of human civilization. Several of our Montessori elementary presentations highlight this notion that humans are able to create an idea, to imagine with the intellect, and then make that idea a reality through the work of the hand. This is illustrated in the exploration of early humans, forming tools by carving stone. In addition, this concept is conveyed in our discussions with the children regarding the development of written language, for which the hand and its connection to the intellect and language is crucial. Dr. Montessori finds the hand to be so significant, that she considers it to be one of human being’s three gifts which set us apart from other members of the animal kingdom (the other two gifts being the mind to think and imagine, and the heart with which to love).

“The human hand, so delicate and so complicated, not only allows the mind to reveal itself but it enables the whole being to enter into special relationships with its environment . . . his hands under the guidance of his intellect transform this environment and thus enable him to fulfill his mission in the world” (Montessori, 1966, p. 81).

Dr. Montessori also recognized how speech is connected to gestures made by the hands and body in order to further communicate the intentions of the mind. She considered this to be

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distinctive trait unique to human beings. “Men have instinctively recognized the importance of these two external manifestations of the intellect, that is, of speech and human gestures, and have implicitly recognized them as being specific characteristics of the human race” (Montessori, 1966, p. 81). The very invention of ASL as a language created by and for the deaf and hard of hearing community illustrates this marriage between the intellect, the hands, and the fundamental need to communicate. Signs rely strongly on gesture and conventions of expression. The use of signing to facilitate communication is essentially “language in movement” (Daniels, 1994, p. 296).

Dr. Montessori felt that the hand was not only essential to the advancement of human civilization, but also pivotal in the role it plays in the development of the child. “Men subconsciously regard the hand as a manifestation of the inner ego. If this is so, what can be more sacred than the development within the child of this essentially ‘human activity’” (Montessori, 1966, p. 82). Children learn to mimic the movements of the adults within their immediate environment. As children progress in their language acquisition, language in movement is the true social language of the developing mind. When the use of sign is introduced by the adult in addition to spoken language and learned by the children during the first plane of development, the children come to employ more gesture and mime in their communications with others (Daniels, 1996, p.296).

Daniels argues that for children, applying the use of the hand to aid verbal communication via ASL is not only quite natural for them, but also as they sign the children become truly active participants in language learning. The children experience added pleasure in communicating and appear more enthusiastic about participating in communication activities (Daniels, 1996, p. 295-297). Dr. Montessori argues that children’s movements and their use of

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the hand are intentional, based in the foundation of the intellect. Therefore, it is logical to theorize introducing simple ASL use with elementary children will appeal to their reasoning minds, for “A child’s constructive movements have a psychic origin and are of an intellectual nature. Knowledge always precedes movement” (Montessori, 1966, p.83). More research on Montessori education and sign language may reveal the strength of these relevant connections.

The Impact of Teaching Sign Language

Taught in a classroom, sign language benefits not only deaf children, but also hearing children in the early childhood classroom of the three to six year old age range. (Dennis & Azpiri, 2005). Much research has proven the many potential benefits of teaching sign language to hearing infants, toddlers, and preschoolers (Brereton, 2010; Larson & Chang, 2007; Daniels, 1994). The vast majority of these studies have taken place in the children’s home settings, and at traditional early childhood learning centers/programs and conventional schools.

Young children can use signs to communicate their needs effectively, before they are able to produce speech (Brereton, 2010). The benefits of using sign language extend past young childhood (Brereton, 2010). However, there is very little research on teaching elementary students American sign language. Conclusions can be drawn from the positive effects of teaching signs to infants, toddlers, and preschoolers that elementary children could also benefit from this practice. The potential positive effects of teaching and using sign language in the classroom are widespread. Sign language provides academic and social/emotional support for all children, boosts inclusivity and community in the classroom, and offers an additional avenue for classroom management.

Children who are introduced to sign language benefit academically. “Sign language support[s] children’s learning” (Brereton, 2010, p. 95). Signs help children pay attention, focus,

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and concentrate (Daniels, 1994). It can enhance literacy and language development; however, further research on the effects of sign language on hearing children's language development is needed (Daniels, 1994). Signing appeals to active, kinesthetic, and movement-based learning styles, and it is a visual and sensorial mode of transmitting information (Daniels, 1994).

Engaging different learning styles facilitates learning for all children. As children sign, they "become active participants in learning" (Daniels, 1994, p. 296). Finally, children tend to find sign language interesting to learn as a subject in and of itself. Children who sign articulate more pleasure and enthusiasm in communicating (Daniels, 1994). Marilyn Daniels, a leader in the field of implementing the use of American sign language with hearing, hard of hearing, and deaf children, states, "It is very likely that improving these communication skills will carry over into other aspects of these children's educational endeavors" (1994, p. 297).

Teaching sign language is more than just academically valuable. It fosters empathy, and is inherently inclusive and culturally sensitive. A barrier to one child's ability to learn and participate is an issue for the entire classroom community, because all members miss out on the opportunity to experience that child's contributions (Brereton, 2010). The use of sign language has been promoted as a method for inclusion of children with disabilities in the classroom (Brereton, 2010). According to the Hearing Loss Association, the number one disability in the United States is hardness of hearing or deafness, with three out of every thousand school children having hearing loss (Lieberman, Columna, Martinez de la Vega Mansilla, & Taylor, 2010). Montessori educators strive to create welcoming classroom environments, and sign language inflates an atmosphere of inclusion (Lieberman et al., 2010). Sign language is a common language for all in the community to use. It is a chance for everyone to learn together. This sentiment is echoed in current research, that "all children (hearing and deaf) can benefit from the use of sign

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language, with no risk to academic, social, or emotional development, or spoken language skills” (Freeman King, 2017, p. 52).

Sign language involves the nonverbal expression of feelings and emotions. It can be presented as a component of a conflict-resolution toolbox. Signs for emotions expand a child’s emotional vocabulary and offer an alternative to the demand of vocalization of feelings. In one study, a preschooler undergoing an emotional situation relied on sign language to communicate that she was upset, because the words could not surface orally (Brereton, 2010). Manual communication appeared to lessen the child’s anxiety and aided her interactions with her classmates (Brereton, 2010). Teaching children signs for feelings provides an alternative outlet for emotional expression (Dennis & Azpiri, 2005). Signing is physical, but peacefully so (Dennis & Azpiri, 2005). Conflict resolution and emotional self-regulation via sign language will in turn reduce behavior issues in the classroom.

Teaching sign language to children certainly benefits the educator as well, and it is “feasible” to implement, taking as little as five minutes per day when meaningfully integrated into the curriculum (Brereton, 2010, p. 97). Implementation of sign language “can be used to influence the noise level of [the] classroom” (Dennis & Azpiri, 2005, p. 37). It can also assist communication between the teacher and the children, curb undesired and unwanted behaviors, and develop class community (Dennis & Azpiri, 2005).

Why Teach ASL (American Sign Language)

Educators with little or no experience using American Sign Language who want to incorporate signs into their curriculum but feel intimidated by the task of learning ASL may be inclined to use nonverbal communication such as gesture or miming, or invent their own signs. Some teachers present SEE, or Signed Exact English, which was developed by people who can

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hear. SEE uses signed gestures for words, but retains the syntax, or word order and sentence structure, of English (Dennis & Azpiri, 2005). For example, in Brereton's study, the educators attempted to use ASL sentence structure, but upon feeling "minimally successful" they replaced their use of ASL with SEE (2010, p. 93).

SimCom, or Simultaneous Communication, is another example of a version of a signed language that has been used in education. SimCom involves dual encoding or use of speech and sign at the same time (Hamilton, 2011). Research has indicated that while SimCom might aid in memory retention for hearing and deaf people better than sign-only or speech-only presentations, its use warrants further investigation and improvements are necessary (Hamilton, 2011).

Dennis and Azpiri, educators and researchers on teaching ASL, advocate for teaching authentic, correct ASL rather than any other forms of signed language (2005). As the language created by and for deaf people in the United States, ASL is the "preferred form of communication" for the Deaf culture (Dennis & Azpiri, 2005, p. 1). By teaching and using true ASL with hearing students, we "show respect" to the Deaf community (Dennis & Azpiri, 2005, p. 15). Dennis and Azpiri stress the need to not "make up" signs, to use ASL dictionaries instead of Signed English references, and to teach lessons that illustrate the differences between ASL (a visual language) and English (a spoken language).

As previously mentioned, it is "feasible" to implement sign language in the classroom curriculum (Brereton, 2010, p. 97). However, if we are going to do so, we want to present to the children with the most authentic and respectful form of sign language we can. Montessori educators always strive to provide the most appropriate experience based on the child's development and characteristics. Start simple; especially in the beginning stages of ASL implementation, simple signs are introduced to build the children's vocabularies. According to

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Dennis and Azpiri, “Young children are very motivated to learn ASL, and engaging them in signing activities is not difficult” (2005, p. 14). The educator introducing ASL is not expected to become fluent in ASL or an expert in the language or Deaf culture; rather, the educator can simply implement a sign language program that is intentional and courteous (Dennis & Azpiri, 2005).

American Sign Language Potential to Reduce Classroom Noise

The research and sources cited above demonstrate the benefits of introducing signed communication, particularly ASL, to both hearing and non-hearing children alike. It is clear that use of American Sign Language with children has many benefits, including academic benefits and social and emotional benefits. It also is beneficial to classroom management. We believe the implementation of simple American Sign Language in the elementary environment has the potential to reduce the overall level of noise in the classroom, resulting in an atmosphere that is productive and conducive to concentration, while still allowing children the freedom to communicate.

There is a need for further research of the effects and impact of ASL use with elementary age children in a school environment. This action research project hopes to contribute to this body of knowledge via a process that is consistent, relevant, meaningful, and in adherence to Montessori theory and philosophy.

Methodology

The Action Research Process

Our action research project was performed at two Montessori schools, both in lower elementary classrooms. One school where the research was conducted was a private Montessori school located in Maine, with 29 hearing children (ages six to nine, or 1st-3rd grade) in the class.

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The other setting was a public charter Montessori school located in Wisconsin, with 34 hearing children (ages six to nine, or 1st-3rd grade) in the class.

Each classroom had one full-time lead guide and one full-time teaching assistant. In the Maine classroom, the researcher (who performed the intervention and the data collection) was not the lead guide. However, she was formerly employed by the school and was familiar with the children and the school community. The Maine setting also employed an additional part-time teaching assistant who was present during the three-hour morning work period, during the time data was collected. In the Wisconsin classroom, the lead guide was also the researcher performing the intervention and data collection.

Intervention

The intervention for our project was to teach several simple and intentional ASL signs to the children on a consistent basis, as an integrated method of communicating directions or instructions, applicable in all areas of the classroom environment. Both researchers referred to a list of ASL signs to teach. Three to four new signs were introduced each week for four weeks, in a large group lesson. The signs on the list included: *yes, no, help, clean, work, sit, stand, stop, I'm sorry, wait, please, thank you / you're welcome, peace, take care, important, calm down, focus, slow, friends, and quiet.*

The three-period Montessori lesson methodology was used to introduce the selected ASL signs. Three-period lessons are commonly used in the Montessori environment to introduce a new concept to the child which leads them on a path towards mastery and understanding. The first period involves naming the new concept, or isolating the desired nomenclature (for example, the guide will tell the child, "This is . . ."). The second period focuses on recognition and association. This extends the action of the first period (for example, the guide will instruct

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the child, “Show me . . .”). The third period is the period of the lesson that requires the child to recall the name or nomenclature on their own (for example, the guide will ask the child, “What is this?”). Montessori guides proceed with the third period only when they are fairly certain the child will be successful in their ability to recall the name and concept.

In our study, the first period used to introduce the signs involved saying the word aloud, signing it manually in ASL, and then repeating. The children were encouraged to practice right away (the second period). Then the guide would offer the next sign. Once all the new signs were introduced, the guide checked for comprehension by quizzing the children informally about the meaning of the manual sign or asking the children to sign the words (the third period). After the first lesson, the following lessons involved the same steps but also included a brief review of the previously learned signs first.

Data Collection and Procedures

In our action research project, data was measured with a variety of tools. The tools included a smartphone decibel measuring app (Appendix A), an observation form (Appendix B), a tally sheet (Appendix C), and a structured discussion with the children (Appendix D). The integration of all of these different tools, described in more detail below, simplifies analysis and enhances credibility.

The smartphone decibel measuring app allowed us to record the noise level (volume) in the classroom during the three-hour morning work period. The app is called *Sound Analyzer* and is free to install on Android mobile devices. We used the app twice per week for five weeks, including one week of baseline data. A recording session consisted of four separate recordings, each recording lasted approximately five minutes, with thirty-minute intervals in between recordings. The total duration recorded was twenty minutes per day, or forty minutes per week,

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for a grand total of 200 minutes for the entire project. Therefore, the five-minute recordings, were taken four times during the course of the morning work period, on two separate days of the week, for the duration of five weeks total (one week of baseline data collection and four weeks of intervention).

On paper, we recorded the duration (start and end times) and the maximum, minimum, and average noise levels in decibels for each interval (see Appendix A). Using this data, we were able to notice fluctuations in the overall noise level of the classroom during the morning work periods which we chose to observe for the purpose of our action research (two morning work periods per week, over the course of a five-week period).

We based our work on the perceived issue of increased noise level in the elementary classroom. We recognized this work needed to be investigated based on our observations of the children's inability to achieve the deep concentration and productivity desired during work periods when the noise level was too high. An observation form, or a graphing measure for noise as perceived by the guide, was used to reflect on the impact of volume on concentration and productivity. The form is titled "Short Observation of ASL Use and Perceived Classroom Noise Level" (see Appendix B). This tool involved qualitative approach, supplementing the decibel app's quantitative measurements. The guide wrote down any signs observed in use, as well as a rating (1 to 10) of the perceived noise level. We compared the guide's subjective views of noise level with the objective numbers to determine if there was a discrepancy between it seeming or feeling too loud in the classroom and the decibel range that is acceptable.

A simple tally sheet enabled the recording of ASL signs in use during the work period, in use by the children and/or the guide herself, as observed by the guide (see Appendix C). In other

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words, it measured the frequency of the guide's use of ASL signs to affect noise levels and the children's frequency of ASL use.

The structured discussions lent insight into the children's perceptions of noise in the classroom, as well as their experience and interest in using ASL signs. A form titled "Conversational Questions for Small Group Discussions" outlined the questions posed to the children and provided space to record their responses (see Appendix D). This tool shed more light on the benefits of using signs between the children and the guide. The conversation took place at the outset of the research, or within the first week.

Baseline Data Collection

For this study, baseline data was collected one week prior to the implementation or teaching of ASL signs and regular data collection. Collecting baseline data involved measuring and documenting noise level using the decibel measuring app over two morning work periods. The procedures for recording baseline data with the decibel app were exactly the same as for regular data collection. When compared to the regular data collection period, the baseline data indicated whether a change in noise level occurred after the children had been introduced to ASL signs.

Analysis of Data

Key Evaluation Questions

We began with an "Overview of Analysis" to describe how we gathered results and performed interpretations. In the following subsection, "Impact on Noise Level," we addressed whether teaching ASL signs to hearing children reduced the overall noise level in the Montessori classroom during the morning work period. Next, we considered how frequently the lower elementary children used ASL signs in the "Observed Frequency of Target Behavior" subsection. In the final subsections, we analyzed two important viewpoints, the "Researcher's

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Perception of Noise Level in the Classroom” and the “Children’s Perspectives on Learning
ASL.”

Overview of Analysis

Our data analysis involved the interpretation of the quantitative and qualitative data we collected over four weeks, in comparison to the baseline data we collected during the one week prior to implementing our intervention, the use of ASL signs. To address our key evaluation questions, we calculated the minimum, the maximum, the mean, and the median noise levels in decibels for each classroom. We examined the frequency of the target behavior (usage of ASL signs by the children and the guide) observed. We also categorized the children’s responses during the facilitated group discussions, as well as the researchers’ written observations and reflections.

The new signs introduced in the Maine Montessori School included: *hello, yes, no, stop, friends, help, focus, sorry, why, wait, clean, choose, listen, peace, walk, and stand*. The Maine children previously knew the ASL signs for *thank you, work, and sit*. The new signs introduced in the Wisconsin Montessori School included: *yes, no, clean, work, stop, I’m sorry, wait, please, you’re welcome, peace, calm down, focus, and quiet*. The children already knew the sign for *thank you*.

Impact on Noise Level

The baseline data differed between the two schools. The Maine Montessori classroom had an initial volume that was approximately 21% lower than the initial volume in the Wisconsin Montessori classroom, as seen in Table 1 below.

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Table 1: Baseline Decibel Data*Baseline Data of Noise Level in Decibels (dB)*

	Minimum	Maximum	Mean
Maine	29.9	82.6	56.39
Wisconsin	40	85	71.25
Combined	34.95	83.8	63.82

Figure 1, as displayed below, illustrates the weekly change in measured minimum dB levels of both the Maine and Wisconsin environments, where Week 1 was the baseline data and the subsequent Weeks 2-5 signify the weeks of intervention. In the Maine classroom, minimum dB levels raised slightly (34.3 dB) in the second week of intervention, while in Wisconsin minimum dB levels were the highest (42 dB) during the third week of intervention. In Maine, minimum dB levels were at the lowest (29.9 dB) during the baseline week of the study, while in Wisconsin minimum dB levels were at the lowest (39 dB) during the first week of the intervention. Overall, it can be determined that both Maine and Wisconsin classrooms experienced little change in minimum dB levels over the course of the intervention.

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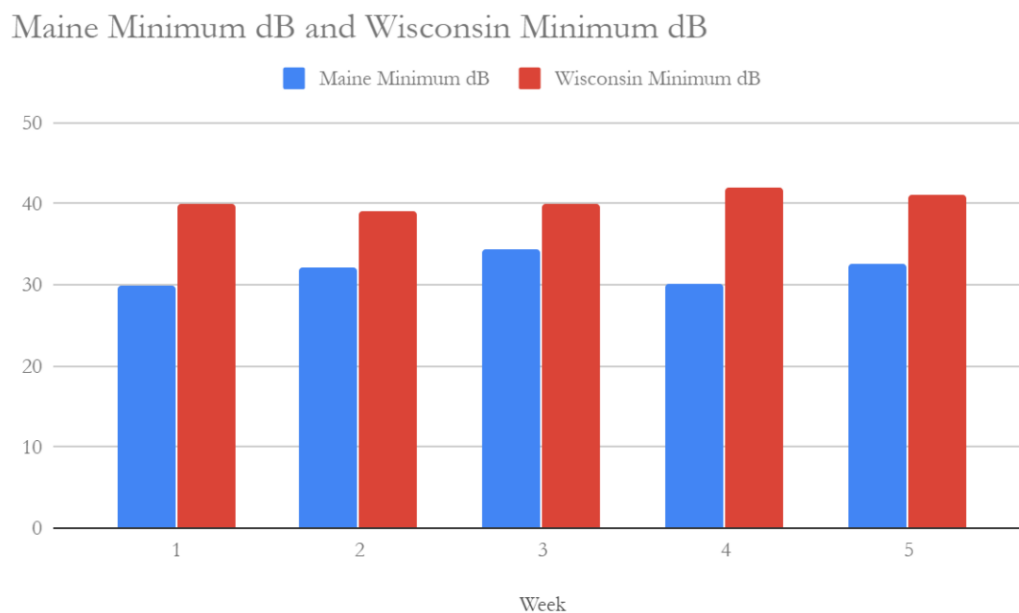


Figure 1: Change in Weekly Minimum dB Levels

Figure 2, as displayed below, illustrates the weekly change in measured maximum dB levels of both the Maine and Wisconsin environments, where Week 1 was the baseline data and the subsequent Weeks 2-5 signify the weeks of intervention. In the Maine classroom, maximum dB levels measured at the highest in the third week of intervention at 83.3 dB, while in Wisconsin maximum dB levels were at the highest during the baseline data collection week at 85 dB. In Maine, maximum dB levels were at the lowest during the first week of the intervention at 81.1 dB, while in Wisconsin maximum dB levels were at the lowest during the final fourth week of the intervention, at 80 dB. Overall, it can be determined that both Maine and Wisconsin classrooms experienced little change in maximum dB levels over the course of the intervention.

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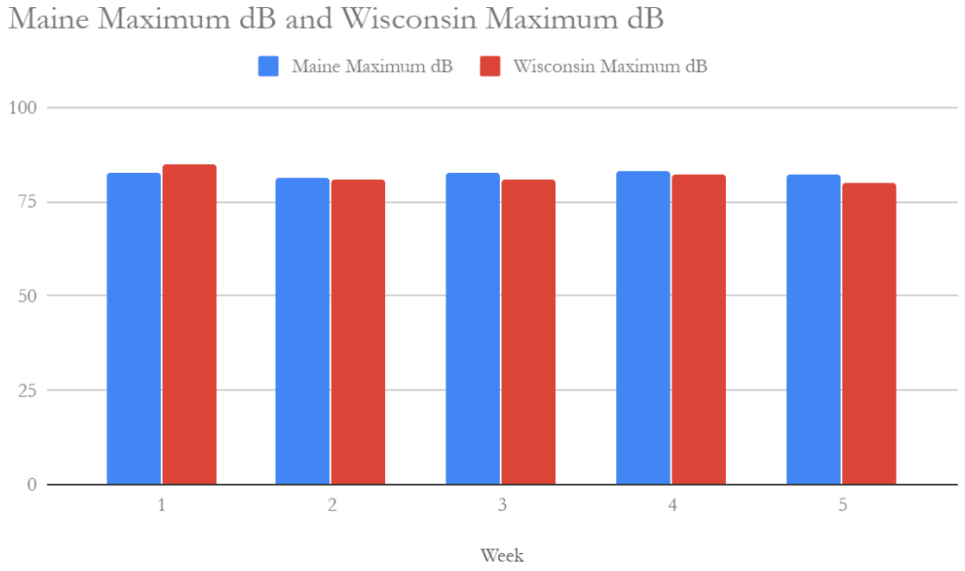


Figure 2: Change in Weekly Maximum dB Levels

Figure 3, as displayed below, demonstrates the change in weekly median dB levels in each environment over the course of the five-week study. The Wisconsin setting began the study with a higher measured median dB level during the baseline week (71.5 dB) which lowered during the subsequent intervention weeks and remained between 65 - 67 dB (normal conversation level at 3 ft.). The median dB level in the Maine classroom remained relatively level during the entire course of the study, measuring between 57.15 - 59.45 dB (between a quiet office and normal conversation level at 3 ft., as categorized by the sound meter app). When comparing the medians, we found that the decibel level overall remained fairly consistent.

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Maine Median dB Levels and Wisconsin Median dB Levels

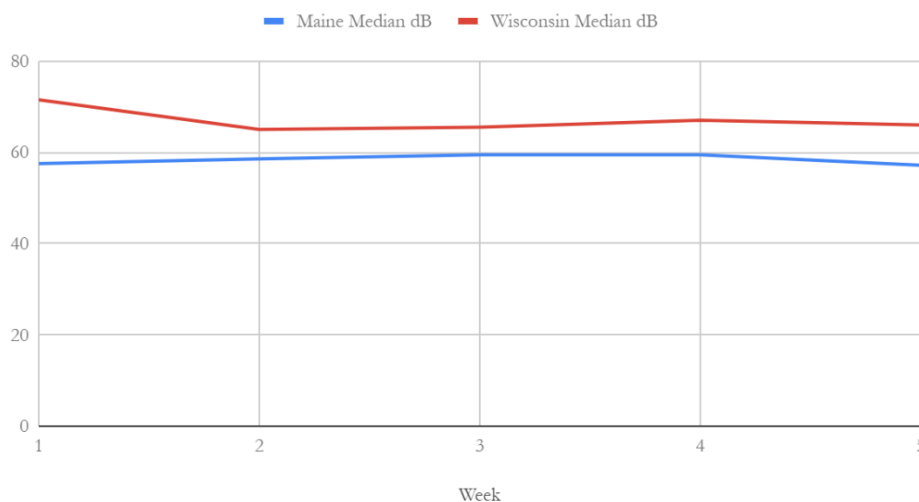


Figure 3: Change in Weekly Median dB Levels

In the Wisconsin classroom, the baseline average measured 71.25 dB. After four weeks of intervention, it decreased to an average of 65.66 dB. This result is a 7.8% improvement in overall noise level. In the Maine classroom, the baseline average measured 56.39 dB. After four weeks of intervention, it was slightly louder, averaging 58.56 dB. This result is an increase of 3.8%, or worsening, in overall noise level. In both classrooms, the change in noise level was minimal over the course of data collection and implementation of ASL signs. The baseline average for the classrooms combined was initially 63.82 dB. After four weeks, it measured 62.11, which is a 2% improvement in overall noise level.

An analysis of the decibel data is displayed in Figure 4: Change in Weekly Mean dB Levels.

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Change in Weekly Average dB Levels



Figure 4: Change in Weekly Mean dB Levels

Table 2: Intervention Decibel Data

Noise Level in Decibels (dB) During the Intervention

	Minimum	Maximum	Mean
Maine	30.1	83.3	58.56
Wisconsin	39	82	65.66
Combined	34.55	82.65	62.11

Observed Frequency of Target Behavior

In addition to measuring the decibel levels, we used a tally sheet to make observations of the target behavior, ASL sign usage (see Table 2 in Appendices). The researcher in Maine obtained over 10 times more observational data regarding use of signs by the children and the

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guide than the Wisconsin researcher did. The Maine researcher marked a total of 134 tallies, whereas the Wisconsin researcher/guide marked a total of 13 tallies. However, the data does not reflect the differing roles of the researchers. The researcher in Maine was not in the position of lead guide during the research project. The primary role of the Maine researcher in the classroom during the five-week period was to observe, collect data, and introduce the intervention as described. In contrast, the researcher in Wisconsin had a dual role of also being the lead guide in the classroom during the research project. This disparity in roles certainly affected the researchers' abilities to observe and tally accurately.

Both researchers noted that the overall frequency of sign usage by the children seemed very low. In Maine, the children were observed signing at a slightly higher frequency than the guide; in Wisconsin, just the opposite was true. On average, the children were using the signs 49% of the time, while the guide was signing 51% of the time.

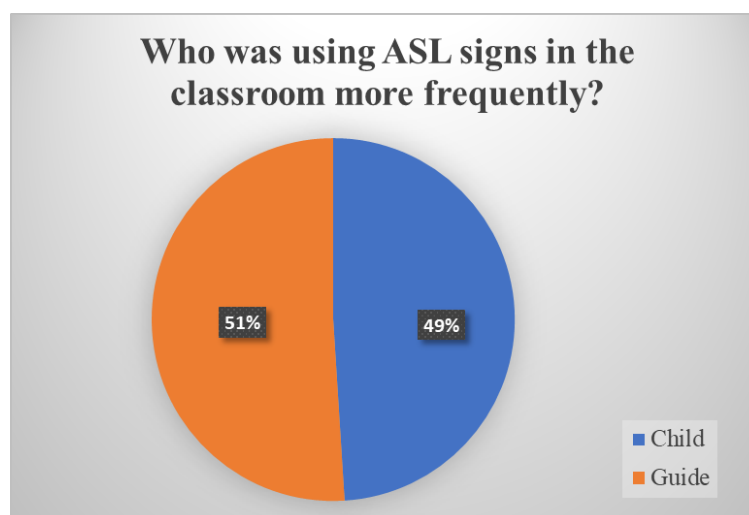


Figure 5: Target Behavior Comparison

The ASL sign observed most frequently was *hello*, as this became a customary method of greeting among the children on a daily basis (see Table 2.1 in Appendices).

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The researchers made several interesting observations pertaining to sign usage. In both classrooms, the children signed the word *stop* quite aggressively. The ASL sign for *stop* is made by extending the left palm in front of the body, facing upward. The open right hand is then sharply brought down to meet the left palm at a 90-degree angle. When used in an aggressive manner, such as with increased force or speed, this is considered the equivalent of shouting in ASL. The use of *stop* by the children in this manner resulted in some constructive conversations regarding respectful means of communication and courtesy.

Based on the data collected from the researcher's reflection form, patterns emerged in both classrooms (see Table 5 in Appendices). In Maine and Wisconsin, the children made connections between the arbitrary gesture and the meaning of a sign. For example, a child verbalized a technique to aid in the memorization of the sign for *help*, saying "Help lifts you up!" Another example of this language association occurred when the children learned to sign *friends*. The children commented that, "It's like your fingers are friends, giving each other a hug." In each group lesson during which new signs were introduced, at least one child would create this type of verbal association to aid in the memorization of the sign. Children often smiled and laughed while these connections were being made. On their own, the children connected multiple signs together to form phrases and sentences, such as "*help friends clean*," "*no thank you*," and "*please stop*." Children also often asked for more signs, "How do you sign . . . ?" The words requested most were those the children felt would help them to communicate full sentences or complete thoughts using ASL signs.

Supplementary ASL materials were incorporated into both learning environments. In the Maine classroom, flashcards and books about ASL were provided like a material on the shelf, accessible to the children at any time during the work period. In the Wisconsin classroom, a child

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donated an ASL book from home, and placed it on a shelf so others could use it as a reference.

All of the materials were used by the children of their own free will and interest. This supported the children's ability to explore the use of ASL further and discover signs that were of particular significance to them. Children were observed to be especially interested in signed names for certain animals and foods, as well how to form full sentences using ASL in a grammatically correct manner.

Researcher's Perception of Noise Level in the Classroom

Before this research project began, the researchers and guides often felt that the noise level in their respective classrooms was too loud. A high noise level affects the children's abilities to concentrate and work productively. We wanted to consider the adults' perceptions of the volume as compared with the actual volume measured by the decibel app.

The decibel measuring app described the classroom noise levels as either "busy traffic, vacuums" (70 dB), "normal conversation" (60 dB), "quiet office" (50 dB), or "quiet library" (40 dB). In the Maine classroom, the researcher perceived the noise level to be higher (6 on a scale of 1-10) or lower (3 on a scale of 1-10) on different days. The decibel measuring app stated the noise level was also lower or higher on those corresponding days. For example, the researcher rated the noise level a 3 on a day when the median noise level was 55.95 db. The day the researcher rated the highest, a level 6 on a 1-10 scale, the decibel app measured the class as having a 59.97 db daily average. The day that the researcher believed to be the lowest level of noise was proven to be the lowest level by the decibel measuring app. In turn, the day the researcher perceived to have the highest level of noise was also measured as the highest by the sound meter app. In the Wisconsin classroom, the researcher rated the noise level from moderate (4 on a scale of 1-10) to high (7 on a scale of 1-10). Like in Maine, the Wisconsin researcher's

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perception aligned closely with the quantitative results. For example, the average volume on the day rated 4 was 63.25 dB. The average volume on the day rated 7 was 66.5 dB. There is a correlation between the ratings and actual decibel levels. The researchers could sense when the overall volume was reasonable, increasing, and peaking.

The presence of multiple adults in the classroom influenced the researchers' perceptions of the volume. When more than one adult was in the classroom, the researchers indicated that the overall noise level seemed to increase. In the Maine classroom, there was always a higher-than-usual number of adults in the classroom (a minimum of four adults daily). The researcher of the Maine environment also noted in observation that adult voices often registered at a higher dB level on the decibel sound meter app than the voices of children.

Children's Perspectives on Learning ASL

We were also curious about the children's attitudes towards learning sign language. To gauge this information we relied on responses collected during a structured group discussion (see Table 4 in Appendices). Despite the low frequency of target behavior sign usage observed, the children generally claimed to enjoy learning ASL signs. When introduced to a new sign, the children practiced it immediately without being prompted. They were willing to continue to practice the new signs after the lesson was complete. Some children even requested to learn signs in addition to those taught during the intervention lessons. They expressed a desire to make sentences using ASL signs and inquired about the art of ASL conversation. In the Wisconsin classroom, one child exclaimed "I love learning signs!"

Additional evidence of the children's positivity towards learning ASL signs presented itself when two children of the Wisconsin environment asked to give a lesson to their classmates

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of some additional ASL signs they knew. Children in the Wisconsin site also requested to translate an English poem into ASL.

In the Maine environment, when ASL signs were introduced to children in the form of small group lessons, many children regularly requested to be in the next lesson if they were not selected for the first. This repeated occurrence suggests the children were generally interested in the subject matter. Also, in the classroom of Maine, children who were outside of the lesson often observed the small group learning the new ASL signs of the week, and then attempted to practice the new signs before coming to their own sign lesson. This was interpreted by the researcher as the existence of an overall excitement surrounding the ASL sign lessons each week. In Maine, children independently sought to explore the lesson topic further by often returning to the ASL sign flash cards, and ASL books introduced as a classroom material by the researcher.

The children of both environments suggested examples of situations and times when the use of ASL signs would be useful and appropriate in their lives. Several children from both schools commented that ASL sign could help them communicate with those who are deaf and hard of hearing in the future, should they meet others with this exceptionality. Some children theorized learning ASL would be helpful should their own offspring be born deaf or hard of hearing. This displays a certain level of empathy present in our elementary children, the ability to be considerate and thoughtful of human beings with whom they have not even met yet.

Assessment of the qualitative data collected through the guided small group discussions with the children of both environments led the researchers to believe that the children generally enjoyed the ASL sign lessons and gained positive associations of otherness and inclusiveness through exposure to such lessons.

Action Plan

Variables that May Have Affected the Research

According to the Acoustical Society of America, the maximum acceptable noise level for a traditional-school classroom is 70 dB overall and 35 for background noise (Nelson, Stoli, & Stelz, 2002). From the start, the Montessori classrooms in our study had high decibel measurements. An exception was found with the measurement of minimum volume. The combined minimum averaged below 35 decibels in the baseline and elapsed data sets (refer back to Table 1). The minimum value is not representative of the overall noise, nor was it consistently maintained during the work period.

In Montessori education, we allow the children the freedom to communicate. During the work period the teacher does not stand in front of the class and lecture the information to the children; rarely, if ever, does he or she demand silence. Therefore, the Montessori learning environment automatically has a moderate noise-level expectation that is distinct from a traditional classroom. Montessori classrooms need to establish their own maximum acceptable noise level to take this difference into account.

As can be said when comparing any two classrooms, whether they exist within the same school or not, or even within the same style of education (Montessori, Waldorf, traditional, etc.), the dynamics at play are unique to each educational environment and evolve over academic years. It is also true that those dynamics fluctuate within an individual classroom during a single academic year, as well. In educational research, it is worth noting classroom dynamics because they undoubtedly influence data and analysis.

In our study both researchers relied on the Montessori three-period lesson to teach the ASL signs, but the method of instruction was not consistent between the two. In the Maine

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classroom, ASL lessons were taught in small groups through a series of rotations. This method adheres closely to the Montessori philosophy of instruction and was the plan from the outset. In the Wisconsin classroom, due to logistical challenges, the ASL lessons were presented to one large group (typically the entire class) during times of transition. Each researcher had to be flexible to meet the learning needs of the children while also maintaining their other classroom responsibilities.

Many occurrences of the children using signs were observed after the data collection period ended. The project's long-term effects are immeasurable due to the five-week time constraint. Perhaps the intervention should have been implemented first, and then the noise measured in the following weeks. The simultaneous process of implementation and data collection was difficult for the researchers, and not necessarily reflective of the learning that occurred, and the progress made.

Summary: Contributions of this Action Research Project

Undramatic quantitative results do not necessarily signify that this research project was not meaningful. Although the decrease in average noise level was a mere 2%, the qualitative results indicate that the project was still worthwhile. Even if teaching ASL signs does not impact the volume in the classroom, the children's perspectives of enjoyment, enthusiasm, and engagement in learning signs justifies continuing the intervention.

The results of the research will most likely impact our teaching practice in both roles as guides and researchers in several possible ways. Throughout the course of the project, both researchers gained a new wealth of knowledge regarding ASL sign usage and ASL language as a whole. Many of the signs introduced to the children during the course of the intervention can be used as respectful means to communicate instructions and implement classroom management. In

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observation and practice the researchers have noted that their elementary children often respond quite positively to a direction or request from the guide made using a non-verbal signal or ASL sign. This can be contrasted with the resistance from children guides often face if an instruction is verbally repeated two, three, or five times. As a result, in teaching practice the researchers hope to implement on a regular basis the learned ASL signs the children have acquired as a method of respectfully ensuring the classroom runs smoothly, as well as a way to discourage disruptive behavior.

In addition, witnessing the excitement the children displayed in learning about a new language was very inspirational to the researchers. Such a show of interest from the children was a fresh reminder of their obvious draw to codes and foreign language in general. As a result, in practice the researchers may wish to intentionally increase their elementary children's exposure to foreign languages and other forms of communication present throughout human history and around the world.

Finally, the impact of the intervention on student learning must be taken into consideration as well. The introduction of ASL sign use in the elementary classroom environment afforded the children an excellent opportunity to be exposed to and discuss otherness and exceptionalities. For some children, this was the first time, or one of the few occasions, that they had been able to ask questions or share thoughts regarding differences in the lives of people who experience difficulties with hearing, sight, movement, speech, etc. The researchers quickly recognized the importance of such conversations in the classroom and wish to encourage this continued dialogue in the future.

The ASL signs introduced to the elementary children of this study also provided the students with new methods of giving helpful, respectful, and kind reminders to their peers

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regarding classroom expectations and norms. For example, all the children in the Maine study now know the sign for *walk*. In this particular environment, as in many classroom settings, the children are prohibited from running in the classroom. The children of the Maine study now have a method to deliver a kind reminder to their fellow classmates to move safely in the classroom by signing *walk*, should they see someone running.

Although the findings of the research did not conclude that the noise level of the elementary environment was greatly affected by the introduction of ASL signs, the children did become more aware of the overall volume of the classroom through the project being conducted. Many children noted the researchers gathering data through use of the decibel measuring app. This developed into conversations regarding appropriate noise levels and how the children felt personally about noise level and the effect it may have on their ability to work and concentrate. The small group discussions conducted with the children during the baseline data collection week also required the children to reflect on the overall noise level produced in their class environment (see Appendix D). This new drawn attention and awareness to the general volume the collective voices of the classroom produce may cause the children pause. They may notice more often when the noise levels are at their peak. The fact that the children now have an increased awareness of appropriate noise levels for the class environment may lend itself to more self-regulation and voice modulation among the children, creating a setting conducive to work.

Potential for Future Action Research Investigations

The possibility for future studies regarding the effects of ASL signing with populations of elementary-age hearing children are endless. Non-verbal communication methods have been employed to help children with social-emotional development difficulties communicate more effectively. It may be of interest to other researchers in the field to study if using ASL signs with

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hearing children of the elementary age could aid in the development of their social-emotional communication skills. In addition, action researchers may wish to study the effectiveness of ASL signed or other non-verbal instruction methods with elementary children in comparison to verbalized directions in regards to classroom management techniques.

Researchers may also be interested in continuing studies to examine whether ASL sign usage among elementary hearing children may aid children's ability to memorize new words and expand vocabulary. As noted earlier, the sensitive period for language acquisition is strongest during the child's first plane of development, from the ages of zero-six years old. Once the child reaches the second plane of development (6-12 years of age), they no longer have the benefit of the absorbent mind. Rather, they must rely on their will, their desire, to learn new things. In consideration of language vocabulary enhancement, it would be of great significance to study if pairing ASL signs with new vocabulary words impacts the children's ability to memorize and use the introduced vocabulary. Future action researchers interested in ASL sign use among populations of hearing children could also examine similarities and differences between first plane children and second plane children's ability to acquire sign vocabulary.

In observation, it was noted that some signs were challenging for the children to replicate, for example, the ASL sign for *why*. This caused the researcher to question whether continued practice with the use and implementation of ASL signing could affect children's agility with their hands. A study could be conducted measuring if ASL sign use strengthens the hand, possibly affecting handwriting, drawing skills, pencil grip, dexterity, etc.

In regards to classroom noise level studies, it was noted previously by the researchers that we recommend future studies be implemented to establish a scientifically standard, expected and accepted noise level for an active Montessori elementary classroom. This information could

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assist Montessori guides to determine if indeed their classroom environment is too loud, or if the opposite problem is present, when a class is too quiet.

Future action research projects could examine further the effects of noise level on concentration and productivity in elementary age children. Researchers may also like to examine factors which seem to cause noise level increase among elementary children. Along those same lines, researchers in the future may be interested to study other methods and interventions designed to reduce noise level in the classroom. ASL sign use in our study was introduced as a proposed method of decreasing the overall noise level of the learning environment. However, researchers could also study the effects of ASL sign use in other areas of classroom management, such as providing instruction, redirecting children, positive discipline, and more.

Action researchers of the future may wish to investigate any of the proposed studies mentioned above, and in doing so we hope that our study may be a contribution of support in their scientific inquiries.

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Appendix A
Decibel Measuring Application Data Collection Tool

Data Collection Form for Decibel Measuring App

Name of sound measurement application: *Sound Analyzer - used on a Samsung Galaxy S9*
Duration of recording time: 5 minutes x 4 times during work period = 20 minutes, twice per week for a total of 40 minutes per week, or 200 minutes for the entire project

Week # 1: BASELINE DATA

Date	Name	Start time	End time	Minimum dB	Maximum dB	Average dB

Week # 2: BEGIN ASL LESSONS + DATA COLLECTION

Date	Name	Start time	End time	Minimum dB	Maximum dB	Average dB

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Week # 3: CONTINUE ASL LESSONS + DATA COLLECTION

Date	Name	Start time	End time	Minimum dB	Maximum dB	Average dB

Week # 4: CONTINUE ASL LESSONS + DATA COLLECTION

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Date	Name	Start time	End time	Minimum dB	Maximum dB	Average dB

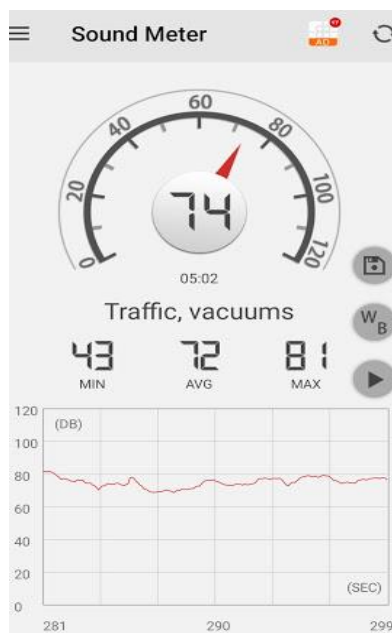


Figure 1: An example screenshot of the decibel measuring app, post-recording

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Appendix B
Observation Form

Short Observation of ASL Use and Perceived Classroom Noise Level

# of Children:	Daily Weather:
Date:	Time:
ASL Sign Observed in Use:	Children's Response to ASL Sign Used:
Context e.g. Where ASL use is taking place, used by children in group work, used between child and guide, activity focus, etc:	
Perceived Noise Level in the Classroom, Scale of 1-10 (1 being quiet, 10 being loud):	
Name of Observer:	
Observation Details:	
Additional Observations:	

Reflection on Small Group ASL Lessons

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Observation of ASL Intro Lesson		
# of children in small group lesson:	Date:	Lesson #:
Activity/Discussion/Sign Introduced:	Time Started:	Time Ended:
General reflections on the lesson/ children's comprehension of content and context, etc.:		
Characteristics of Lesson Engagement and Comprehension		
DO THE CHILDREN PARTICIPATE? <i>(engagement)</i>	ACTIVE LEARNING <i>(motivation)</i>	CREATING AND THINKING CRITICALLY <i>(thinking)</i>
<i>Questions Asked:</i>	<i>Being involved and concentrating</i>	<i>Having their own ideas</i>
<i>Comments Made:</i>	<i>Repeated Practice</i>	<i>Making links</i>
<i>Being willing to 'have a go'</i>	<i>Enjoyment of the Group Lesson/Activity</i>	<i>Independently Seeking to Explore Lesson Topic Further</i>

NEXT STEPS FOR FUTURE LESSONS

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Tally: Mark each time the student exhibits the target behavior per block. Then you can be able to figure a

daily % of occurrences and will also be able to see if there is a pattern developing when these

behaviors occur most.

Appendix D
Structured Discussion Form

Conversational Questions for Small Group Discussion

- How do you feel (in general) about the noise volume in our classroom during the morning work period?

- Does the noise volume produced in our classroom during the morning work period affect your ability to work, either positively or negatively or not at all?

- Do you find it easier or more difficult to do your best work when the classroom is noisy? Why?

- Do you find it easier or more difficult to do your best work when the classroom is quieter? Why?

- Do you know any American Sign Language (ASL) signs?

- Do you know anyone who uses ASL to communicate?

- Do you enjoy learning about different languages, and different ways to communicate? If so, what is it that appeals to you (or what do you like about it)?

- How might learning some ASL signs be helpful to you, now or in the future?

Appendix E
Complete Data Tables

Table 1: A Comparison of the Baseline Data to the Intervention Data Collected

Table 1

Baseline Data, Noise Level in Decibels (dB)

	Minimum	Maximum	Mean
Maine	29.9	82.6	56.39
Wisconsin	40	85	71.25
Average	34.95	83.8	63.82

Intervention Data, Noise Level in Decibels (dB)

	Minimum	Maximum	Mean
Maine	30.1	83.3	58.56
Wisconsin	39	82	65.66
Average	34.55	82.65	62.11

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Table 2: A Comparison of ASL Sign Usage Frequency (Target Behavior)

Table 2.1

Maine

Sign Observed	By Child	By Researcher/Guide
hello	22	27
yes	6	3
no	8	2
stop	12	2
friends	3	0
help	4	0
focus	1	5
sorry	2	1
why	3	0
wait	0	2
clean	4	6
choose	3	5
listen	0	1
peace	2	0
walk	0	7
stand	0	3

Table 2.2

Wisconsin

Sign Observed	By Child	By Researcher/Guide
focus	0	2
calm	2	2
work	0	2

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quiet	3	0
stop	1	1

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Table 3: Baseline Data Collected from the “Conversational Questions for Small Group Discussions” Form)

Table 3.1

Maine Montessori School

Question	Response(s)
How do you feel (in general) about the noise volume in our classroom during the morning work period?	<ul style="list-style-type: none"> ○ “It’s distracting” ○ “It’s annoying” ○ “It gets loud” ○ “It’s hard to concentrate” ○ “I need quiet when I do math” ○ “People pretend to play drums” ○ “People make unnecessary/silly noises”
Does the noise volume produced in our classroom during the morning work period affect your ability to work, either positively or negatively or not at all?	<ul style="list-style-type: none"> ○ “It interferes with my concentration a little” ○ “Negatively” x16 ○ “Positively” x4 ○ “Not at all” x6
Do you find it easier or more difficult to do your best work when the classroom is noisy?	<ul style="list-style-type: none"> ○ “It’s distracting” ○ “I can’t concentrate” ○ “Easier” x7 ○ “More difficult” x19
Do you find it easier or more difficult to do your best work when the classroom is quieter?	<ul style="list-style-type: none"> ○ “It calms you down” ○ “It feels nice” ○ “There is not so much chit chatter” ○ “You can hear yourself think” ○ “Easier” x21 ○ “More difficult” x5
Do you know any American Sign Language (ASL) signs?	<ul style="list-style-type: none"> ○ “Yes” x26
Do you know anyone who uses ASL to communicate?	<ul style="list-style-type: none"> ○ “Yes” x4 ○ “No” x22
Do you enjoy learning about different languages and different ways to communicate? If so, what is it that appeals to you (or what do you like about it)?	<ul style="list-style-type: none"> ○ “Yes, language is fun” ○ “It is interesting to learn about another culture” ○ “I like to learn how language is connected”

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	<ul style="list-style-type: none"> ○ “It would be fun to be able to communicate with people in different languages” ○ “It can help you if you travel”
How might learning some ASL signs be helpful to you, now or in the future?	<ul style="list-style-type: none"> ○ “It could help if you meet someone who is deaf or hard of hearing, or if you have a kid who is deaf” ○ “It can make you more independent”

Table 3.2

Wisconsin Montessori School, Qualitative Baseline Data

Question	Response(s)
How do you feel (in general) about the noise volume in our classroom during the morning work period?	<ul style="list-style-type: none"> ○ “Sometimes it’s okay but other times too loud” ○ “Perfectly fine” x2 ○ “Okay, a little loud” ○ “Often too loud” x2 ○ “Terrible” x2 ○ “It makes me get a headache” x2 ○ “Sometimes I wear noise-cancelling headphones and it’s still too loud”
Does the noise volume produced in our classroom during the morning work period affect your ability to work, either positively or negatively or not at all?	<ul style="list-style-type: none"> ○ “When I hear all the noise it’s hard to focus” x2 ○ “Negatively” x7 ○ “Not at all” ○ “Positively”
Do you find it easier or more difficult to do your best work when the classroom is noisy?	<ul style="list-style-type: none"> ○ “Easier” x5 ○ “More difficult” x7
Do you find it easier or more difficult to do your best work when the classroom is quieter?	<ul style="list-style-type: none"> ○ “Easier” x10 ○ “More difficult” x1
Do you know any American Sign Language (ASL) signs?	<ul style="list-style-type: none"> ○ “Yes” (all children)
Do you know anyone who uses ASL to communicate?	<ul style="list-style-type: none"> ○ “Yes” x4

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Do you enjoy learning about different languages and different ways to communicate? If so, what is it that appeals to you (or what do you like about it)?

- “Yes” x16
- “Travel”
- “ASL is quiet”
- “It’s fun to learn because it’s hard but it gets easier”
- “To speak to others in ASL”

How might learning some ASL signs be helpful to you, now or in the future?

- “To communicate with lots of people”
 - “It’s easy to use”
 - “I have a friend who speaks ASL”
 - “To teach ASL to others”
 - “To have a quieter classroom”
-

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Table 4: Regular Data (Data Collected from “Reflection on Small Group ASL Lessons” Form)

Table 4.1

Maine Montessori School Researcher’s Reflections and Observation Notes

<p>The three-period lesson method seemed effective for children learning and retaining the meaning of the ASL sign and how to use each sign.</p>
<p>Children appeared to enjoy the activity, displayed through their willingness to practice and participate.</p>
<p>Many children made connections between the sign and it’s meaning by verbalizing a connection that assisted in memorizing the meaning (ex: for the sign <i>help</i>, “Help lifts you up!” The sign involves making a thumbs up with one hand and using the opposite palm to raise the thumbs up.)</p>
<p>Children displayed interest by requesting more and more signs not covered in the lesson. They expressed a desire to make sentences using ASL signs and inquired about the art of ASL conversation.</p>
<p>Children did not always take the lessons very seriously, sometimes making jokes or inappropriate gestures, or making up their own signs during the lesson.</p>
<p>Children independently sought to explore the lesson topic further by examining ASL sign flash cards, and reading books about ASL sign usage introduced to the classroom by the researcher as an available resource for the children.</p>
<p>ASL signs were introduced to children in the form of small group lessons. Many children requested to be in the next lesson if they were not selected first, displaying interest in the subject matter.</p>
<p>Children observed other small groups learning the new ASL signs of the week and attempt to practice them before coming to the lesson in an effort to be prepared.</p>
<p>Children began to connect signs from previous lessons together in an attempt to form phrases and sentences (ex: <i>help friends clean</i>).</p>

Table 4.2

Wisconsin Montessori School, Qualitative Data

<p>The children suggested examples of situations and times when the use of ASL signs would be useful and appropriate.</p>
<p>The children made connections between the gesture of a sign and its meaning.</p>

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When introduced to a new sign, the children practiced it immediately without being prompted.

All previously introduced signs were reviewed before introducing any new signs.

Children requested to translate poem recited before lunch into ASL.

A child commented "I love learning signs."

Two children asked to give a lesson to their classmates on some signs they knew.

A child made a request to learn a few particular signs.

A child donated an ASL book to the class, and it was referenced by multiple students.

The children seemed to really enjoy learning the sign for *stop*.

The children connected the signs *no* and *thank you* to say *no thank you* as well as *please* and *stop* to say *please stop*.

Due to classroom logistics, ASL signs were introduced to the children via one large group lesson during times of transition.
