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# The Effects of Record-Keeping on Teacher Self-Efficacy and Student Self-Regulation in the Primary Montessori Classroom

Molly W. Wheeler
*St. Catherine University*

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Molly W. Wheeler

St. Catherine University

St. Paul, Minnesota

Advisor _____          Date _____

Abstract

This paper examines the effects of teacher use of an online record-keeping system on teacher self-efficacy and student self-regulation behavior. Four teachers and thirty-four students between the ages of three and six years old participated in this seven-week study in one of the few Montessori schools in a Latin American capital city. Pre- and post-study data collection methods included a teacher self-efficacy questionnaire and small group discussion, as well as use of the Head-to-Toe Test, a means of measuring children's self-regulation behavior. For seven weeks, teachers used the program Transparent Classroom to record lessons, inform their lesson presentations, and track overall student progress. Through weekly classroom observations, child behaviors hindering and encouraging normalization were tracked with a tally sheet. Data showed increases in both teacher self-efficacy and student self-regulation, especially in children with the lowest pre-study scores, who saw dramatic gains. These results show the use of a record-keeping system may be a means of increasing achievement and satisfaction in both students and teachers.

*Keywords:* teacher self-efficacy, self-regulation behavior, record-keeping

In areas of the world where Montessori teacher certification is not yet available, Montessori school directors must find alternate routes of training staff and achieving an authentic Montessori environment for young children. Undergoing thorough training programs are optimal and obviously recommended; however, not always possible. I currently live in a South American country, working as a certified Montessori consultant for a school aspiring to follow the Montessori method closely. The only certification program on the entire continent is far away in Argentina. The staff at my school has neither the financial means nor the family circumstances to allow such a lengthy and costly endeavor. Until proper training is accessible, other means of professional development can positively impact the content of classroom activity and teachers' belief in their ability to be effective Montessori educators.

I move internationally every few years to countries with little to no experience with Montessori education and have spent a large part of my career educating teachers, parents, and other caregivers on the merits of the Montessori method. I find when educators misunderstand the method, it is poorly executed, leading to less than ideal results in child development. I offer guidance through observations, focused teacher trainings, and environmental design changes, and notice a gradual shift in the teachers' understanding not only of their role as guides, but also of children's true nature.

When I arrived at my current school, many children behaved the way Dr. Montessori spoke of the first children in her charge, as wild monkeys. They lacked motivation, they played like much younger children instead of working on age appropriate activities, as if attempting to communicate a need for greater challenge. Teachers I spoke with continually referenced students' inability to focus and/or poor preparation for certain work. This attitude led to a lack of initiative on the part of the teachers. Materials on the shelves became fewer and simpler until

student behavior worsened even more. After convincing teachers to use the work as a *means* to reach intrinsically motivated, focused behavior, the classrooms became richer and the teacher frustrations fewer. I realized teachers needed a guide beyond myself to chart students' courses through the Montessori curriculum, and they needed to better their record-keeping to observe progress. By turning the responsibility to teachers, I could examine any change in their level of self-efficacy. I wanted to find a way to increase the children's focused behavior on engaging activity and in doing so, study the possible correlation with teacher self-efficacy. Uncertified Montessori teachers do not necessarily lack the motivation for training. Rather, they need a roadmap leading to the cornerstone of Montessori education: student self-regulation.

Surprisingly, the extent to which teacher self-efficacy effects student self-regulation behavior has not been extensively researched. Teachers without access to quality Montessori certification hope to encourage classrooms full of focused, joyful child activity, yet have lacked a thorough guide steering them through lesson presentations. Furthermore, few uncertified teachers record lessons they have either presented or plan to present to students, and few spend enough time observing children working independently. Rather, they can spend a sizable portion of their instructional time trying to quell "misbehaviors," leading teachers to feel less effective and motivated. The purpose of this study was to examine the effect of a Montessori web-based record-keeping system on teacher self-efficacy and student self-regulation behavior.

The following research questions were examined.

1. What effect does the use of a record-keeping system have on the development of teacher self-efficacy?

2. What, if any, effect does teachers' use of a record-keeping system have on student self-regulation behavior?

3. To what extent are TSE and student self-regulation behavior correlated?

## Literature Review

### Child Self-Regulation Behavior

After a great deal of observing young children at work, Dr. Maria Montessori discovered the phenomenon she coined *normalization*, characterized by profound concentration, an affinity for order, spontaneous self-discipline, free choice of activity, independence, initiative, and joy (Standing, 1962). When children are engaged in work that captivates them, they exhibit calm, focused behavior. Studied outside of the Montessori context, *self-regulation* skills allow children to control themselves physically, control their emotions, problem solve, persist at tasks, self-correct errors, sustain attention, and have strong working memory. These skills begin to develop at birth but reach a critical point in the preschool years, making the focus on their development at this age significant (Bronson, 2000). Children in Montessori classrooms develop independent work habits since they direct their own learning, choosing what lessons to work with and for how long. Since the concepts of normalization and self-regulation both pertain to inner discipline, Montessori's concept of normalization can be considered a form of group self-regulation (Ervin, Wash, & Mecca, 2010). In both cases, children demonstrate concentrated effort, persisting toward a task independently without needing to seek attention through inappropriate behavior. They are absorbed in their activity and satisfied physically, cognitively, and emotionally.

### Factors Affecting Self-Regulation

Children do not mature to normalization when they are prevented from acting on their own will, when their will is replaced with that of an adult, or when their environment does not offer developmentally appropriate activity (Standing, 1962). Normalization is an observable phenomenon that cannot be forced upon a classroom but is instead encouraged by teachers who

are trained to observe children skillfully and present lessons at the peak of children's interest. While there has been a renewed interest in the importance of self-regulation skills, Montessori and other educational methods have emphasized them for over a hundred years. In examining the Montessori method specifically, Angeline Lillard (2005) reported on many studies demonstrating the importance of children's sense of control, physical movement, and desire for order, all of which contribute to self-regulation. Lloyd's (2008) study, involving highly experienced Montessori educators, points to additional factors in the Montessori environment that yield concentrated behavior. These include sufficient level of challenge, the fading of self-consciousness, children's sense of time warping due to deep focus, and clear objectives built into concrete materials through which the child receives immediate feedback and enjoyment (Lloyd, 2008). Many studies stressed the importance of child self-regulation skills on learning and future achievement through adulthood (Skibbe, Connor, Morrison, & Jewkes, 2011; Connor et al., 2010). Posner, Rothbart, and Tang (2013) found childhood self-regulation skills to be positively correlated to IQ, health, reduced criminality, and income in adulthood.

**Teacher Self-Efficacy**

Developed by psychologist Albert Bandura (1997), self-efficacy theory is based on the belief in one's ability to be effective despite situational challenges. Teacher self-efficacy (TSE) is not one's actual competence, but the perception of proficiency. It has been identified as one of the few teacher characteristics to affect student learning. Belief in one's ability may be more influential than content knowledge according to Bandura's theory, as self-efficacy is a strong predictor of behavior and therefore, attainment of the set goal (McMahan-Giles, Byrd, & Bendolph, 2016). Friedman and Kass (2002) argued that TSE involves more than knowing how to teach a certain subject. Self-efficacy includes teacher effectiveness at maintaining positive

child behavior, developing an environment conducive to learning, and the effective use of resources.

Tschannen-Moran and Hoy (2007) point out that many environmental factors play into teachers' belief in their successful execution, including quality of school facilities and availability of teaching resources. Mastery experiences have been shown to positively impact TSE more significantly than do verbal interactions with co-workers, vicarious teaching experiences, or psychological arousal, both positive and negative (Tschannen-Moran & Hoy, 2007). This indicates that perceived successful direct experiences with students progressively build teacher perception of future success. While observing mentor teachers may help novice teachers acquire some knowledge, they must practice teaching to gain their own self-perception of success. Self-efficacy improves most when teachers enlist the collaboration of parents and co-workers, engage more in school-wide decision-making, and observe high student engagement, all of which may ultimately lead to higher job satisfaction (Friedman & Kass, 2002; Guo, Justice, Sawyer & Tompkins, 2011).

Teachers measuring higher on the self-efficacy scale are more likely to ask for and receive administrative support and collaboratively design the learning process not only with other teachers but with students themselves. They are also less likely to perceive children as problematic and instead attempt interventions suggested by other professionals in an attempt to redirect child behaviors (Zee & Koomen, 2016). Low efficacy teachers tend to see their work as more custodial or supervisory rather than student-focused (Tschannen-Moran & Hoy, 2001). High efficacy teachers tend to be more student-oriented, have more student-teacher interaction, and differentiate their teaching styles to meet individual students' needs.

**Teacher Organization, Student Observation, and Time Management**

Tschannen-Moran and Hoy (2001) state, "efficacy affects the effort [teachers] invest in teaching, the goals they set, and their level of aspiration. Teachers with a strong sense of efficacy tend to exhibit greater levels of planning and organization" (p. 783). Different educational methods employ various means of organizing instructional time, planning curriculum, and tracking child observations. The Montessori method places particular significance on teachers' astute and intentional observation of children's individual activity and crafting future lessons accordingly. Montessori teachers may schedule blocks of time to watch their students work, a step beyond assessing their progress while completing other work. Teachers, conventional and Montessori alike, have increasingly recognized that differentiating learning for students is more effective at keeping children actively engaged (Subban & Round, 2015). Jones and Reutzel (2012) and Connor et al.'s (2010) findings support the use of individualized instruction in yielding higher self-regulation. Differentiated learning can involve presenting information verbally or visually, as well as overall differences in timing of lessons based on readiness.

The more organized teachers are, both with their lesson planning and presentation of material, the more likely children are to learn. Cameron, Connor, Morrison and Jewkes (2008) found a positive correlation between teachers' informing children of the sequence of steps and expectations involved in the learning process and child academic achievement. They observed that children took more ownership over their learning after the teacher outlined the expectations for productive class time early in the year. This focus on teacher organization also yielded more student-led activity, a key feature of normalization. Furthermore, teachers who are more organized with their time tend to spend less of it in transition and other non-instructional activity.

Children with higher amounts of instructional time show greater academic growth (Cameron, Connor, & Morrison, 2005).

Teachers' self-efficacy beliefs may be most impressionable in the early years of teaching and grow progressively more rigid with experience (Hoy & Spero, 2005). Declines in self-efficacy have correlated with declines in professional support (Hoy & Spero, 2005). Therefore, support for mastery experiences should be fostered intentionally to new teachers to encourage life-long passionate and effective educators. Mahasneh and Alwan (2018) found new teachers training through a project-based (or learner-centered) model showed higher self-efficacy, classroom management skills, and student engagement compared to the control group training in a more conventional model, less directed by the learner. McMahan-Giles, Byrd, and Bendolph (2016) found preservice teachers who enrolled in a methods course with lesson planning as a focus had markedly higher self-efficacy ratings.

Malone (2008) studied the use of personal learning plans with preservice early childhood educators and found that this organization helped them understand teaching materials and their own educational needs, allowing them to feel more capable in the classroom. He also found that having opportunities to practice lesson presentations and reflect on their performance through feedback from co-workers increased teacher self-efficacy. Oliver, Wehby, and Nelson (2015) found that teachers demonstrated greater classroom management skills by observing a mentor teacher, being observed, receiving performance feedback, and finally self-monitoring checklists used as guides for observational methods and lesson-planning. After implementing workshops and a mentoring program for teachers, Domitrovich et al. (2009) found higher levels of complicated student verbal interaction, positive emotional climate, and preventative behavior management strategies compared to a control group without such professional support.

Educators have implemented various means of record-keeping methods as an organizational tool to support academic achievement and classroom management. The online communication and record-keeping systems Montessori Compass and Transparent Classroom provide the scope and sequence of all Primary Montessori lessons, equipped with descriptions and illustrations in multiple languages. By tracking child behavior, lesson choice, and observed level of engagement, teachers can build a shareable path toward academic achievement and child self-regulation. On a group level, researchers can track characteristics of normalization. Long used by Montessori guides in various forms, record-keeping is a powerful means of organization that provides teachers with useful data marking child progress, their reflections, and planned lessons for the future.

Connor et al. (2010) studied the use of web-based software called Assessment-to-Instruction to plan and present lessons. Through this tool, teachers limited non-instruction time such as transitions and discipline, giving more time to instruction and building engaged learning. Teachers' use of this software to plan and organize instruction was correlated with increased child self-regulation primarily by giving small group or individual lessons. Students of teachers who used the web-based software for more minutes per day scored significantly higher on self-regulation assessment tests, such as the Head-to-Toe Test (see Methodology section), than did students of teachers who used the record-keeping method for fewer minutes or not at all (Connor et al., 2010). Connor et al. (2010) found surprisingly little literature on the effect of teacher organization techniques on student self-regulation, yet their study found a correlation between the two. Their findings showed that teachers' access to and frequent use of planning tools led them to plan lessons specifically for certain students. This planning then led directly to higher self-regulation behavior. Though not specifically studied, Connor et al. (2010) discussed the

likelihood that these self-regulation skills are what leads to literacy gains and other academic achievement.

The children who benefited most from this record-keeping strategy were those who began the study with lower self-regulation abilities, indicating a correlation between the two. While multiple sources identified the challenge of teachers' continued use of online observational methods due to technological or time restrictions (Shaw, Pedersen, Cooley, & Callingham, 2013), the repeated benefit of this method is the priority on individualization of instruction.

**Discrepancy in TSE between Montessori and Conventional Teachers**

Teachers who follow student interests and pace of learning tend to have higher self-efficacy ratings (Connor et al., 2010). However, despite the Montessori method's core principle of allowing children to direct their own learning, Ervin, Wash, and Mecca (2010) found lower teacher self-efficacy among Montessori teachers compared to non-Montessori teachers. Ironically, they also found higher self-regulation levels among Montessori children. As previously mentioned (Lloyd, 2008), many characteristics of Montessori classrooms contribute strongly to student self-regulation. Because children in Montessori environments work at their own pace based on their interest and do not produce a large amount of artifact data (such as homework and worksheets), teachers rely more on observational data and lesson tracking to record children's curricular progress and behavior. One could surmise that should Montessori teachers have a more comprehensive means of tracking lessons and overall child progress through web-based programs, Montessori teacher self-efficacy would improve and would likely contribute to higher child self-regulation behavior, especially for those lacking it most. Teachers with conventional teacher preparation reported higher levels of confidence in lesson planning, organizing learning activities, and teaching to a variety of learning styles than did

teachers with "alternative" teacher preparation (Elliot, Isaacs, & Chugani, 2010), where

"alternative" tracks were considered expedited, with minimal supervised teaching practice and

often learning as they teach, rather than slower, more focused programs. Neither teacher training

programs in this study were within Montessori pedagogy, yet we can conclude that the level of

professional support and ability to plan their teaching content contributes to self-efficacy.

**Conclusion**

Self-regulation skills align with Montessori's theory of normalization and have

increasingly become a focus for educators and researchers. To support children's development of

the tools needed to focus attention, remember the task at hand, and control impulses, teachers

must feel effective at their jobs. At the very least, the results indicate a need for greater

professional support in the Montessori system. Without guidance and continuing professional

development, classroom management and teachers' sense of effectiveness can often snowball

downward together. With proper intervention, teachers can become empowered with effective

methods of curriculum implementation leading to child engagement in constructive activity.

Professional development initiates the development of teacher self-efficacy, yet researchers have

used various methods of supporting teachers' effectiveness from observation of mentor teachers,

self-checklists, feedback, and collaborative teaching environments. Studies show a correlation

between the level of teacher self-efficacy and teacher organization (planning, clear explanation

of the learning process to students, and delivering an atmosphere with clear guidelines). Through

a focus on teacher organization, child self-regulation skills develop, and a culture of meaningful,

child-directed, joyful work is more likely to arise. Individualizing learning for each child is a

tenant of Montessori education, and has now been supported by many researchers as a means of

supporting optimal development in children. Due to the specific results of Connor et al. (2010)'s

research, use of a web-based record-keeping system is a valuable model to follow in hopes of increasing self-regulation behavior.

## Methodology

To conduct this study, I used both qualitative and quantitative data collection methods. In June 2018, I met with the four teachers in the study, explained the expectations of them, and asked for their consent to participate. All teachers agreed. Parents of both classrooms were sent a consent letter fully explaining the purpose of the study and what it would entail. All parents gave consent for their children to participate. Participants included a total of four teachers and thirty-four children between the ages of three and six, split into two classrooms. Before implementing the Transparent Classroom system for teacher use, I held a training session with the four teachers and a Spanish-speaking employee of Transparent Classroom in the US, who walked the teachers through all site functions and answered teacher questions. I asked teachers to use the program for an average of thirty minutes per week, more if they desired. Teachers began familiarizing themselves with the program for five weeks, reading lesson presentations and inputting student information. Before the start of the seven-week study, teachers completed a self-efficacy questionnaire (see Appendix A). In order to maintain their anonymity, they wrote the last three numbers of the government issued ID number (which I do not have access to) rather than their name. I did this to encourage honest answers with no perceived consequence of judgement. Teacher self-efficacy questionnaires were numerically scored using a Likert Scale with the options "not at all true," "barely true," "moderately true," and "exactly true" in response to statements about their beliefs of their professional capacity. The rating prompts use first-person perspective and are focused on challenges, as this is where self-efficacy is most tested. The questionnaire was adapted from Schwarzer, Schmitz, and Daytner's (1999) scale created in

accordance with Bandura's Social Cognitive and Self-Efficacy Theories. At the same meeting, I held a semi-structured group discussion with the four teachers in which we discussed their level of self-efficacy and their challenges in the classroom.

Literature repeatedly cited the measurement of children's self-regulation through use of the Head-to-Toe Test (Ponitz et al., 2008). In this test, the adult administering the test instructs children to touch their heads, at which point they must touch their toes, and vice versa. If children were asked to touch their heads (and therefore were expected to touch their toes), they received two points for immediately touching their toes, one point for moving their hands toward their heads but then changed their mind and touched their toes, and zero points for touching their heads. The total number of points from four practice rounds (in which the administrator was able to remind children of the instructions) and ten test rounds were compiled before and after the study. The children's identities were coded to be able to compare changes in the two tests while still maintaining confidentiality. The order of commands ("touch your toes" followed by "touch your head" etc.) was kept consistent between small groups. The test judges children's inhibitory control, working memory, and attention focusing. It has been used to determine the change in self-regulation before and following intervention, providing a simple, fast, and reliable means of data collection (Skibbe et al., 2011; Connor et al., 2010).

I conducted this test in groups ranging from four to eight children, recording the sessions on video to be able to more easily record their responses. Recordings were deleted following data collection and were never shown to anyone else. Children were never aware I was recording them, and the atmosphere was kept casual yet consistent from one session to the next. Some children chose to not participate, and some were absent for an extended period; these children's data were not included in the study. If children began the test but then got

distracted and did not complete it, their data was included. If I could not obtain both pre- and post-study data for children, those sets of data were not included.

For the seven weeks of the study, I observed each classroom weekly for ten minutes at the start of the work cycle and ten minutes at the end. Barring any special event that changed the work cycle times, I observed at consistent times each session to eliminate factors influencing student behavior outside of the overall process of normalization. During these observations, I used a tally sheet (see Appendix B) to note the number of times children worked independently, interrupted other children, consulted with a teacher, wandered through the classroom, used a material as a prop in front of them without engagement, or acted defiantly towards a teacher.

After these seven weeks, teachers completed the Teacher Self-Efficacy Questionnaire again and participated in another teacher discussion. I was then able to compare comments made during the discussion as well as quantitative ratings before and after the study. I conducted the Head-to-Toe Test again for post-study comparisons. Finally, I consulted with Transparent Classroom staff to obtain data on teachers' use of the program. With this data, I was able to compare actual versus anticipated use of the online program controlled for the effect of the program on TSE and self-regulation, thereby examining research question three.

**Analysis of Data**

The purpose of this study was to examine the impact of the record-keeping system Transparent Classroom on teacher self-efficacy and self-regulation behavior of these teachers' students. The subjects of this study included four teachers with one to five years of teaching experience and thirty-four children between the ages of three and six. These teachers and students were spread between two classrooms within one Montessori school in the capital city of a Latin American country. Fourteen of these students were female and twenty were male. The

research questions examined were: 1) What effect does the use of a record-keeping system have on the development of teacher self-efficacy? 2) What, if any, effect does teachers' use of a record-keeping system have on student self-regulation behavior? and 3) To what extent are TSE and student self-regulation behavior correlated?

**Teacher Self-Efficacy Ratings**

To answer the first research question, I asked teachers to rate themselves on ten variables anonymously and privately. Immediately afterwards, they discussed both their feelings of self-efficacy and their observations of child behavior in the classroom. As shown in Figure 1 below, teachers either reported no change or an increase in TSE following the study.

Figure 1. *Pre- and Post-Study Reported Teacher Self-Efficacy Ratings.*
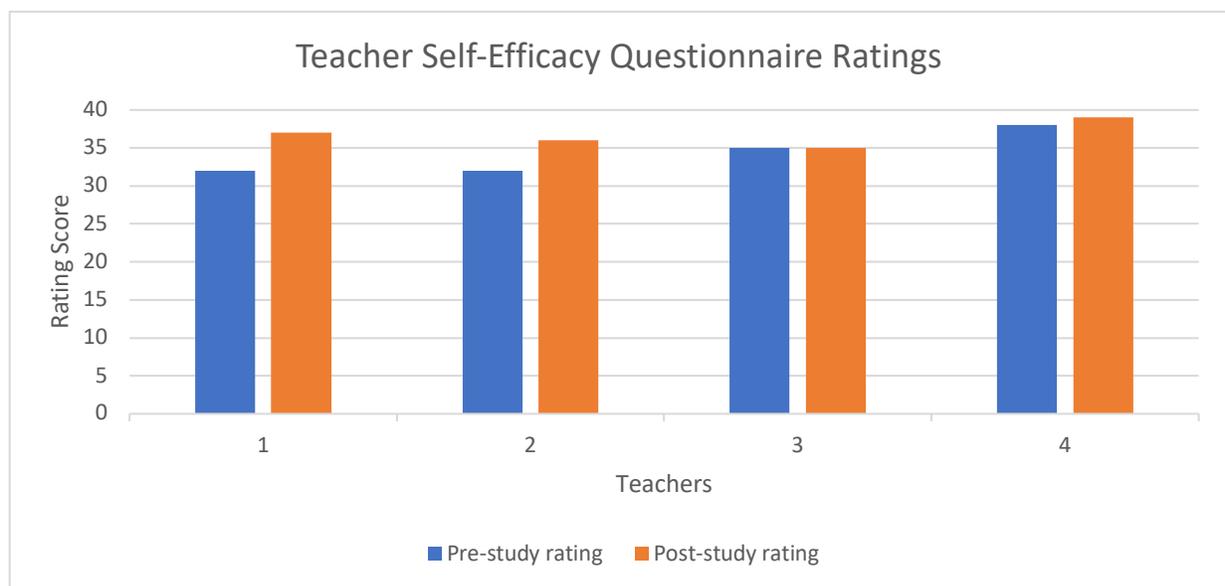


Teacher self-efficacy ratings following the seven-week study increased an average of 2.5 points. Two teachers reported increases of four and five points, while the other two reported no change and an increase of one point. The data points showing the greatest overall increase were the following measures: "I am convinced that I am able to successfully teach all relevant subject content to even the most difficult students," "I am confident in my understanding of the

Montessori philosophy and method for the level I teach," "I am convinced that, as time goes by, I will continue to become more and more capable of addressing my students' needs," and "Transparent Classroom gives me a guide for knowing which lessons to present." Table 1 shows details of these data summaries.

Table 1. *Teacher Self-Efficacy Questionnaire Responses*

| | I am able to successfully teach all relevant content to even the most difficult students. | | | I am confident in my understanding of Montessori philosophy and method for the level I teach. | | | When I try hard, I am able to reach even the most difficult students. | | | I will continue to become more capable of helping address my students' needs. | | | I am confident in my ability to be responsive to my students even if I'm having a bad day. | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | B | F | C | B | F | C | B | F | C | B | F | C | B | F | C |
| Teacher 1 | 3 | 3 | 0 | 4 | 4 | 0 | 3 | 3 | 0 | 3 | 4 | 1 | 3 | 4 | 1 |
| Teacher 2 | 4 | 4 | 0 | 2 | 4 | 2 | 4 | 4 | 0 | 3 | 4 | 1 | 3 | 3 | 0 |
| Teacher 3 | 3 | 4 | 1 | 3 | 3 | 0 | 4 | 4 | 0 | 4 | 4 | 0 | 3 | 3 | 0 |
| Teacher 4 | 3 | 4 | 1 | 3 | 3 | 0 | 4 | 4 | 0 | 4 | 4 | 0 | 4 | 4 | 0 |

| | Even if I get disrupted while teaching, I can continue to teach well. | | | If I try hard enough, I know I can have a positive influence on the personal and academic development of my students. | | | Transparent Classroom gives me a guide for knowing which lessons to present. | | | I am comfortable using Transparent Classroom to organize my time. | | | Using this program makes me feel like a more effective teacher. | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | B | F | C | B | F | C | B | F | C | B | F | C | B | F | C |
| Teacher 1 | 3 | 3 | 0 | 3 | 4 | 1 | 3 | 4 | 1 | 3 | 4 | 1 | 4 | 4 | 0 |
| Teacher 2 | 2 | 4 | 2 | 4 | 4 | 0 | 3 | 3 | 0 | 3 | 3 | 0 | 4 | 3 | -1 |
| Teacher 3 | 4 | 3 | -1 | 4 | 4 | 0 | 3 | 4 | 1 | 4 | 3 | -1 | 3 | 3 | 0 |
| Teacher 4 | 4 | 4 | 0 | 4 | 4 | 0 | 4 | 4 | 0 | 4 | 4 | 0 | 4 | 4 | 0 |

B = Baseline discussion, F = Final discussion, C = Change
1 = not at all true, 2 = barely true, 3 = moderately true, 4 = exactly true

**Teacher Self-Efficacy Discussions**

Comments made during the pre- and post-study were coded in order to find themes among the lengthy conversations. The frequency of these comments is noted below, divided by pre- and post-study discussion for ease of comparison.

Question 1: How do you feel about your understanding of the Montessori method and practice of tracking child progress?

**Pre-study responses.**

*I feel pressure and a lot of responsibility.* (3 teachers responded this way) Teachers reported feeling a high level of pressure to cover the curriculum, a high level of responsibility, and referred to the task as "super difficult." They noted it was a challenge to keep their own voices to a low volume in the classroom. One teacher noted, "people think Montessori is very casual but it's not."

*I know a longer work cycle is probably best, but I can't get my children to focus that long.* Three teachers expressed a desire to conduct their routine in a different way but were hesitant that it would work.

*I want to learn more.* (2 teachers responded this way)

*Teachers reported enforcing guidelines including:* 1) children ask for help calmly when needed rather than yelling across the room and 2) children put their work away when they are finished. One classroom's teachers reported that children seem to work independently more now than before establishing such guidelines. These teachers noted that their students sometimes work all morning and never ask to go outside because they are so focused on their work. These experiences made teachers feel "proud."

**Post-study responses.**

***We use many resources to guide us, realizing there will always be more to learn.*** (4)

***We are more organized.*** All agreed and noted, "we create songs, we talk between ourselves, we read through all the materials on TC and sometimes realize when we have gone astray and try to orient ourselves back to the program. We mark what we have done online, using the photos as guides when needed."

Question 2: When you don't have the professional support you need, how do you find it?

**Pre-study response.**

***We wait to ask an administrator because we don't want to do the wrong thing****. **We use a guide like YouTube videos or printed albums as a reference.*** (4 teachers)

**Post-study response.**

***We have many sources to use as guides, whether co-workers or albums. We see how much more there still is to learn.*** **(**4 teachers)

Question 3: Describe how you handle child behavior problems, including lack of motivation, disrupting peers, and dismissal of teacher redirection.

**Pre-study responses.**

***Our greatest challenge is maintaining children's focus on independent work****.* All teachers felt the number of children felt "overwhelming" and prevented them from giving lessons to every child.

***We remove students from the classroom****.* (2 teachers) Teachers felt it helped disruptive or upset children to have a quiet space with the teacher to calm down.

***We remove classroom materials.*** (2 teachers) If a lesson is mistreated or not complete, they reported taking it out and generally having fewer lessons.

*We redirect them by suggesting a lesson*. (4 teachers) Specifically, teachers gave "impulsive" children physically active suggestions like Walking on the Line in different ways. Teachers noted that this did not work well unless they stayed with the children. When they left their side, children showed a lack of engagement and were "floppy."

*We call everyone to Circle Time when things get out of control.* (2 teachers) The idea of losing control was mentioned three times during this initial discussion.

*Behavior is starting to be regulated by peers, not by us teachers.* (2 teachers) They felt observing peer behavior helped contribute to normalization.

**Post-study responses.**

*Almost all children can sit and work now*. Maintaining order is still a challenge at times, but all teachers said the volume of children's voices has lowered because their volume has lowered.

*We create more lessons and feel more creative*. All teachers reported feeling satisfied that they could use photos of example lessons on Transparent Classroom to create their own materials.

*Children problem solve without needing a teacher more often.* (4 teachers)

*The day goes so quickly with a plan in place and I leave happy.* (4 teachers)

*I feel capable of managing my classroom*. (2 teachers)

Question 4: To what degree do you feel organization (planning lessons, structuring your time, and ordering your physical space) affects your teaching?

**Pre-study responses.**

*We organize who will work with which children*. (2 teachers) One teacher mentioned that she watches for child preparation and tries to maximize co-teacher verbal communication. Children talk during Circle Time about what lessons they will choose that day.

*Many children are not ready for many lessons*. (3 teachers) One teacher noted she felt that three students were "not interested in lessons."

*I don't always know who is ready for which lesson*. (2 teachers)

*I can observe the group when I'm not needed*. (2 teachers)

*I cannot observe the group because I am always needed*. (2 teachers)

*I don't have time to plan and create materials*. (4 teachers)

*When I leave school, I stop thinking about work.* (2 teachers)

**Post-study responses.**

*Children are more relaxed*. (4 teachers) All teachers repeatedly noted an atmosphere of increased calm and peace. All teachers reported having a couple of children who sometimes have a hard time settling into work, but that overall, the classroom is a much calmer space.

*I am calmer and more focused. I can observe the room more now*. (4 teachers) Teachers reported having a plan every day and communicating that plan to the students. One teacher felt she was no longer "hustling children to put things away."

*I am part of a good team*. (2 teachers)

*I evaluate child progress by reviewing a previous lesson with children and showing them how lessons fit into the overall sequence*. (2 teachers) One teacher said, "It's easier to have a resource to guide me. Earlier I didn't remember what I had done and had no record of it." This

teacher had seen progress with children in math because she has time to focus on instruction and review.

*Our students work better when I'm standing or not visible.* (2 teachers) Two teachers felt that when they sit down, children get distracted and come sit with them.

*I teach the lessons I enjoy*. (2 teachers) One teacher enjoys math more than language and vice versa with her co-teacher, so they present lessons accordingly, making sure they cover all subjects between them.

*I enjoy all the lessons.* (2 teachers)

*I feel like I'm not working sometimes because all the children are busy.* (4 teachers) All teachers referenced feeling unneeded at some points and felt "happy" to have achieved that.

*Access to technology allowing us to record lessons was sometimes a challenge*. Having a laptop in the room was sometimes a distraction.

In summary, there was a marked change in tone in the post-study discussion compared to the pre-study discussion. Teachers' outlook changed from generally anxious and negative to calm and hopeful. In response to challenging behavior, the teachers' intention moved from exerting control over the children to focusing on the curriculum and teacher creativity. Before the study, teachers expressed not having time to focus on lessons and were skeptical about not only their students' preparedness for those lessons but also their own ability to identify student readiness. Even though the study gave the teachers what could have been understood as more work, the post-study comments all have an ease about them and a confidence in not only themselves, but also in their students' ability to work and problem solve independently. Changes in TSE were more apparent in the discussion comments than in the TSE questionnaire scores,

which did not change as dramatically. Possible explanations for this are explained in the Action

Plan section.

**Observed Child Self-Regulation Behavior**

To examine the second research question "*What, if any, effect does teachers' use of a

record-keeping system have on student self-regulation behavior?"* I noted the frequency of child

behaviors not conducive to self-regulation as well as frequency of concentrated, independent

work. Figure 2 shows the combined sum of behaviors across both classrooms each week. The

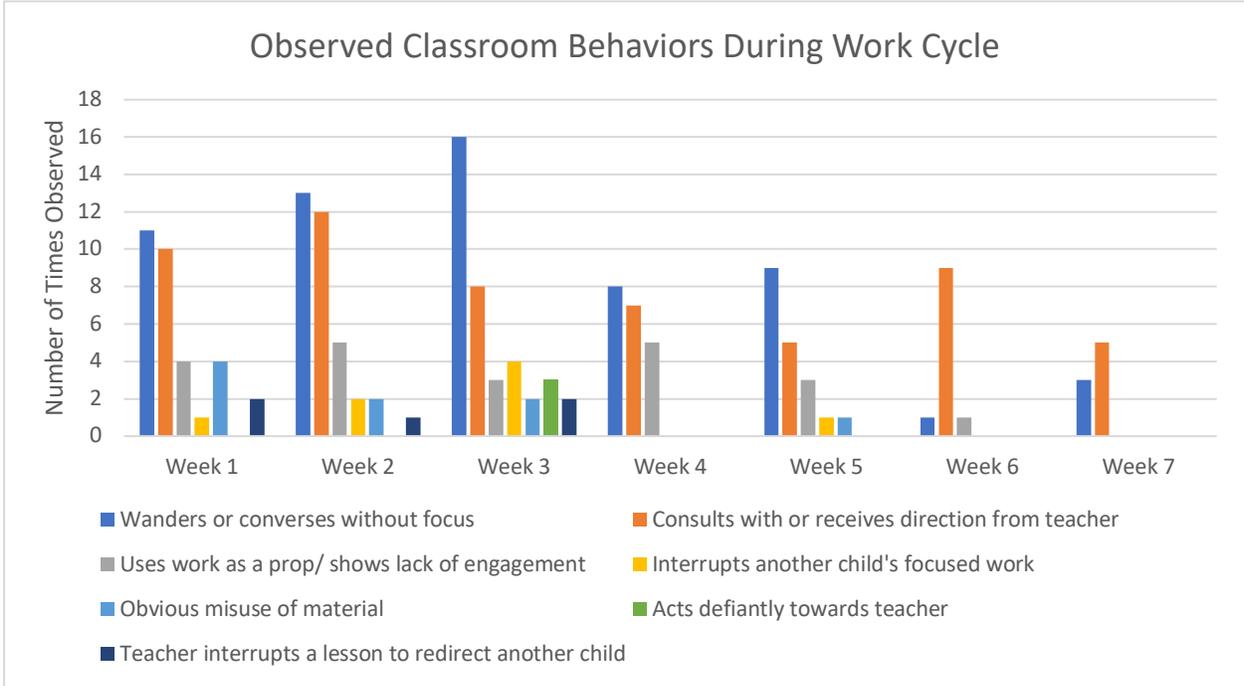two observations from the beginning and end of the work cycle are also totaled together.



*Figure 2. Observed Classroom behaviors during Work Cycle.*

Children's wandering through the classroom increased for the first three weeks and then

decreased sharply through the remainder of the study. Interruptions, both on the part of students

and teachers, ceased entirely for the final two weeks. Consulting with the teacher did not change

dramatically, as many students asked for lessons and had questions about the process of their

material. Obvious misuse of materials fell, as did child defiant behavior.

Figure 3 shows the frequency of positive behaviors that promote normalization in the classroom. Again, the totals of both classrooms and both observations are shown. In Figure 4, however, I have shown the frequency of focused work in the first observation of the day compared with the follow-up observation.
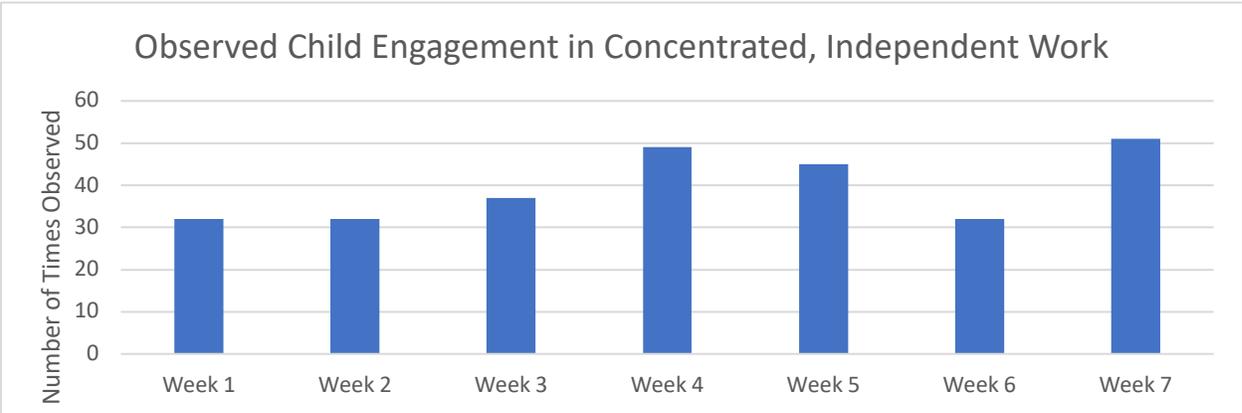


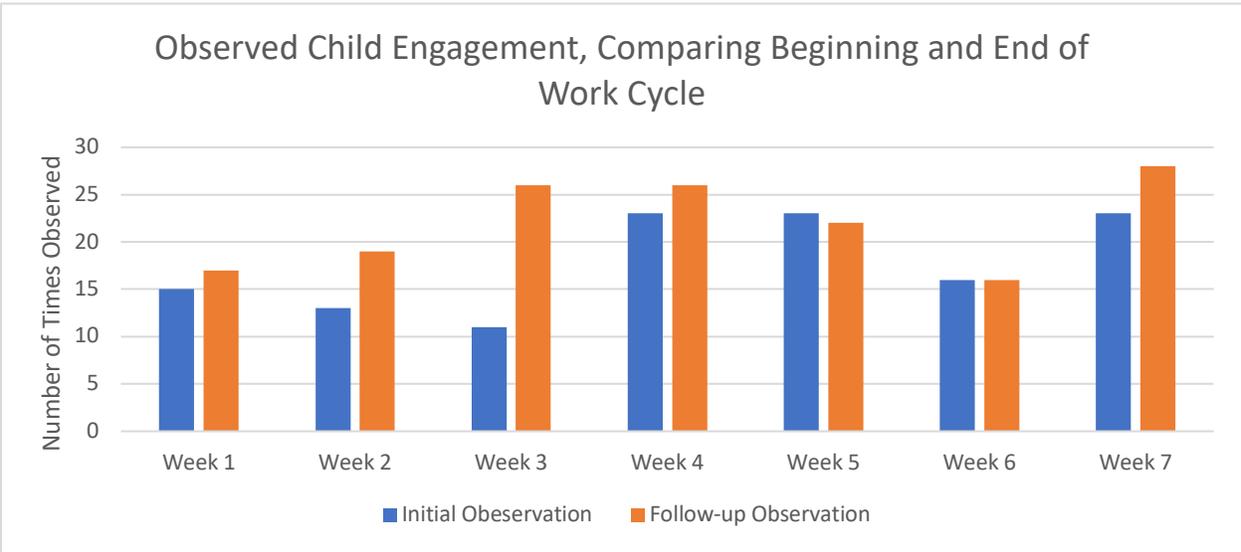*Figure 3. Observed Child Engagement in Concentrated, Independent Work.*



*Figure 4. Observed Child Engagement, Comparing Beginning and End of Work Cycle.*

The tally of behaviors observed shows an increase in children's focused, independent work. Five out of seven weeks, the frequency of this behavior was greater during the follow-up observation at 11:00am than it was at the 9:00am initial observation. This demonstrates

children's tendency to sink deeply into their work over the course of the morning. Weeks five

and six were exceptions to this trend. Two school-wide celebrations occurred during weeks five

and six of the study, so work cycles were shorter and likely consisted of more distracted behavior

because of these changes. Also, in the week six observation of one classroom, a teacher had a

health emergency, which led to a dramatic rise in students consulting with teachers and not

working independently.

Other notable observations include an increase in floor work over the seven weeks of the

study and a decrease in group activity such as communal snack time and playing with play dough

at tables at the decision of the teacher. When teachers introduced an extension of a traditional

material such as cards to guide formation of the knobless cylinders, activity with those materials

increased. Teachers began giving shorter messages to redirect child behavior fewer times and in

closer proximity rather than repeating a child's name from afar. There was an increase in peer

motivation during child-initiated activity. For example, a small group of children in the sixth

week of the study sat calmly around the fabric box, chose who would be blindfolded and then

quietly, yet excitedly, cheered for that child to find a match. In this case, there was never any

teacher intervention.

Another means of collecting quantitative data on any change in child self-regulation

behavior was through the use of the Head-to-Toe Test, conducting before and after the study.

Twenty-one of the thirty-four children in the classrooms completed both pre- and post-study tests

and were therefore used to demonstrate any potential change in self-regulation. Comparison of

pre- and post-study scores on the Head-to-Toe test indicate an overall increase in self-regulation

behavior, by an average of 1.33 points. The exception to the average results was one child whose

score dropped eleven points in the post-study test. Though this is only speculation, I believe she

was distracted that morning after arriving late and not having begun her day with the typical

routine, but instead coming straight to the small group test. Further study would be needed to

verify this finding. Removing this one child's data, reveals the average increase in score to be

nearly two full points (1.95).

Table 2. *Change in Head-to-Toe Test Scores*

| Child | Pre-study Score | Post-Study Score | Change |
|---|---|---|---|
| 1 | 5 | 7 | 2 |
| 2 | 6 | 0 | -6 |
| 3 | 10 | 19 | 9 |
| 4 | 13 | 22 | 9 |
| 5 | 13 | 17 | 4 |
| 6 | 16 | 16 | 0 |
| 7 | 16 | 24 | 8 |
| 8 | 17 | 19 | 2 |
| 9 | 19 | 22 | 3 |
| 10 | 21 | 10 | -11 |
| 11 | 21 | 21 | 0 |
| 12 | 23 | 24 | 1 |
| 13 | 24 | 27 | 3 |
| 14 | 24 | 27 | 3 |
| 15 | 24 | 23 | -1 |
| 16 | 24 | 27 | 3 |
| 17 | 24 | 24 | 0 |
| 18 | 26 | 27 | 1 |
| 19 | 27 | 27 | 0 |
| 20 | 27 | 25 | -2 |
| 21 | 28 | 28 | 0 |

When grouped into children who scored under 20 in the pre-study test and those who

scored over 20, the greatest gains were shown in the children who began with lower scores. Two

children raised their score nine points, and one eight. The average difference in the lower pre-

study score group was an increase of 3.44 points, whereas the average difference in the higher

pre-study score group was 0.72 increase (again, after removing the outlier's data). While nearly

all children scored higher on the post-study test those beginning with lower self-regulation scores

showed the greatest gains.

**Use of Transparent Classroom's Connection to TSE and Self-Regulation**

The final research question asks, "*To what extent are TSE and student self-regulation*

*behavior correlated*?" The overall increases in TSE and self-regulation appear to be correlated.

This study is not testing for causation, though I would like to draw a correlation between TSE

and child self-regulation by examining the impact of the record-keeping program's structure. To

do that, it is important to note with what regularity teachers were actually using Transparent

Classroom. At the start of the study, teachers were asked to use the program for a minimum of 30

minutes per week. There was no expectation for the number of lessons recorded.
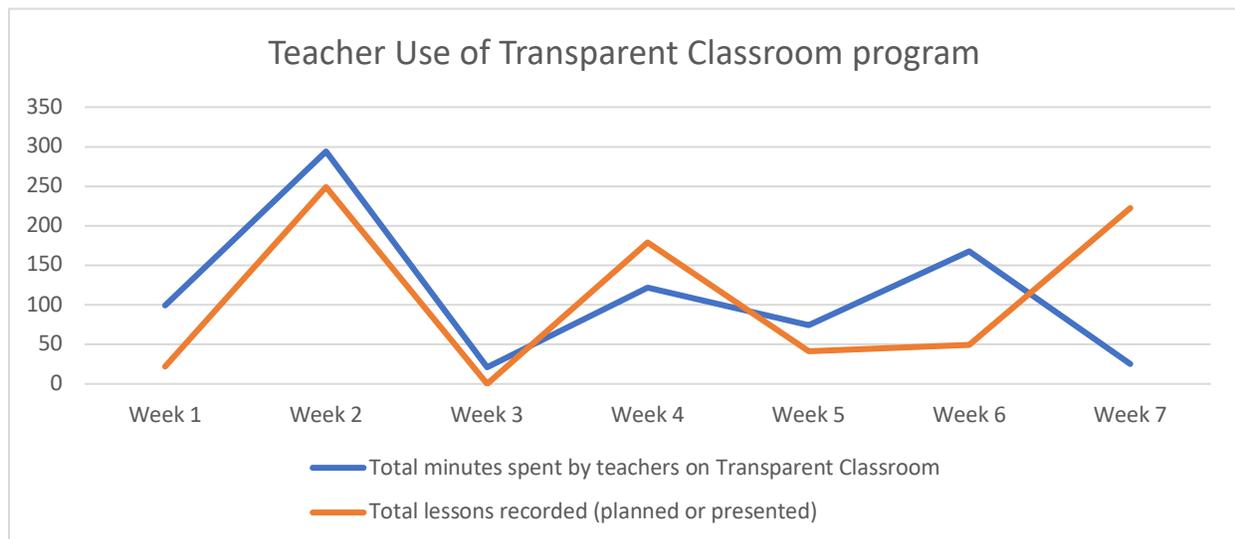


*Figure 5. Teacher Use of Transparent Classroom.*

Figure 5 shows teacher use in both minutes and number of lessons recorded was rather

irregular. However, with the exception of week 3, teachers did use the program for more than the

minimum number of minutes (thirty) per week expected of them. When cross-referencing this

data with child behavior observation data, one can see an increase in children wandering

aimlessly during week three with a sharp decrease in teacher use of Transparent Classroom during the same period. Though it is not the aim of this study to determine if low teacher use caused an increase in wandering behavior, it is a notable correlation. Teachers expressed that access to tablets or computers needed to record lessons or research lesson presentations was sometimes a challenge, as they did not want children to see the screen.

**Action Plan**

The goal of this study was to examine the effectiveness of teacher use of Transparent Classroom to support teachers' belief in their ability to be successful in the classroom and children's ability to focus their attention on joyful work of their choosing. When I began my work with this school, I found children generally under stimulated intellectually and physically. Our ultimate goal as Montessori educators is to achieve normalization in the classroom. This phenomenon can be observed when teachers prepare the appropriate level of challenge in a caring, beautiful, and rich environment. My hope was that this tool would give teachers a guide beyond myself that they could return to as needed and one that would be easily digested by a group of young, technologically savvy professionals.

The findings of this action research support the use of an online record-keeping system such as Transparent Classroom to increase TSE and child self-regulation skills. Although it is difficult to control for all variables including school events that affect the classroom work cycle, there was an increase in focused behavior on the part of students and an attitude of tranquil confidence on the part of teachers. This study has not attempted to argue that increased TSE is what directly causes higher self-regulation behavior, but the two show a correlated relationship. This study was designed specifically around uncertified Montessori teachers who do not have access to a formal training site. An important question to further examine is what specific

support Transparent Classroom yielded that increased TSE. Does simply having instruction on lesson presentations and the sequence of said lessons increase TSE or is it the focus on planning instructional time? Future research could delve deeper into this question.

After seven weeks of using the Transparent Classroom program, teachers reported a greater sense of calm, focus, and satisfaction in their work. They felt they had a plan and knew how to execute that plan. If they hit roadblocks, they had resources to work around them. I found it surprising that teachers rated their self-efficacy so highly in the pre-study questionnaire. Out of a possible forty points, they average pre-study score was thirty-four. The teachers had little formal Montessori training and few years of experience, which I saw reflected in their professional self-efficacy in the form of verbal comments during our training sessions. Because of these feelings of inadequacy and confusion, I was expecting lower pre-study scores. In the country this study was conducted, it is not culturally common to admit any level of weakness. This may have caused teachers to inflate their initial self-efficacy. Another explanation for the high initial TSE scores could be that there were only four response options on the questionnaire (one through four). This format may not have collected the most accurate data reflecting teacher self-efficacy perceptions. Future research may wish to offer more scoring options and perhaps different criteria on which teachers rate themselves.

Students who demonstrated higher self-regulation skills did not show much change over the course of the study. However, the children who began with low self-regulation scores increased their scores dramatically. In this way, the intervention narrowed the gap between children and created the atmosphere that encouraged low-scoring children to choose and engage in classroom materials. Connor et al. (2010) also found that children who began the school year with weaker self-regulation skills demonstrated significantly greater gains than those with higher

pre-study scores following teacher use of an online record-keeping system. These researchers also saw children cause fewer overall disruptions and saw more child-directed activity. By focusing on the development of these skills in the preschool years, we help set children in most need of these executive function assistance on a path of lifetime success. It seems preparing teachers to set the climate of engaged learning can be a keystone to this process.

By encouraging teachers to be more intentional in the use of their time and proactive in the materials they created and presented, I saw a shift towards teacher camaraderie and energy. Teachers began posting the food preparation lessons they planned to present in the teacher room, giving one another ideas, motivation, and pooling their needed resources to shop for one another. This built a sense of community by giving them a concrete goal. They spent child rest times discussing changes in child behavior and their own attitudes toward work. The outcome that gives me most satisfaction and pride- not in my work but in theirs- is that, as this school year ends, we plan to have 100% teacher retention for next year. Last year, the school lost at least half its staff. It appears teachers view their work and their ability to do it in a much different light than they previously did. My hope is that their finding greater satisfaction in work they love will urge them to continue it.

Over the course of this study, various limitations became apparent. One limitation was that I was unable to collect pre- and post-study scores on the Head-to-Toe Test for all students observed in the classroom. Three children in the two classrooms have been diagnosed with Autism Spectrum Disorder and have personal aides present in the classroom to assist them. These children did not participate in the Head-to-Toe Test, nor did students who had extended absences from school during the study period. Another child, who had extreme difficulty making choices in the classroom, happened to leave the school in the first two weeks of the study. It is

impossible to know if any change in overall classroom behavior or TSE was affected simply by

his absence and not the intervention alone. Another limitation is the short duration of the study.

Due to the relatively short nature of this study, future research on self-regulation may wish to

include more tests than one pre- and one post-study test to have more data. It may also account

for other variables that may affect children's scores. Normalization in a classroom and

familiarization with online systems take time, and a longer study may uncover useful factors

related to self-regulation and TSE that this study only began to explore.

It is important to note that this intervention takes time to record and plan, a luxury some

teachers do not feel they have. It also carries a cost of one dollar per child per month and requires

access to either a computer or tablet. Having this tool in the classroom is not always possible or

may become a distraction to children, yet the results seem to argue that by changing teachers'

focus away from putting out behavioral "fires" and towards observation, lesson planning, and

practice presenting lessons, normalization is more likely. Teachers are also more likely to feel

more effective and simply put, happy in their work. As a result of these findings, I will continue

supporting the use of this record-keeping system. I will encourage the practice of classroom

observation and self-reflection as a means to encouraging normalization and also teacher self-

efficacy and staff retention.  If funding or time constraints prevent extensive use of Transparent

Classroom, use of a trained teacher's albums, regular teacher trainings, and paper-based lesson-

planning and record-keeping methods may also be effective in working towards an increase of

TSE and child self-regulation.

As a final note, this study does not attempt to argue that replacing Montessori

certification through an accredited training site with use of Transparent Classroom is advisable.

However, the demand for Montessori schools around the world is eclipsing the rate at which

training sites are becoming available worldwide. In countries that have no training site at all, it is

worth examining alternatives that employ trained Montessorians as guides. I believe it is worth

giving deserving children the best possible option until Montessori-certified guides, training

centers, and Montessori-accredited schools become more prevalent world-wide.

Appendix A

**Teacher Self-Efficacy Scale Questionnaire**

Adapted from Ralf Schwarzer, Gerdamarie S. Schmitz, & Gary T. Daytner, 1999  At StatisticsSolutions

(Retrieved from https://www.statisticssolutions.com/teacher-self-efficacy-scale/)

Please answer the following as honestly as possible, as findings of the action research depend on
the provided answer. There will be no penalty for any response given and your
participation is optional.

Beside each statement, mark your level of agreement according to the following:

(1) not at all true, (2) barely true, (3) moderately true, (4) exactly true

|  |  | 1 | 2 | 3 | 4 |
|---|---|---|---|---|---|
| 1 | I am convinced that I am able to successfully teach all relevant subject content to even the most difficult students. |  |  |  |  |
| 2 | I am confident in my understanding of Montessori philosophy and method for the level I teach. |  |  |  |  |
| 3 | When I try really hard, I am able to reach even the most difficult students. |  |  |  |  |
| 4 | I am convinced that, as time goes by, I will continue to become more and more capable of helping to address my students' needs. |  |  |  |  |
| 5 | I am confident in my ability to be responsive to my students' needs even if I am having a bad day. |  |  |  |  |
| 6 | Even if I get disrupted while teaching, I am confident that I can maintain my composure and continue to teach well. |  |  |  |  |
| 7 | If I try hard enough, I know that I can exert a positive influence on both the personal and academic development of my students. |  |  |  |  |
| 8 | The Transparent Classroom gives me a guide for knowing which lessons to present. |  |  |  |  |
| 9 | I am comfortable using Transparent Classroom to organize my time. |  |  |  |  |
| 10 | Using this program makes me feel like a more effective teacher. |  |  |  |  |

Appendix B

**Child Self-Regulation Behavior Tally Sheet**

Recorded for 10 minutes at the beginning and end of each work cycle observed

Initial Observation:

| | **Primary Behavior** | **# Times Observed** | **Totals** |
|---|---|---|---|
| Child Behaviors | Engages in concentrated, independent work | | |
| | Wanders or converses without focus | | |
| | Consults with or receives direction from teacher | | |
| | Uses work in front of him/her as prop, shows lack of engagement | | |
| | Interrupts another child's focused work | | |
| | Obvious misuse of material | | |
| | Acts defiantly towards teacher | | |
| Teacher Behavior | Teacher interrupts a lesson to redirect another child | | |

Observational Narrative:

Follow-Up Observation:

| | **Primary Behavior** | **# Times Observed** | **Totals** |
|---|---|---|---|
| Child Behaviors | Engages in concentrated, independent work | | |
| | Wanders or converses without focus | | |
| | Consults with or receives direction from teacher | | |
| | Uses work in front of him/her as prop, shows lack of engagement | | |
| | Interrupts another child's focused work | | |
| | Obvious misuse of material | | |
| | Acts defiantly towards teacher | | |
| Teacher Behavior | Teacher interrupts a lesson to redirect another child | | |

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