THE EFFICIENCY OF THECNIQUE FOR TEACHING ADDITION OPERATION SUPPORTED WITH MONTESSORI MATERIALS AND DIRECT INSTRUCTION METHOD TO STUDENTS WITH MILD INTELLECTUAL DISABILITY IN THE RURAL

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ABSTRACT
The most basic expectations of mathematics education are the concretization of education and its adaptation to daily life. For this reason, the social environment in which mathematics education is applied constitutes one of the important factors affecting the functionality of education. In the mathematics education carried out in rural areas, the limitations of the environment and the deficiencies in the experiences of the students negatively affect the quality of the mathematics education offered. To minimize the mentioned disadvantages, teaching techniques and auxiliary materials that support the process are needed. The Montessori approach is particularly efficient in teaching mathematics to students with intellectual disabilities. This approach both supports mathematics teaching with natural teaching in adapting it to daily life and facilitates concretization with its original materials.
The general purpose of the research is to determine the effectiveness of the addition process, which is supported by Montessori materials and presented with a direct instruction method, in teaching addition to a ten-year-old student with a mild intellectual disability who attends general education in the countryside. The ABAB model, which is one of the basic experimental designs, was applied in the research. It is a direct instruction method. The ABAB model, one of the basic experimental designs, was applied in the research. This research was carried out in line with the achievements listed by the individualized education plan (IEP), with a total of fifteen sessions, including the initiation, application, generalization, and follow-up periods. As Montessori materials, colored number cards, and brand names were used. The effectiveness of the presented addition instruction was examined by applying three follow-up tests (two, four, and six weeks after the end of the application) and generalization activities, such as the post-intervention student's addition process while playing with the Montessori mathematical material brand game and participating in the addition operations in his class. In addition, social validity data was collected. As a result, the student gained the skill of adding with one, two, and three-digit numbers. It was observed that he was able to maintain the acquired skill two, four, and six weeks after the intervention, and at the same time, he was able to associate these learned skills with his daily life.
Keywords: Montessori education, mathematics, addition teaching, single subject.

Introduction

For individuals with intellectual disabilities, it is highly important to make decisions independently so that they can live without being dependent on others; they need to know how they can earn, control, and spend money, as well as the concept and management of money in general (Browder & Grasso, 1999). At the same time, even though there are differences in education methods, the skills of reading and writing, controlling time, using money, and making transactions are in the category of functional academic skills for each child (Snell & Brown, 2011). The adequacy of the act of shopping, which is included in self-care skills, also requires mastery of the concept of money, albeit at a simple level. In order for individuals with intellectual disabilities to master the concepts of shopping and money, it is essential that they be able to perform the two most basic mathematical operations, addition, and subtraction, in the amount of currency they have.

There are many methods and techniques for teaching addition and subtraction to individuals with intellectual disabilities. When we consider at the studies carried out in recent years, it has been determined that simultaneous prompting is used relatively less in terms of method, while the direct instruction method is frequently used. Apart from these methods, there is also a study in which constant time delay procedure is used (Kırcaali İftar et al., 2008). In terms of technique, it was determined that the point detection technique, discover-copy-compare (cover-copy-compare) application, and animation programs were used. To give an example of the studies in question, Arı et al. (2010) studied the effectiveness of teaching addition and subtraction operations with a simultaneous hinting method, and they worked with a nine-year-old student with a mild intellectual disability. In the study, in which the multiple probe model was used, teaching, monitoring, generalization, daily probe, and mass probe sessions were held to determine the effectiveness. In the generalization part, the differentiation levels

of students' responses between environments, between individuals, and between tools and materials were examined. According to the graphical analysis, it was determined that teaching addition-subtraction operations with the simultaneous hinting method was effective and had the same effectiveness in generalization and monitoring processes.

When we look at the studies in recent years in which the direct instruction method was used with students with intellectual disabilities, the studies conducted by Çalık and Kargın (2010) with three students with intellectual disabilities attending general education classes stand out. In this study, they examined the effectiveness, generalizability, and continuity levels of presenting the touch math technique through direct instruction in teaching addition to students with intellectual disabilities. In the study, in which the multiple probe model was preferred, it was determined that the point determination technique through direct instruction was sustainable, effective, and generalizable in the teaching of the addition process. In the context of social validity, it was determined that teachers expressed positive opinions about this technique. Another study on the teaching addition process based on direct instruction and point-determination techniques was carried out by Eliçin et al. (2013). In the study conducted with three students diagnosed with intellectual disabilities, it was concluded that the point-determination technique was effective. Kot et al. (2017) compared the number line strategy and the touch math technique in terms of efficiency and effectiveness in teaching addition with the direct instruction method in their study with two students with intellectual disabilities. In this study, in which the rotational applications model was used, it was determined that the point determination technique was more efficient and effective than the number line strategy in teaching addition. Geçal and Eldeniz Çetin (2018) presented the animation program to students with intellectual disabilities through a tablet computer in the teaching of addition without hand. The multiple probe model was applied in the research conducted with three students attending a special education class. It has been determined that the animation program presented through the tablet computer is effective in teaching the hand-free addition process and can be generalized with different tools and materials. According to the social validity findings of the same study, mothers stated that they were very satisfied with the application and its results.

Mathematics skills are within the scope of cognitive skills, and it is obvious that individuals with intellectual disabilities have difficulties acquiring cognitive skills. For this reason, it is necessary to use efficient and effective teaching methods and present effective materials while teaching the skills that they will need throughout their lives to individuals with intellectual disabilities. Providing effective teaching is also very important in terms of creating and preserving the functionality of cognitive skills (Tekin-İftar, Kurt, & Acar, 2008). One of the methods that can be used to teach mathematical operations is the Montessori approach.

Manipulating techniques that can be used with Montessori materials in the Montessori approach are very functional, especially in increasing success in mathematics teaching from early childhood (Laski et al., 2015). This approach envisages that students with special needs progress in an environment where they are together with their typically developing peers and by supervising their learning. With the necessary environment and material arrangement, it is aimed at helping students with special needs learn in the easiest and best way possible (Montessori, 1912/65; Seldin & Epstein, 2003; Yıldırım Dogru, 2009). One of the effective strategies for concretizing the mathematics lesson is the use of materials. In the meta-analysis study of Kul et al. (2018), it was determined as a common result of many related studies that the use of educational materials affects mathematics achievement. Again, in the case study of Reyes et al. (2019) on how students learn mathematics based on student opinions, it was determined that the two most important elements in learning mathematics are associating mathematics subjects with students' lives and using materials. In light of these studies and when it is accepted that the main thing in mathematics teaching is concretization, it can be said that Montessori mathematics materials can be used as effective tools in concretizing mathematics lessons. Hallumoğlu (2019), in his thesis, study carried out with Montessori materials, determined that the mathematics studies carried out in the 1st grade with the support of Montessori materials significantly improved the reasoning skills of the students who received the education. Zinderen (2021), on the other hand, determined in her thesis study that the processing of 2nd-grade geometric objects and spatial relations with the Montessori method provides significantly higher learning compared to curriculum-based teaching. Zinderen (2021), on the other hand, determined in his thesis study that the processing of 2nd-grade geometric objects and spatial relations with the Montessori method provides significantly higher learning compared to curriculum-based teaching.

One of the factors affecting the functionality of mathematics education is the social environment in which it is applied. On the basis of different countries, the limitations of rural opportunities and the lack of experience of students are considered factors that reduce the quality of mathematics education (Zhang & Sheu, 2013). Gökçek and Toker (2015) determined in their research that teachers working in rural areas evaluate the problems in mathematics education as teachers, students, and family environments. Teachers working in rural areas emphasized that they had difficulties applying the mathematics curriculum, especially in rural areas, and that

students had problems adapting mathematics to daily life. Mathematics education, supported with Montessori materials, can be applied as an alternative solution to the problem of curriculum association and lack of experience in especially rural areas. Based on this idea, this study aimed to determine the effectiveness of teaching addition to a ten-year-old student living in the countryside with a direct instruction method supported by Montessori materials. In line with this general purpose, answers were sought to the following questions:

1. Is the presentation of the direct instruction method supported by Montessori materials effective in learning the addition process of the student with a mild intellectual disability living in the countryside?

2. Can the addition process, supported by Montessori materials and taught by the direct instruction method, be generalized to different tools and environments?

3. Can the level of learning the addition process, which is supported by Montessori materials and gained by presenting the direct instruction method, be maintained after the education is over

Methodology

Research Model: It was supported with Montessori materials and presented with a direct instruction method to gain the ability to add three-digit numbers with and without carry. The ABAB model, which is one of the single-subject research methods, was applied in the research carried out to test the effectiveness of this method. The dependent variable of this study is the subject's ability to perform addition with three-digit numbers correctly. The independent variable is the direct instruction method supported by Montessori materials. The application was carried out according to the order of achievement in the individualized education program (IEP) prepared for the student. The application was carried out according to the order of achievement in the individualized education program (IEP) prepared for the student. To the student who can read and write two-digit numbers, respectively, reading and writing of three-digit numbers, the concepts of addition, addition with one-digit numbers, addition with two-digit numbers without and with one hand, and addition with three-digit numbers without and with one hand were supported with Montessori materials and presented with the direct instruction method. In each session, the researcher and the student worked one-on-one.

Participant: The research was carried out in a village primary school in the Gölmarmara district of Manisa province. A student who was diagnosed with mild intellectual disability at the designated school was included in the study. It was determined that according to the addition skill assessment tool and the teacher interview form, the student did not have basic addition skills. In the research, the prerequisite skills of the subject were to be able to read and write numbers and two-digit numbers and to count from 1 to 100 forward rhythmically. Kerem (codename) is in 4th grade. The student, who started the first grade in 2018, failed at the end of the first grade, and in the second year (2019), he was diagnosed as having mild intellectual disability' by the Guidance and Research Center (RAM), to which he was referred while going back to the first grade. In addition to the education he received in the general education classroom, Kerem also receives one-on-one training with his classroom teacher in the support training room for 4 hours a week. Apart from that, he has never been to any rehabilitation institution. At the beginning of the research, it was determined that he could read the two-digit number shown next to each rhythmic counting skill or write the two-digit number that was said.

Table 1. Demographic Information of the Subject Participating in the Research

Gender	Age	Diagnosis	Support Training Time	Educational Environtment
Male	10	Mild intellectual disability	4 year	Education in the general education classroom through mainstreaming/integration

Practitioner: Experimental applications of the research were carried out with the first author, a Montessori instructor who has a special education master degree and is pursuing a doctorate in the same field. The practitioner also works as a classroom teacher in a public school affiliated with the Ministry of National Education in Türkiye.

Coder-Observer: The study has two observers. The first observer is the second author, a Montessori instructor with a Ph.D. in special education. The second author has a doctorate in special education, is a Montessori instructor, and made the necessary controls during the experimental application process. The second observer is

a research assistant with a doctorate in special education. The second observer provided data on inter-observer reliability and application reliability. Inter-coder reliability data for the dependent and independent variables were collected by two observers. By looking at the planning and implementation outputs, the coders examined how accurately the level determination exam developed for the student was completed. All sessions, including baseline data, were monitored while inter-coder reliability data was collected. For application reliability, the second observer observed all the sessions. The observer evaluated whether the practitioner carried out the teaching according to the determined steps. They filled out the application reliability data form by marking + (plus) what they did and - (minus) what they did not do. One point is given for each plus.

Environment and Materials: The study was conducted in the library of the primary school where the subject attended. The library, where the application is carried out, has an area of 25 square meters, and there are bookshelves containing different kinds of children's publications, an interactive board, study tables, and chairs in the area. The practitioner and the student performed the applications by sitting side by side. The camera is positioned at a distance not to distract the student, but its angle is adjusted so that the work can be seen clearly.

For teaching the addition process, A4-sized worksheets in which one, two, and three-digit numbers are read and written, and then the addition operations are carried out. In the Montessori method, different colored felt-tip pens (the ones digit-green, the tens digit-blue, and the hundreds digit-red with the same colors for three digits) were developed by the number steps. Montessori colored number cards, colored base blocks, an addition operation tool developed by the practitioner with the materials at hand, natural materials such as walnuts and beans used in one- and two-digit addition operations by the Montessori approach, and Montessori mathematical materials 'mark game' were used. The same written attendance sheet, which was created at the beginning of the research, was used as a pre-test (beginning of the application), post-test (end of the application), and three follow-up tests (one week, fifteen days, and one month after the application ended) at all test stages of the application. This written examination consists of a set of open-ended questions, including the reading and writing of two- and three-digit numbers and two- and three-digit addition operations with and without carries, scored in such a way that 100 (one hundred) points can be obtained if all questions are answered correctly. To meet the generalization condition, three-digit additions with and without carries were prepared with numbers appropriate to the level, different from the numbers used in practice, before and during the follow-up sessions, except for the follow-up test. The prepared procedures were analyzed by the subject in different environments and in the presence of different people. In addition, the "brand game" of Montessori mathematical materials was played, and the subject was expected to perform the three-digit addition operations during this game.

Reinforcers: In interviews with the family and classroom teacher, information was obtained about the subject's favorite things, and as many different reinforcers as possible were prepared for each session. These address the different needs and wishes of the subject, such as stationery, food, balloons, and playing games. Reinforcers were shown or explained to the subject at the beginning of each session, and it was reported that they would be given or performed at the end of the session. In addition to these reinforcers, an attempt was made to increase the frequency of the subject performing the behavior by using verbal reinforcers such as "Well done", "You are great", "You guessed it right, you are doing very well" and confirming gestures and facial expressions during the sessions.

Intervention Process

Table 2. Initial Case Detection (A1)

Session Phases	Session Number	Targeted Gains	Applicaitons	Materials Used and Reinforcers
Initial Case Detection (A1)	1	Pre-test application and separating two-digit numbers into tens and ones.	At the end of the research, a pre-test consisting of gradually progressing collection processes towards the goal desired to be achieved is applied. Two-digit numbers are represented as tens and ones with colored base blocks.	Level Determination Test, colored base blocks, colored paper, and pencils/playing ball

	2	Introduction to three-digit numbers: reading and writing three-digit numbers.	Reading and.writing three-digit numbers are taught with Montessori-colored number cards.	Montessori colored number cards, colored pencils, and paper/playing a game of choice

Table 3. Intervention (B1)

Session Phases	Session Number	Targeted Gains	Applicaitons	Materials Used and Reinforcers
Intervention (B1)	3	Dividing three-digit numbers into hundreds, tens, and ones (using Montessori colored number cards).	Three-digit numbers are written by saying them. The expansion of the number is printed with the digit values. It is desired to show the number with Montessori colored number cards. Then, hundreds-tens-ones are displayed with colored base blocks.	Montessori colored number cards, colored base blocks, colored pencils, and paper/ playing a desired game
	4	Separating three-digit numbers into hundreds, tens, and ones (independently).	Three-digit numbers are printed and separated into place values. It is desired to display hundreds, tens, and ones with colored base blocks.	Colored base blocks, colored pencils, and paper/playing a game of your choice
	5	Introduction to the concept of addition: performing addition with one-digit numbers.	The addition tool explains what addition is, how numbers multiply when you add two numbers, and the use of plus and equal signs. Sample collection is carried out. Then, the student is asked to perform addition operations with the addition operation tool. When it is observed that he can do it, he is directly allowed to do addition operations with one-digit numbers.	Addition tool, colored pencils, and paper/playing a game of choice
	6	Adding a two-digit number and a one-digit number and demonstrating the process with colored base blocks.	It is desired to represent two-digit and one-digit numbers with colored base blocks. These are then brought together, and the result of the addition process is displayed.	Colored base blocks, colored pencils, and paper/playing a desired game/verbal reinforcer-congratulations and appreciation

7	Adding two two-digit numbers without carrying.	It is required to write two two-digit numbers, one after the other. Reminding the student that the addition process will start with the one's digit and then move on to the tens digit, the student is expected to complete the operation. They are asked to construct and write the addition process as a mathematical sentence. Example: "35 is 13 more than 48."	Colored pencils and paper, or colored balloons
8	Introduction to addition and carrying: Adding two two-digit numbers whose sum does not exceed 99 and solving problems that require addition.	It is asked to show two two-digit numbers written one under the other with colored base blocks. Colored blocks are combined (collected) into tens and tens, ones and ones. It is explained that the units completed to 10 should be changed to a ten and transferred to the tens section. The student is expected to perform other examples independently.	Colored base blocks, colored pencils, and paper or verbal reinforcers for greeting and appreciation
9	Repetition of previous learnings and adding two three-digit numbers whose sum does not exceed 999 without hand and solving problems that require addition.	It is asked to add two three-digit numbers written one below the other by following the order of ones, tens, and hundreds of digits.	Colored pencils and paper/playing a desired game/verbal reinforcer: congratulations and appreciation.

Table 4. Final Situation Assesment (A2)

Session Phases	Session Number	Targeted Gains	Applicaitons	Materials Used and Reinforcers
Final Situation Assesment (A2)	10	Addition of two three-digit and/or two-digit numbers whose sum does not exceed 999 and post-testing.	When adding two three-digit numbers, it is repeated that the hand in the one's place is transferred to the tens place, and the hand in the tens place is transferred to the hundreds place, and the student is asked to perform the relevant addition operations. Then, the test applied as a pre-test at the beginning of the research is applied again as a post-test.	Level Determination Test, colored base blocks, colored pencils, paper, colored balloons/verbal reinforcer: congratulations and appreciation
	11	Mixed questions: doing addition operations with two- and three-digit numbers whose sum does not exceed 999.	It is required to perform addition operations with and without carries with two- and three-digit numbers spoken only with paper and pencil and to express them as mathematical sentences.	Colored pencils and paper; playing a desired game; verbal reinforcement - congratulations and appreciation

Table 5. Generalization and Tracking (B2)

Session Phases	Session Number	Targeted Gains	Applicaitons	Materials Used and Reinforcers
Generalization and Tracking (B2)	12	Doing addition while playing with the Montessori math material brand game. Participating in addition to his/ her class.	The brand game, which is a Montessori mathematics material, is introduced, and how addition can be done is shown. The ternary number system relationship is explained with the colors red-blue-green. In this regard, he/she is asked to perform additional operations with the brand game. The last of the teaching practices is completed. As another element of generalization, the student is ensured to participate in the collection processes performed in the general education classroom.	Montessori brand game (1 set), red-blue-green pencils and paper, fancy pen, verbal reinforcer - congratulations and appreciation

13	Applying the follow-up test after 2 weeks in a different classroom.	The level determination test, which was prepared at the beginning of the research, is applied in different classrooms other than the school library where the teaching takes place.	Level Determination Test
14	Applying the follow-up test after 4 weeks in a different classroom.		
15	Applying the follow-up test after 6 weeks in a different classroom.		

Inter-Coder Reliability: The practitioner and the second observer scored the level determination test, which was evaluated out of 100 points and administered to the student during the pre-post-intervention and generalization-monitoring periods, separately. Inter-coder reliability data were evaluated in line with the formula "Agreement/ (Agreement + Disagreement) x 100" suggested by Miles and Huberman (1994). Calculations made according to this formula yielded the following result: 410/415*100= 98.79% inter-coder reliability.

Application Reliability: For each session, the second observer determined whether the steps constituting application reliability were implemented according to the general procedure presented below:

1. The practitioner has the materials to be used in the study ready.
2. He introduced the reinforcer (if any) to the student (At the end of our work, if we work well ….. you will win).
3. The student is reminded of what was covered in the previous session.
4. The new topic to be covered is explained to the student.
5. The student was told to watch himself.
6. When the student made a mistake, it was waited for 3-5 seconds, then a hint was given and if he still made a mistake, it was corrected.
7. The student was allowed to make an example by himself.
8. After the 8th session, the student (You were great, well done, you worked very well today… etc.) was verbally reinforced.

After each session, the second observer examined whether the above steps were followed and filled out the relevant form by typing + if yes, - if not available. 1 point is given for each plus. The implementation reliability coefficient was calculated using the formula "Observed Practitioner Behavior / Planned Practitioner Behavior x 100" (Tekin-İftar and Kırcaali-İftar, 2012). According to this formula, application reliability of 98/104*100 = 94.23% was achieved.

Data Analysis: Graphical analysis method was preferred to analyze the data in the research. Teaching and monitoring sessions are arranged on the horizontal axis (x-axis) of the graphs; On the vertical axis (y-axis), the scores the participant received according to the placement test prepared out of 100 points are presented at equal intervals. The validity of experimental control was determined by ensuring that the change in the dependent variable during the teaching period was obtained only as a result of the application of the independent variable.

Limitations of the Study: Since the study was conducted in a less populated rural area, more than one participant with similar characteristics could not be found. For this reason, the research was continued with a

participant whose family and other teachers volunteered to participate in the study. The difficulty of generalizing the data obtained from a single participant to different areas is the most important limitation of the study.

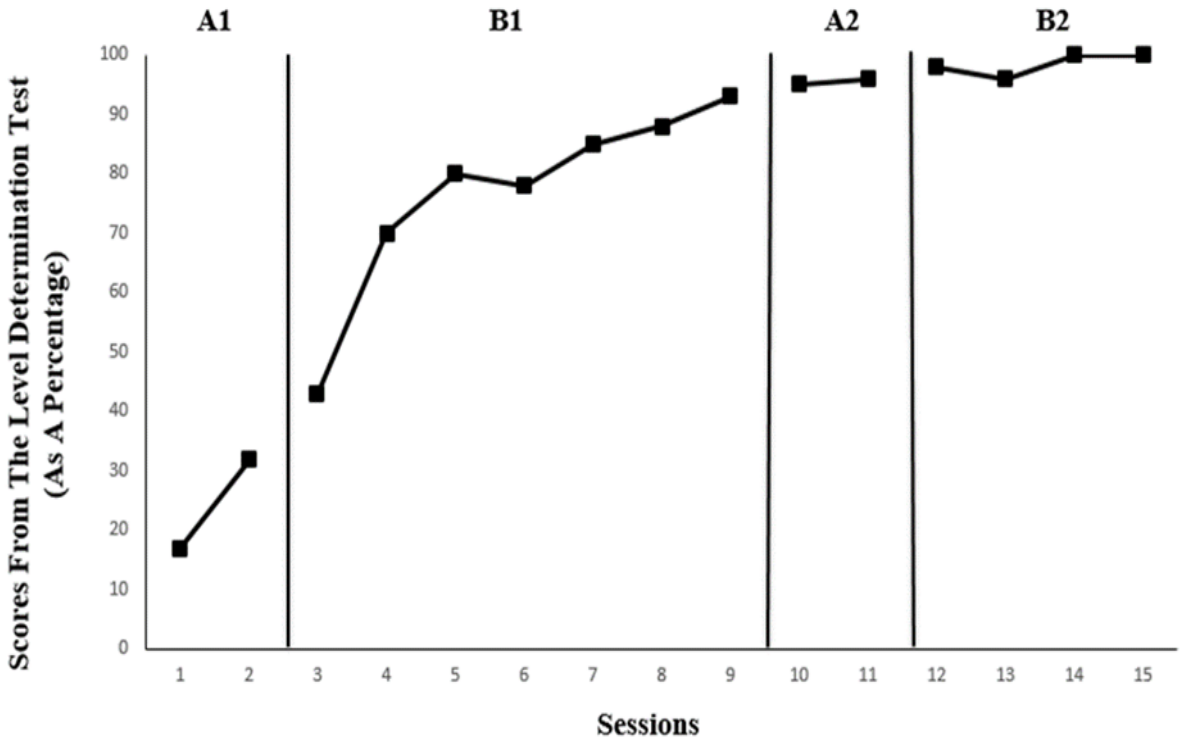
In the research, addition was taught using the direct instruction method, supported by Montessori materials. Another limitation is that different teaching methods were not applied and could not be compared with the model applied in the research due to time constraints. In addition, the fact that no similar study has been found supported by Montessori materials in teaching addition has created a limitation in terms of comparing the intervention.

Findings and Discussion

In this part of the research, the effectiveness and generalization findings and social validity findings of the intervention applied to the student participating in the research are discussed and presented.

Effectiveness and Generalization Findings: Baseline, application, and follow-up data are included. The target acquisition is based on the student; "It divides two-digit numbers into tens and ones using base blocks. Writes two-digit numbers and separates tens and ones. Reads and writes three-digit numbers." etc. has been attempted. Afterward; "Addition of two three-digit and/or two-digit numbers, the sum of which does not exceed 999, and a post-test application" were carried out. The application process with the student is presented in the graphic below.

Graph 1. The process of teaching addition to a student with mild mental retardation is supported by Montessori materials and presented with a direct instruction method.



Graph 1 shows the situations before, during, and after teaching the subject's mathematical skills of recognizing ones-tens-hundreds and performing addition operations with these numbers. According to this, in the situation determination made at the beginning of the intervention, it is seen that the initial level of the subject is between 15-35%. However, in the interim evaluations made after the practice sessions; the level of realization of the desired behavior increased to 95-96%.

During the intervention process with the subject; The practice started with colored Montessori cards related to the ones-tens-hundreds steps. The three-digit number created with the Montessori colored number digits material was shown to the subject and written first in numbers and then in text. Afterward, the subject was asked to create three-digit numbers using colored number cards of hundreds, tens, and ones, read them, and write them in numbers and words. The process continued until the number of cards in the material was exhausted. While the subject was writing the numbers he created, the numbers were shown in two applications, then the numbers were

closed and he was asked to mentally write these numbers in numbers and words. Afterward, the subject was asked to create three-digit numbers using colored number cards of hundreds, tens, and ones, read them, and write them in numbers and words. The process continued until the number of cards in the material was exhausted. While the subject was writing the numbers he created, the numbers were shown in two applications, then the numbers were closed and he was asked to mentally write these numbers in numbers and words. Letter errors have been corrected while writing. In this process, the first application phase consists of four sessions regarding the recognition and addition skills of three-digit numbers. For the additional problem-solving skill, which is the second application phase with the subject; Three sessions were studied. In this process, the first application phase consists of four sessions regarding the recognition and addition skills of three-digit numbers. For the additional problem-solving skill, which is the second application phase with the subject; Three sessions were studied. It is observed that the subject gained this skill at a rate of 96% after the intervention sessions. When the study was concluded with the generalization and follow-up sessions held after the intervention, the subject's success level reached 100%. Sustainability-permanence findings were collected in the probe sessions held after all mass probe sessions. After the generalization sessions, the success level increased to 98%. Success rates of 96, 100 and 100% were observed in the probe sessions held two, four, and six weeks after the end of the study.

Social Validity Findings: In this study, social validity findings were obtained through semi-structured interviews with the student's primary school classroom teacher, secondary school mathematics teacher, and parents. The research was conducted when the subject was in the 4th grade (the last grade of primary school in Turkey). During post-implementation generalization and follow-up studies, the classroom teacher was asked, "What changes have occurred in your student's attitude and behavior towards the mathematics course?" Do you think the intervention program applied to the student was beneficial? If so, what level of progress have you observed?" questions were asked. The subject's primary school 4th-grade teacher said, "Kerem developed a positive attitude towards mathematics after this application started. He didn't like math classes before. I am now very willing and confident to participate in the lesson. The number of operations and problems he solved reached that of his typically developing peers. It reaches solutions in collection processes more practically and faster than them. His scores in mathematics exams increased significantly. Since he learned addition very well, I had no difficulty teaching him subtraction. This education enabled him to acquire many benefits before going to secondary school and was very useful." He expressed his thoughts with his words.

Since the intervention was expected to continue its effectiveness in secondary school after the research was completed, an interview was held with the mathematics teacher of the subject when she started the 5th grade (the first grade of secondary school in Turkey). In the interview, "What kind of performance did you initially expect from your student who came to your course with a diagnosis of mild intellectual disability? What can you say about your student's performance during the lesson? "To what extent do you see your student's mathematical skills in the context of addiction?" questions were asked. The subject's mathematics teacher said, "Since I knew Kerem was a child with special needs, I did not expect a good performance from him at the beginning. However, while teaching four and five-digit numbers, he made a surprise for me and the whole class. "Teacher, I know numbers very well. Last year, a teacher taught me a different method. Can I tell this to my friends too?" said. Of course, I was very excited. Kerem explained the triple number system with red-blue-green colors. This method worked. My students learned six-digit numbers in one lesson without me explaining the subject. In my research after class, I learned that this system is the Montessori number system. Later, when we moved on to addition operations, I saw that Kerem could solve them at least as well as his peers. Kerem is generally very participatory and determined in both my general education classes and support training. He can do the homework I give him correctly at a rate close to that of his typically developing peers. Again, considering that he is a child with a mild mental disability, I can say that he was quite successful in the exams. "I often forget that he has a mild mental disability." he expressed his thoughts.

At the end of the research, in terms of adapting the intervention to daily life, the interview with the subject's family was asked, "What changes did you observe in your child's mathematical skills as a result of this research?" After learning three-digit numbers and addition, was he able to use these skills in his daily life? If so, how did he do it? "Are you satisfied with the education your child received?" questions were asked. The subject's parents said, "Kerem did not like mathematics at all before receiving this education. He was worried that his friends would make fun of him because he could not solve the questions. When the training started, we first saw that he learned three-digit numbers easily. He started to love mathematics more and more. He was eagerly waiting for the training days. Once we learned three-digit numbers, we taught money very easily at home. When he learned addition and problem-solving, he started to calculate money very well. Before the training, he could only buy bread or snacks. We couldn't give him big money because he couldn't calculate. Now we can give big money. We can give him a list and have him pick up the needs of the house. He can accurately calculate how much the things he buys will cost and how much money the grocer should give back. That's why we say it's a good thing he received this training. We were very pleased with the training provided." They

expressed their thoughts with their words. In line with the opinions received from three different parties of the research, it is possible to say that the intervention applied to the subject was effective and that he was able to adapt the mathematical skills he learned to his daily life.

In the Montessori approach, presenting abstract concepts concretely is possible with Montessori tools. According to the Montessori approach, since the child's ability to understand abstract concepts develops at an advanced age, many academic and mathematical subjects are tried to be explained with concrete materials in early childhood. In this regard, Yıldız and Çağdaş (2019) examined the effect of Montessori Mother Support Training given to mothers of 4-5-year-old children receiving education with the Montessori education method on the children's mathematics and daily life skills. Looking at the research findings; No significant difference was found between the experimental and control groups when the post-test mean scores ($p = 0.5$) were taken into account. However, the mothers in the experimental group stated that they thought that the education they received contributed to their children's mathematics and daily life skills. Additionally, Lillard (2013) stated that the Montessori approach allows students to make choices; He emphasizes that it supports their learning and provides autonomy, especially in the process of reading, writing, and problem-solving.

Teaching mathematics to individuals with intellectual disabilities is important so that they can participate in independent life comfortably. Individuals with intellectual disabilities have more difficulty in learning mathematics skills than their peers with typical development, and they need more interest and motivation in acquiring these skills. Additionally, these individuals learn more easily with concrete data. In this regard, it can be said that Montessori materials that appeal to multiple senses are an important tool in providing concretization and motivation (Murray, 2011). For this reason, the fact that the mathematics education offered using Montessori materials was effective on the subject and the later permanence-sustainability scores were high indicates that this education was successful in providing permanence. The findings of the studies on this subject can also contribute to the student's acquisition of these skills by concretizing abstract concepts in the process of teaching mathematics to individuals with intellectual disabilities (Özer, 2019). On a similar subject, in the research conducted by Özlü (2016), a concrete-to-abstract teaching strategy presented by the direct instruction method was used in teaching basic multiplication to students with intellectual disabilities. Three students aged 9-10 with intellectual disabilities participated in the research. On a similar subject, in the research conducted by Özlü (2016), a concrete-to-abstract teaching strategy presented by the direct instruction method was used in teaching basic multiplication to students with intellectual disabilities. Three students aged 9-10 with intellectual disabilities participated in the research. Research findings have shown that the concrete-semi-concrete-abstract teaching strategy presented with the direct instruction method is effective in teaching basic multiplication. Additionally, according to the data obtained; Teachers expressed positive opinions about the concrete-to-abstract approach used in the research. As can be seen in the findings obtained from these studies, it is important to present abstract concepts concretely, especially to individuals with mental disabilities. It is thought that the Montessori materials used in this study also contribute to facilitating the learning process.

No significant differences were found in studies comparing the effectiveness of mathematics education with the Montessori approach to traditional education or other techniques (Brown and Lewis, 2017; Lopata et al., 2005). One of the reasons for this may be that the studies were not conducted in detail and in a long-term manner. Essentially, long-term research is needed to monitor the effectiveness and continuity of mathematics skills. Basargekar and Lillard (2021) stated that although there is not enough data that teaching mathematics with the Montessori approach consistently provides an advantage compared to other techniques; However, they stated that if long-term research is conducted, the Montessori approach can be seen to be more advantageous. Based on this view, in this study, the subject's development in the next academic period was monitored with social validity findings to determine to what extent the subject was able to maintain the skills she acquired after the intervention. As a result, it has been seen that the student retains the skills he has acquired in the next level of education and can even build new knowledge on the acquired skills. It is predicted that this study is important in terms of being an example for long-term follow-up in mathematics teaching and may guide future studies. Apart from these, studies on interventions regarding Montessori mathematics education in the preschool period in Turkey (Aygün Bozkurt et al., 2019; Durkaya, 2019; Mutlu et al., 2012; Tayfun & Aydoğan, 2021; Yıldırım, 2019) are more frequently available, while Montessori-based intervention in primary school studies (Hallumoğlu, 2019; Zinderen, 2021) are quite limited. In this sense, the current study is expected to contribute to the field and future research.

Result and Suggestion

In this study, it was aimed to determine the effectiveness of the teaching addition process supported by Montessori materials and presented with a direct instruction method, in terms of gaining the skills of recognizing three-digit numbers, making addition, and solving problems that require addition. The target acquisition is based

on the student in the study; "Divides two- and three-digit numbers into tens and ones using base blocks. Write the decimal and units of two- and three-digit numbers. "Reads and writes three-digit numbers." etc. has been attempted. After the number recognition phase, "Applications for solving problems that require adding and adding three-digit and/or two-digit numbers with hands that do not exceed 999" were carried out. After the post-test application, generalization and follow-up sessions were held. As a result of the research, it was seen that the student gained the skills of recognizing numbers (reading and writing), adding, and solving problems that require addition (100%). In addition, it was observed that the student was able to perform these skills with 100% accuracy after the intervention was over. After the research, the teachers at the school where the student attends also stated that the student is more willing to attend the mathematics lesson, there is an increase in his participation in the mathematics lesson, he does his mathematics homework more and correctly, and there is also an increase in his mathematics exam scores. The student's family, on the other hand, stated that they were satisfied with the education provided and that their children can now do large amounts of shopping easily. In conclusion, it can be said that the teaching of addition, which is supported by Montessori materials and presented with a direct instruction method, is effective, generalizable, and permanent in the long term.

This study was conducted with a single-subject research method and a student with mild intellectual disability. In addition, it was made from Montessori materials by using brand games and digit number cards. For this reason, it should be supported by similar studies that will increase the reliability coefficient in future studies and by working with individuals with different types of disabilities. Conducting similar studies with more than one participant, if possible, will be more valid and reliable in revealing the quality of mathematics education supported by Montessori materials. In the study, only Montessori mathematical materials brand games, and digit number cards were used. In future studies, different types of materials from Montessori mathematical materials can be used and the effectiveness of the intervention can be increased.

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