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ROLE OF TECHNOLOGY IN THE FIDELITY OF IMPLEMENTATION
A STUDY ON THE IMPLEMENTATION OF THE MONTESSORI METHOD ONLINE

MA thesis

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Abstract

The study explored how the Montessori Method was implemented through Zoom for pre-primary students based in India. The study examined whether the core elements of the Montessori Method were fully implemented while adopting it online.

The data collected through observation and interviews show that the implementation of Montessori Method is compromised. The challenges of adopting the conventional Montessori Method on a modern online platform like Zoom, were also studied. The data shows that implementing the Montessori Method's essential components in its entirety on an online platform such as Zoom presents several challenges. It is found that both teachers and students deal with these challenges. Nonetheless, there was evidence of pupils responding well to learning because parents accepted and shared the responsibility of the teacher.

Keywords*: Online Montessori Education, implementation fidelity, technology in education, Montessori Method, challenges in Montessori implementation*

Table of Contents

1. Introduction

Numerous curricula and teaching strategies are used in the current educational system to instruct pupils in accordance with various age groups. These techniques typically have some genuine components, as they were first developed, planned, and put into practice by the creator (Carroll et al., 2007). Following these real components yields the desired effects for the pupils' growth (Gresham & Gansle, 2002). As time passes, the faithfulness with which the educational approaches are implemented changes. The main reasons for these changes could be cultural, societal, environmental, or technological (Holmes, 1912).

Prior to the COVID-19 pandemic, that is, prior to 2019, only students enrolled in postsecondary education institutions frequently received instruction online (Chen et al., 2020). It wasn't a common practice to teach pre-primary, primary, middle school, or higher secondary school students online (Mishra et al., 2020). However, the pandemic has introduced a novel approach to education—online instruction for children as young as three years old. During the past two years, online education for school students has started picking up momentum (Mishra et al., 2020). A quick Google search would turn up hundreds, if not thousands, of K–12 schools that are popping up all over the internet. The best part is that a large number of these institutions accept students from all around the globe and have the necessary accreditations and recognitions. (Salsberry, 2010). Like any other traditional brick and mortar school, the institutions take pride in their own curricula and accolades (Salsberry, 2010).

This study aims to determine how technology influences the adoption of a Method like Montessori, being taught on an online platform like Zoom, against the backdrop of this shift to online education. The main focus of this research project is if the fundamental components of the Montessori Method can still be delivered using technology.

1.1. Statement of the Problem

Montessori education is facing a global crisis today, all the more so during and after the pandemic, even though it is demonstrably consistent with the science of healthy child development and learning (e.g. Marshall 2017; Lillard & Else-Quest 2006). This is because the program has adopted unconventional delivery methods, such as online platforms like Zoom (Miulescu, 2020). Strong academic and social-emotional outcomes are demonstrated by a properly incorporated Montessori

school system (e.g. Diksha 2016; Lillard 2005). However, despite spending decades *on the fringe* of mainstream education, it is reported to be diminishing (Whitescarver & Cossentino, 2008). The low application fidelity of the Montessori principles and philosophy is one of the causes found. The more schools neglect to fully and accurately apply the fundamental principles that make up the *Montessori Method*, the more the efficacy and demonstrated quality of Montessori education are misunderstood (Lillard, 2019). Hence, many times, a preschool's name with the word *Montessori* attached could just suggest that it's a preschool; it has nothing to do with the educational tenets of the Montessori movement (Lillard, 2019).

One of the countries Maria Montessori picked to share her method was India. (Debs, Mira 2022). In the Indian subcontinent, the Montessori Method's history began in 1915. Through the efforts of Maria and Mario Montessori in India between 1939 and 1949, the Method was disseminated throughout the Indian subcontinent. Since then, for almost a century, Montessori education in India has undergone numerous local adaptations and changes (Debs, Mira 2022). Therefore, the adaptation of online platform used to deliver Montessori education in India is the main emphasis of this study. This would not only narrow the research gap regarding the fidelity of online Montessori education implementation, but it would also narrow the research gap regarding the fidelity of online Montessori education implementation in the country India.

According to a sample study carried out in 2016 by *First Crayon* in Mumbai, a city in northern India, 30% of pre-schools, or roughly 500 schools, use the term Montessori and are chosen by parents over other schools because they are Montessori (Jain, 2016). But according to the report, just 7 of the 500 schools are still traditional Montessori schools, in keeping with the Montessori pedagogy (Jain, 2016). The *basic essential elements* of the Montessori Method appear to be primarily misapplied in Montessori schools, despite the fact that they are still seen as a distinctive alternative to regular mainstream pre-schools and remain on the perimeter of mainstream education (Debs, 2022)

Variations may occur, as previously stated, to some extent. For social, political, cultural, and technological adaptation, it is inevitable (Holmes, 1912). To maintain its demonstrated importance, distinctiveness, and efficacy—which give children's holistic development a distinct advantage over traditional education—the fundamental components of Montessori education must be followed (Lillard, 2005).

Therefore questions arise as to, whether a method like Montessori, which is based on manipulative and sensorial learning with specially designed Montessori materials, could implement all the components of authentic Montessori education in an online learning environment, as opposed to in-person instruction. The two main questions seeking answers in this study are How Montessori Method of teaching is implemented via online platforms for school children and what would be the challenges faced during the online implementation of the Montessori Method?

1.2. Research Purpose, Aims, Objectives, and Research Questions

The purpose of this study will be to explore and understand the application of Montessori Method online, to deliver the lessons. The study aims to understand the newly evolving virtual Montessori education in India, while using technology that is an online platform like Zoom, to impart the lessons. The research objective is to explore and describe how the Montessori Method is implemented, while it is delivered online to children of the age group 3 to 6.

The results of the research will be useful for the stakeholders of Montessori education, to know, how a method like Montessori, is being implemented and delivered via an online platform like Zoom. The results could inform the stakeholders like parents, if it is worth the time and money to invest in online education. The results could inform the educators of the implementation gap and put them in a direction toward corrective action.

Following are the research questions that is addressed in this study

- How Montessori Method of teaching is implemented via online platforms for pre-primary children, aged 3-6?
- What are the challenges encountered by educators, in fully implementing the essential elements of a Montessori classroom, while delivering online lessons?

This thesis is organized in chapters. Following this first chapter of the introduction, in the second chapter, the literature on the Montessori Method, Online education, Online Montessori education, and Implementation Fidelity is reviewed. Following this, the Research design, Methodology, and Methods of data collection and analysis, are presented in the third. In the fourth chapter, the analyzed data is presented. Under the final chapter, discussion, conclusion and limitations are presented.

2. Theoretical Overview

The Montessori Methodology is a unique educational approach that Italian physician Maria Montessori developed. This approach was founded on an educational theory to address the developing child's demands (Lillard, 2008). This method was designed with the needs of the child in mind, encouraging a desire for learning through internal motivation as opposed to external rewards (Lillard, 2016). A teacher's role was described as a conduit between the classroom and the outside world, enabling students to learn by introspection (Barbieru, 2016). According to Maria Montessori, children go through sensitive times during learning and development, and that self-construction in children can be enhanced by having them participate in self-directed activities in a setting that has been specifically prepared (e.g. Montessori 1912; Montessori 1964).

The oppressive nature of previous teaching methods, which denied children the freedom to explore and learn, worried Maria Montessori (Lillard, 2008). Montessori insisted that we *follow the child* since she thought that children learn via activities (Lillard, 2005). She further believed that preparing a nurturing environment makes children self-learn through creative activity and exploration (Montessori, 1964). As a result, Montessori firmly believed that her approach would transform both society and education. As a result, her theory developed and was essentially transformed into the five fundamental components of a Montessori classroom (Lillard, 2005).

2.1. Essential Elements of a Montessori Classroom

The primary educational concepts and principles of Montessori are implemented in a regular classroom setting. According to the American Montessori Society (AMS), below are the five main elements (e.g. Montessori, 1964; Montessori, 1988) that are determined and enumerated as necessary for the high-fidelity application of the Montessori Method's principles.

- Trained Montessori Teachers

  High-fidelity Montessori instruction could be implemented by a teacher who has received the appropriate training in the method. A teacher's job is to see a child's natural gifts and abilities and to help them down the path to learning by serving as a mentor, guide, and facilitator (Sibel et al., 2016).

- The Multi-age Classroom

  Children are grouped by age in order to facilitate peer learning. Three age groups are merged with the purpose of fostering student leadership and teamwork; in preschools, this may mean children from ages 2.5 or 3 to 6 (Alwi et al., 2021).

- Using Montessori Materials

  The purpose of Montessori materials is to provide students a hands-on learning experience. Materials are used to help children transition from the concrete to the abstract, or from practice to theory, by providing a concrete understanding of an abstract concept (Lillard, 2008).

- Child-directed work

  Students are allowed to select their preferred work based on their interests, and children are not subject to standard assessments and grades in order to promote intrinsic motivation and increased attentiveness (Lillard et al., 2017).

- Uninterrupted work periods

  A block of uninterrupted work time, lasting up to three hours, is provided to students so they can work at their own pace and focus on the materials until they are satisfied. The five aforementioned elements mainly define the Montessori education in practice (e.g. Montessori 1964; Lillard, 1996).

  If compromised in practical application, this may indicate that the implementation integrity of the Montessori classroom is not being met. The term *fidelity of implementation* (FOI) or *implementation fidelity* describes how the program or intervention is being carried out by its original conception, design, or intended use (Carroll et al., 2007). We will delve into greater detail about the concept of *implementation fidelity* later in this chapter.

2.2. Adaptability vs Authenticity

The practice of Montessori education dates back more than a century. Its adaptability might be partly responsible for its longevity (Lillard, 2012). Changes are unavoidably necessary when applying the Montessori Method to adjust to various social situations as they arise (Holmes, 1912). Additionally, there are risks associated with blindly embracing an educational approach like the Montessori Method, which emerged more than a century ago in a context very different from our own (McDermott, 1957). Thus, flexibility becomes essential. Increased adaptation may also

indicate a decrease in fidelity and authenticity (more details on this in the research review), which would mean the Montessori Method would no longer be as effective.

2.3. Adaptability of Montessori Method to Online Environment

When COVID-19 forced traditional brick-and-mortar schools to close worldwide and, unexpectedly, approximately 1.2 billion children were left out of the classroom, the adaptability of a traditional pedagogy such as Montessori to technology began to change (World Economic Forum, 2020). E-learning was created as a result of remote instruction using digital platforms (Chaney, 2010). Institutions were compelled to employ Zoom, which offers free virtual meetings for up to 100 participants, or Google Meet (Dhawan, 2020). Google Classrooms were used for announcements, online conversations, assignment evaluation, and the exchange of course materials (Dhawan, 2020). Some parallels are drawn between the Montessori Method and online learning, bringing out the compatibility between them (Sue, 2020).

First of all, the Montessori Method is self-paced, claims Sue (2020). Children are allowed to pick and select which topics they want to learn in their timeline. According to Sue (2020), this is also the primary element of online learning. Second, independence is a requirement of Montessori. Similar to in-person instruction, online learning necessitates that students be largely independent and unmonitored by teachers (Sue, 2020). Thirdly, a comprehensive family approach is necessary for Montessori. In a similar vein, most online learning takes place in the coziness of one's own home, with the presence of one or more parents or other family members (Sue, 2020). This argument makes a strong case for the Montessori Method's suitability for online instruction. On the other hand, the actual workings of the Montessori Method's online implementation. Nevertheless, further research is needed to determine the practical workings of the online Montessori Method implementation.

2.4. Montessori Implementation Fidelity

The idea of ‘integrity or adherence’ or ‘implementation fidelity’ refers to comparing implemented programs to their original program design (Dane & Schneider, 1998). The four major components of the implementation are participant responsiveness, program delivery quality, exposure, and adherence (Dane & Schneider, 1998).

- Adherence refers to whether the Montessori Method is being delivered as designed, with all essential components being delivered. Trained Montessori teachers, using the right protocols, using Montessori-prescribed materials, techniques, locations, and contexts.
- Exposure refers to the number of sessions, the length of each session, and, in the Montessori Method, an uninterrupted block of time.
- Quality of delivery refers to the manner in which a teacher teaches the program. This element in the Montessori approach could refer to a prepared setting and a teacher who serves as a mentor, guide, and observer of a student's natural abilities.
- Participant responsiveness is the extent to which children in Montessori classrooms are engaged and involved in activities and content of the program.

Table1: Implementation Fidelity of the Montessori Method

Components of Implementation Fidelity	**Elements of the Montessori Method**
1. Adherence	Trained Montessori teacher. Montessori prescribed materials. A full set of Montessori materials is available. Multi-age classroom (3 age levels) Student-chosen works. Children regularly prepare food.
2. Exposure	Long uninterrupted blocks of time
3. Quality of Program	Prepared environment. Trained Montessori teacher. Teacher as a mentor and guide Absence of grades and tests. Observation is used for daily lesson planning. Children's activities are recorded each day.
4. Participant Responsiveness	Children's responsiveness and learning. Children give lessons to one another.

Source: (e.g. Dane & Schneider, 1998; Montessori, 1964; Murray et al, 2019)

Table 1 represents the four components of *implementation fidelity*, determined under the corresponding *elements of the Montessori principles* put in practice in the class rooms. *Implementation fidelity* may be higher or lower, meaning, well-implemented or poorly implemented, depending on how closely a program or educational approach is followed from its original design, verifying adherence, exposure, program quality, and participant responsiveness (Lillard & Angeline 2012). Student learning gains in *classic (higher fidelity) Montessori programs* and *lower fidelity Montessori programs* and *other preschool programs* were compared in a study conducted by Lillard & Angeline (2012). According to Lillard & Angeline (2012) children who attended traditional Montessori programs showed *significantly greater school-year gains* in reading, math, vocabulary, executive function, and social problem-solving compared to their classmates who attended less authentic Montessori schools or Montessori-affiliated schools. Reduced fidelity in implementation has an adverse effect on the program. Program outcomes are hampered by lower implementation fidelity (Lillard & Angeline, 2012). High Implementation Fidelity is critical for any educational approach, including Montessori, as it regularly demonstrates improved program outcomes for the target and intended audience (e.g. Lillard & Angeline, 2012; Gresham et al., 1993). When the program's essential elements are determined and defined beforehand, and then periodically reviewed to guarantee compliance, high-quality or high-fidelity implementation can be achieved (Gresham et al., 1993).

The key components of a Montessori education—structure, curriculum, and freedom—are all included in the instruments that Murray et al (2019) designed to measure Montessori teaching practices. Human learning research already supports the efficacy of several of these components (Lillard, 2005). Additionally, research has shown that a Montessori education that adheres to the founder's ideals can help children develop socially and cognitively (Lillard, 2012). High fidelity program implementation almost always yields better results from implementation fidelity analyses, also known as process evaluations (e.g. Fors & Doster,1985; McGrew et al., 1994).

Nonetheless, inadequate application of the Montessori Method is currently observed globally (Debs, 2021). There is no trademark for the Montessori Method (Whitescarver & Cossentino, 2008), and many schools utilise the name without even following the most fundamental components of the approach (e.g. Lillard & McHugh 2019; Daoust, 2004), which is blatantly against the Montessori principles. It's simple to infer that Montessori education becomes

ineffective when proper implementation guidelines are not observed (Lillard and McHugh 2019). The challenge is in applying the method with more exactness rather than ineffective Montessori instruction (Lillard, 2012). As a result, the idea of implementation fidelity becomes particularly crucial for Montessori education (Lillard, 2012) to maintain the important elements that distinguish it from mainstream educational methods.

Research about Online Montessori implementation is very limited. Hence, this study attempts to narrow the gap in the literature about the implementation of Montessori Method online among the pre-primary students.

2.5. Benefits and Challenges of Online School

According to studies, there are advantages and disadvantages for students between the ages of three and nineteen who choose to learn online. Due to the greater costs involved in operating a physical school, one advantage of online learning is its overall affordability (Liyanagunawardena & Aboshady, 2018). Students now have more control over their learning. The location, duration, and speed of learning are all decided by the learner. More self-learning assignments allow students to construct new knowledge (Eastmond, 1998).

Transitioning from usual instruction in the traditional classroom to online cyber-rooms presents significant structural, psychological, and pedagogical challenges (Stone & Perumean-Chaney, 2005). Less individualised training and personal attention are the drawbacks of online learning. More than twice as many early childhood instructors reported that their children received the same materials, lessons, and assignments, making it impossible for them to provide the individualised attention and guidance that comes with teaching in a traditional classroom setting (Murray et al., 2021a). There is no physical movement allowed and students are limited to using laptops or computers. It is found that teachers cannot effectively support students' freedom of mobility through online learning (Gillett-Swan, 2017). It is more difficult for young pre-primary pupils, ages 3 to 6, to sit in front of a computer and communicate with a teacher who is not physically there (Murray et al., 2021a). Attaining the desired learning outcomes requires a strong sense of self-motivation, the ability to work independently while maintaining discipline, and self-regulation—the capacity to control one's attention, thoughts, and actions (Berger, 2011); emotional regulation—the ability to manage one's emotions positively for learning (Graziano et al., 2007). For young learners, this can be particularly difficult (Cerniglia, 2011). According to Khalil et al

(2020) and Stone & Perumean-Chaney (2005), another issue with the digital divide is the absence of resources such as a computer, laptop, internet connection with necessary broadband connections, and other peripherals such as webcam sound systems.

2.6. Benefits and Challenges of Online Montessori School

Regarding the online Montessori Method, there are benefits as well as drawbacks. The Montessori Method is centered on tactile and sensory learning in a traditional setting (Lillard, 2016). It entails using resources to provide learners with tangible learning experiences, which eventually helps them grasp abstract concepts. Students study a variety of subjects using appropriate Montessori-designed materials in a physically prepared space that is exclusively provided by the teacher (Lillard, 2016). Children in multi-age groups collaborate to exchange knowledge and work for continuous blocks of time either alone or in groups (Montessori, 1964).

In an online Montessori program, the pedagogy and principles of Montessori should be implemented in a virtual environment to educate children in accordance with their developmental needs and sensitive times as defined by Montessori (L'Ecuyer et al., 2020). The development and delivery of high-quality online courses are dependent upon the effective translation of established pedagogies, such as the Montessori Method, into an online setting (Sloboda, 2005). Before the Covid-19 pandemic, there was no such thing as online Montessori education. However, the COVID-19 virus's outbreak made it necessary to offer Montessori education online. The primary advantages of the Montessori online programs are as follows: firstly, they provide every child with an equal opportunity to study using the Montessori Method, particularly in situations where there are no reasonably priced brick and mortar schools in the area (Black et al., 2019). Second, just as in a traditional online school, time and location are flexible, allowing teachers and pupils to work from the comfort of their homes and set their own schedules (e.g. Hodges et al., 2020; Stafford, 2020; Brown, 2019). Thirdly, parental involvement and communication with their children develop spontaneously (Konca, 2021). Lastly, the self-paced nature of the Montessori Method promotes independence and self-correction; online learning at home would be a perfect setting for these principles to be implemented (Sue, 2020).

After weighing the advantages, it becomes necessary to evaluate the challenges that online Montessori education presents. First and foremost, the learners encounter two challenges: first, the child's home does not have the prepared environment found in a brick-and-mortar Montessori

school (Murray et al., 2021b); second, the child is unable to engage in direct contact with the teacher, which results in a lack of personalised instructions. For younger children sensorial learning is prioritised, therefore schedules with more limited screen time are typically advised. Additionally, this makes the shift to an online setting for early childhood Montessori classes challenging (e.g. Powell 2016; McDonald 2016). Distractions at home leads to inadequate learning, which is another problem for children in an online Montessori classroom (Li & Lalani, 2020). Second, there are obstacles that Montessori teachers should overcome. Murray et al. (2021b) discovered that these hurdles included transferring the in-person Montessori atmosphere to an online format. A study by Miulescu (2020) highlighted the challenge of converting in-person lesson plans and curricula into online content that is age- and developmentally-appropriate for young students. Thirdly, additional institutional difficulties are found. A study conducted by Murray et al (2021a) among Montessori instructors revealed that one of the challenges was allowing children to choose their own tasks and giving them access to Montessori resources. A barrier for each child who is at home is the expense of the Montessori items, as well as their availability, convenience of acquisition, and ease of shipping (Murray et al 2021a). Furthermore, the cost is not split up and shared like it is in a physical classroom. Although the online Montessori Method offers advantages such as accessibility, reachability, and convenience due to freedom of space and time, it still is in its early stages of development, and there are more obstacles to overcome than the benefits (Scott & Myers, 2021).

3. Research Methods

The purpose of this study is to find out how the Montessori Method is delivered online by incorporating all the core elements of the Montessori Method. The goal of the study is to improve the online delivery of the Montessori Method. It is a descriptive and explorative study; hence, qualitative data is sought. Qualitative research helps to explore a topic in depth, promotes discussion, and is an emergent method that is quite flexible (Maxwell, 2016). It also allows for exploring complex phenomena that may not be achievable through quantitative research methods (Hennink et al., 2020). Another reason for finding the qualitative approach to be a suitable method for this study is because the teachers are considered the main actors who directly implement the Montessori program. It becomes necessary to draw from the teachers (through class observations and interviews) the relevant primary data about how the Montessori program is implemented and the challenges faced during its online implementation. There is not much research in this field of

online Montessori implementation. Using the Indian context as a case study, the online implementation fidelity of Montessori education is studied. Since the core elements of Montessori education are used as a framework to study the online implementation fidelity of the Montessori Method, a deductive approach is adopted. The suitability of qualitative research designs like ethnography, grounded theory, phenomenology, ethnography, narrative study, and case study (e.g. Creswell & Poth, 2016; Creswell, 2014) was evaluated and considered to answer the research questions. This research is done to gain an understanding of Montessori implementation in the group or situation of an online Montessori classroom. Eventually, case study research strategy was chosen because it is a form of qualitative investigation that helps determine meaning, explore processes, and gain insight into an individual, group, or situation (Lodico et al., 2010).

3.1. Data Collection

This qualitative case study aims to describe and investigate Montessori fidelity when adopting online delivery methods. In addition, the study also sets out to comprehend teachers' perspectives of challenges when putting the Montessori curriculum into practice via online platforms. Data collection in a qualitative method is based on words from respondents to draw from individual viewpoints connected to a bigger research problem (Creswell, 2012). The choice of the right data collection instrument is very essential for a research study (Creswell, 2014). The qualitative design utilised in this study has allowed for multiple sources of data, such as observations, interviews, and document analysis. This triangulation of data sources gives a more comprehensive understanding of the Montessori implementation fidelity in an online Montessori classroom (Patton, 1999). As mentioned earlier, in this qualitative study, based on the sources of the data, non-participatory observations, semi-structured interviews, and document analysis were employed as the data collection instruments. The type of data is more descriptive. The semi-structured nature of the interview questions allowed the participants the flexibility to respond to the questions with all possible views they held regarding the online Montessori implementation (Creswell, 2014).

3.2. Participants

Initially, the pre-primary and elementary groups of students were considered to be the observation unit to find out how the implementation of the Montessori Method is carried out by online means to learn the challenges faced during the implementation. However, the school to which access for observation was granted permitted to observe only the pre-primary group of students (3-6 years) as the school was adopting a combination of methods of curriculum with the older students. Hence, online Montessori implementation for the pre-primary group of students, aged 3-6, was chosen for observations to study the online Montessori implementations and the challenges encountered during their implementation.

Eight non-participatory observations were carried out on eight different days. Non-participatory observation was chosen to not cause any interruption to the learning of the student's group. To more deeply observe, non-participatory observation seemed more appropriate. The class duration was two hours, with short breaks. Two hours of session usually begin with a warm-up activity involving physical movement, followed by learning the English language, then a new concept like *Far and Near* or the life cycle of plants or animals is taught, followed by math, and then a real life-based story is read out, followed by culture (maps), and then a final circle time. More or less, in all the eight observed days, the schedule was similar, with subjects like English, math, science, and culture being taught in the two-hour session. The predetermined implementation fidelity framework was used as a guideline to write down the notes on observation of the sessions. Any data observed outside of the framework was also written down for analysis and to seek answers to the research questions.

A focus interview was planned initially to obtain rich data on the challenges faced by the online Montessori teachers in implementing the Montessori online program. However, in reality, only two teachers agreed to answer the interview questions. Besides signing the confidentiality agreement with the institution, participants were informed that participation is voluntary and that at any time they could withdraw from giving interviews (Merriam, 2014). Semi-structured interviews with open-ended questions were used to avoid the potential for the interviewer's prejudice of limiting the data with a set of predetermined questions (Barriball & While, 1994).

3.3. Data analysis

Thematic analysis is used to analyse the data collected through observations and interviews. Stemler (2001) proposes two approaches to data coding: preset coding, which creates codes beforehand, and emergent coding, which creates codes from the text. Determining if the pre-defined code could be applied to raw data is an important step in creating a framework for data analysis (Boyatzis, 1998). In this study, both predetermined codes and emergent codes are utilised to analyse the data. Descriptive observational notes were made during the observations, and the interview was transcribed. Pseudonyms, not real names, are used throughout the research process, including analysis. During the first step of analysing the observation data, initial themes from predetermined and emergent codes were identified, and examples were collected to support each of the themes. Then broader themes were identified, and the previous ones were categorised under them. Thus, arrived at the final two themes. The two primary research questions posed by this study were addressed using these final themes.

4. Results

A summary of the results for each of the two primary research questions posed and addressed in this study is provided in this section.

Table2: Research Themes

Research Questions	**Main Themes**	**Sub-Themes**
RQ1. How the Montessori Method of teaching is implemented via online platforms for pre-primary children, aged 3-6?	Implementation Fidelity of Online Montessori Method	1. Adherence 2. Exposure 3. Quality of Program 4. Student Responsiveness
RQ2. What are the challenges encountered by educators, in fully implementing the essential elements of a Montessori classroom, while delivering online lessons?	Challenges encountered in the online implementation of the Montessori Method	1. Learner's Challenges 2. Teacher's Challenges

		3. Challenges common to Teachers and Learners

The answers to the two primary research questions are provided in several sub-themes under the two predetermined main themes (4.1, 4.2), which correspond to the two primary key questions. This is shown in the *Table 2* as presented above.

4.1. Implementation Fidelity of Online Montessori Method

Finding out how much (lesser or more) the fundamental elements of the Montessori Method—having a qualified teacher, using materials recommended by Montessori, grouping students according to age, having them choose their own projects, and incorporating 'practical life module' into the curriculum—are being followed when providing Montessori education online constitutes an assessment of the method's implementation fidelity. Along with the program's quality of delivery and the students' assessment and responsiveness—whether good or bad—during the online Montessori Method delivery, the frequency of exposure is also taken into consideration. The results on the elements of the Montessori Method—Adherence, Exposure, Program Quality, and Student Responsiveness—are given below in order to address the initial research question regarding the method's online application. The observations and teacher interviews are the source of the following results.

4.1.1. Adherence

Two of the five fundamental elements of the Montessori Method are found to be uncompromised when the five pre-primary pupils under observation are using the Zoom platform to learn through Montessori Method. The first element that is observed to be uncompromised is the class taught by 'Montessori trained teacher'. The appropriate use of materials to enhance students' concrete experiences in efficiently learning concepts and theory through hands-on experience is another crucial component that is found to be uncompromised during implementation. It is discovered that the other elements—collaborative learning, student choice autonomy, and the practical life component—are compromised during implementation. The following sections provide more

explanations of the findings of each compromised and uncompromised component during the online application of the Montessori Method.

Trained Montessori Teachers

Teresa and Cathy, the teachers in this study who are observed and interviewed, are both fully qualified Montessori teachers with training from accredited Montessori Institutes in India. Teresa had experience with the Brick and Mortar Montessori School prior to implementing the Montessori Method in an online classroom. Cathy has no prior experience teaching in a brick and mortar school and simply began using the Montessori Method in an online setting. Both, however, are certified and skilled to instruct children in the age range of three to six using the Montessori Method.

Use of Montessori prescribed materials for teaching

Teacher Teresa utilised the *Stamp game material* to teach place value and fundamental arithmetic operations for two-, three-, and four-digit numbers. The lessons progressed from static and dynamic addition, subtraction, and multiplication to dynamic division, giving the students a concrete experience with the materials to an abstract understanding of the arithmetic operations.

Similarly, students were taught about the provinces of India, the continents, and the nations of the world through the use of the *Puzzle Maps of India and the world*, which provided them with a tangible opportunity to touch and feel the puzzle pieces of the maps while also learning about the locations, their capital cities, and their theoretical significance. Teresa frequently employed whole sets of blue geometric solids to understand the shapes, as well as their dimensions and characteristics.

In addition to the materials, it is observed that the books and flashcards are modified for the online setting. The lifecycles of plants and animals, as well as concepts like ‘Near’ and ‘Far’, are being taught using the virtual flashcards. Science-based narratives about animals and their lifestyles are also taught through virtual books. It is also noted that ideas and theories are directly imparted through PowerPoint presentations without the need for materials.

Regarding the use of Montessori materials online, Teresa responded as follows:

“Since it is a two-hour class period, I am unable to facilitate, self-exploration of materials"

Cathy responded as follows, *"The constraint I face is the range of materials sent to teachers and children is limited for utility, due to cost. This to a certain degree, is a constraint".*

Multi-age group/Collaborative learning

There are five children in the observed pre-primary group, ranging in age from 3.5 to 5. In spite of the multiple age groups, there is no collaborative learning environment, older students teaching younger kids, no academic or social interaction of any kind.

Teresa responded to a question on whether teachers could help pupils interact with one another by saying *"Limited time and break-out rooms might be complicated for younger students"*

Cathy responded by saying *"As students grow older, it is possible to facilitate communication within them"*

Student-chosen works /Autonomy

It is noted that during the two hours of the regular timetable, the pupils' flexibility to select their task was curtailed. The majority of the time, the use of resources, and the activities are all observed to be according to the teacher's pre-planned daily program. It is noticed that the teacher occasionally asked the students if they would want to solve the math problems on their own to help them in revision. After the two-hour period, the kids select a topic they are interested in and dedicated roughly twenty minutes of undisturbed attention to it. It is called 'circle time'. The teacher is seen asking the kids, *"What would you like to do?*" during this circle time. Ann claims she wishes to sketch. Without any noise others start sketching too.

Practical life /activities for gross and fine motor skills

The practical life module is supposed to be taught for at least twenty minutes every day of the academic calendar, according to the school's website timetable. However, no part of the practical life module—which is essential for the growth of kids' gross and fine motor skills—is discovered to be included. Only once, during the eight observation sessions, did the teacher and the kids cook the salad together. Regarding the facilitation of practical life, Cathy responded as follows

"It *is difficult because the other modules are considered important and easily given priority. I think even parents prefer it this way, to teach Math, English, and Science instead of practical life. Maybe children will like more of practical life module."*

4.1.2. Exposure

Compared to the typical six to eight hours of student-teacher contact in a traditional physical Montessori environment, it is found that the students' exposure to the Montessori lessons is extremely limited. The lessons last only two hours per day, five days a week.

4.1.3. Quality of Program Delivery

Prepared environment

It is discovered that Teresa is unable to assist in setting up the physical surroundings for the students, which includes giving them a sequence of materials and curricular areas that are clearly defined and organised. She did, however, succeed to an extent in setting up through the virtual setting by modelling it and telecasting it using her camera. Teresa stated in the interview that she helps parents, especially moms, who are involved in setting up the atmosphere for their kids through a shared *WhatsApp Group* that was made just for the parents and teachers of the kids. The day before, the teacher informs the parents of the necessary arrangements for the following day's lesson. By being present near their children it is seen that the mothers are actively assisting the kids. The parent and the teacher work together to set up the virtual Montessori school environment.

Shared Montessori roles of teacher and the parents

Further observation reveals that although the teacher plays the main role of Montessori instructor, moms in particular are observed mentoring and assisting their children at home by setting up study tables, providing materials, rephrasing questions from the teacher and hinting the answers. Particularly, the mother of the students Lara and Sara (sisters) are observed assisting the kids during the lesson. Eva's mother is also seen to be constantly there to assist her. On occasion, it is also observed that other mothers assist their children in repeating the concepts taught by the teacher.

Teacher as a Mentor and Guide

Despite being physically separated from the students, the instructor is frequently observed to be successfully assuming the position of a mentor and guide and making an effort to maintain an emotional bond with the kids. Teresa frequently inquires of Eva whether she comprehends, given Eva's seeming lack of participation. When Ann is discovered sobbing and complaining that she is having trouble finishing a drawing assignment, Teresa gives her the advice, "*Never give up, keep trying, you can do it*." On another day, at the start of the Zoom session, Ann could be heard talking

to the teacher about how nervous she is about her new swimming lesson. Teresa comforts her once more, telling her that 'don't worry, with practice, you will become better'.

Student Evaluation

In order to go to the next lesson, questions about the previous lesson are asked of the students after it has been taught, rather than using grades and tests to gauge their progress. Teachers interviewed for this study revealed that students' development is tracked on a regular basis in accordance with policies set by the school administration. "*For me, Zoom recording comes in handy, to refer back about the child,*" adds Cathy.

4.1.4. Student Responsiveness

Children's Engagement

When students follow the teacher's example and start paying attention, they are found to be understanding and responding favorably, with accurate answers, most of the time. However, at first, they struggle with organizing the contents. It is discovered that students become less enthusiastic about the teachings when there are no materials available, as opposed to when materials are used to teach new concepts. The results of use of the online Zoom platform to apply the Montessori Method are shown above. The next section presents the findings of the challenges faced in implementing the Montessori Method online.

4.2. Challenges of Online Montessori Method Implementation

The following are the barriers or challenges that are identified to be inhibiting the proper implementation of the Montessori Method online. The issues are divided into three categories: learner challenges, teacher challenges, and challenges common to learners and teachers.

4.2.1. Learner Challenges

The findings through both observations and interviews of teachers Teresa and Cathy, revealed the following challenges, for the young learners:

Using imitation or substitute materials

Montessori materials composed of natural materials, such as wood, are not given to students. While some materials, like the geometric solids, are made of wood, others, like the plastic materials, are made of synthetic materials like plastic. According to Cathy during the interview, the purpose of

the plastic material is to keep the cost of materials for each child low because it is not shared as it would be in a real Montessori classroom.

Noises and distractions at home

Many instances of phone conversations can be heard from the student's residences. For instance, during a math session, the father of Ann is overheard talking on the phone for nearly thirty minutes. These noises never worried Teacher Teresa. Ann's mother is also heard conversing with someone else for roughly 10 minutes at home. Often, there is a background sound—a cooker whistle. Children are seen conversing with their parents more frequently. Lara and Sara, two sisters who are students, are frequently observed conversing with one another while utilising the same laptop without turning it off. Dogs barking, background music playing, cooker whistles, and other background noises are occasionally heard clearly, though their particular sources sometimes are unknown. All of the parents of the students are frequently overheard repeating the teacher's advice to help their kids. However, in material-based sessions, two of them in particular—Eva's mother and Diana's mother—act as second teachers by literally repeating to their kids what the teacher says. Most of the time, Ann, Lara, and Sara are heard thinking aloud while doing the math problems.

Lack of connection with the teacher and other students

The majority of the time, Eva is seen relying on her mother and not connecting directly with the teacher; all five students were found more communicative with their mothers than with the teacher; Ann is the only student who is found to be frequently talking to and questioning the teacher; Additionally, it is discovered that there is not enough social interaction amongst students to satisfy their need for connection. Ann is a talker by nature, but she never approached other pupils to strike up a conversation instead she frequently interrupted the teacher or talked to her mother. It is discovered that other pupils also spent most of their conversations with their parents, infrequently with the teacher, and never with other students.

Challenges of self-regulation and emotional regulation

When it comes to keeping the student’s study space organised, adhering to schedules, scheduling breaks, and controlling their emotions, the students are seen to struggle greatly with self-regulation. One time, Ann—who usually comes out as bold and talkative—broke down in tears and claimed she didn't know how to design a teddy bear using the geometrical solids. Eva also flatly refused to respond to a question in another instance. She didn't respond or inform the teacher that she requires

assistance because she didn't know the answer. During the session, Ann is seen disappearing from the screen, to fetch some items or drink. Not everything she required was on hand at her table.

4.2.2. Teacher Challenges

Lack of training and limited availability of materials

Both Teresa and Cathy, the teachers who are interviewed, expressed their opinion that even though unofficial Montessori communities and groups are attempting to support one another, it is still difficult to stay up to date with the latest online Montessori practices because even the most knowledgeable individuals appear to be still experimenting with this relatively novel delivery method. Although the school had provided some basic in-house training, Cathy stated that there is no official training available for delivering the Montessori program online. Teacher Cathy stated that because of the increased costs, a smaller selection of materials are shipped. Lessons must therefore be created with the materials available in mind. Teresa also commented about the materials that due to the non-availability of materials, some concepts have to be taught with digital materials.

Inability to facilitate child-led learning and the challenge of parents co-teaching

According to Cathy, the lack of time and physical separation prevents kids from having the chance to independently explore the materials under the teacher's observation. Teresa claims that the kids are unable to fully examine the materials they want to while she is observing them because of the time constraints. It is noted that children are not given many options to select from, explore, and learn on their own because of the restricted access to the wide variety of Montessori materials. Academic topics are observed to be given priority. Although the practical life module is listed on the time table of the school website, it is not seen to be followed in the actual class schedule. According to Teacher Cathy, priorities are set aside because Indian parents are particular that their children understand academic subjects in the allotted two hours. The teacher faced further difficulties when her communication is frequently cut off when she co-taught with parents. For example, the mother of Diana explains without muting when a child didn't seem to grasp the teacher, while the mother of Eva repeats everything the teacher said afterward. Parents co-teaching is a chance to improve the children's online Montessori education. It is seen to remain as a challenge as well.

Communication gap and Inability to facilitate Collaboration

Teresa believes that when a teacher is physically absent, it is more difficult for the students and the teacher to communicate. A communication gap arises when there is a lack of both physical presence and emotional connection with the youngsters. Teresa expressed optimism that it might be feasible to help the students communicate with one another as they became older and more talkative. In response, Cathy said that the teacher needs to be animated throughout the lesson, keeping the material engaging and tailored to the needs of the students at that particular moment. It can be difficult to meet someone's requirements and comprehend their mental state when you are not physically present, she adds. According to Cathy, it gets more difficult to foster discussion and cooperation in break-out rooms because the students are younger. There is less interaction because each student has their own set of resources to work with.

Concepts feeder vs observer, mentor, and guide

In contrast to a traditional classroom, Teresa believes that observation is more challenging because it might be challenging to read a child's emotions or thoughts through a camera. "*It is difficult to always have a full view when the child works with materials,*" Cathy said. In order to demonstrate how the resources are used, parents do not use or supply second devices like the teacher does. According to both teachers, their responsibility is limited to teaching academic lessons, and they don't have enough time or space to observe, mentor, and guide the children who have emotional needs for learning and sharing.

4.2.3. Challenges common to learners and teachers

Technological interruptions

Numerous instances of network problems for students and teachers are noted during observations. Diana refrained from participating on a specific day due to an outage of power. Eva missed a session on a different day because of an issue with her Internet connection. It is noticed that the Zoom session ends in the middle of meetings almost every other day, even though the teacher notifies the students in advance that the session would end in five minutes and they must log in again. Teacher Teresa experiences occasional difficulties with her internet connection, and occasionally the problems with the connection cause her second gadget to malfunction.

5. Discussion

The Montessori Method's Compromised online Implementation

Because the Montessori Method is self-paced and promotes independence and self-correction (Montessori, 1912), it has all the necessary components to be delivered online (Sue, 2020). Online learning at home would be the perfect setting for these principles to be easily practiced. In contrast to Sue's (2020) assertion, this study's results provide strong evidence that the Montessori Method is not fully applied online, when using the fundamental components of a Montessori education as a frame of reference. Furthermore, the aforementioned conclusions from this empirical study using interviews and observations show that the online application of the Montessori Method is diminished.

Montessori trained teachers are the element that is implemented without compromising. Two aspects that are either better executed or less compromised are *the student evaluation* and the appropriate use of *Montessori materials* in online instruction. On the other hand, the aspects that were discovered to be inadequately executed include the training of teachers for online Montessori instruction, student collaboration, child-led learning, regular implementation of practical components, appropriate exposure to Montessori lessons, setting up the Montessori environment, and the teacher's role as a mentor and guide. The best possible use of Montessori materials for instruction has been made possible by the fundamental element, namely the *Trained Montessori teachers*. However, the other crucial components of the Montessori Method—such as the teacher's incapacity to facilitate collaborative learning and serve as a mentor and guide—are negatively impacted due to the compromised element of the Montessori teachers' insufficient training for the *online delivery* of the method. It's possible that the instructors would have implemented some of the aforementioned Montessori components more successfully if they had received training on online education and access to current technology tools.

Given that Montessori materials are seen as the second teacher (Lillard, 2012), effective use of these resources by teachers appears to be a factor in the pre-primary program's continued success. Despite the numerous compromises in the Montessori implementation, student response can be considered to be good during observations. This is a result of parents actively stepping in,

to take the position of the teacher. These and the compromised elements described under "online implementation challenges" are further covered in detail and with explanation.

Online implementation challenges

The numerous online execution challenges with the Montessori Method are revealed to be the cause of the compromised implementation. The following paragraphs in this section go into detail on these highlighted challenges in the context of previous literature.

Lack of Online adaptation training

Despite having received formal Montessori training—one of the teachers even having extensive Montessori experience in a brick and mortar school—both of the Montessori teachers interviewed for this study appeared to find it difficult to implement all of the fundamental Montessori components in an online setting, as previously discovered by researchers Murray et al. (2021b) and Miulescu (2020). This is a result of inadequate training in utilising technology and adjusting to the novel virtual learning environment, which is necessary to completely convert the offline Montessori setting into an online one. According to the teachers surveyed for this study, it would be beneficial if they had received training on how to use online resources and what to do and not do when implementing the Montessori Method virtually.

Access to Montessori Materials

Although the study's finding regarding the element of Montessori materials is less compromised than that of the previous survey conducted among Montessori educators by Murray et al. (2021a), giving children the freedom to choose their assignments and granting them access to Montessori materials was found to be a challenge in this study as well. As already discovered by Murray et al. (2021 a), the expense of the Montessori materials, their availability, and the convenience of obtaining and shipping them, for every child who is located at home, continue to remain a difficulty. In contrast to previous studies, this study has demonstrated an interesting finding: to promote sensory learning, synthetic materials like plastics are used in place of natural materials like wood. In some ways, this addresses the issue of the Montessori Materials' affordability, but it is ineffective since it prevents the child from having a real sensory experience (Montessori, 1995). Another outcome from this study indicates that the only digital material substitutes being utilised for training to keep younger pupils' short attention spans active are *virtual flashcards*. Still, this will prevent students from engaging in tactile and sensorial learning—two crucial components of

a true Montessori education (Jones, 2017). The research conducted by Murray et al (2021b) discovered that parents might be educated by teachers to create materials at home. Nonetheless, the analysis of the teacher interviews in this study offers a unique alternative that involves finding pre-owned Montessori materials in the secondhand market or borrowing them from the school or other students, adhering to the idea of a *Montessori Materials library*.

Collaborative Learning and Child-led Learning

Despite the presence of multi-age grouping, a crucial Montessori component of collaborative learning was noticed as being absent from the group. The children's considerably younger ages and the physical distance within the virtual world are the causes of this. Therefore, the teacher's essential task is to help the younger children communicate with one another. Since the students are too young, even a break-out room can't be provided for them. This result supports the research of Stone and Perumean-Chaney (2005), who hypothesised that there would be significant pedagogical, structural, and psychological difficulties in transferring instructions that naturally occur in traditional classrooms to online cyber-rooms.

Time and material limitations prevented students from having the freedom to select the materials they wished to study (as previously noted). As a result, the child has little choice in selecting the lesson they wish to learn. Given that the example concerns younger pupils in an online Montessori class—as previously documented in a study by Cerniglia (2011)—teachers may find it difficult to give their students the flexibility to select their own assignments due to the latter group's lack of emotional and self-control. In addition to the teacher, parents' participation might also make it challenging to give pupils the autonomy they require to pick the lessons they are interested in learning. Consequently, the teacher confronts the major problem of being unable to support child-led learning because of the physical distance, the students' relatively younger ages, and the use of limited materials. In place of the observer, mentor, and guide roles that Montessori prescribes, the teacher is compelled to assume the nearly exclusive position of the *concepts feeder*. This is once more a result of the student's relatively young age, time and material constraints, and the parent's priority to cram or feed in the academic concepts. Therefore, it is discovered that child-led learning—which Maria Montessori (Montessori, M. 1912, 1964) originally intended to promote intrinsic motivation and increased attentiveness for the students—is lacking. In order to support child-led learning, more hours per day could be added. This would change the teacher's function from one of merely feeding concepts to one of mentor, guide, and observer. Additionally, giving

pupils greater choice through the accessibility of Montessori resources supports child-led learning. Teachers believe that holding occasional in-person meetings could assist close the communication gap with the pupils. As pupils get older and are able to interact through breakout rooms, collaboration may become possible.

Absence of Practical-Life Component

Although it is regarded as one of the fundamental components of the Montessori Method (e.g. Dane & Schneider 1998; Montessori, 1964; Murray et al., 2019), there are no practical life lessons taught to the pupils. Teachers have explained that this is because parents value academic concepts more than engaging their children in non-academic activities. As a result, teachers are often forced to act more as concept feeders than as facilitators of the essential components of the Montessori Method—like cooking—which are the hands-on activities that help young children develop their fine and gross motor skills as well as their life skills. The Montessori Method's 'practical life component' is skipped online for a variety of reasons, including time constraints and parents' perceptions of the academic education's usefulness.

Preparation of the Montessori Environment and the Significant Role of the Parents

Due to space constraints and an absence of furniture and Montessori materials (compared to a physical school), the Montessori setting seems unprepared at home. The teacher's physical absence, which also contributes to the cause, is a concern. In a traditional classroom, the teacher would be in charge of setting up the environment. The above-mentioned findings appear to be exclusive to this case study. But as (Murray et al., 2021) have already found, carers or parents are crucial for online Montessori education. The findings of this current study demonstrate and validate the same. The findings also reveal, that the parent's shared role with the teacher in an online Montessori implementation, becomes inevitable, to make learning more fruitful, for the children. This could be witnessed when the mothers in particular, of all the children, except one, in this case study, are found to be present throughout the sessions, helping in organizing the environment and bringing the necessary materials to the table. In addition, Mothers are also seen eagerly waiting by the side of the children's desks, to help the children understand, what the teacher is teaching, by rephrasing the teacher's words and questions. This result supports the findings of Lillard & Lynn (2003) and Ilgar (2013), who found that parents serve as their children's primary teachers in accordance with Montessori principles. The better student responses may also be attributed to the parent's active

participation in this program, which they may or may not have been aware of co-facilitating with the teacher.

Lack of emotional connection among students and the teacher

The problems of emotional detachment between instructors and students who begin their courses online have previously been noted in earlier research (e.g. Murray et al., 2021a; Berger, 2011). A physical Montessori school involves children of different ages working together to share knowledge and working for an uninterrupted block of time in groups or individually (Lillard, 2016). In contrast, an online Montessori school does not provide the same level of individualised instruction from the teacher as a physical school (Murray et al., 2021b). The results of this study also imply that, despite the teacher's best efforts, being physically present with the student has a greater impact on their development as a mentor and guide. There was frequent evidence of an emotional distance between the teacher and the students. The children and the teacher don't seem to connect all that well, despite the teacher's best efforts to bridge the physical distance.

When the kids spend most of their time talking to their parents, it becomes obvious. This is explained by the children's lower ages and the fact that they are still, in many aspects, nonverbal. It can also be linked to the physical separation that causes a rift in communication. It is evident that the parent, who is physically there with the child, steps in and assumes the position of mentor in lieu of the teacher. This conclusion that parent involvement and communication in their children's education occur naturally in an online environment has also been supported by earlier study conducted by Konca (2021). The challenge of parents co-teaching, which increases a child's dependence on the parent and interferes with other children's learning, is brought about by the shared roles of teachers and parents. A recent study has already discovered that the distractions that children experience at home negatively impact their engagement, teamwork, and learning in an online Montessori classroom (Li & Lalani 2020). Surprisingly, despite the many challenges mentioned above in implementing the Montessori Method online, students' responsiveness—that is, their ability to respond to the teacher's questions—seemed to be generally good most of the time. This is largely due to parents' active involvement in helping their children comprehend the questions the teacher poses.

Conclusion

Previous studies indicate that fidelity was found to be rather low and that authentic Montessori delivery was lacking even in the physical traditional Montessori setup (Lillard, 2019). The faithfulness with which educational approaches are implemented is impacted and compromised over time by a number of elements, chief among them being time and the changes that accompany it. Cultural, societal, environmental, or technological factors may be the primary causes of the changes (Holmes, 1912). In this study, technology has a significant impact on how the Montessori Method is applied. As previously said, adaptation becomes essential in a century-old approach such as Montessori (e.g. Lillard, 2012; Holmes, 1912). The Montessori Method's effectiveness may be lost if there is a decrease in fidelity and authenticity due to increased adaptation (Lillard, 2012). The fundamental reason for the compromised application of the Montessori Method in this study is the increased flexibility required to abandon the traditional brick-and-mortar school setup alongside the need to embrace the new technology needed to deliver the Montessori Method virtually. It's not surprising that Montessori delivery suffers from low fidelity in the online setting, even though the method itself probably includes all the underlying concepts that are compatible with online education delivery (Sue, 2020). This is a result of the previously mentioned challenges. The online version of the Montessori Method has the potential to maintain authenticity and achieve more authenticity in the future with continued deliberate efforts by the Montessori Community and the proper utilisation of technology resources. The program outcomes may be adversely affected in the long run by the compromised Montessori implementation caused by the untrained Montessori Teachers (for delivering Montessori online), the lack of collaboration between students and teachers, the absence of child-directed work, and the interrupted work periods. There may be a need for further research to examine the long-term program outcomes of the *Online Montessori Program*. Examining conditions that could potentially improve the online Montessori Method’s authenticity and authenticity may also be a novel area of study.

Limitations of the study

Although the information gathered from a single early childhood online Montessori classroom case has provided some insight into the challenges associated with implementing Montessori education

online, a more comprehensive study involving elementary school students and more teacher interviews may have produced more trustworthy findings. However, these findings provide some original insights regarding the implementation of Online Montessori implementation and the challenges encountered when implementing Online Montessori Education.

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Author's declaration

I hereby declare that I have written this thesis independently and that all contributions of other authors and supporters have been referenced. The thesis has been written in accordance with the requirements for graduation theses of the Institute of Education of the University of Tartu and is in compliance with good academic practices.

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Appendix 1

Online Montessori Teacher Interview Questions

Are you a qualified Montessori Teacher?
Probe: Which institute did you undergo your training?

Have you worked as a Montessori teacher, in a brick and Mortar school before?
Probe: Are you currently also teaching in a Montessori Physical school?

Do you consider yourself up-to-date of the best practices for delivering Montessori Method online?
Probe: Why, How, explain? What challenges do you face in teaching online, using Montessori Materials?

Are you able to let students choose the lessons or activities or materials to work with?
Probe : How and why?

Are you able to facilitate student's interaction with one another?
Probe : How and why?

Are you able to incorporate the Practical life into online lessons?
Probe : How and why?

Based on your observations do you plan your daily lessons?
Probe : How and why?

What roles as an online Montessori teacher, do you think is challenging for you, for example, observer of the child, mentor, guide, and any other role you could think of?
Probe : Explain?

Do you allocate some time for students to work by themselves?
Probe : How and why?

Do you have test and grades to assess the students?
Probe : How and why?

Do you record the children's activities, regularly?
Probe : How and why?

How does preparing the environment for the children work in virtual Montessori setting?
Probe : How and why?

How do you assess the child's progress? Do you conduct tests and grade them?
Probe : How and why?

Any other challenges that you face in delivering Montessori Method online?
Probe : Explain with instances?

What conditions do you think, will help you to improve your delivery of Montessori Method online?

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10/01/2024