

The Effect of PEARL "Emotional Empathic Proximal Learning-Educational Environment" on the Social-Emotional Development of Children Aged 3-4 Years

Ümit Deniz^a, Esra Ömeroğlu^b, Saide Özbey^c, Aysel Tüfekci^d, &

Nafia Kübra Karakaya Dohman^{e*}

Research Article

Received: 12.5.2022

Revised: 22.5.2023

Accepted: 17.7.2023

a Prof. Dr., Gazi University, <https://orcid.org/0000-0001-5338-8254> *umitdeniz@gazi.edu.tr

b Prof. Dr., Gazi University, <https://orcid.org/0000-0003-2535-2793>

c Prof. Dr., Gazi University, <https://orcid.org/0000-0001-8487-7579>

d Assoc. Prof. Dr., Gazi University, <https://orcid.org/0000-0001-7792-5624>

e Res. Asst., Gazi University, <https://orcid.org/0000-0002-8901-6679>

Abstract

The interaction of mind and environment are important in the formation of learning, based on the theories of scientists such as Piaget, Vygotsky, Bandura and Montessori. The mind's potential is shaped, diversified and revealed by the environment. This study was produced from the results of the Erasmus+ K201 project coded 2018-1-IT02-KA201-048515, named PEARL "Emotional Empathic Proximal Learning-Educational Environment". This article aims to reveal the effect of PEARL "Emotional Empathic Proximal Learning-Educational Environment" on the social-emotional development of children aged 3-4. The study was conducted with the non-selective semi-experimental research model with the final test control group. The characteristics of this experimental model are the creation of randomly determined experimental and control groups and the determination of the effectiveness of the applied model by the final test. Children from Italy, Turkey, Spain and Lithuania, which are PEARL project partners, participated in the research. 195 children were recruited for robotic activities and 207 for non-robotic activities in schools where the project partners volunteered in their countries. The PEARL Education Model was applied to the children participating in the study before the assessment. After the applications, each child was assessed using the Child Observation Forms by their teachers with the help of video recordings captured. The mean score of the Child Observation Form was obtained by averaging the total and individual country scores. It has been detected that the average in all robotic group children is higher than the average in the non-robotic group. These practical findings confirm the project hypothesis – "Group activities enriched with robotic coding activities develop children's social skills, cooperation skills, and ability to understand and express emotions".

Keywords: early childhood education, early childhood, robotic coding in early childhood, social emotional development.

Pearl "Duygusal, Empatik ve Proksimal Öğrenme Eğitim Ortamı"nın 3-4 Yaş Çocukların Sosyal Duygusal Gelişimlerine Etkisinin İncelenmesi

Öz

Öğrenmenin oluşmasında, Piaget, Vygotsky, Bandura ve Montessori gibi bilim insanlarının teorilerinden de hareketle zihin ve çevre etkileşimi önemlidir. Zihnin potansiyeli çevre ile şekillenmekte, çeşitlenmekte ve açığa çıkmaktadır. Bu çalışma 2018-1-IT02-KA201-048515 kodlu, Erasmus+ K201 projesi olan PEARL "Duygusal, Empatik ve Proksimal Öğrenme Eğitim Ortamı" isimli projeden üretilmiştir. Bu çalışma PEARL Duygusal, Empatik ve Proksimal Öğrenme Eğitim Ortamı'nın 3-4 yaş aralığındaki çocukların sosyal ve duygusal gelişimi üzerindeki etkisini incelemektedir. Araştırma, son test kontrol gruplu seçkisiz yarı deneysel araştırma modeli ile gerçekleştirilmiştir. Araştırmaya, PEARL proje ortakları olan İtalya, Türkiye, İspanya ve Litvanya'dan çocuklar katılmıştır. Proje ortakları ülkelerinde gönüllü olan okullarda, robotlu etkinliklere, toplam 195, robotsuz etkinliklere ise 207 çocuk alınmıştır. Araştırmada, PEARL projesinde çocukları değerlendirmek amacı ile geliştirilen "PEARL Çocuk Gözlem Formu" kullanılmıştır. Tüm robotlu grup çocuklarının ortalamasının robotsuz grup ortalamasından daha yüksek olduğu saptanmıştır. Uygulama sonucunda elde edilen bu bulgular ile proje hipotezi -"Robotik kodlama etkinlikleri ile zenginleştirilmiş grup etkinlikleri, çocuklarda sosyal becerileri, işbirliği yapma becerilerini ve duyguları anlama ve ifade etme becerilerini geliştirir."- doğrulanmıştır.

Anahtar kelimeler: okul öncesi eğitim, okul öncesi dönem, okul öncesi dönemde robotik kodlama, sosyal duygusal gelişim.

To cite this article in APA Style:

Deniz, Ü., Ömeroğlu, E., Özbey, S., Tüfekci, A. & Karakaya Dohman, N. K. (2024). The effect of pearl "Emotional empathic proximal learning-educational environment" on the social-emotional development of children aged 3-4 years. *Bartın University Journal of Faculty of Education*, 13(2), 285-300. <https://doi.org/10.14686/buefad.1115964>

INTRODUCTION

The learning process emerges through the interaction of the mind and environment. The individual makes an effort to explain a new situation s/he has encountered with the schemes s/he created in the past. If an existing scheme explains a new situation, this means reinforcing the previous learning rather than a new learning process. If existing schemes cannot explain a new situation, a new scheme is needed, and the learning process begins. The individual goes through the stages of assimilation, accommodation, and equilibration, respectively during the learning process (Bacanli, 2011). When new knowledge reaches the equilibration stage, learning is realized. The individual configures information with environmental effects and his/her mental processes (Beilin, 1994; Cole & Wertsch, 1996; Erdem & Demirel, 2002; Vygotsky, 1978). Experiences in early childhood are important in acquiring and structuring information.

It is well known that early childhood education is crucial and unique for the development of an individual. The first 36 months of life is the period when the brain makes the most connections (synapses). Between the ages of two and three, milestones occur in communication and emotional development, as well as in cognitive and motor development. In the sensorimotor stage from birth to age two, babies receive information through their senses by touching, looking, and listening. In the sensorimotor stage from birth to age two, babies receive information through their senses by touching, looking and listening. A baby may not be able to make sense of a particular toy at first, but may represent the object in his/her mind as s/he begins to look, feel, and manipulate it frequently (Kurt, 2020). Piaget states that from the age of one, children begin to develop their sensory-motor skills before their language develops (Piaget, 1965). Yet, in the presence of a new object, without knowing how to speak, the child knows how to assimilate and incorporate this new object into each of her already developed schemes (Bruce et al. 2006).

Vygotsky theorized that interaction with others has a major impact on cognitive development (Hockenbury & Hockenbury, 2011). He believed that a child's mind develops when interacting with others (Bernstein et al., 2008). During this interaction, children use language to ask questions and others respond to them, which contributes to the development of children's cognitive abilities (Babakr, Mohamedamin & Kakamad, 2019; Cacioppo & Freberg, 2013). Albert Bandura, in his social learning theory, developed the idea that human behaviour occurs through interaction between the person and his/her environment. He suggests that learning is a cognitive process that takes place in a social context, primarily through observation, reinforcement, or direct teaching. Montessori, on the other hand, adopts a philosophy emphasizing that every child should be given their sovereignty and freedom. She emphasizes that the five senses should work actively in learning (Koh & Frick, 2010).

Brain and environmental interaction are important for learning, based on the theories of scientists such as Piaget, Vygotsky, Bandura, and Montessori. The potential of the mind is shaped, diversified, and revealed by the environment. Therefore, the most important task of educators is to create deliberate environments in education, to support all areas of mind-oriented improvement, and thus to enhance the environment. Accordingly, the PEARL project, in which this study was produced, is subject to Piaget's Theory of Cognitive Development, Vygotsky's Sociocultural Theory, the Montessori Method, and Bandura's social learning theory. Piaget and Vygotsky configure information from the constructivist approach.

The constructivist approach clarifies what information is and how it is learned (Erdem & Demirel, 2002). It allows the child to experiment with the information s/he got involved in through his/her mechanisms rather than memorizing (Perkins, 1999). Children's active participation in their learning processes and constructing knowledge by experiencing ensures that the learning is permanent (Cole & Wertsch, 1996). Concrete experiences and well-designed materials facilitate for children to construct knowledge. In addition, advisory teachers who have a good understanding of the scaffolding method aim to support the child's developmental potential. Mora Teruel (2018) states that if the events are emotionally meaningful, attention, memorization, and other cognitive processes will improve.

The educational environment encourages the emergence and expression of emotions. There is no learning without emotion. Miller (2002) and Pintrich (2003) stated that learning does not solely mean "cold cognition" of reasoning and problem-solving; They stated that learning and information processing are affected by emotions, that is, "warm cognition" is also important in learning.

With the increasing importance of socially and emotionally supported education programs developed in light of these approaches in recent years, early childhood educators focused on developing socially and emotionally supported education programs. PEARL education is one of these programs. The learning environment

proposed as part of the PEARL model focuses on empathy so that children who engage in activities together can share their feelings and accept diversity. Hence, it creates an educational style that draws attention to diversity. Furthermore, the model cares about the collaborative learning environment. The distribution of roles in collaborative tasks allows children to adopt different perspectives, consider their abilities and challenges and those of their peers, and come to create a final product or achieve a goal or perform a task with the contributions of all. The PEARL model suggested that using robots in education would also be effective. Robots allow children to experiment with materials. It leads to the emergence of emotions, motivation, empathy, and well-being (Deniz et.al,2022).

For these reasons, this study aims to develop and promote an innovative, high-quality and inclusive education model that increases the impact of early childhood education on the physical, mental, emotional, and global well-being of individuals and groups, while promoting positive social values in society, academic institutions, teacher training institutions. The PEARL project, which was conducted to create a network that includes educational institutions, aimed to examine the social-emotional development of children aged 3-4.

METHOD

Method section may include research design, the study group or participants of the study, data collection tools, data analysis.

Research Objectives

The PEARL project aims to develop and test an innovative, high-quality and European-level replicable educational model suitable for developing emotional and empathic skills by supporting zone of proximal development areas of children between the ages of 0-6. Within the framework of this general objective;

- The sub-objectives of the project include establishing an international network of experts and organizations in close cooperation with academia, educational institutions, and teacher training agencies to promote innovative and quality education in early childhood.

- Building a new curriculum for teachers to put into practice an experimental educational model to develop the necessary skills in early childhood.

- Preparing a White book for public institutions and decision-makers at the national and European level on educational approaches and models tested in children aged 0-6.

This study aimed to examine the effect of the PEARL “emotional, empathetic and proximal learning educational environment” on the social-emotional development of 3-4-year-old children.

Research Design

The study was conducted with the non-selective semi-experimental research model with the final test control group. The characteristic of this experimental model is the creation of randomly determined experimental and control groups and the determination of the effectiveness of the applied model by the final test (Büyüköztürk et al., 2016).

Study Group

The research was conducted with children from Italy, Turkey, Spain, and Lithuania, which were PEARL project partners, in the schools which were volunteered from the PEARL Project Partners. For robotic activities; 25 children from Italy, 40 children from Turkey, 60 children from Spain and 70 children from Lithuania participated in the study. For non-robotic activities; 25 children from Italy, 47 children from Turkey, 65 children from Spain and 70 children from Lithuania participated in the study. When there were children with special needs in schools, they were asked to participate in the experimental groups. Thus, robotic activities were held with a total of 195 children, and non-robotic activities were held with a total of 207 children in all countries. The experimental and control groups for the groups aged 3-4 were formed as follows:

- Application of the activity with a robot to a group of 5 children (Experimental Group)
- Application of the activity without a robot to a group of 5 children (Control Group)

Data Collection

“PEARL Child Observation Form” was used to evaluate the effectiveness of the PEARL Education Model.

The Pearl Child Observation Form:

In order to evaluate the effectiveness of the PEARL Education Model, measurement tools that serve to collect quantitative data were developed by the research team. "PEARL Child Observation Form" was prepared

by the Gazi University project team in Turkey, which is one of the project partners. To write the items to be included in PEARL Child Observation Form, discussions were done with researchers in the project partner countries. Project objectives and in the literature (Beilin, 1994; Cole & Wertsch, 2002; Erdem & Demirel, 2002; Ömeroğlu et al, 2015; Santrock, 2011a; Santrock, 2011b; Vygotsky, 1978) were taken into consideration, and categories were determined. These categories are as follows:

- communication,
- group communication,
- collaboration,
- expressing emotions,
- self-expression,
- cooperation,
- coping with challenges,
- creating strategies,
- following the instructions,
- achieving a purpose,
- understanding and managing positive and negative emotions.

The following steps were followed in order to ensure the scope and content validity and reliability of the categories created for the Observation Form and the items created in this context.

- The categories which were determined and listed above were presented to the project partners in order to get feedback whether it was suitable with the project's objectives. Online meetings were planned with the partners so that they can give feedbacks to the categories. The overall feedback of the project partners was to add a category about educational emotions which were well-being, motivation, expressing emotions and prosocial behaviours. Researchers from Turkey had taken notes and they finalised the categories of the form.

- After categories had been finalised, Gazi University project team started to work on the items of the form. Items were prepared by taken into consideration of the categories and the literature. In addition, children's development at 3-4 of age was given importance. Therefore, drafted version of child observation form was created. After that, the expert opinions of the other project partners were taken. For validity and reliability of the form, a literature review is done about the project's objectives.

- After items of the form is written, the items are sent to the experts. The items are revised depending on the expert opinion.

- Before, the project's application, a pilot study was conducted, and two experts filled the child observation form. Project group came together and controlled the data of the two experts. Depending on the data collected by the two experts, some of the items were revised or eliminated.

- Then, adjustments were made to the form, taking into account the feedback of the project partners on adding items related to educational emotions (well-being, motivation, expressing emotions and prosocial behaviour) in the observation forms.

In addition, demographic questions about the child's age and country were added to each form with the opinions of the project partners.

Observation forms were prepared for 3-4 years of age;

- Child Observation Form applied to a group of 5 children who did the activity without a robot
- Child Observation Form applied to a group of 5 children who did the robotic activity

Two observation forms were created for both robotic activities and non-robotic activities. 45 items included the robotic activity form, 40 items is included in the non-robotic activity form. Some items in the forms are intended for positive-desirable, and some are intended for negative-undesirable behaviors. All items in each form are graded with a Likert type between the scores of "0" and "10". The absence of behavior is evaluated as "0", and fulfilment at the highest level is evaluated as "10". For example;

For the item "The child invites his/her teacher to join the game.": If the score 0 (zero) is marked for the item, the child has never invited his/her teacher to the game. On the contrary; If the score of 10 (ten) is marked, it means that the child has invited his/her teacher to the game pretty frequently.

The Pearl Education Activities

The PEARL education model is based on Piaget's approach to learning, Vygotsky's area of proximal development, Montessori's use of materials, and the Constructivist Approach's concepts of active learning and knowledge structuring. The theories of Piaget and Vygotsky form the constructivist basis of the PEARL model. As mentioned previously; "The constructivist approach explains what knowledge is and how it is learned" (Erdem & Demirel, 2002). It does not support the child's memorization of literate but supports the construction of the information with its mechanisms in the process in which s/he is involved by experiencing (Perkins, 1999). It ensures that children actively participate in their learning processes and learn the structuring through experience and knowledge (Cole & Wertsch, 2002). Concrete experiences and well-designed materials make it easy for children to construct knowledge. In addition, educators who have a good understanding of the scaffolding method also aim to support the developmental potential of the child. In the PEARL Educational Model, it is essential to ensure that all children, regardless of their abilities, reach their developmental potential by being included in the education process. The Montessori approach adopts a philosophy that argues that every child should be empowered to their dominance and freedom. It is a child-oriented approach that allows children to learn at their own pace. The Montessori Approach emphasizes that the five senses should work actively in learning (Koh & Frick, 2010). The PEARL Education Model also prioritizes learning by doing and experiencing for children.

The activities for the PEARL Training Model were prepared in a few stages. At the first stage, the project partners held online meetings and discussed the features that educational activities should carry. In the light of the literature (Beilin, 1994; Cole & Wertsch, 2002; Erdem & Demirel, 2002; Ömeroğlu et al, 2015; Santrock, 2011a; Santrock, 2011b; Vygotsky,1978) and within the framework of the theories on which the project is based, it was determined as the first feature that the activities should be prepared by the children and conditions of the country involved in the project. The active participation of children in the activities and providing an opportunity for teacher guidance were among the priorities. In addition, the importance of implementing activities both in a group environment and individually was emphasized (Deniz et. al, 2022).

After determining the main characteristics of the activities, each country that is a partner of the project prepared examples of activities for each age group of children with its team. These prepared activities were presented to the opinion online. At this stage, each country evaluated the activities prepared by the other partner countries in terms of compliance and applicability to the basic criteria by examining the effectiveness. As a result of the evaluation, the activities with the highest score according to the scoring of all partners were selected to be applied in the project. The activities prepared by the Spanish and Lithuanian teams were re-submitted to the revision of the teams for application in the project. The revisions were discussed at online meetings and the activities were finalized.

Two separate versions of the 3-4 age group events are "robotic and non-robotic activities". The theme of the event does not differ according to these two versions. In the activity where the robot is not used, the activity process continues routinely and ends. In the activities where the robot is used, the robot is included in the activity process in the last part of the activity; at the beginning of the activity, children are expected to perform the tasks that they perform themselves, this time through the robot. For example, in the 3-4-year-old activity non-robotic, children try to create sentences of three words with pictorial cards. In the 3-4-year-old activity with a robot, after studying with sentence cards, a robot platform consisting of picture sentence cards is revealed, and children are asked to code the robot and collect the picture cards related to the specified sentence on the platform via the robot.

At PEARL educational activities, Clementoni-produced Robot Doc is used to teach children Robotics and coding skills. Robots are known to help cultivate digital thinking skills (Bers, Flanney, Kazakoff, & Sullivan, 2014). The PEARL Education Model also teaches robots to learn about group sharing, social and communication skills, empathy, creativity, personal expression, and so forth. In this project, robots are used to develop prosocial skills and values.

Implementation Process of Pearl Educational Activities

Before the implementation started, the schools are chosen by the partner countries with convenient sampling. Schools in Turkey and Italy are private schools, and the schools in Lithuania and Spain are public schools with this way variety of the population is tried to be provided. The teachers in the schools in Italy, Turkey, Spain and Lithuania, which are the partner countries of the project, were trained online at an international level on the purpose and process of the project, the observation forms, the activities to be implemented, and the filling of the observation forms. In addition, detailed information meetings were held on the project by providing training to teachers at the national level on the Zoom. After the training, the activities and materials (such as robots) to be used in the application were shared with the teachers.

Children aged 3-4 years in Italy, Turkey, Spain and Lithuania were included in the application. In the project partner countries, the robots were used in the activities developed as part of the PEARL Education Model in the experimental groups; And the same activities were adapted as robot-free variations for the control groups. The teachers, who received the activities and materials, applied some of the five-person groups they created robotics and some non-robotics in their schools. Teachers recorded their practices as videos. During the implementation and evaluation process, the researchers in the project team were in contact with the teachers by e-mail and telephone. With ongoing communication, teachers' questions were answered and their experiences were shared.

After the application was completed, all the teachers participating in the application created many activities under the PEARL Education Model, using their practical experience. These created activities were edited by the experts involved in the project and shared online at an international level for the benefit of program makers, practitioners, and other professionals in the field of pre-school education.

Data Analysis

After the implementations were completed, each child was evaluated with the Child Observation Forms developed within the scope of the project, by watching the video recording by their teacher. The child observation forms filled in by the teachers were hand-delivered by the researchers. The data were evaluated descriptively using the SPSS programme. The mean score was obtained by taking the average of the child observation form scores for each country and in total, and presented as the mean score in the Table 1.

FINDINGS

In this section, the mean scores of 4-years-old children from the observation form items are given in the Table 1.

Table 1. Distribution of child observation form item score means of children in 3-4 age group by country

	Italy		Turkey		Spain		Lithuania		Total	
	Group Robotic	Group Non-robotic	Group Robotic	Group Non-robotic	Group Robotic	Group Non-robotic	Group Robotic	Group Non-robotic	Group Robotic	Group Non-robotic
The child is interests in participate in the activities	8.0	7.6	8.9	8.4	9	8.9	8.2	8.2	8.6	8.3
The child is anxious when starting the activity	1.4	2.6	2.5	2.3	8.6	8.4	4.0	3.9	4.4	4.4
The child does not lose motivation during the activity	6.5	4.6	6.6	6.8	7.6	8.1	7.0	7.2	7.0	7.0
The child has difficulties following the teacher's directions	4.3	3.3	2.6	2.4	3.2	4.4	4.2	4.6	3.6	3.8
The child endeavours to stay the activity	6.1	6.7	7.6	7.8	8.3	8.4	7.5	7.3	7.6	7.6
The child wants to quit the activity when confronts a difficulty during the activity	2.1	2.8	2.7	3.2	2.2	2.4	3.4	3.9	2.8	3.2
The child is willing to deal with the difficulty confronted during the activity	6.6	6.7	6.5	6.1	7.4	7.1	6.6	6.3	6.8	6.5
The child becomes upset when having difficulty during the activity	3.4	3.0	4.4	3.9	2.4	2.7	4.1	4.6	3.7	3.7
The child becomes happy when dealt with difficulty during the activity	6.0	4.6	8.5	7.9	7.3	7.7	3.2	2.1	5.9	5.3
The child expresses negative feelings with a gesture, facial expression, and voice when	5.3	6.0	6.6	6.7	3.8	3.7	5.4	6.4	5.3	5.8
The child gets angry when having difficulty during the activity	3.1	3.3	2	1.8	2.2	2.2	3.6	4.9	2.8	3.2
The child becomes happy after finishing the activity	8.3	8.0	9.3	8.3	9.2	8.7	7.6	7.5	8.5	8.0
The child expresses positive feelings with a gesture, facial expression, and voice when feels happy during the activity	7.9	7.7	8.7	8.2	8.3	8	7.8	8.4	8.2	8.2

	Italy		Turkey		Spain		Lithuania		Total	
	Group Robotic	Group Non-robotic	Group Robotic	Group Non-robotic	Group Robotic	Group Non-robotic	Group Robotic	Group Non-robotic	Group Robotic	Group Non-robotic
The child asks for others' help when having difficulty during the activity	5.3	4.7	6.5	5.8	3.5	3.2	4.4	3.4	4.9	4.2
The child is willing to experience new activities	7.5	7.3	7.9	6.6	8.8	8.6	7.8	8.3	8.0	7.8
The child shows willingness to complete the activity	7.7	7.2	8.1	6.8	8.4	8.3	5.0	6.8	7.0	7.2
The child gets angry when making a mistake	2.7	3.2	1.7	1.5	1.8	2.3	3.0	4.3	2.3	3.0
The child smiles often during the activity	6.8	5.1	7.3	6.2	7.3	6.8	6.5	7.1	6.9	6.5
The child gets excited when produces new ideas or things during the activity	6.3	6.6	7.9	7.5	7.6	7.4	5.5	7.3	6.7	7.3
The child shows sadness when making a mistake	5.1	6.1	5.5	4	2.4	3.4	4.4	4.8	4.3	4.4
The child leaves the game when gets angry	2.5	2.2	3.2	2.5	1.2	1.5	1.9	2.7	2.1	2.3
The child shows courage when starting a new activity	6.9	6.4	7.9	7	7.9	7.5	7.1	7.7	7.5	7.3
The child practices willingly the roles given during the activity	7.5	7.2	8.4	7.9	8.9	8.3	7.2	7.2	8.0	7.7
The child tries different ways to solve the issue when having difficulty during the activity	6.2	4.9	7.3	6.6	5.5	6.3	6.0	6.6	6.2	6.3
The child gets anxious when confronts a difficulty	2.4	4.0	3.5	3.1	4.5	4.9	4.6	6.3	4.0	4.8
The child is happy in group work.	7.3	7.1	8.3	7.7	8.5	8	7.1	7.6	7.8	7.7
The child gets angry when The child cannot fulfil his role in the group.	3.4	3.4	2.6	1.7	2.2	2.5	3.2	5.3	2.8	3.4
The child angers his friends because of his misbehaviour in the group.	1.3	2.8	2	2	1.8	1.7	2.3	3.4	1.9	2.5
The child focuses on the materials (robot) used in the activity	7.4		8.7		8.7		7.7		8.2	
The child enjoys using materials (robot) used in the activity	7.6		9.1		9.2		7.8		8.5	
The child gets excited with the material (robot) used in the activity	7.2		9.4		9		7.5		8.3	
The child creates new games with the material (robot) used in the activity	5.0		7.1		4.5		5.7		5.7	
The child passionately shares with the teacher experiences s/he had with the robot	5.9		8.9		7.3		6.7		7.3	
The child expresses others' positive/negative feelings	6.7	5.7	7.4	7.1	7.4	7.2	7.6	8.0	7.4	7.3
The child displays behaviours that disturbs the flow of the activity	3.0	2.4	2.4	1.8	3	3.4	3.1	4.5	2.9	3.2
The child complains about classmates during the activity	2.8	3.3	7.7	5.6	6.4	5.2	5.6	5.8	6.1	5.3
The child communicates positively with the children in the group at the activity.	1.5	3.5	1.5	1.1	1.8	1.4	2.2	4.0	1.8	2.5
The child has difficulty communicating with the children in the group at the activity.	1.6	2.3	1.8	2	2.1	2	3.0	4.0	2.3	2.8
The child collaborates with friends in the group	6.7	5.8	7.6	7.1	8.1	7.3	6.2	6.5	7.1	6.8
The child cooperates with classmates	6.5	6.2	7.9	7.8	8.4	7	6.6	6.1	7.4	6.8
The child enjoys helping classmates during the activity	6.1	5.7	7.9	7.3	7.7	7.1	6.9	6.3	7.3	6.7
The child stays calm when solving issues with others	6.8	6.9	6.8	7.1	8	7.6	6.5	5.4	7.0	6.6
The child cares about classmates who are upset	4.4	4.8	6.2	4.4	5.3	6	5.4	5.9	5.5	5.4

	Italy	Turkey	Spain	Lithuania	Total					
	Group Robotic	Group Non-robotic	Group Robotic	Group Non-robotic	Group Robotic	Group Non-robotic				
The child displays reluctance in participating in the group work.	1.6	2.6	1.8	1.2	1.6	2.5	2.2	2.2	1.8	2.1
The child provides support to other children while they perform their role in the group work	5.6	5.6	7.4	5.8	6.8	6.7	6.1	5.9	6.5	6.0
Total points average	5.2	5	6.1	5.2	5.9	5.6	5.5	5.7	5.7	5.5

In Table 1, the mean scores of children in the 3-4 age group by country are given for the items they receive from the PEARL Child Observation Form. According to countries, graphs for mean score comparisons for each item are shown in Figure 1-12. The graphs are chosen to show how PEARL Educational Model is impacted both robotic and non-robotic groups. Therefore, the most meaningful items and result are chosen and they are presented below.

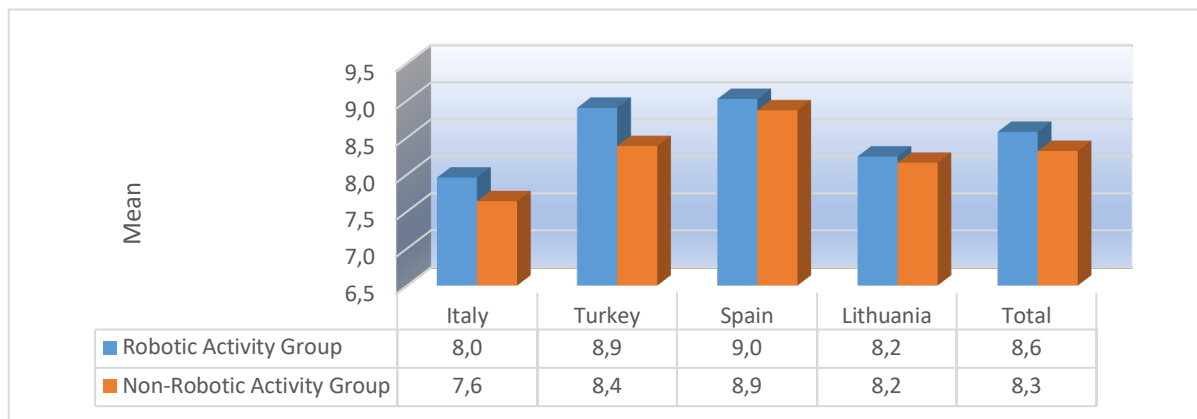


Figure 1. Country-specific distribution of “The child is interested in participating in the activities” item scores for 3-4 age group children.

When examining the mean scores of the item “The child is interested in participating in the activities” by countries, it is seen that while the children in Spain have the highest mean score in the administration “Non-robotic”, the children in Italy have the lowest mean score. In the administration “Robotic”, it has been determined that while the children in Spain have the highest mean score, the children in Italy have the lowest mean score.

The mean score difference between the group robotic and the group non-robotic is determined to be the highest in Turkey and the least in Lithuania for the robotic activity group. When examining the total scores of all children in all countries, the mean score of the ones robotic is higher than the mean score of those non-robotic.

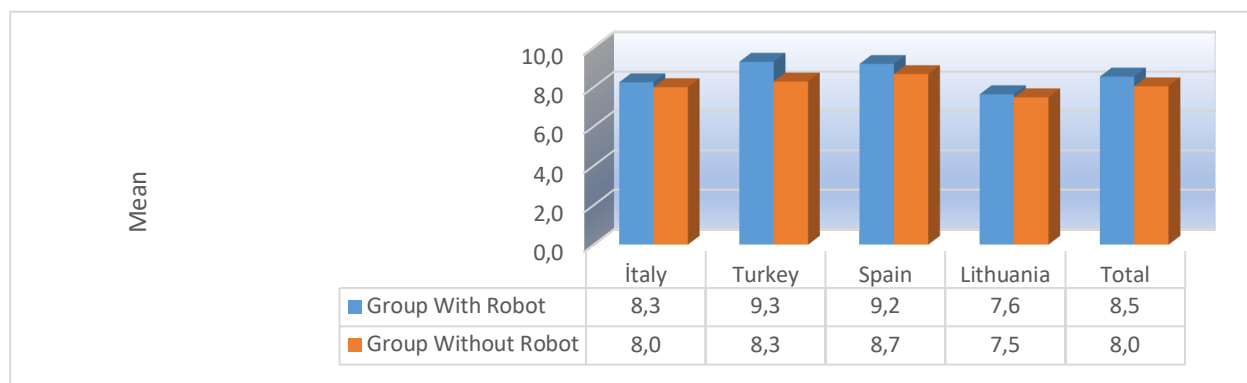


Figure 2. Country-specific distribution of “The child becomes happy after finishing the activity” item scores for 3-4 age group children.

When examining the mean scores of the item “The child becomes happy after finishing the activity” by countries. As it is seen that while the children in Spain have the highest mean score in the administration “Non-robotic”, the children in Lithuania have the lowest mean score. In the administration “Robotic”, it has been determined that while the children in Turkey have the highest mean score, the children in Italy have the lowest mean score.

The mean score difference between the group robotic and the group non-robotic is determined to be the highest in Turkey and the least in Spain in favor of the group robotic. When examining the total scores of all children in all countries, the mean score of the ones robotic is higher than the mean score of those non-robotic.

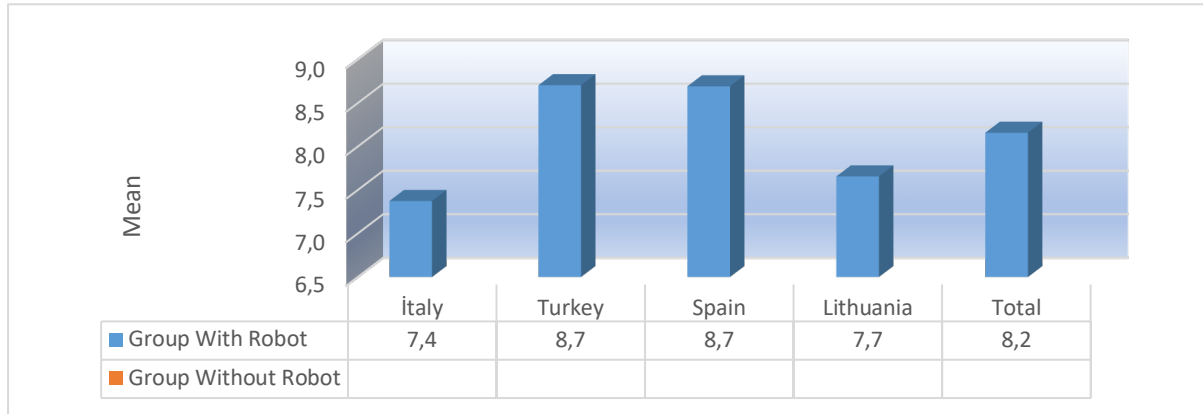


Figure 3. Country-specific distribution of “The child becomes happy after finishing the activity” item scores for 3–4 age group children.

When the mean scores of the item “The child becomes happy after finishing the activity” are examined according to the countries, it is observed that the children in Turkey and Spain have the highest average in the “with-robot” application, while the children in Italy have the lowest average.

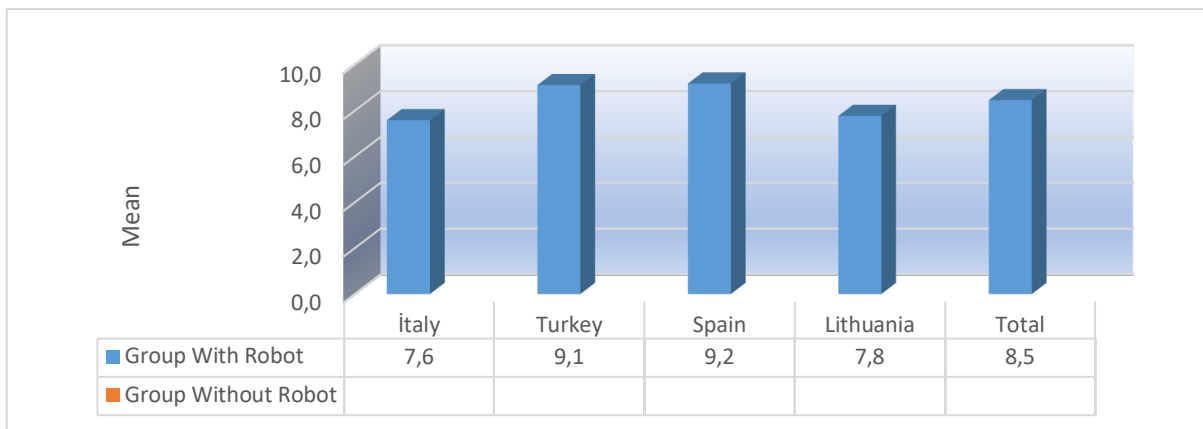


Figure 4. Country-specific distribution of “The child enjoys using materials (robot) used in the activity” item scores for 3–4 age group children.

When examining the mean scores of the item “The child enjoys using materials (robot) used in the activity” by countries, it is seen that while the children in Spain have the highest mean score in the administration “Robotic”, the children in Italy have the lowest mean score.

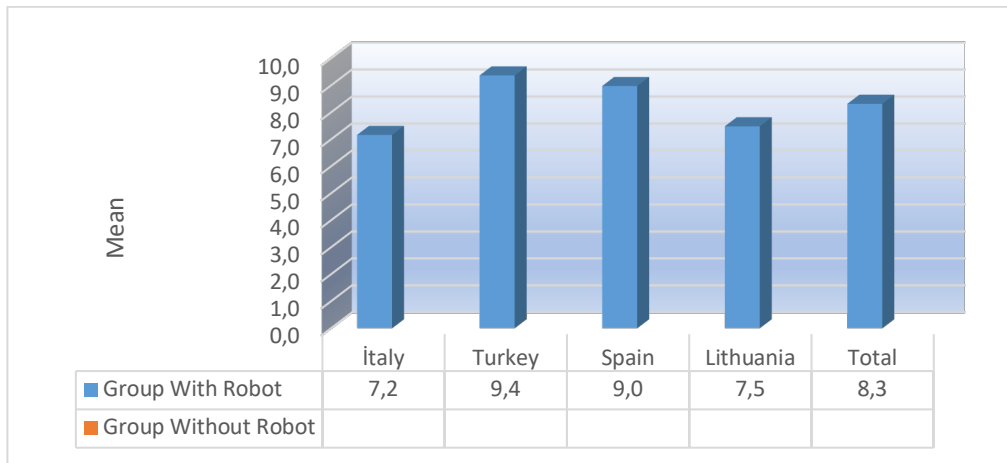


Figure 5. Country-specific distribution of “The child gets excited with the material (robot) used in the activity” item scores for 3–4 age group children.

When examining the mean scores of the item “The child enjoys using materials (robot) used in the activity” by countries, it is seen that while the children in Spain have the highest mean score in the administration “Robotic”, the children in Italy have the lowest mean score.

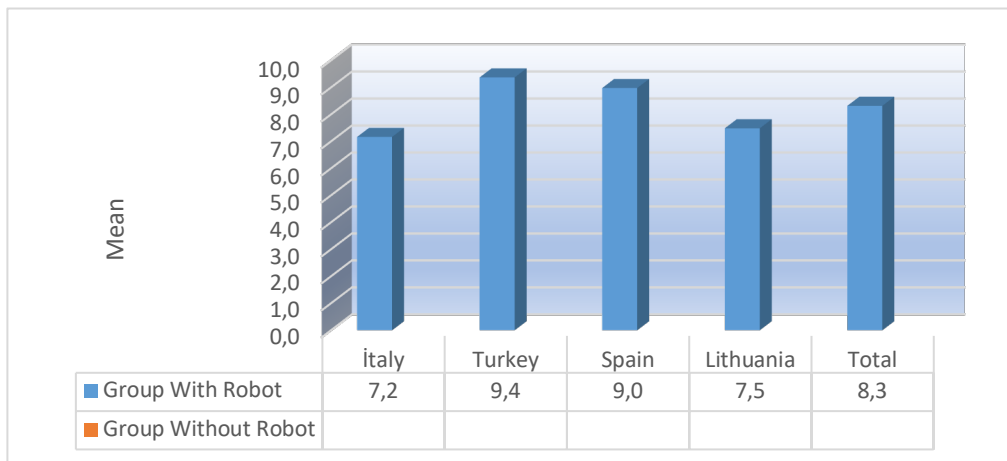


Figure 6. Country-specific distribution of “The child creates new games with the material (robot) used in the activity” item scores for 3–4 age group children.

When examining the mean scores of the item “The child creates new games with the material (robot) used in the activity” by countries, it is seen that while the children in Turkey have the highest mean score in the administration “Robotic”, the children in Spain have the lowest mean score.

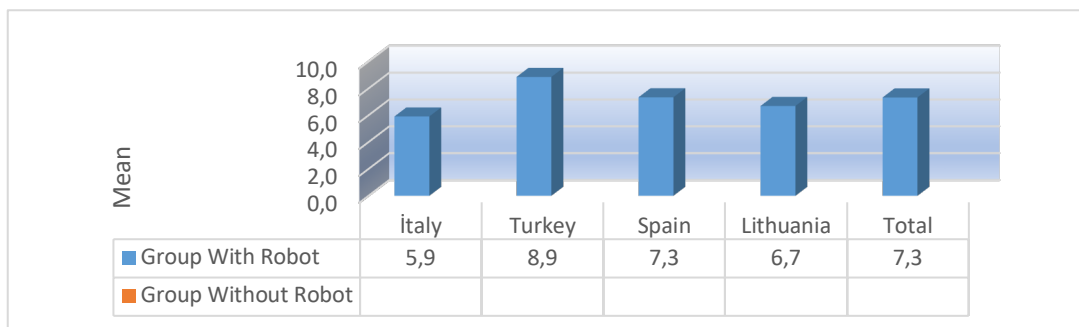


Figure 7. Country-specific distribution of “The child passionately shares with the teacher experiences The child had with the robot” item scores for 3–4 age group children.

When examining the mean scores of the item “The child passionately shares with the teacher experiences the child had with the robot” by countries, it is seen that while the children in Turkey have the highest mean score in the administration “Robotic”, the children in Italy have the lowest mean score.

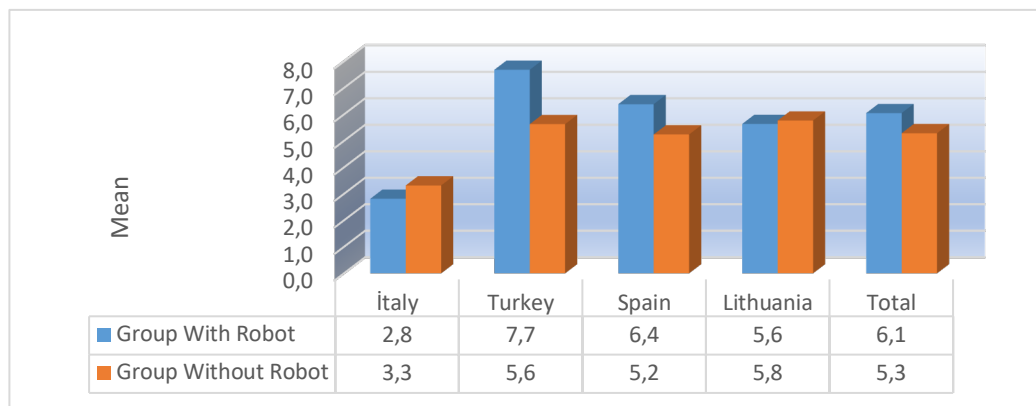


Figure 8. Country-specific distribution of “The child expresses others’ positive/negative feelings” item scores for 3–4 age group children.

When examining the mean scores of the item “The child expresses others’ positive/negative feelings” by countries, it is seen that while the children in Lithuania have the highest mean score in the administration “Non-robotic”, the children in Italy have the lowest mean score. In the administration “Robotic”, it has been determined that while the children in Italy have the lowest mean score, the children in Lithuania have the highest mean score at an equal rate have the highest mean score in the administration “Robotic”, the children in Italy have the lowest mean score.

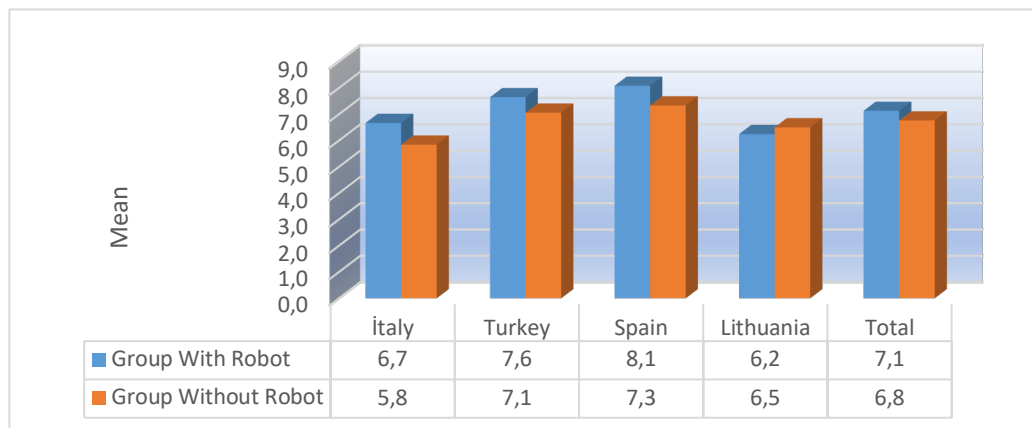


Figure 9. Country-specific distribution of “The child cooperates with classmates” item scores for 3–4 age group children.

When examining the mean scores of the item “The child cooperates with classmates” by countries, it is seen that while the children in Spain have the highest mean score in the administration “Non-robotic”, the children in Italy have the lowest mean score at the equal rate. In the administration “Robotic”, it has been determined that whereas the children in Spain have the highest mean score, the children in Lithuania have the lowest mean score.

The mean score difference between the robotic group and the non-robotic group is determined to be the highest in Italy and the least in Lithuania for the robotic group. When examining the total scores of all children in all countries, the mean score of the ones robotic is higher than the mean score of those non-robotic.

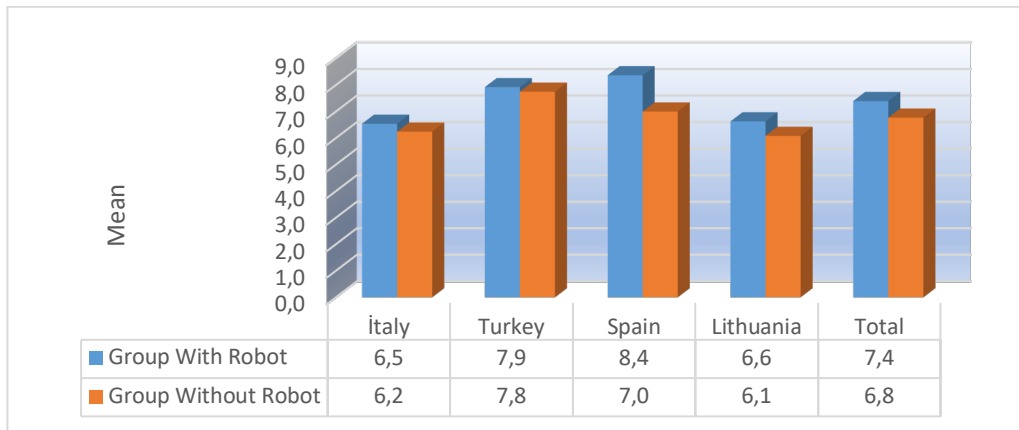


Figure 10. Country-specific distribution of “The child fulfils his/her role in the group work (The child collaborates with friends in the group)” item scores for 3–4 age group children.

When examining the mean scores of the item “The child fulfils his/her role in the group work” by countries, it is seen that while the children in Turkey have the highest mean score in the administration “Non-robotic”, the children in Lithuania have the lowest mean score at the equal rate. In the administration “Robotic”, it has been determined that while the children in Spain have the highest mean score, the children in Italy have the lowest mean score.

The mean score difference between the group robotic and the group non-robotic is determined to be the highest in Lithuania and the least in Spain for the group robotic. When examining the total scores of all children in all countries, the mean score of the ones robotic is higher than the mean score of those non-robotic.

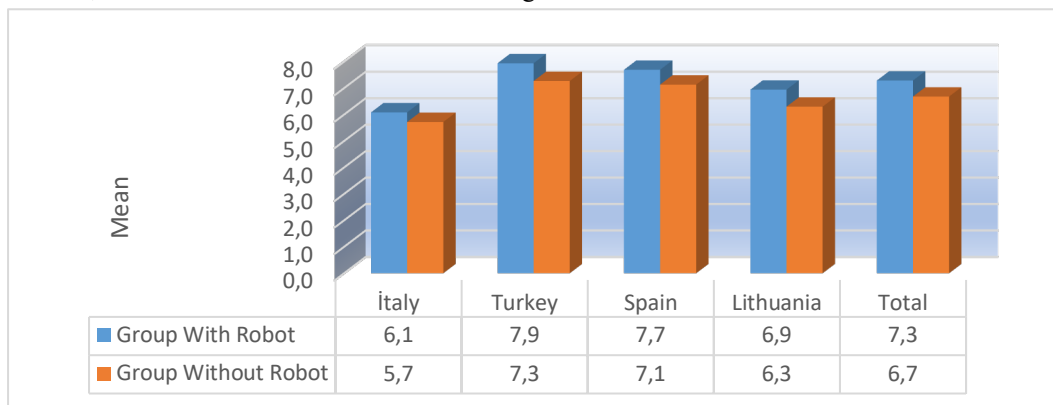


Figure 11. Country-specific distribution of “The child enjoys helping classmates during the activity” item scores for 3–4 age group children.

When examining the mean scores of the item “The child enjoys helping classmates during the activity” by countries, it is seen that while the children in Turkey have the highest mean score in the administration “Non-robotic”, the children in Italy have the lowest mean score at the equal rate. In the administration “Robotic”, it has been determined that while the children in Turkey have the highest mean score, the children in Italy have the lowest mean score.

The mean score difference between the robotic group and the non-robotic group is determined to be the highest in Lithuania and the least in Turkey in favor of the non-robotic group. When examining the total scores of all children in all countries, the mean score of the ones robotic is higher than the mean score of those non-robotic.

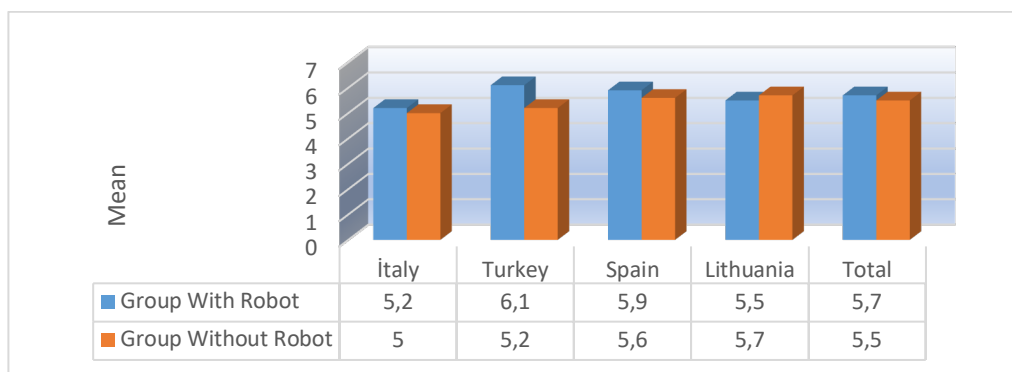


Figure 12. The graphic regarding the distribution of total mean scores obtained by the children aged 3-4 from the items of Child Observation Form by countries.

When examining the total mean scores obtained by the children aged 3-4 from the items of Child Observation Form by countries, it is seen that while the children in Lithuania have the highest mean score in the administration “Non-robotic”, the children in Italy have the lowest mean score. In the administration “Robotic”, it is observed that while the children in Turkey have the highest mean score, the children in Italy have the lowest mean score.

The mean score difference between the group robotic and the group non-robotic is determined to be the highest in Turkey and the least in Italy in favor of the group robotic. When examining the total scores of all children in all countries, the mean score of the ones robotic is higher than the mean score of those non-robotic.

DISCUSSION & CONCLUSION

Discussion

The study was conducted with children in Italy, Turkey, Spain, and Lithuania. When the total mean scores of the children aged 3-4 years old from the Child Observation Form items were analyzed, it was determined that the children in Lithuania had the highest average and the children in Italy had the lowest average in the application non-robotic. In the application robotic, it was observed that the children in Turkey had the highest average, and the children in Italy had the lowest average. For groups robotics, the mean score difference between groups with and non-robotics is the highest in Turkey and the lowest in Italy.

All children who joined the application robotic received over seven points from the matters “The child is interests in participate in the activities, The child does not lose motivation during the activity, The child endeavors to stay the activity, The child becomes happy after finishing the activity, The child expresses positive feelings with a gesture, facial expression, and voice when feels happy during the activity, The child is willing to experience new activities, The child shows willingness to complete the activity, The child shows courage when starting a new activity, The child practices willingly the roles given during the activity, The child is happy in group work, The child focuses on the materials (robot) used in the activity, The child enjoys using materials (robot) used in the activity, The child passionately shares with the teacher experiences The child had with the robot, The child expresses others’ positive/negative feelings, The child collaborates with friends in the group, The child cooperates with classmates, The child enjoys helping classmates during the activity, The child stays calm when solving issues with others, The child gets excited with the material (robot) used in the activity” in PEARL Child Observation Form. When the total scores of the children in the countries were examined, it was determined that the average of the group robotics was higher than that of the group non-robotics.

The PEARL Education Model places peer relationships and the development of empathic feelings at the center of the model and group interaction. Children collaborate with their peers when they encounter difficulties by their developmental level. Concerning peers, the child can take on different roles, cooperate in small groups, learn the perspective of others and develop sharing skills. Group relationship provides both emotional and cognitive development, and solving problems together is internalized by children.

The PEARL “Emotional Empathic and Proximal Learning-Educational Environment” is a project that aims to develop and test an educational model, it is innovative and replicable at an international level and aims at the very first phase of childhood, which is 0 – 6 years. When the purpose of the project is taken into consideration, as seen from the research findings, children aged 3-4 years participating in an activity with a robot in a group

environment are more willing to engage in activities, feeling excited about working with a robot, reflecting their emotions using body and verbal language, and have more problems than children participating in non-robotic activities. It was determined that they scored higher in the skills of solving in easy and positive ways, fulfilling their responsibilities, cooperating with their friends, and interacting in a shared way. With these findings obtained as a result of the application, it can be said that the project hypothesis “Group activities enriched with natural materials and robotic coding activities improve social skills, abilities to cooperate and to understand and express emotions in children” has been proved.

Examining Piaget's theory, the learning process occurs through the interaction of the mind and environment. During this process, the individual tries to explain the new situation with the schemes he or she created in the past. If existing schemes explain a new situation, reinforcement of previous learning happens instead of learning. If existing schemes cannot explain a new situation, a new scheme is needed. Thus the learning process is initiated. In the learning process, individuals go through the processes of assimilation, adjustment and balancing, respectively (Bacanli, 2011). When new information becomes balanced, learning takes place. Individuals structure information with environmental impact and their mental processes (Beilin, 1994). PEARL's Education model has also enabled children to structure the knowledge they have gained through their interactions with their environment (organizing teachers and classroom environments, integrating materials such as robots into events, and so forth) (Beilin, 1994; Cole & Wertsch, 2002; Erdem & Demirel, 2002; Vygotsky, 1978).

According to Vygotsky, the individual constructs knowledge by interacting with people in the child's social environment. The person knows that the child can construct his/her own. In the zone of proximal development, on the other hand, there is the knowledge that an individual can construct accompanied by a peer or an adult (Vygotsky, 1978). Through the scaffolding method, the individual can also construct knowledge that the child cannot construct on his/her own. The PEARL Educational Model emphasizes the importance of the zone of proximal development, argues that peer communication and effective teacher support are required for children to fulfil their potential.

Conclusion

This study is conducted within Erasmus+ KA201 project PEARL “Emotional Empathic and Proximal Learning-Educational Environment” that aims to develop and test an educational model, which is innovative and replicable at an international level and aims at the very first childhood, 0 – 6 years. Thus, the study examines PEARL Emotional, Emphatic and Proximal Learning Environment's effect on the social-emotional development of children age 3-4. The study results are summarized below.

- Group activities with children ages 3-4 enriched with robotic coding activities, develop children's social skills, cooperative skills, and ability to understand and express emotions. The hypothesis is confirmed.
- An international network of experts and organizations has been established in close cooperation with academia, educational institutions, and teacher training institutions to promote innovative and quality education in early childhood.
- New activities aimed at teachers have been created to launch an experimental education model in early childhood to develop the necessary skills.
- Teachers shared many activities they prepared in line with the PEARL Education Model on the international platform through the digital network established.

Recommendations

According to the results of the study, which aimed to reveal PEARL Emotional, Emphatic and Proximal Learning Environment's effect on the social-emotional development of children aged 3-4 years, the recommendations are listed below:

- An innovative, high-quality and repeatable European-level education model could be developed to enhance emotional and empathetic skills by supporting proximal development areas of children aged 3-4. The model developed is based on structured learning in the education of children aged 3-4, using educational materials such as robots to support the proximal development of children and provide teacher guidance in collaboration, sharing and empathic development.
- An international network of experts and organizations may be established in close cooperation with academia, educational institutions and teacher education institutions to encourage innovative and quality education

in early childhood. This educational model can be shared with children both in-person and online to enrich the model and ensure equal opportunity, inclusion and sustainability by reaching all children.

- A new teacher-oriented curriculum could be created, using the established academic network, to deliver an experimental teaching model in collaboration with international experts and organizations to develop the necessary skills in early childhood.

Limitations

The study had also some limitations. One of the limitations of the study was that the study was conducted during the Covid-19 pandemic. Therefore, it became impossible to work face-to-face with partners in other counties. Therefore, all of the meetings and training course are done online. Therefore, the Covid-19 pandemic had limited face-to-face interaction among the project partners. Another limitation of the study is that the data collection tool is first written in Turkish, then it is translated in English. All of the countries translated the PEARL Child Observation Form in their language. Therefore, this may have had effect on the results of the study. In addition, the reliability study PEARL Child Observation Form were not conducted. Thus, the results of the study would not be generalized.

Statements of Publication Ethics

Authors of the research declare that they obeyed the principles of publication ethics. Ethical Committee Permissions are gotten from Gazi University Ethical Committee Commission on 12.25.2020 date and meeting 22 (E-77082166-604.01.02-75142)

Abbreviations

PEARL, Emotional Empathic Proximal Learning-Educational Environment

Researchers' Contribution Rate

Authors	Literature review	Method	Data Collection	Data Analysis	Results	Conclusion
Author 1	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
Author 2	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
Author 3	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
Author 4	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
Author 5	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>

Conflict of Interest

This study does not have any conflict of interest of authors.

REFERENCES

- Babakr, Z., Pakistan M. & Kakamad, K. (2019). Piaget's Cognitive Developmental Theory: Critical Review. *Education Quarterly Reviews*, 2(3), 517-524. <https://doi.org/10.31014/aior.1993.02.03.84>
- Bacanlı, H. (2011). *Eğitim Psikolojisi (Educational Psychology)*. Ankara: Pegem.
- Beilin, H. (1994). *Jean Piaget's enduring contribution to developmental psychology*. In R.D. Parke, P.A.
- Bers, M. U., Flannery, L., Kazakoff, E. R., & Sullivan, A. (2014). Computational thinking and tinkering: Exploration of an early childhood robotics curriculum. *Computers & Education*, 72, 145-157.
- Bernstein, D. A., Clarke-stewart, A., & Roy, E. J. (2008). *Psychology*. USA: Houghton Mifflin.
- Büyüköztürk, Ş., Çakmak, E. K., Akgün, Ö. E., Karadeniz, Ş., & Demirel, F. (2016). *Bilimsel araştırma yöntemleri (Scientific Research Methods)*. Pegem.
- Cacioppo, J. T., & Freberg, L. A. (2013). *Discovering Psychology The Science of Mind*. USA: Wadsworth.
- Canestrari, Alan & Marlowe, Bruce. (2003). *Educational foundations: an anthology of critical readings*. School of Education Faculty Papers.

- Cole, M., & Wertsch, J. V., (1996). Beyond the Individual-Social Antinomy in Discussions of Piaget and Vygotsky. *Human Development*, 39(5), 250–256.
- Deniz, Ü., Ömeroğlu, E., Özbey, S., Tüfekci, A., & Karakaya, N. K. (2022). Effects of the PEARL “Emotional, Empathetic and Proximal Learning Educational Environment” on the Social-Emotional Development of Children Aged 5–6 Years. *International Journal of Educational Reform*, 10567879221124876.
- Erdem, E., & Demirel, Ö. 2002. Program geliştirmede yapılandırmacılık yaklaşımı (Constructivist approach in program development). *Hacettepe Üniversitesi Eğitim Fakültesi Dergisi*, 23(23).
- Hockenbury, D. H., & Hockenbury, S. E. (2011). *Discovering Psychology*. New York: Worth Publishers.
- Koh, J. H. L., Frick, T. W. (2010). Implementing autonomy support: insights from a Montessori classroom. *International Journal of education*, 2(2), 1.
- Kurt, S. (2020). "Jean Piaget and His Theory & Stages of Cognitive Development," in Educational Technology. Retrieved from: <https://educationaltechnology.net/jean-piaget-and-his-theory-stages-of-cognitive-development/>
- Miller, P.H. 2002. *Theories of developmental psychology* (4th edition). New York.
- Mora Teruel, Francisco (2018). *Sólo se puede aprender aquello que se ama*. Madrid: Alianza Editorial.
- Ornstein, J.J. Reiser & C. Zahn-Waxler (Eds.), *A century of developmental psychology*. Washington, DC: American Psychological Association.
- Ömeroğlu, E. at al. (2015). Determination and Interpretation of the Norm Values of PreSchool Social Skills Rating Scale Teacher Form. *Educational sciences-theory & practice*, 15(4), 981-996.
- Perkins, D. N. (1999). The many faces of constructivism. *Educational Leadership*, 57(3). Pp.6-11.
- Piaget, Jean (1965). *The growth of logical thinking*. Routledge and Kean.
- Pintrich, Paul. (2003). A Motivational Science Perspective on the Role of Student Motivation in Learning and Teaching Contexts. *Journal of Educational Psychology - J EDUC PSYCHOL*. 95. 667/-686 Yaş 10.1037/0022-0663.95.4.667.
- Deniz, Ü., Ömeroğlu, E., Özbey, S., Tüfekci, A., & Karakaya, N. K. (2022). Effects of the PEARL “Emotional, Empathetic and Proximal Learning Educational Environment” on the Social-Emotional Development of Children Aged 5–6 Years. *International Journal of Educational Reform*, 10567879221124876.
- Santrock, J.W. (2011a). *Educational psychology*. New York: Mc. Graw-Hill Companies.
- Santrock, J.W. (2011b). *Life-span development*. New York: Mc. Graw-Hill Companies.