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The Impact of Educational Robotics on the Executive Functions of Preschool Children

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Abstract: This quasi-experimental study examines the impact of an educational robotics program on the development of executive functions (EF) in preschool children in Morocco. Throughout the school year, 84 pupils from two schools in Rabat and Salé participated in a progressive program that combined unplugged activities with the exploration of the Bee-Bot robot. Five key dimensions (planning, working memory, cognitive flexibility, problem-solving, and collaboration) were assessed using a 22-indicator grid to measure the children's progress in these areas. Data collection occurred over a seven-day period. Statistical analysis highlighted significant inter-dimensional correlations ($0.533 \leq r \leq 0.931$, $p < 0.001$), indicating a strong interdependence between the skills developed and higher mean scores for the early stages of the program (notably spatial planning and getting to grips with the Bee-Bot). Conversely, problem-solving and collaboration, although more demanding, appeared to be closely linked ($r = 0.931$), suggesting that the consolidation of individual problem-solving skills creates favorable conditions for mutual aid and collective work. These results confirm that the gradual, supervised integration of educational robotics can enhance executive functions in early childhood by engaging working memory, inhibitory control, and cognitive flexibility through structured, interactive activities. This study thus contributes to a better understanding of the potential of educational robotics in a non-Western context and lays the groundwork for future longitudinal and comparative research exploring how cultural and pedagogical factors influence early childhood learning outcomes.

Keywords: Educational robotics; executive functions; preschool education; cognitive development; problem-solving skills

教育机器人对学前儿童执行功能的影响

摘要：这项准实验研究考察了教育机器人项目对摩洛哥学龄前儿童执行功能 (EF) 发展的影响。在整个学年期间，来自拉巴特和萨累两所学校的 84 名学生参加了一个渐进式项目，该项目结合了不插电活动和对 Bee-Bot 机器人的探索。使用 22 个指标的网格评估了五个关键维度（规划、工作记忆、认知灵活性、解决问题和协作），以衡量儿童在这些技能上的进步。数据收集发生在七天内。统计分析强调了显著的维度间相关性 ($0.533 \le r \le 0.931$, $p < 0.001$)，表明在项目早期阶段，所发展的技能和较高的平均分数之间存在很强的相互依存关系，尤其是空间规划和掌握 Bee-Bot。另一方面，尽管解决问题和协作的要求更高，但它们似乎密切相关（$r = 0.931$），这表明巩固个人解决问题的能力是互助和集体工作的有利条件。这些结果证实，在监督下逐步整合教育机器人技术，可以通过寓教于乐的互动活动调动工作记忆、抑制能力和认知灵活性，从而从幼儿期开始增强学习效率 (EF)。因此，本研究有助于更好地理解教育机器人技术在非西方背景下的贡献，并为开展纵向和比较研究铺平道路，以进一步探究文化和教育因素对学前教育学习的影响。

关键词：教育机器人， 执行功能， 学前教育，认知发展， 问题解决能力

1. Introduction

The development of executive functions (EF)—notably inhibition, cognitive flexibility, and working memory—is a key factor in preschoolers' academic success and social adaptation [1-2]. These skills enable children to plan their actions, regulate their behavior, and adapt to change, all of which are essential for later learning.

In recent years, there has been growing interest in educational robotics as a means to stimulate these EFs through interactive and playful approaches. Programmable robots such as Bee-Bot offer children the opportunity to practice planning (working memory), inhibit impulsive behavior, and adjust strategies in the event of failure (cognitive flexibility) [3]. Some studies also point to improvements in cooperation and problem-solving [4]. Moreover, Bee-Bot's simplicity (e.g., directional buttons and concrete movement) makes it developmentally appropriate for children aged 5–6, aligning well with motor and cognitive milestones at this stage [5]. The robot's progressive learning curve and unplugged compatibility also make it accessible in environments with limited technological infrastructure [6]. However, most of this research has been conducted in Western contexts, leaving open the question of its applicability in other educational environments.

In Morocco, although the Preschool Curricular Framework [7] values pedagogical innovation, the integration of robotics remains limited. This situation raises important questions regarding the contextualization, adaptation, and scalability of such tools within local preschool education systems. This research thus contributes to non-Western empirical studies and proposes a structured, progressive model of implementation grounded in constructivist principles and adapted to the realities of Moroccan preschool education.

2. Literature Review

2.1. Executive Functions at the Preschool Age

Executive functions (EF) encompass several cognitive processes essential for self-regulation and adaptation to new situations [8]. According to [1], they consist mainly of the following:

- Inhibition, which consists of resisting impulsive or automatic responses;
- Working memory, which involves the simultaneous retention and manipulation of information; and
- Cognitive flexibility, which enables them to modify their strategies despite change.

In children, these skills develop rapidly and are strong predictors of future academic and social success [2]. To measure these skills, researchers such as Hughes [9] and Carlson [10] have designed specific tasks, demonstrating the importance of early assessment in anticipating children's cognitive trajectory.

Recent research also suggests that targeted educational interventions can positively influence EF development, particularly when based on engaging and interactive activities [11]. In this regard, recent findings [5] have confirmed that both unplugged and robotic activities can significantly support EF enhancement in preschoolers, especially when interventions are playful, structured, and contextually appropriate.

2.2. Educational Robotics and Cognitive Development

Educational robotics is based on of the principles of constructivism and constructionism [12], according to which learning emerges from experimentation and concrete problem-solving. Programmable robots like Bee-Bot help children develop skills in planning, self-regulation and sequential thinking [3].

As demonstrated in [13], using Bee-Bot significantly increased children's ability to sequence actions and solve logical problems, underlining the potential of robotics to support EF development starting from the preschool years. Critten et al [14] also found that children's engagement was enhanced when they interacted with robots in a playful and educational setting.

Furthermore, according to [4], educational robotics promote not only logical reasoning and problem-solving but also collaboration and communication among peers. In the same vein, a pilot study [15] showed that educational robotics intervention had a positive effect on preschoolers' executive functions. Specifically, improvements were observed in inhibition, working memory, and cognitive flexibility, suggesting that these interactive tools may play a key role in early cognitive development. Based on a systematic review of teacher training in educational robotics, this idea was reinforced by highlighting the importance of structured pedagogical guidance and progressive implementation [16]. This finding aligns directly with our protocol, which includes guided sessions and scaffolded learning.

However, these findings derive predominantly from research conducted in Western contexts, suggesting the possibility of variations according to cultural and pedagogical contexts. Manches and Plowman [17] invite debate on the introduction of computer education in the early years, stressing the need to design appropriate pedagogical approaches and analyze the cognitive skills called upon. Similarly, [18] observed that with the KIBO robotics kit, 3-year-old children could already create syntactically correct programs, thus demonstrating early integration of essential programming concepts.

Building on these findings, more recent curriculum-oriented studies suggest that programmable tools such as Bee-Bot can foster sequential logic and cognitive autonomy when integrated into structured pedagogical designs [19]. Similarly, the SEEDS Pedagogy project [20] highlights the importance of combining creativity, collaboration, and critical thinking in technology-based preschool education. These values resonate with the broader vision of our intervention.

Finally, while the current results appear promising, they also raise questions about the optimal conditions for integrating robotics into diverse environments. Against this backdrop, the present study aims to examine the effectiveness of educational robotics in Morocco by assessing its impact on preschoolers' EFs, and thus provide fresh insight into the potential benefits of this approach in a specific educational context.

3. Methods

This study adopts a quasi-experimental and purely quantitative design to evaluate how a structured educational robotics program can support the development of executive functions (EF) in preschool children. The research methodology is grounded in a pedagogical approach for integrating EF, implemented through a sequence of progressive activities. Throughout these activities, children's observable behaviors and task performance were recorded using a multi-dimensional evaluation grid specifically developed for this purpose. The collected data were analyzed using descriptive statistics and inter-dimensional correlations to examine patterns and associations in the development of EF-related skills.

3.1. Pedagogical Approach and Integration of Executive Functions

This study is based on an educational robotics program designed to familiarize preschool children (Final year of preschool) with the Bee-Bot robot. It is a progressive and sequential approach, designed to specifically strengthen executive functions (EF) – working memory, cognitive flexibility and inhibition – through playful and interactive activities.

As illustrated in Figure 1, learning is organized into several complementary stages.

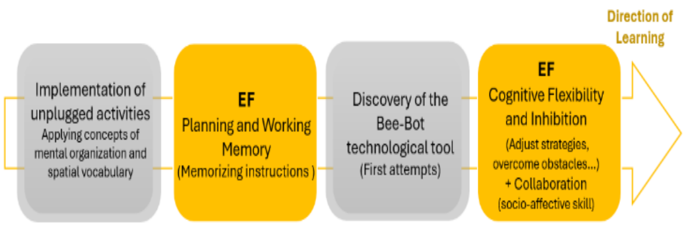

Figure 1. Progressive approach to integrating the Bee-Bot to develop executive functions (elaborated by the authors)

3.1.1. Unplugging Situations

Initially, children take part in technology-free ("unplugged") games, where they become familiar with the organization of thought and acquire a spatial vocabulary (left/right, forward/backward, etc.). This phase enables them to anticipate and mentally plan sequences of actions while learning to memorize simple instructions.

3.1.2. Discovering the Bee-Bot

Once these concepts have been integrated, the technological tool is gradually introduced. The children then associate each command with the robot's actual movements, consolidating their skills in planning, logical reasoning and working memory by following a sequence of instructions step by step.

3.1.3. Challenges and Obstacle Management

As they become more comfortable, children take on more complex tasks, requiring them to adjust their strategies and overcome unforeseen obstacles. This situation mobilizes their cognitive flexibility, as they must re-evaluate their choices and inhibit possible impulsive responses to reach the solution.

3.1.4. Collaboration and Problem-Solving

Finally, collaborative activities are offered: children work in small groups to jointly design programming sequences and solve more ambitious problems. This collaboration not only consolidates socio-affective skills (communication, mutual aid) but also contributes to the development of EFs by requiring joint planning and inhibiting certain impulsive behaviors in favor of a shared solution.

This progressive approach prepares children for the next phase by consolidating their cognitive, psychomotor and social skills. The experimentation carried out as part of this study will highlight how educational robotics, thoughtfully and progressively integrated, can support the development of executive functions by offering a stimulating, structured, and developmentally appropriate learning environment.

3.2. Participants

The study sample consisted of 84 children aged 5 to 6, including 45 girls (53.6%) and 39 boys (46.4%). All were enrolled full-time in the final year of preschool at two pilot preschools managed by the Moroccan Foundation for PreSchool (FMPS), located in urban areas in the cities of Rabat and Salé. These preschools serve as pilot sites, with plans to extend the program to other regions of the country. No additional exclusion criteria were applied, and the informed consent of the parents or legal guardians was obtained in accordance with current ethical standards.

3.3. Research Procedures

The experiment was conducted over a one-week period, during which each educator planned daily sessions of approximately 45 to 60 minutes to assess the skills acquired by the children as part of the educational robotics program. At each session, groups of five children were simultaneously invited to participate in a variety of activities (storytelling, concept exploration, etc.) on specially designed mats (Figure 2).

Throughout the week, the children followed a progressive sequence of instructions, ranging from unplugged situations to more complex problem-solving, in line with the pedagogical approach already described.

Each educator used an internal evaluation scale to observe and record individual and collective performance. Depending on the objectives, the educator provided individual instructions to each child or addressed the group as a whole. This mixed modality was designed to stimulate both individual initiative and cooperation among peers. Data on the development of skills were systematically recorded over the course of each session, ensuring traceability and consistency in the observation of progress.

Figure 2. Illustration of children at work during the experiment (the authors' photo)

3.4. Measuring Instruments

In order to identify the evolution of skills in educational robotics, an assessment grid has been specifically developed based on a framework integrating cognitive, psychomotor and socio-affective dimensions. Presented in Table 1, this instrument lists 11 skills divided into five main dimensions (e.g., unplugged situations, discovery and use of Bee-Bot, etc.), each of which is broken down into one or more targeted evaluation indicators. Children's progress is assessed according to three levels: "Acquired" (1 to 2 attempts), "In progress" (3 to 5 attempts) and "To be reinforced" (6 or more attempts). This gradation, based on the number of attempts required, provides detailed tracking of skill development, from initial technology-free exercises to more complex tasks that involve the Bee-Bot robot and collaborative problem-solving.

Table 1. Assessment grid for skill development in educational robotics (compiled by the authors)

Dimensions	Skills	Indicators
Dimension 1 Engaging in Unplugged Activities (without Bee-Bot)	Moving physically on a grid from Point A to Point B following the step-by-step instructions.	The child moves from the starting cell “A” following instructions to reach the destination cell “B”: Move forward two steps, then turn right, then move forward three steps.
		The child moves from the starting cell “A” following instructions to reach the destination cell “B”: Move backward two steps, then turn left, then move forward three steps.
	Verbally articulating instructions while moving on the grid to achieve a specific goal (Using Spatial Vocabulary).	The child moves toward the target cell “B” while verbally articulating the applied instructions: “I move forward three steps,” “I turn right,” “I move forward four steps”.
		The child moves toward the target cell “B” while verbally articulating the applied instructions: “I move backward four steps,” “I turn left,” “I move forward three steps”.
	Verbally stating a sequence of instructions to achieve a specific goal (without moving) from a given starting point (Planning and Decoding).	The child verbally states a simple sequence of instructions to reach a target cell from a given starting point: “I move forward two steps, turn left, then move forward three more steps”.
	Memorizing a Sequence of Instructions to Achieve a Specific Goal (Working Memory).	The child memorizes a simple sequence of instructions necessary to reach the designated target cell: “I move forward two steps, turn left, then move forward three more steps”.
Dimension 2 Exploring the Technological Tool (Bee-Bot)	Visually identifying the different buttons on the Bee-Bot Robot	The child identified the four orange buttons with arrows.
		The child identifies the green “GO” button at the center of the robot.
		The child identifies the two blue buttons at the lower section of the robot.
	Understanding the Function of each button on the Bee-Bot Robot	The child identified the button that moved the robot forward.
		The child identifies the button that moves the robot backward.
		The child identifies the button that turns the robot to the right.
		The child identifies the button that turns the robot to the left.
		The child identifies the button that executes a programmed sequence.
		The child identifies the button that clears a programmed sequence.
Dimension 3 Initial Manipulation of the Technological Tool (Bee-Bot)	Performing simple programming sequences (e.g., One-Step Forward, Two Steps Forward, One Step Forward + Turn Right) (Coding)	The child programs the robot to move forward one step by pressing the buttons: “↑” and “GO”
		The child programs the robot to move forward in two steps by pressing the buttons: “↑”, “↑”, and “GO”
		The child programs the robot to move forward one step and then turn right by pressing the buttons: “↑”, “→”, and “GO”
	Clearing memory and executing more advanced programs	The child clears the robot’s memory by pressing the blue left-side button (“X”) and then programs the robot to move forward one step, turn left, and then move forward again by pressing the buttons: “↑”, “→”, “↑”, and “GO”
Dimension 4 Using the Technological Tool (Bee-Bot) for Problem-Solving	Programming the robot to reach a defined goal in various problem-solving scenarios (Cognitive Flexibility and Inhibitory Control)	The child identifies the target position on the grid, selects an appropriate path to reach it, and programs the robot accordingly.
		The child clears the robot’s memory, inhibits the immediate response of repeating the same path, selects an alternative trajectory to reach the same target position, and programs the robot to execute it.
	Executing complex programming sequences to navigate obstacles on the grid and reach a defined goal in more complex problem-solving scenarios (Creativity, Critical Thinking, Lateral Thinking, and Behavioral Inhibition)	The child identifies the target position on the grid, analyzes the presence of obstacles requiring route adjustments, inhibits inadequate strategies, selects an appropriate path, and programs the robot to reach the target position.
Dimension 5 Using the Technological Tool (Bee-Bot) for Collaboration	Collaborating with peers to develop optimal strategies for achieving defined objectives in problem-solving scenarios (Cooperation)	The child collaborates with peers to identify the target position and develop the appropriate program for the robot to reach the desired destination.

3.5. Data Analysis

The data collected during the experiment were analyzed using the Jamovi statistical software. Two main analyses were conducted:

3.5.1. Analysis of the Inter-Dimensional Correlations

Each dimension was represented by an overall score, which was obtained by summing the cumulative scores of its indicators. To explore the relationships between these dimensions, the Pearson correlation coefficients were calculated. The goal was to determine whether progress in one dimension (e.g., spatial understanding developed through unplugged activities) is associated with improvements in other dimensions, such as problem-solving and collaboration.

3.5.2. Descriptive Statistics

Measures of central tendency (mean, median), dispersion (standard deviation, variance), and skewness were calculated for each of the five dimensions assessed. These analyses make it possible to examine how children's performance is distributed and to identify general trends in skill development related to educational robotics.

4. Results

4.1. Inter-Dimensional Correlations

Analysis of the inter-dimensional correlations (Table 2) shows that the various dimensions of the educational robotics program are significantly related (coefficients ranging from r = 0.533 to r = 0.931, p < 0.001). The links observed between Dimension 4 and the previous dimensions (r = 0.903 with Dimension 3, p < 0.001) and between Dimension 4 and Dimension 5 (r = 0.931, p < 0.001) are among the highest.

These results indicate that a progression exists between the competencies assessed: for example, the competencies of Dimension 2 show a strong link with those of Dimension 1 (r = 0.829, p < 0.001). The correlation between Dimensions 3 and 4 (r = 0.903, p < 0.001) was also high, suggesting a strong continuum between these steps.

Table 2. Inter-dimensional correlations of the assessed skills (compiled by the authors)

		Dim1	Dim 2	Dim 3	Dim 4
Dim 2	r of Person	0.829**			
	p value	< 0.001			
Dim 3	r of Person	0.745**	0.851**		
	p value	< 0.001	< 0.001		
Dim 4	r of Person	0.697**	0.763**	0.903**	
	p value	< 0.001	< 0.001	< 0.001	
Dim 5	r of Person	0.533**	0.605**	0.831**	0.931**
	p value	< 0.001	< 0.001	< 0.001	< 0.001

4.2. Descriptive Statistics

Descriptive data for the five dimensions assessed are summarized in Table 3. Each dimension comprises a distinct number of indicators, resulting in different score scales. As a result, the mean values are not directly comparable in absolute terms from one dimension to another.

The observed averages varied from 1.57 (Dimension 5) to 19.27 (Dimension 2), while the standard deviations ranged from 0.74 (Dimension 5) to 7.83 (Dimension 2). This variability reflects the differences in dispersion and scale specific to each dimension. Regarding the shape of the distributions, Dimensions 1 and 2 show a slightly negative skewness (skewness = -0.379 and -0.279 respectively), while Dimensions 3, 4 and 5 show a positive skewness (0.163, 0.621 and 0.895). Medians are generally close to means, except Dimension 1 (median = 13.50 vs. mean = 12.95), which shows a slight shift toward higher scores.

Table 3. Descriptive statistics of the evaluation dimensions related to skill development in educational robotics (compiled by the authors)

	N	Mean	Median	SD	Variance	Minimum	Maximum	Skewness	Standard Error
Dimension 1	84	12.95	13.50	4.71	22.23	6	18	–0,379	0.263
Dimension 2	84	19.27	18.00	7.83	61.35	9	27	–0.279	0.263
Dimension 3	84	7.60	8.00	3.21	10.36	4	12	0,163	0.263
Dimension 4	84	5.06	5.00	2.19	4.82	3	9	0,621	0.263
Dimension 5	84	1.57	1.00	0.74	0.56	1	1	0,895	0.263

5. Discussion

The results of the present study clearly show how a progressive educational robotics program can support the development of executive functions (EF) in preschool children by offering them targeted activities around the Bee-Bot. In line with approach applied in [1], our data indicate that the children showed improvement in essential EF components such as working memory, cognitive flexibility and inhibition, all of which are linked to academic and social success [2, 9, 10]. Several figures from our statistical analysis confirm this impact. First, the inter-dimensional correlations (Table 2) revealed significantly high coefficients, ranging from r = 0.533 to r = 0.931 (p < 0.001). This suggests that strengthening a skill in one dimension (e.g., spatial planning or memorization) promotes the consolidation of other, more advanced skills (e.g., problem-solving or collaboration). For example, there was a strong link between Dimension 4 (problem-solving) and Dimension 5 (collaboration), with r = 0.931, indicating that a good command of problem-solving strategies simultaneously translates into better collaborative engagement. Furthermore, the strong link between Dimension 3 (initial manipulations) and Dimension 4 (r = 0.903) underscores the importance of consolidating basic skills (e.g., simple programming, inhibitory control) prior to engaging in more complex problem-solving tasks (e.g., devising multiple paths to bypass obstacles).

Second, the descriptive analysis (Table 3) shows that Dimensions 1 and 2, corresponding respectively to unplugged activities and discovery of the Bee-Bot, have relatively high mean scores (mean = 12.95 for D1 and mean = 19.27 for D2). These scores reflect the ease with which the children acquired the initial skills of spatial planning, memorizing short sequences and locating the Bee-Bot's buttons. In the case of Dimension 2, however, the higher standard deviation (7.83) underlines a certain heterogeneity: while some children progressed rapidly, others needed more time to assimilate these technological basics.

Dimension 3 (mean = 7.60) illustrates a more "moderate" progression in terms of scores, but the median, very close to the mean (8.00), suggests a fairly homogeneous distribution: most children have acquired simple programming skills, mobilizing both their working memory (retaining instructions) and their inhibition (avoiding impulsive actions). Moving on to Dimension 4 (mean = 5.06), which focuses on problem-solving, also demonstrates the key role of mental flexibility, since the lower standard deviation (2.19) indicates that most children progress coherently, probably thanks to the support of prior learning (Dimensions 1, 2 and 3). This consistency is reflected in the very high correlation r = 0.903 between Dimensions 3 and 4.

Finally, Dimension 5 (mean = 1.57) had a lower mean score, reflecting the additional complexity involved in collaboration (socio-emotional regulation, collective coordination). However, the strong correlation with Dimension 4 (r = 0.931) shows that a good command of problem-solving is an essential foundation for effective collaboration. In other words, children must first consolidate their cognitive flexibility and understanding of programming mechanisms before they can help each other and coordinate their strategies. This synergy illustrates the importance of strengthening cognitive foundations (planning, working memory, inhibition) to make the most collaborative skills.

Most studies on robotics and EF have been carried out in Western contexts [17]. By situating this project in Morocco, our results show that constructivist and constructionist principles can be successfully transposed, provided that appropriate pedagogical guidance and materials are offered [12]. The high correlations and significant mean scores for the basic tasks (Dimensions 1 and 2) suggest that the Bee-Bot's playful and interactive format supports engagement and cognitive progress even in diverse cultural contexts.

6. Conclusion

6.1. Main Findings

This quasi-experimental study provides compelling evidence that a structured educational robotics program can substantially enhance the development of executive functions (EF) in preschool children. Through quantitative analysis of 84 participants in Moroccan pilot preschools, the study identified strong inter-dimensional correlations among key EF components—including planning, working memory, cognitive flexibility, problem-solving, and collaboration. These findings confirm a progressive continuum in EF development, from foundational planning and working memory to higher-order problem-solving and collaborative skills. The results are consistent with international literature while offering novel insights specific to the Moroccan educational context.

6.2. Limitations

Several limitations of this study should be acknowledged:

- The sample size, while sufficient for initial analysis, limited the exploration of inter-individual and socio-cultural variations in EF development.
- The intervention was conducted over a short time frame (one week), precluding longitudinal assessment of skill sustainability.
- The absence of qualitative data, such as observational recordings, limited the depth of understanding of the cognitive and collaborative strategies employed by the children.

6.3. Future Research

Future studies should incorporate longitudinal designs to assess the stability and evolution of EF gains over time. Expanding the sample size and including children from diverse socio-cultural backgrounds would provide a more comprehensive understanding of the generalizability of the findings. Additionally, incorporating qualitative methods—such as video observations and interviews with educators—could yield richer insights into the mechanisms underlying EF development. Comparative studies using different types of educational robots would also be valuable in identifying which tools best support specific EF dimensions.

6.4. Practical Implications

The findings offer important practical guidance for early childhood educators and curriculum developers.

Educational robotics, when integrated progressively and with intentional pedagogical guidance, can become an effective tool for enhancing children's cognitive and socio-emotional readiness for school. Implementing similar structured programs in other Moroccan preschools—and more broadly in non-Western contexts—could provide children with playful, interactive opportunities to strengthen core executive function skills.

6.5. Theoretical Contribution

This study makes a theoretical contribution by situating educational robotics within a constructivist and constructionist framework tailored to the Moroccan preschool context. It expands the literature on the relationship between robotics-based activities and EF development by highlighting the cultural and contextual factors that shape this relationship. In doing so, it underscores the value of integrating structured, playful robotics interventions as a means of fostering foundational cognitive flexibility, working memory, and problem-solving skills in early childhood.

Declarations

Author Contributions

Conceptualization, M.Z. and M.Z.; methodology, M.Z.; software, M.Z.; validation, M.Z. and M.Z.; formal analysis, M.Z.; investigation, M.Z. and M.Z.; resources, M.Z.; data curation, M.Z.; writing—original draft preparation, M.Z.; writing—review and editing, M.Z.; visualization, M.Z.; supervision, M.Z.; project administration, M.Z.; funding acquisition, M.Z. All authors have read and agreed to the published version of the manuscript.

Data Availability Statement

The data presented in this study are available on request from the corresponding author.

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Institutional Review Board Statement

The study was conducted in accordance with the Declaration of Helsinki and was approved by the Review Committee of Research Center of the Moroccan Foundation for PreSchool (FMPS), Rabat, Morocco.

Informed Consent Statement

Informed consent was obtained from all the subjects involved in the study.

Conflicts of Interest

The authors declare that there are no conflicts of interest regarding the publication of this manuscript.

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