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# **Fostering Self-Sufficiency through Problem-Solving**

An Action Research Report

By: Elizabeth Hamilton

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**Fostering Self-Sufficiency through Problem-Solving**

Submitted on May \_\_\_\_\_

In fulfillment of final requirements for the MAED degree

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### Abstract

“What is this picture?” “This arrow is missing.” Montessori teachers hear these questions daily. These requests, while valid, often come at inopportune times, interrupting the adults work. This study aimed to see if children could gain independence through problem solving thus decreasing interruptions. 26 children and 4 adults were in this experiment. The intervention had two aspects. The first, a series of Grace and Courtesy lessons to help the children problem-solve common work related issues. The second was incorporation of a waiting necklace that the children would wear if they required an adult. Effectiveness was measured by evaluating the number of interruptions received for ten days prior and following the intervention. The results revealed the overall number of interruptions decreased from 71 to 53 and little to no change in the children’s problem-solving habits. This leads to the question, if the experiment was augmented would the results differ?

Keywords: Interruptions, problem-solving, Preschool, Grace and Courtesy,

Imagine this. You are a Montessori guide that has been waiting for the opportunity to show a Billy how to do addition, the day has come. Billy agrees to come to a lesson. You sit down with the child. Billy has built the numbers individually using beads. That magic moment is about to arrive when you show how two numbers become one, and a little student by the name of Sally says, “What is this?” This is an innocent enough question however, The little image of a fern the girl holds has ruined the moment. This experience is not unlike that of some teachers.

The practice in Montessori schools of each child being able to do individual appropriate work has obvious benefits. The children are not pushed to do work that is too advanced or work that is disinterests them. However, there is the inevitable disadvantage that at any given moment several children will be in need assistance. Inevitably this will result in several children coming up to the adult seeking help. These requests for assistance can come at perfectly appropriate moments, such as when a teacher is sitting observing the classroom, or they can come at the most inopportune times such as when an adult is giving a presentation or reviewing a piece of work.

In order to resolve the issue of interruptions one must give the children the skills necessary to complete the process of realizing that the child has a problem, find a possible solution, and carry out a solution. This process also allows for children who are not able to solve the issue at hand to be identified without involving an adult.

The participants were 26 children who were enrolled in a Montessori classroom, with age ranging from three to six years of age with a reasonably even distribution across the age range. The intervention took place in the months of February and March when the children had sufficiently acclimated to the room. The day began at approximately 8:30

AM and concluded with children either returning home or leaving for lunch at approximately 11:15. The last 30 minutes of this time is spent outside in a playground when weather permits. The class is lead by three instructors all of whom have received Montessori training. The room consists of four main areas; Practical Life, Sensorial, Language, and Math, and two sub-areas; art and science.

### **Literature Review**

It is well acknowledged that problem-solving is not only an integral part of academia but also key to daily life and social situations. Therefore the topic of the development problem-solving abilities during youth and how the process can be encouraged has been of great interest to researchers over the years. This interest and subsequent research have produced a rather broad base of literature to review on the subject.

The literature regarding problem-solving during the preschool years is vast and varied. That being said, it can be broken down into distinct categories. Primarily, these groups can be divided into three separate categories: Literature aimed at examining and stating kind of problems youth encounter and what problem-solving occurs during the preschool years,; Research with the aim of determining what are the natural factors that affect a young child's ability to problem-solve and it affects on their academic and social achievement,; and Literature that seeks to identify factors that can help promote problem-solving during the preschool year. Each of these categories is an integral part in helping to develop a clear and detailed picture of problem-solving during one's earliest year.

Krasnor and Rubin (1983), describe social problem-solving skills as, "the process of achieving personal goals through social interaction"(p.1545). In a study of 15

preschools, which lasted for 5 hours and totaled 6,338 social problem-solving encounters, initiation or requesting others to act were the most common goal, demand, and result. It was found that most often the children seeking assistance from an adult (Walker et. al., 2002)

Another factor is, questioning. Legare (2013) found that six-year-old asked constraint-seeking questions at a higher rate than four or five-year-olds. Constraint seeking questions are key to problem-solving because they are the issues that help narrow down possible options. The study further revealed that children appreciated the need to ask these issues before the children were able to apply the answers given to the problem consistently. In other words, children understand the need to limit options before they can apply them. The need to model such questions, out loud, becomes evident as well as the likelihood that older children will likely be asking more questions and not need to be assisted.

The constant seeking of adult assistance has proposed the question as to whether children possess the necessary metacognitive skills to resolve their issues. Lambert (2001) proved with a study of 60 preschoolers between 4.5-3.4 years of age that children are capable of several metacognitive tasks including identifying a problem, the ability to plan, self-persistence, self-monitoring, and “subtractive restructuring”, or taking apart work already done to reconstruct it differently. These metacognitive skills are vital to all children and their ability to problem-solve, which would be tough without them. That being said, other factors lead children to one problem-solving strategy over another.

Gender has been found to be one of the major factors in determining a child’s problem-solving style. Walker et. al. (2002) studied the categories of provocation, peer

group entry, and sharing or taking a turn. It was found that girls often showed more reflection when dealing with issues and therefore overall involved less retaliation or physicalness. When seeking help from other peers. It was found that same-sex peers were the most common source of assistance with 57% of the time the students being successful helping one another (Rubin, 1983). Holmes (1996) looked at gender pairings with regards to problem-solving and found out that two girls put together used more “mitigating” language during the process whereas a mixed gender group or two boys used more aggressive language.

The factor of temperament has been found to be a neutral one. Walker and Henderson (2012). Examined the factor in 1117 children through the Children’s Behavioral Questionnaire and the Social Problem Solving Test-Revised. It was found, that higher levels of inhibitory skills lead to greater achievement in the kindergarten and first grade, but there was no correlation between shyness and future skills. This fact lead to the conclusion that temperament itself is not a defining factor in problem solving. Moss et. al. (1997) discovered how securely attached preschoolers were equally capable of completing a task with their parent as well as an adult stranger and were able to maintain task relevance, and metacognitive behavior were as these qua but so that the observer can be aware of these factors outside the control of the adult. This also allows the researcher to see if any of these factors can be compensated for by other factors. Though adults have little impact on these factors, there are some that can be manipulated by the powers at hand.

The first such factor is visual-imaging. Carr and LeBlanc (2010) used laminated scenes and covered objects for each scene to test the children's ability to use visual



imaging to problem-solve by asking the children to identify which objects went with which scene. The research revealed that while just training in visual imagining was not enough to produce results, training along with prompting provided great success.

Perceptual color clues have also been found to be of assistance. Joh and Spivey (2012) studied 48 three-year-olds ability to predict the trajectory of a ball into one of three separate tubes. The research revealed that the use of color perceptual cues in the form of each tube could assist children leading to roughly a 50% increase in accuracy.

Teacher control has been shown to have an impact. Brinkmann (1987) studied the effect that teacher control had on children's problem-solving skills. After studying the ability of 72 four to five-and-a-half-year-old children to make a rolling object it was found that for children deemed to have high intelligence teacher direction, even at the moderate and high levels were much successful in completing the tasks. However, in children with average intelligence no difference was seen. This research helps point out that often teacher intervention does not have much impact. Therefore, giving time for the children to use their knowledge, to work the problem to be of benefit in that their self-esteem will increase as they see that they can complete the task independently.

Finally, Teachers, in particular, can find modeling and instruction to be imperative. Clark et. al. (1975). Educators have found that education was essential and that children who received instruction and modeling or just direction were found to be more successful than those who simply received modeling.

One educational theorist that invented just such an instructional-modeling practice for social behavior was Dr. Maria Montessori. Within the Montessori theory lays the practice of "Grace and Courtesy" lessons. During these lessons, the instructor invites a

small group of children to come and view a short prepared skit that models social behavior. The children are then encouraged to practice such behavior immediately after the presentation and in the future. Such instruction allows the children to focus on the behavior desired and take in every detail. When paired with subsequent modeling by the teaching, the pro-social behaviors are often seen to be taken up by the students quickly

What this proposed research hopes to accomplish is to use Dr. Maria Montessori's methods to fill the void in between the natural tendencies of the child to problem-solve and the teaching methods. The hope is that by using the best practices in the best way, and being supported by the Montessori theory, one can instruct the children once and then the children will be able to promote amongst themselves to self-problem-solve.

The following study hopes to add to the established literature on children problem-solving by filling this gap answering the question, how will the introduction of child centered and child appropriate problem-solving techniques along with innovative attention getting procedures affect the need for adult involvement?

### **Research Methodology**

Weeks were dedicated to the adults collecting data on the number of times they received an interruption in order to establish a baseline for interruptions received by the adults. In this case an interruption was described as any time a child verbally intruded on an adult's interaction while they were performing their duties with another child. The number of interruptions were recorded using a tally sheet (see Appendix A).

The third week of the intervention involved a series of what is referred to as Grace and Courtesy lessons. These lessons involve small little skits that the children observe and then apply to their everyday activities. In each of these situations the adult

played the role of the child while occasionally calling on the children to play other roles in my skit. In each of these skits the adult attempted to open a box in which they were unsuccessful in opening. The adult would acknowledge the problem and state it. “oh dear, I can’t open the box”. The adult would then state what they had and their goal, in this instance “I have a container with a lid and I need to take the lid off of the container.”. The child would then come up with a hypothesis about how they might accomplish this goal. “Maybe if I try to use these tabs that I see I can open the box.” At this point the presentation could take one of several paths. In the first instance the child was able to come up with a way to open the box and was successful. In the next the child tried three different ways to open the box and was not able to do so. The child would then go to a teacher and seek their help.

The situation with this particular box was one that several students had encountered before and therefore would be familiar to the children. The repeated use of the same problem, the difficulty in opening a box, was designed to help present the students from falling under the assumption that these distinct problems all had unique solutions instead of there being steps to the large process of problem solving.

It should be noted that there were several processes in the classroom that had to be respected in order for research to be valid. Within this classroom children would complete a work and then have an adult check their work. The process was established that if a child had completed their work, they were to approach a teacher and silently put their hand on the adults shoulder, signifying to an adult that they required their work to be checked. The child would then return to their work space and begin another work while leaving the first work undisturbed until an adult came to check their work. A

reminder of this process was given at the beginning of each lesson and highlighted to make sure the children were able to maintain that process. There was also an established work that was entitled “peace works” that allowed the children to help solve social issues. Therefore, the interruptions and any methods introduced were able to focus strictly on issues regarding a child’s work, both physical issues, such as not being able to open a box, and academic, not being able to identify a picture.

On the final day of the presentations what is referred to as the “waiting necklace” was introduced in this presentation. The child, being played by the adult in the skit, found themselves, as before, unable to open the box. However, when they had attempted to problem-solve and found themselves unsuccessful, they looked up to find all the “teachers” occupied. “The child” then went to designated part of the classroom and put on “the waiting necklace”. The child would then return to their work and continue to try and problem solve. It was at this point that the presentation could go one of three ways. In the first scenario the child would continue to problem solve until a teacher came and then, once the problem was solved, in this case the box being opened, the child would return the necklace to the shelf. In the second scenario another child, who had finished their work but had not selected another work stopped and said, “May I help you?” The first child would say, “yes,” and describe their problem. The assisting child would then help the first child and the child was able to put the waiting necklace back on the shelf. In the third possible scenario the older child was unable to help the younger child and an adult was required to come and assist.

Weeks four and five provided the opportunity to not only compare the number of interruptions before and after the intervention but also see how effectiveness of the

intervention. In addition to continuing to tally each time they were interrupted, following the process for the first two weeks prior to the intervention, each of the adult will also collect one of three points of data.

The first of these three points of data explored the use of the waiting necklace. The adult put a tally in one of three categories each time the waiting necklace was used. Each section representing a possible outcome the child could experience; the child was able to successfully problem solve, another child was able to come and assist, and an adult assisted (See Appendix B).

The second data point involves how the children interact. If a child was struggling did another child refuse to help, did another child help and was unsuccessful, or did another child help successfully (see Appendix C).

The third and final data collection point involved collecting narratives and general observations. This third adult kept their eyes and ears open for any comments and situations regarding the problem-solving and the implementation of the waiting necklace. This adult took charge of taking notes on both a general scale, traffic in the classroom seems to have decreased, as well as specifics, “a child said ‘yay’ when after approximately 30 seconds of problem-solving they were able to find their missing marble.” (See Appendix D).

### **Data Analysis**

Each of the three forms of data were analyzed separately in order to reveal something regarding their individual parts and then put into connection with one another to provide an image of the whole.

**Interruptions**

An analysis of the number of interruptions provided interesting results. The number of interruptions each teacher received was added together to find the total number of interruptions received each day. The mean number of interruptions received over the two-week period was then calculated. For the two weeks prior to the intervention the average number of interruptions received by an adult was 7.1. Post-intervention, two weeks, the average decreased to 5.3. This means that the number of interruptions decreased each day by 1.8.

The number of interruptions each adult received, pre and post- intervention varied depending on the adult. Adult number one received 48 interruptions pre-intervention, and 19 post-intervention. This indicates a decrease number of interruptions of 29 or 59%. Adult number two received 16 interruptions pre-intervention and 24 post-intervention. This indicates a total increase of eight interruptions or 50%. Adult number three experienced 7 interruptions pre-intervention and 10 post-intervention. This is an increase of three interruptions or 43%. It should be noted that teacher number one was responsible for presenting the material to the class. This is note worthy as adult number one experienced a decrease in interruptions while the other teachers experienced an increase. It is possible that the children formed a connection between the individual presenting the material regarding interruptions and not interrupting that specific person.

Table 1. Number of Interruptions Pre-Intervention

Day	Adult			
	Adult 1	Adult 2	Adult 3	Total
1	8	0	0	8
2	9	2	2	13
3	5	3	1	9
4	4	2	0	6
5	7	1	0	8
6	1	0	0	1
7	1	5	0	6
8	3	0	1	4
9	4	2	2	8
10	6	1	1	8
<b>Total</b>	48	16	7	71

**Mean**      7.1

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Table 2. Number of Interruptions Post-Intervention

Day	Adult			
	Adult 1	Adult 2	Adult 3	Total
1	0	3	0	3
2	3	2	1	6
3	0	1	1	2
4	2	1	1	4
5	3	2	1	6
6	0	2	2	4
7	2	5	1	8
8	1	0	0	1
9	2	4	1	7
10	6	4	2	12
<b>Total</b>	19	24	10	53

**Mean** 5.3

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### **Waiting Necklace Usage**

The waiting necklace was used a total of 13 times throughout the two weeks. An adult coming, after they became available, and assisting the child was the most out of the three options. This chain of events occurred ten different times. There was one situation in which the child put on the waiting necklace and another child came and assisted him or her. Finally, twice a child put on the waiting necklace and was able to resolve the situation independently.

Table 3. Waiting Necklace

Usage

Day	Necklace Usage Conclusion			
	AA	CA	SA	Total
1	0	0	0	0
2	3	0	1	4
3	1	0	0	1
4	0	0	0	0
5	3	0	0	3
6	0	0	0	0
7	2	0	0	2
8	0	1	0	1
9	1	0	0	1
10	0	0	1	1
<b>Total</b>	10	1	2	13

**Mean** 1.3

AA Adult Assisted

CA Child Assisted

SA Self Assisted



### **Children Interacting**

It was found that children were problem-solving over an issue a total of one time. There were 0 times in which a child refused assistance from another child, one time in which the child was invited to assist and did so successfully, and 0 times in which the child was unsuccessful in assisting the other child. This would indicate that the most common interaction resulted in a child successfully helping another child.

To isolate the effectiveness of the Grace and Courtesy lessons, it should be noted that any pre-established situation in which children helped each other problem-solve, such as an older child helping a younger child zipping up their coat, was not added to the tally.

Table 4. Children Interacting

Day	Possible Interaction			
	RH	CHS	CHU	Total
1	0	0	0	0
2	0	0	0	0
3	0	1	0	1
4	0	0	0	0
5	0	0	0	0
6	0	0	0	0
7	0	0	0	0
8	0	0	0	0
9	0	0	0	0
10	0	0	0	0
<b>Total</b>	0	1	0	1

**Mean**      0.1

RH            Refused Help

CAS          Child Assisted Successfully

CHU          Child Assisted Unsuccessfully

**Observations**

There were two instances of children connecting the concept of a problem to the waiting necklace. In one instance the child put on the necklace and when asked by the teacher what their issue was replied, "I guess I have a problem." This comment might demonstrate a lack of understanding in what a problem was or confusion on when to utilize the necklace. Though the separation of when to use the necklace as apposed to applying the other practices was made as clear as possible, the attempt to maintain all three may have lead to some confusion. The second situation was one in which a child came up to an adult who had just stood up and said, "Ms. X, do you see I have the waiting necklace on. I have a problem."

There were also two trends that were observed by the adult noting any general observations. One trend was that the waiting necklace was used more often during class time as the experiment continued and also there were certain children that applied the waiting necklace with relative frequency while other children did not utilize the resource once.

**Action Plan**

These results naturally lead to a desire to investigate more. The procedures could be augmented in several different ways and combined with other factors to seek different results. For instance, in this experiment only one necklace was placed in the classroom. Also, instead of utilizing a pearl necklace, which could have gender connotations, would using a more gender-neutral necklace be of assistance. How would introducing multiple necklaces in various parts of the classroom affect the results? Also, how would including different Grace and Courtesy lessons affect the classroom? Some additional Grace and

Courtesy lessons might be how to wait to talk to someone or how to look for another adult if one is busy.

Additionally, the Grace and Courtesy lessons were given in a group presentation to the whole class. Would splitting the class up into smaller groups have an effect? Also, the children were not given the opportunity to repeat the lesson immediately after being presented. Would personal rehearsal by the entire class be of assistance?

It would also be interesting to see how the necklaces might have an effect if the waiting necklaces were utilized for all interactions the children wish to have with adults. It would not be out of the realm of possibility that the use of various methods of getting the adults attention may have caused the children to be confused. Also, how would the adults taking turns presenting the material make an impact on how many interruptions each adult receives? Despite the thoughtfulness put into each presentation, more thought could only benefit and potentially lead to better wording that might have a stronger effect. One might also include vocabulary related to problem-solving in every day conversation, such as saying, "Oh, let's solve your problem," prior to giving the Grace and Courtesy lessons so that the children were able to develop a concept of the idea of what a problem was prior to the lesson.

Also, the same issue, having difficulty opening a certain box, was used for each presentation to help promote understanding and emphasize the aspect that made each presentation unique. It would be interesting to study what using a different problem for each presentation would accomplish. It would also be of benefit to see how spreading out the lessons might effect the presentation. In this instance the presentations were given in

a reasonably fast succession, what might happen if time was allowed for the children to internalize each presentation, or even the children given a representation.

More than anything the research shows the impact the presenter has on the children and the association the children form between the presenter and what is being presented. It is interesting that in presenting the Grace and Courtesy lessons, the adult may have inadvertently created a connection between the idea of not interrupting and that specific adult. This is evident by the fact that the number of interruptions to the adult who presented the lessons decreasing while the number of interruptions of the other two individuals increased. Would the results be different if the adults took turns presenting and played an active roll?

While this research will have no direct effect on the classrooms at the current moment, the adults will be moving forward attempting to help the children become more and more aware of when to use the necklace. Moving forward, all the adults will also be keeping in mind the relationship between what is being presented and who is presenting to see if this phenomenon might be observed in other situations, such as a child wishing one specific adult to check their work because that adult presented it to them. The possible variations discussed above may also be considered for future implementation.

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**Appendix A**

Dates: \_\_\_\_\_

Number of Interruptions

Mon:	Tues:	Wed:
Thur:	Fri:	Notes:

Mon:	Tues:	Wed:
Thur:	Fri:	Notes:

Mon:	Tues:	Wed:
Thur:	Fri:	Notes:

**Appendix B**

Dates: \_\_\_\_\_

Number of Interruptions

Mon:	Tues:	Wed:
Thur:	Fri:	Notes:

Necklace Utilization:

AA	CA	SA

AA	CA	SA

AA	CA	SA

AA	CA	SA

AA	CA	SA

Necklace Utilized Key:

AA= adult assist (adult came and assisted)

CA= child assist (another child assisted)

SA = self assist (child was able to problem solve independently)

**Appendix C**

Dates: \_\_\_\_\_

Number of Interruptions

Mon:	Tues:	Wed:
Thur:	Fri:	Notes:

Assistance Between Students: :

RH	CHS	CHU

RH	CHS	CHU

RH	CHS	CHU

RH	CHS	CHU

RH	CHS	CHU

Assistance Between Students Key:  
 RH = Refused Help  
 CHS = Child helped and was successful  
 CHU = Child helped and was unsuccessful

**Appendix D**

Dates: \_\_\_\_\_

Number of Interruptions

Mon:	Tues:	Wed:
Thur:	Fri:	Notes:

Comments Heard/ General Observations: