

Supplementary Table 5

Observations and reflections in the classrooms of the teachers who participated in the project

Theme	Category	Sub-Category	Codes	Quotes From Field Notes, Interviews, and Video Recordings
Teachers	Emotional Changes	Reducing prejudice		Six teachers who attended the project (attendees) that helped them develop professional skills in math teaching methods and techniques performed more math activities than four experimental group teachers who did not attend the project. Most teachers who attended the project stated that it dispelled their prejudices against math.
		Increase in responsibility		The attendees had more thorough math activities on their daily plans and spent more time on those activities. They also put in an extra effort to integrate the MAWS into their plans.
		Increase in self-confidence and courage		The attendees integrated math activities with other types of activities whenever they could. One of the teachers explained this by stating <i>"I realize that I can be creative with math, too. I feel braver...There are more concepts and skills we're supposed to teach our students. I should do more math activities."</i> (Tch,4)
		Increased interest and satisfaction		The attendees performed more math activities, tried to use more materials and techniques in the activities, and were more pleased to enrich their learning experiences than those who did not attend the project.
		Gaining an innovative perspective		The project has made the attendees realize that the desk-bound math activities they used to perform during their lectures are actually not very effective. The observations conducted in the lectures of the attendees showed that they incorporated different materials into their lectures. This had three advantages. First, it made students' math experience richer. Second, It allowed the teachers to apply different strategies. Third, it helped them design creative activities.
		Feeling of gratitude		<i>"MAWS materials help my students use math all over the classroom. Thank you for making that happen. I'm so happy that I got the chance to attend your project..."</i> (Tch,2) This comment shows that most attendees are grateful to the project team for the positive change in their lectures.
		Caring for needs		We observed that some teachers came up with extra materials for students who lagged behind and integrated those materials into MAWS. <i>"Some of my students need more simple stuff to learn with; that's why I revise the materials in the center."</i> (Tch, 1)
		Guidance		Almost all attendees let their students choose materials during the time they spent on MAWS. They just guided their students whenever they needed guidance. <i>"One of the students picked something up and went up to the teacher and asked her what he was supposed to do with it. They both sat down, and the teacher told the kid that he was supposed to group the beads of different colors in the hair gel. They then counted the beads together."</i> (Classroom 4, Third week observation,09/20/18)
		Less pressure		The observation notes showed that the attendees put their activities into practice more easily. The students chose activities more freely, and the teachers guided their students better.
		Teacher-child Interaction	Physical contact	
Wh- questions			Six attendees posed more 4W 1H questions in their lectures, which helped their students question things and learn more.	
Sincerity and engagement			The observation notes and video recordings showed that the attendees participated in their students' MAWS games more often and more sincerely than those who did not attend the project. They also devoted more time to math in their daily plans and paid more attention to the distribution of roles.	

Creating new material	Maintaining high interest	The attendees tried to use different techniques to arouse their students' curiosity and keep them focused. <i>"The teacher wrapped a few MAWS materials in a gift wrap and put it back in the center as if it were a new material. The students opened the gift packages and played with the materials inside."</i> (Classroom 5, Fourth week field notes,09/24/18)	
	Waste materials	<i>"One day, the teacher showed up with a large waste bin, which drew all students' attention. There were some worn or torn figures. The teacher said that they were going to build a hospital with waste materials and that they were going to treat numbers in that hospital (Number Hospital) ..."</i> (Classroom 1, 11th week video recordings, 11/13/18)	
	Natural materials	<i>"It was Friday. The teachers took their students out to the garden, where they collected stones of different sizes and shapes. Then, they all went back to their classrooms. They used the MAWS scale and compared the weights of the stones... They then talked about the shapes and properties of the stones."</i> (Classroom 3, 9th week field notes,11/02/18)	
Using MAWS (Math Work Stations)	Attach importance and allow time	The attendees did more math and MAWS activities most days for 4.5 months.	
	Effective use	Exchange of ideas	<i>"The students in Classroom 4 used MAWSs in small groups. The teacher actively participated in their math games. They often exchanged ideas and had discussions to solve problems."</i> (Classroom 4, 14th week field notes,11/28/18)
		Determining private areas	<i>"In almost all classrooms, the MAWSs were put in places where students could easily access, and teachers could easily make observations."</i> (First week field notes,09/07/18)
		Giving children responsibility	The attendees invited their students to play with MAWS in mixed groups. One of the teachers stated <i>"I have students with different cognitive levels. I put fast and slow learners into the same group to promote peer learning. I'm always there for them anyway..."</i> (Tch, 6)
	Use for different purposes	Using in activity transitions	<i>"Some students finished the art activity earlier than the others. The teacher told those students to use MAWSs before the science activity. Those students continued to play the games they had left unfinished..."</i> (Classroom 5, 12th week field notes,11/21/18)
Specific days and weeks		<i>"Some teachers were given MAWSs for the Animal Protection Day. The teachers of three classrooms showed their students some photos of animals to raise their awareness."</i> (5th week field notes,10/04/18) <i>"MAWSs were placed in classrooms for the Domestic Goods Week. Most teachers turned those MAWSs into greengrocer stands, vitamin centers, or local food markets."</i> (15th week field notes,12/13/18)	
Activities	More planned activities	The attendees drew up more detailed daily plans during the research process. Two teachers stated, <i>"As far as I can remember, this is the first time I have drawn up such a detailed plan..."</i> (Tch,1). <i>"I know I should be meticulous to make sure that my students make the best of MAWSs."</i> (Tch,3)	
	More associating with mathematics	<i>"Your project has made me realize that my monthly plans should contain more math activities. Integrated activities help my students make the best of other activities and be involved in math activities at the same time."</i> (Tch,6)	
	Devotion	The attendees did more math activities during their lectures. Besides, they had more time for each student.	
	Increase in individual and small group activities	<i>"After I had MAWSs in my classroom, I realized that each group of students wanted to play with different MAWSs depending on their areas of interest. I divided students into smaller groups to pay much more attention to their needs. I think that dividing students into smaller groups helps teachers recognize their students' differences."</i> (Tch,4)	
Experience	Being confident and determination	<i>"I'm happy that I have a lot of material in my classroom now. I'll use each of them for my students. I'm sure it'll contribute to their development. They'll be freer; I think it'll do them good. I can assure you that I'll put all I've learned from the project into practice."</i> (Tch,2)	
	Competence	Some experienced attendees were better at encouraging their students to use MAWS materials according to their needs and interests during the activities than those who were new in the profession. One of the teachers said to one of the students who had difficulty choosing materials: <i>"I suggest you choose the 'Greedy Number Snake.' We can observe how it feeds and gets bigger."</i> (Classroom 4 Third week field notes,09/20/18)	

		Forethoughtfulness / providence	Some experienced teachers believed that MAWSs could change classroom interactions and classroom management strategies. They systematically reminded students how to use the center before they started using it. <i>"Some teachers turned the MAWS user manuals into visual elements to help their students understand it more easily."</i> (18th week field notes,01/16/19)
		More active	The video recordings and the field notes showed that the teachers and students were more active in the classrooms where the MAWSs were used more effectively. <i>"In general, the students used MAWSs more often to come up with games, and the teachers were more enthusiastic about participating in those games."</i> (Second week field notes,09/11/18)
Classroom	Environment	Variation and efficient	The attendees changed their classroom settings to keep their students more focused and attentive. <i>"I've noticed that the more I changed the classroom setting, the more curious and interested my students were in the materials, which made the lectures more productive."</i> (Tch,5)
		Idealistic / Qualified	<i>"The students felt more free and interacted with MAWSs more often and structured their own learning more, which made me feel like it was a very idealistic model that we employed. We, the teachers, become more productive when students are more active, which makes the classroom setting more qualified...In fact, I believe I've managed to turn my classroom into a learning setting my undergraduate teachers used to talk about and I've always wanted to have."</i> (Tch,2)
	Productivity	Activities	<i>"...We come up with more detailed and multidimensional extraordinary activities as they (students) gain new perspective on things. We even turn some activities into projects and discuss them in small groups."</i> (Tch,1)
		Interactions	<i>"Students in highly efficient classrooms interact more with their classmates and teachers and are more interested in the materials."</i> (15th week field notes,12/24/18)
		Materials	The attendees kept changing the classroom settings and materials. In addition, the teachers and the students made modifications to materials and integrated them into activities. <i>"I sometimes see some students create their own materials. They are so impressed by those materials that they even come up with their own materials back at home and bring them to the classroom with them."</i> (Tch,1)
Children	Emotional Effect	Astonishment	<i>"We placed MAWSs in ten classrooms. All students in those classrooms were positively shocked. It was obvious that it was the first time they'd seen so many math materials all in the same place. They just wouldn't put the materials back even though their teachers told them to."</i> (First week field notes,09/07/18).
		Increased curiosity	<i>"...You see how interested my students are in the materials in the center... Here's what I've realized, they are looking forward to me adding new materials to the center. I'm so happy to see their enthusiasm."</i> (Tch,1)
		Increase in courage and self-confidence	<i>"Some of my students were less active than their classmates. But, they became more interested, probably because they saw their classmates play with the materials. Now, they pick up materials from the center and mingle with their classmates and play with them."</i> (Tch,2)
		Increased interest and demand	<i>"The students in the productive classrooms were more interested and enthusiastic about math and materials. They asked their teachers to show them activities they could use those materials in."</i> (8th week field notes,10/23/18)
		Feeling of independence	<i>"The attendees let their students use MAWSs however they wanted. They let them choose materials, integrate them into their games, and discuss about how to use them."</i> (6th week field notes,10/11/18)
		Developing patience	<i>At first, the students used to argue because they didn't want to share the MAWS materials. But, in the following weeks, I told them many times that they should be patient and wait for their turn. Now, they're more patient. In fact, now, they always kindly ask their classmates for materials."</i> (Tch,3)
		Experiencing enthusiasm	The students became more enthusiastic about participating in math activities (Classroom 2-3-4, 11th week field notes,11/13-14-15-16/18). Two teachers explained the situation as follows: <i>"For us, math activities were just desk-bound activities before we attended the project... (Tch,2). "I'd never integrated math into games this much before...Now, my students enjoy math."</i> (Tch,4)

Peer Interactions	Synergy	Studying and learning	<i>"I can say that the MAWS has changed the way my students look at math. I got them to do activities in small groups, which helped them develop teamwork and learning skills. I make sure that the groups are heterogenous, I mean, I put those who know about stuff together with those who don't, which helps them develop social skills..." (Tch, 4)</i>
		Thinking and questioning	<i>"I used to evaluate my students at the end of activities, but now, I ask them questions throughout activities as well. In this way, they get to interact more and think more." (Tch,3)</i>
	Increase in	Knowledge transfer	<i>"Every student is at a different level, and so they each use the materials differently. I have some students who lag behind. I sometimes see those students ask their classmates questions about materials or even take them as role models." (Tch,5)</i>
		Math talks	<i>"You're not gonna believe it, but we speak more in math terms during class. We've realized that there are so many terms we hadn't used before. But now, both me and my students are more careful about it." (Tch,6)</i>
		Cooperation	<i>"We divide the students into small groups and get them to do math activities to shift to a project-based approach. We assign different learning outcomes and tasks to each group. The group members work together to complete the tasks...Some students even present their ideas to other groups." (Tch,1)</i>
Child-teacher interaction	More	Inquiry based dialogues	<i>The students in the classrooms where the MAWS was implemented effectively had more math questions to ask. For example, "one of the students went up to the teacher and asked her if he could go and get a snowball from outside. "We are playing lawn dart with Mehmet; but we just can't hit the target (ball pools), the balls are just bouncing back. So we'll use snowballs so that they'll land on the ground. The teacher said: "Let's think differently, kids. It's cold outside. Besides, some students may not want to go out." Mehmet said "I have an idea, let's warp the balls with a duct tape. The teacher replied "That could work, it's worth a try. What else do you think you can do?" Ahmet said, "Maybe we can wrap the balls with our scarves to stop them from bouncing." Mehmet replied, "Why don't we make balls from play dough?"...The students and the teachers searched for the items to put those ideas to use...(Classroom 1, 7th week field notes,10/15/18)</i>
		Qualified interactions	<i>Some students used the centers more actively. In those classrooms, the teachers interacted more with their students math-wise. The teachers explained the situation as follows: "I had high-quality discussions with my students about math, which helped them comprehend math better and use it more." (Tch,3) "I talk to my students about math more often. They always ask me questions about things they are curious about." (Tch,6)</i>
Interest in materials	Using math more	Attach to game and long-term use	<i>"The MAWS was used more efficiently in some classrooms. In those classrooms, the students picked up more materials from the center and integrated them into their games more actively. In some classrooms, the teachers asked their students to use the materials to come up with games. Some students took some of the materials back home and continued to play games there." (Classroom 1, 9th week field notes, 11/02/18)</i>
		Astonishment and more attention	<i>In the first weeks of the project, the students were shocked by the materials. They checked the materials with curiosity. Some students stated the following: "The toys are so nice,...made of different stuff (materials),...they're completely different from our toys,...what are we supposed to do with them?...I wish we always had them in the classroom." etc. (Classroom 1-2-3-5, first week video recordings)</i>
		Games	<i>The teachers stated many times that their students integrated math into their games more than they used to. One of the teachers said "...The students' games have become more comprehensive after the project. They enjoy playing with the materials. They try to use them in their games. You'll hear them use math terms quite often." (Tch,4)</i>
		Daily life and routines	<i>The video recordings showed that the students who used the materials more effectively experienced changes in their daily routines. Teacher 3: "Kids, from now on, I want all of you to drop by the math station every morning. Then, we'll have a chat about new toys, and I'll ask you for your opinions...and then we'll do math activities." (Classroom 3, second week video recordings, 09/10/18)</i>

Checklists (Mathematic skills)	Faster improvement in counting skills	We developed checklists in accordance with the early childhood learning outcomes and indicators of the Turkish National Education system. We administered a checklist to each student at the beginning and end of the study. The MAWSs were used more effectively in some classrooms. In those classrooms, most students developed more math skills (counting, relationships between numbers, symbolic use of numbers, and simple addition and subtraction with numbers 1-10). In those classrooms, the students had more opportunities to gain experience with the MAWS materials. They also had the opportunity to discuss, explore, discover, and become acquainted with gamified math. These positive changes in the checklists may be due to the methods and techniques used by the teachers for the MAWSs. (<i>Checklist results</i>)
	Faster improvement in perceiving numerical relationships	
	Faster improvement in symbol usage	
	The ability to use numbers (1-10) quickly in operations	