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| Research Article / Araştırma Makalesi |

The Impact of Early Literacy Skills Curriculum on Early Literacy and Mathematics Skills[1]

Erken Okuryazarlık Becerileri Eğitim Programının Erken Okuryazarlık ve Erken Matematik Becerileri Üzerine Etkisinin İncelenmesi[1]

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Keywords

1. Early literacy
2. Early mathematics
3. Preschool age

Anahtar Kelimeler

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Abstract

Purpose: The present study aimed to investigate the impact of the early literacy skills curriculum on preschool children's early literacy and early mathematics skills.

Design/Methodology/Approach: The study group included 38 kindergarten children attending Aydınlıkevler Public Primary School in Karabuk urban center, Turkey, during the 2017-2018 academic year. The study was conducted with a pretest-posttest, quasi-experimental design with a control group methodology. In the study, the early literacy skills curriculum was implemented in the instruction of experimental group children. The regular curriculum was used in the control group instructed by classroom teachers. Post-test was applied after the application. Early Literacy Skills Assessment Tool and The Test of Early Mathematics Ability-3 (TEMA-3) were used to collect the study data.

Findings: It was concluded that the "Early Literacy Skills Curriculum" employed in the experimental group by the author had a positive effect on the early literacy and mathematics skills of the children.

Highlights: As a result of the study, it was designated a relationship between phonemic awareness ability and writing awareness ability and early mathematics skills.

Öz

Çalışmanın amacı: Bu araştırmada, erken okuryazarlık becerileri eğitim programının okul öncesi dönemindeki çocukların erken okuryazarlık ve erken matematik becerileri üzerindeki etkilerinin incelemesi amaçlanmıştır.

Materyal ve Yöntem: Çalışma grubunu, 2017–2018 eğitim-öğretim yılında Karabük il merkezinde Milli Eğitim Bakanlığı'na bağlı Aydınlıkevler İlkokulu'nda anasınıfına devam eden toplam 38 çocuk oluşturmaktadır. Araştırmada ön test-son test, kontrol gruplu yarı deneysel desen kullanılmıştır. Araştırmada, deney grubundaki çocuklara erken okuryazarlık becerileri eğitim programı uygulanmıştır. Kontrol grubundaki çocuklar ise sınıf öğretmenleriyle normal eğitimlerine devam etmişlerdir. Uygulama sonrası son testler uygulanmıştır. Araştırma verilerinin toplanmasında, Erken Okuryazarlık Becerilerini Değerlendirme Aracı ile Erken Matematik Yeteneği Testi-3 (TEMA-3) kullanılmıştır.

Bulgular: Deney grubuna araştırmacı tarafından uygulanan "Erken Okuryazarlık Becerileri Eğitim Programı'nın çocukların erken okuryazarlık ve erken matematik becerileri üzerinde olumlu etkisinin olduğu sonucu elde edilmiştir.

Önemli Vurgular: Araştırma sonucunda, çocukların ses bilgisel farkındalık becerileri ve yazı farkındalığı becerileri ile erken matematik becerileri arasında ilişki olduğu belirlenmiştir.

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INTRODUCTION

Preschool age is a critical developmental stage. Rapid changes are experienced in the acquisition of cognitive and academic skills and concepts during this period. It was reported that early literacy and early mathematics skills are significant precursors of academic achievement (Duncan et al., 2007).

The literacy knowledge, attitudes, and skills developed before formal education are described as "early literacy skills." Early literacy skills begin to develop before the first five or six years of life and are continuous (Whitehurst & Lonigan, 1998). Basic early literacy skills generally include verbal language, phonological awareness, alphabet awareness, alphabet and letter knowledge, vocabulary and writing skills (Muter, Hulme, Snowling, & Stevenson, 2004). Verbal language skills include vocabulary knowledge, vocabulary and grammar rules (Storch & Whitehurst, 2002). Phonological awareness is associated with the ability of children to perceive and manipulate language through tasks such as developing audio sensitivity, separating words into sounds, and creating words by combining sounds. Alphabet awareness includes knowledge of the names and sounds of the letters, basic typefaces in the books, how to hold and use the books, and the direction of text (Whitehurst & Lonigan, 1998). Alphabet and letter knowledge includes understanding that words include a sequence of letters, the relationship between the letter and the sound, and forming new words by combining letters.

During preschool age, children begin to acquire early mathematics skills that are the foundation of advanced skills. Mathematical skills develop cumulatively based on the early mathematical skills (Aunola, Leskinen, Lerkkanen, & Nurmi, 2004). Early mathematical skills include counting, size comparison, classification of objects, counting skills, numerical knowledge, memorizing the numbers, geometry, ordering and quantity skills acquired before formal mathematics instruction (Krajewski & Schneider, 2006). These skills entail three interrelated but different fields: The concept of numbers and counting skills, numerical relationships and arithmetic operations (Jordan, Kaplan, Locuniak, & Ramineni, 2007). Numerical and counting skills include the number system, counting principles, and the ability to determine the total number of elements (cardinality). Numerical relationships entail knowing the connection and correlation between two or more elements and the relations between the numbers in the number system. Arithmetic operations include the ability of the child to understand changes in quantity and calculate new amounts based on the change in cluster size (Jordan, Kaplan, Nabors Oláh, & Locuniak, 2006). Children first learn to recognize small numerical sets without counting (by heart), distinguish (compare) small quantities, and learn the verbal counting order. They then use the one-to-one counting method, establishing connections between numerical terms and related quantities. For example, they learn the cardinal numbers principle. Finally, they combine numerical terms and related quantities with new numerical terms and quantities without using objects.

Mathematics and reading are two essential skills that affect the development of the other. Starting from a very early age, these two areas are correlated, and they are long-term predictors of the development of the other (Welsh, Nix, Blair, Bierman, Nelson, 2010). Children who experience difficulties are likely to suffer in the other (Barbaresi et al. 2010). Among early literacy skills, phonological awareness skills are significantly associated with early mathematical skills. Several theories argued that there was a direct or indirect correlation between phonological awareness and early mathematical skills. Phonological awareness skills allow children to distinguish and direct the words in the number system (Krajewski & Schneider, 2009; Simmons, Singleton, & Horne, 2008). There is a correlation between alphabet awareness and the basic concepts of mathematics, such as the identification of numbers and letters (Piasta, Purpura, & Wagner, 2010). Comprehension of the functions and nature of writing could logically be associated with early mathematics skills because formal and informal mathematics is based on numbers or symbols. Alphabet awareness is associated with mathematical development, such as familiarity with numbers. As in understanding that the symbol 3 corresponds to the number three. Similarly, non-numeric symbols such as the question mark (?) and the subtraction mark (-) provide information about the mathematical alphabet, as in knowing that the "-" mark is the symbol of the subtraction operation (Purpura, Hume, Sims, & Lonigan, 2010).

Academic skills that were developed early in life are the foundation of later academic skills. Early literacy and mathematics skills are correlated and interactive. Thus, the analysis of early literacy and early mathematics skills of the children, the development and implementation of an early literacy skills curriculum are essential for a substantial investigation of the effects of the curriculum on early literacy and mathematics skills. Literature review revealed that several studies reported a correlation between early literacy skills and early mathematics skills (Krajewski & Schneider, 2009; Purpura, Hume, & Sims, 2010; Davidse, De Jong & Bus, 2014). However, in Turkey, scientific studies on the correlation between early literacy and early mathematics skills are pretty limited. Thus, the present study aimed to investigate the impact of the early literacy skills curriculum on kindergarten children's early literacy and early mathematics skills. It was expected that the study findings would contribute to the acquisition of early literacy skills included in the Ministry of National Education Preschool Curriculum, raise the awareness of preschool

teachers about these skills and encourage further studies on the topic. To achieve these aims, the following research problems were determined:

1. Is there a difference between the "Early Literacy Skills Assessment Tool" pretest and posttest mean scores of experimental and control group children?

2. Is there a difference between the "The test of early mathematics ability-3" pretest and posttest mean scores of experimental and control group children?

3. Is there a correlation between "Early Literacy Skills Assessment Tool" and "The Test of early mathematics ability-3" scores of experimental and control group children?

METHOD

The research design, study group, data collection instruments, study procedures, analysis and data limitations are included in this section.

The Research Design

The present study was conducted with the quasi-experimental design with pretest-posttest and control group method. The pretest was applied both to the experimental and control groups. The instruction was conducted with the "Early Literacy Skills Curriculum" in the experimental group, while the children in the control group were instructed based on the conventional curriculum. At the end of the instruction, the posttest was applied to both groups. The retention test was applied to both groups four weeks after the posttest (Karasar, 2015).

The Study Group

The study group included 5-6 years old kindergarten children attending two different classes at the same school in Karabük province urban center. Nineteen children were assigned to the experimental group, and 19 children were assigned to the control group. Eleven children in the experimental group were female, and 8 were male. Eleven children in the control group were female, and 8 were male.

Data Collection Instruments

Early Literacy Skills Assessment Tool (ELSAT): The Early Literacy Skills Assessment Tool was developed by Karaman (2013) to assess early literacy skills in preschool children. ELSAT includes five subtests: Phonological Awareness, Alphabet Awareness, Story Comprehension, Image Matching, Pre-Writing Skills, and 96 items. All correct answers are scored with 1 point in the assessment tool. Since the normative values were not determined for the subtests in the present study, it was accepted that a higher subtest score denoted a higher level of achievement (Karaman, 2013).

The Test of Early Mathematics Ability-3 (TEMA-3): The Test of Early Mathematics Ability (TEMA) was developed by Ginsburg and Baroody (2003). The test aimed to assess children's mathematical abilities whose calendar age is between three and eight years eleven months. TEMA was revised twice, and it was published as TEMA-2 in 1990 and TEMA-3 in 1993. TEMA-3 includes two forms: Form A and Form B. The reliability and validity of the scale for 60-72 months old children were determined by Erdogan (2006) in Turkey. Each item is marked as true and false by the child. The number of correct answers is the raw score. Math quotient is calculated with the calendar age and raw score of the child. A high math score indicates high math ability (Ginsburg & Baroody, 2003).

The Study Procedure

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"Early Literacy Skills Curriculum" aims to support the acquisition of early literacy skills by kindergarten children. The program was applied three days a week for the first four weeks and two days a week for the remaining six weeks during a 10-week timeframe. In the curriculum, 24 activities were included. Each activity was conducted for about 60 minutes. The curriculum was based on four achievements and ten indicators that were associated with the acquisition of early literacy skills in lingual cognitive, self-care, and social-emotional development areas included in the "Ministry of National Education General Directorate of Preschool Education, Curriculum for 36-72 Months Old Children," and ten novel acquisitions and thirty-five indicators were added.

Activities were developed based on these achievements and indicators. The activities were developed based on learning principles such as from simple to complex, concrete to abstract, and school facilities. The activities ensured that children learned by doing and living the activities promoted curiosity and included diverse methods. The activities were conducted to integrate specific Turkish language, literacy preparation, game, art, music and drama, and significant group activities.

The pretest was applied to the children in the experiment and control groups. The application was conducted with the children in the experimental group, while the children in the control group were instructed based on the current curriculum. After the application was conducted with the children in the experimental group, the posttest was applied.

Four weeks after the posttest, a retention test was applied to the experimental group to determine retention of knowledge. After the retention test, the curriculum and related material were communicated to the classroom teacher, who instructed the control group. The classroom teacher was counseled to implement the same curriculum with the control group.

Data Analysis

The parametric independent group's t-test was employed for the data with normal distribution, and the non-parametric "Mann Whitney U-Test" was used for the data without normal distribution. The correlation between two quantitative variables with normal distribution was analyzed with the Pearson correlation coefficient. The Spearman-Brown correlation coefficient was used when at least one of the quantitative variables did not exhibit a normal distribution.

The Limitations of the Study

- The study is limited to 5-6 years old first-year kindergarten children with typical development and attending public Aydınlıkevler Primary School in Karabuk province urban center during the 2017-2018 academic year.
- The application of the early literacy skills curriculum was limited by ten weeks in the experimental group.
- The joint impact of various demographic variables such as household literacy, family type, parent-child interaction, education level of the parents and presence of older siblings was not taken into account.

FINDINGS

In this section, the ELSAT and TEMA-3 scale scores of the children in the study sample are included based on the aim of the study.

Table 1. The Results of the Independent Groups t-test and Mann Whitney U-test Conducted on ELSAT Mean Pretest Scores of the Experimental and Control Groups

	Variable (N=38) Pretest Scores	Control group (n=19)		Experimental group (n=19)		Statistical analysis* Probability
		$\underline{X} \pm S.S.$	Median [Min-Max]	$\underline{X} \pm S.S.$	Median [Min-Max]	
Phonological Awareness Skills	**Matching the words that start with the same sound**	1,63±1,46	1,0 [0,0-5,0]	1,63±1,89	1,0 [0,0-5,0]	Z=-0,377 p=0,706
	Matching rhyming words	2,63±2,54	2,0 [0,0-9,0]	1,16±2,19	0,0 [0,0-8,0]	Z=-2,317 **p=0,021**
	Recognizing the initial sound in a word	4,84±6,02	1,0 [0,0-19,0]	4,58±5,59	0,0 [0,0-14,0]	Z=-0,270 p=0,787
	Finding the initial sound of a word	3,84±4,76	0,0 [0,0-10,0]	4,16±5,01	0,0 [0,0-10,0]	Z=-0,167 p=0,868
	Creating a word that starts with a stimulus sound	0,47±1,02	0,0 [0,0-4,0]	0,32±0,75	0,0 [0,0-2,0]	Z=-0,656 p=0,512
	Creating a word that starts with the same sound	0,53±1,26	0,0 [0,0-5,0]	0,11±0,46	0,0 [0,0-2,0]	Z=-1,417 p=0,156
	Dropping syllables and sounds	0,74±1,85	1,0 [0,0-8,0]	0,21±0,91	0,0 [0,0-4,0]	Z=-1,967 **p=0,049**
	Combining sounds	1,16±1,17	1,0 [0,0-4,0]	0,53±0,77	0,0 [0,0-2,0]	Z=-,1873 p=0,061
	Total score	11,00±10,65	8,0 [0,0-43,0]	8,11±8,47	3,0 [0,0-27,0]	Z=-1,054 p=0,292
Alph	**Writing concepts**	3,79±2,07	3,0 [0,0-7,0]	3,79±1,71	4,0 [1,0-7,0]	t=0,000 p=1,000

ab et Aw are ne ss	**Book concepts**	2,74±0,73	3,0 [0,0-3,0]	2,95±0,23	3,0 [2,0-3,0]	Z=-1,069 p=0,285
	Letter and word concepts	0,16±0,37	0,0 [0,0-1,0]	0,11±0,32	0,0 [0,0-1,0]	Z=-0,474 p=0,636
	Totals core	6,68±2,31	7,0 [2,0-10,0]	6,84±1,86	7,0 [3,0-10,0]	t=-0,232 p=0,818
	Story comprehension	5,58±1,77	6,0 [3,0-8,0]	5,47±2,12	6,0 [2,0-9,0]	t=0,166 p=0,869
	Matching visuals	4,74±1,79	5,0 [2,0-8,0]	5,32±1,83	6,0 [3,0-9,0]	t=-0,987 p=0,330
	Pre-Writing Skills	4,84±1,57	5,0 [2,0-8,0]	5,79±1,03	6,0 [4,0-8,0]	t=-2,195 **p=0,035**

It could be observed in Table 1 that there was a statistically significant difference between the pre-test Phonological Awareness Skills sub-test Matching Rhyming Words sub-dimension scores of children in the experimental and control groups (Z = -2,317, p <0.05). The mean pre-test Matching Rhyming Words score ($\bar{X}$ = 2.63) of the children in the control group was statistically significantly higher when compared to the experimental group children ($\bar{X}$ = 1.16). A statistically significant difference was determined between the Phonological Awareness Skills sub-test Syllables and Sounds Sub-dimension pretest scores of the experimental and control groups (Z = -1.967, p <0.05). The Dropping Syllables and Sounds pre-test score ($\bar{X}$ = 0.74) of the children in the control group was statistically significantly higher than those in the experimental group ($\bar{X}$ = 0.21). A statistically significant difference was determined between the Pre-Writing Skills sub-test pre-test scores of the children in the experimental and control groups (t = -2,195, p <0,05). The pre-test Pre-Writing Skills mean score ($\bar{X}$ = 5.79) of the children in the experimental group was statistically significantly higher than those in the control group ($\bar{X}$ = 4.84). There was no statistically significant difference between subtest and sub-dimension scores except the significant difference between the pre-test Phonological Awareness Skills sub-test, Matching Rhyming Words, Syllables and Sounds sub-dimensions and Pre-Writing Skills Sub-test scores of the experimental and control groups (p> 0, 05).

Table 2. The Results of the Independent Groups t-test and Mann Whitney U-test Conducted on ELSAT Mean Posttest Scores of the Experimental and Control Groups

	Variable (N=38) Pretest Scores	**Control group (n=19)**		**Experimental group (n=19)**		**Statistical analysis* Probability**
		$\underline{X} \pm S.S.$	**Median [Min-Max]**	$\underline{X} \pm S.S.$	**Median [Min-Max]**	
Pho nol ogic al Aw are nes s Skil ls	**Matching the words that start with the same sound**	1,79±0,92	2,0 [0,0-3,0]	5,11±1,15	6,0 [2,0-6,0]	Z=-5,128 **p=0,000**
	Matching rhyming words	3,05±1,75	3,0 [1,0-7,0]	8,42±1,07	9,0 [5,0-9,0]	Z=-5,275 **p=0,000**
	Recognizing the initial sound in a word	8,16±5,78	10,0 [0,0-17,0]	16,47±4,44	18,0 [6,0-21,0]	Z=-3,956 **p=0,000**
	Finding the initial sound of a word	6,58±4,36	8,0 [0,0-10,0]	9,37±2,29	10,0 [0,0-10,0]	Z=-2,563 **p=0,010**
	Creating a word that starts with a stimulus sound	0,74±1,05	0,0 [0,0-3,0]	3,95±1,96	5,0 [0,0-6,0]	Z=-4,266 **p=0,000**
	Creating a word that starts with the same sound	0,84±1,21	0,0 [0,0-4,0]	3,16±1,83	4,0 [0,0-5,0]	Z=-3,531 **p=0,000**
	Dropping syllables and sounds	1,58±2,61	0,0 [0,0-9,0]	6,32±3,61	8,0 [0,0-10,0]	Z=-3,708 **p=0,000**
	Combining sounds	1,79±1,18	2,0 [0,0-4,0]	3,47±1,50	4,0 [1,0-6,0]	t=-3,837 **p=0,000**
	Total score	16,37±9,57	16,0 [1,0-34,0]	39,79±9,88	42,0 [14,0-51,0]	Z=-4,631 **p=0,000**
Alp hab et Aw	**Writing concepts**	5,05±1,99	5,0 [2,0-8,0]	8,42±0,90	9,0 [6,0-9,0]	Z=-4,843 **p=0,000**
	Book concepts	2,89±0,46	3,0 [1,0-3,0]	3,00±0,00	3,0 [3,0-3,0]	Z=-1,000 p=0,317

are nes s	**Letter and word concepts**	0,37±0,68	0,0 [0,0-2,0]	2,73±1,56	3,0 [0,0-4,0]	Z=-4,215 **p=0,000**
	Totals core	8,31±2,43	9,0 [3,0-13,0]	14,16±2,17	15,0 [9,0-16,0]	Z=-4,844 **p=0,000**
	Story comprehension		6,0 [3,0-9,0]	7,58±1,30	8,0 [5,0-9,0]	Z=-2,524 **p=0,012**
	Matching visuals		7,0 [4,0-9,0]	7,94±1,17	8,0 [5,0-9,0]	Z=-3,333 **p=0,001**
	Pre-Writing Skills		6,0 [3,0-9,0]	7,63±0,90	8,0 [6,0-9,0]	Z=-3,292 **p=0,001**

As seen in Table 2, there were statistically significant difference between total post-test Phonological Awareness Skills subtest score (Z = -4.631, p <0.05), the Phonological Awareness Skills subtest Matching Words Beginning with the Same Sound (Z = -5.128, p <0.05), Matching Rhyming Words (Z = -5.275, p <0.05), Recognizing the Initial Sound of Word (Z = -3.956, p <0.05), Finding the Initial Sound of a Word (Z = - 2.563, p <0.05), Cerating Words Starting with a Stimulus Sound (Z = -4.266, p <0.05), Making Words Starting with the Same Sound (Z = -3.531, p <0.05), Dropping Syllables and Sounds (Z = -3.708, p <0.05), and Combining Sounds (Z = -3.837, p <0.05) sub-dimension scores of the children in the experimental and control groups. The Phonological Awareness Skills subtest (X̄posttest experiment = 39.79, X̄posttest control = 16.37), Phonological Awareness Skills subtest Matching Words Beginning with the Same Sound (X̄posttest experiment = 5.11, X̄posttest control = 1.79), Matching Rhyming Words (X̄posttest experiment = 8.42, X̄post test control = 3.05), Recognizing the Initial Sound of Words (X̄posttest experiment = 16.47, X̄posttest control = 8.16), Finding the Initial Sound of a Word (X̄posttest experiment = 9.37, X̄posttest control = 6.58), Creating a Word Starting with a Stimulus Sound (X̄posttest experiment = 3.95, X̄posttest control = 0.74), Creating Words that Start with the Same Sound (X̄posttest experiment = 3,16, X̄posttest control = 0,84), Syllables and Sounds (X̄posttest experiment = 6.32, X̄posttest control = 1,58), and Combining Sounds (X̄posttest experiment = 3.47, X̄posttest control = 1.79), sub-dimensions posttest mean scores of the experimental group students were statistically significantly higher when compared to the control group.

There were statistically significant differences between total post-test Alphabet Awareness subtest (Z = -4.844, p <0.05), the Print Awareness subtest, Writing Concepts (Z = -4.843, p <0.05), Letter and Word Concepts (Z = -4.215, p <0.05) subdimension scores of the experimental and control groups. Alphabet Awareness subtest (X̄posttest experiment = 14.16, X̄posttest control = 8.31), Alphabet Awareness subtest Writing Concepts (X̄posttest experiment = 8.42, X̄posttest control = 5.05), and Letter and Word Concepts (X̄posttest experiment = 2.73, X̄posttest control = 0.37) sub-dimension posttest mean scores of the children in the experimental group were statistically significantly higher when compared to the control group. There was no statistically significant difference between the posttest Alphabet Awareness subtest, Book Concepts sub-dimension scores of the children in the experimental and control groups (p> 0.05).

It was determined that there were statistically significant differences between post-test Story Comprehension (Z = -2.524, p <0.05), Matching Images (Z = -3.333, p <0.05) and Pre-Writing Skills (Z = -3.292, p <0.000) subtest scores of the children in the experimental and control groups. Story Comprehension (X̄posttest experiment = 7.58, X̄posttest control = 6.16), Matching Images (X̄posttest experiment = 7.94, X̄posttest control = 6.42) and Pre-Writing Skills (X̄posttest experiment = 7.63, X̄posttest control = 6.05) posttest mean scores of the children in the experimental group were statistically significantly higher when compared to the control group.

Table 3. The Results of the Independent Groups t-test and Mann Whitney U-test Conducted on TEMA-3 Mean Scores of the Experimental and Control Groups

Variable (N=38) TEMA-3	**Control group (n=19)**		**Experimental group (n=19)**		**Statistical analysis* Probability**
	$\underline{X} \pm S.S.$	**Median [Min-Max]**	$\underline{X} \pm S.S.$	**Median [Min-Max]**	
Pretest	84,63±17,56	85,0 [65,0-120,0]	81,37±13,69	79,0 [60,0-108,0]	Z=-0,176 p=0,861
Posttest	89,68±16,27	86,0 [70,0-118,0]	92,58±9,41	94,0 [74,0-108,0]	t=-0,671 p=0,507

As seen in Table 3, there was no statistically significant difference between TEMA-3 pre-test and post-test scores of the children in the experimental and control groups (p> 0.05). Although there was no significant difference, the pretest control group scores were higher when compared to the experimental group, while the same difference favored the experimental group in the post-test.

Table 4. Pearson and Spearmen Coefficients for the Correlation Between Mean ELSAT and TEMA-3 Scores

		Mathematical Competency Score (N=38)	
		Pretest	**Posttest**
PHONOLOGICAL AWARENESS SKILLS	*r*	0,475	0,522
	p	**0,003**	**0,001**
Matching the words that start with the same sound	*r*	0,253	0,334
	p	0,125	**0,040**
Rhyme awareness	*r*	0,302	0,273
	p	0,066	0,097
Recognizing the initial sound in a word	*r*	0,500	0,554
	p	**0,001**	**0,000**
Finding the initial sound of a word	*r*	0,502	0,687
	p	**0,001**	**0,000**
Creating a word that starts with a stimulus sound	*r*	0,292	0,325
	p	0,075	**0,046**
Creating a word that starts with the same sound	*r*	0,361	0,431
	p	**0,026**	**0,007**
Dropping syllables and sounds	*r*	0,319	0,598
	p	0,051	**0,000**
Combining sounds	*r*	0,160	0,174
	p	0,339	0,297
ALPHABET AWARENESS	*r*	0,578	0,397
	p	**0,000**	**0,014**
Writing concepts	*r*	0,592	0,429
	p	**0,000**	**0,007**
Book concepts	*r*	0,327	0,203
	p	0,045	0,222
Letter and word concepts	*r*	-0,053	0,187
	p	0,750	0,261
STORY COMPREHENSION	*r*	0,368	0,334
	p	0,023	**0,041**
MATCHING IMAGES	*r*	0,234	0,297
	p	0,158	0,070
PRE-WRITING SKILLS	*r*	0,228	0,282
	p	0,168	0,087

As seen in Table 4, the correlation between ELSAT and TEMA-3 scores was analyzed based on Pretest and posttest scores. There were weak and statistically significant positive correlations between Pretest and posttest TEMA-3 scores and Phonological Awareness Skills subtest total score, Recognizing Initial Sound of Words, Finding Initial Sound of a Word, Creating a Word Starting with Same Sound, total Alphabet Awareness subtest, and Writing Concepts subtest scores ($p < 0.05$). The TEMA-3 scores will increase with an increase in pretest and posttest total Phonological Awareness Skill subtest score, Recognizing the Initial Sound of Words, Finding the Initial Sound in a Word, Creating Words that Start with the Same Sound, total Alphabet Awareness subtest, and Writing Concepts sub-scale scores. Similarly, the TEMA-3 scores will decrease with a decrease in pretest and posttest total Phonological Awareness Skill subtest score, Recognizing the Initial Sound of Words, Finding the Initial Sound in a Word, Creating Words that Start with the Same Sound, total Alphabet Awareness subtest, and Writing Concepts sub-scale scores.

There was a positive, weak, and statistically significant correlation between the posttest TEMA-3 scores and the Phonological Awareness Skills subtest, Matching Words Starting with the Same Sound, Creating Words, Syllables and Sounds subtest, and Story Comprehension subtest scores ($p < 0.05$). The TEMA-3 scores will increase with an increase in posttest Phonological Awareness Skills subtest Matching Words Beginning with the Same Sound, Creating Words Starting with a Stimulus Sound, Dropping Syllables and Sounds Story Comprehension subtest scores. Similarly, the TEMA-3 scores will decrease with a decrease in posttest Phonological Awareness Skills subtest Matching Words Beginning with the Same Sound, Creating Words Starting with a Stimulus Sound, Dropping Syllables and Sounds and Story Comprehension subtest scores.

DISCUSSION, CONCLUSION AND RECOMMENDATIONS

In the study, it was determined that the mean Matching Rhyming Words, and Syllables and Sounds scores of the children in the control group were higher when compared to the experimental group, and the mean Pre-Writing Skills scores of the children in the experimental group were higher when compared to the control group before the application. However, it was observed that the pretest scores of the experimental and control groups were similar in general. Thus, it could be suggested that the early literacy skills of the experimental and control groups were similar before the program. In the study, it was observed that the post-test mean ELSTAT subset scores of experimental group students were significantly higher when compared to the control group. Thus, it could be argued that the early literacy skills program applied with the experimental group had a positive effect on early literacy skills.

Early literacy instruction is conducted with modeling, introduction and practice of various concepts and skills associated with reading, writing, listening and speaking. Active early literacy instruction provides developmentally adequate environments, materials, experiences and social support (Roskos, Christie, & Richgels, 2003). The effectiveness of educators varies in early literacy education (Stuhlman & Pianta, 2009). Only systematic, clear and adequate early literacy skills instruction leads to optimal child development. In a study conducted to determine the long-term effects of early literacy intervention, Suggate (2016) concluded that open literacy intervention and instruction significantly impacted the development of early literacy skills.

Similarly, in a study, Bayraktar and Temel (2014) investigated the impact of the Literacy Preparation Curriculum (LPC) on alphabet awareness, sound awareness, and children's literacy skills. They reported an increase in the literacy skill scores of the children in the experimental group compared to pre-application, and the increase was significantly higher than the one observed in the control group. In a study that investigated the effect of the "Sensory Education Program To Support Literacy Skills" on literacy skills of 61-66 months old kindergarten children, Yazıcı and Kandır (2014) reported that the literacy skill scores of the experimental group children were higher than the control group children. These study findings were consistent with the findings reported in the present study. Other studies reported similar results (Lust & Donica, 2011; Whiting, 2006; Orçan & Kandır, 2011).

Phonological awareness is one of the critical conventional literacy skills that develop during the preschool period. Children's competence in phonological awareness could vary significantly from one day to the next. While some children seem to develop several phonological awareness skills without direct instruction, for most children, the acquisition of phonological awareness largely depends on experience and education. More importantly, proficiency in more complex phonological awareness skills depends on available instruction for almost all children (Pence, 2006). Because phonological awareness tasks are often complex and abstract, acquisition requires an open and systematic education (Phillips, Christopher, & Lonigan, 2008). Munoz, Valenzuela, and Orellana (2018) conducted an in-service training course for kindergarten teachers, which included implementing a program to develop phonological awareness skills of the children. Based on the conducted teacher training, they analyzed the impact of phonological awareness skill interventions. The findings demonstrated that although the general mean score of the children in the control group increased, the children in the experimental group exhibited severe achievements in the acquisition of phonological awareness skills.

Alphabet awareness is an essential part of early literacy skills. Young children perceive writing as a tool to make sense, a communication method that includes spoken and written language. According to McGee and Morrow (2005), the alphabet awareness skills of the children could be developed in collaboration with adults and their peers in planned educational environments. Studies demonstrated that alphabet awareness is observed before three and improves significantly before the first grade (Hiebert, 1981; Huba & Kontos, 1985). Since there is a lot that children do not know about writing during the preschool period, different opportunities should be provided, and new experiences about writing should be offered via these opportunities (Clay, 2000). Thus, it could be suggested that alphabet awareness education is necessary, especially during the preschool period. The study findings that the increase in alphabet awareness skills of the children in the experimental group after the application was consistent with previous reports. Similarly, according to Ehri and Wilce (1985), some form of instruction is necessary to acquire alphabet awareness since preschool children could not analyze the alphabetical system without support.

It was considered normal for literacy education to start in formal education about 25 years ago; however, studies on early literacy revealed that the foundation of literacy skills established, especially in the preschool period, was fundamental (Adams, 1990). It was reported that early literacy skill acquisition of children during this period facilitated the acquisition of formal literacy skills such as reading, comprehension and fluency. However, several children start preschool with limited early literacy skills. Juel (1988) attributed the ongoing lack of literacy skills in children to the inadequacy of educational practices. To tackle this problem, early childhood educators should be trained in literacy education. Several experts stressed that children with limited early literacy

skills should be provided adequate early literacy skills education that emphasizes open, skill-oriented instruction (Neuman, Copple, & Bredekamp, 2000). Interactive instructional activities and environments improve children's motivation, encourage learning, and allow them to experience early literacy skills. After the curriculum was applied to children in the experimental group, a statistically significant difference was observed in early literacy skills when compared to the control group, indicating that the achievements and indicators developed for early literacy skills and the activities conducted for these achievements and indicators included early literacy skill measurements, were suitable for the aim and scope of the thesis and the children. It was demonstrated that it was suitable for the age and developmental attributes of the children, and the time allocated for the implementation of the program was adequate.

There was a weak and statistically significant positive correlation between the children's Phonological Awareness and Alphabet Awareness skills and their TEMA-3 scores. Thus, it could be suggested that specific early literacy skills affected the development of early mathematics skills. Early literacy and early math skills develop incoordination; thus, literacy skill delays are often accompanied by delays in mathematics skills and vice versa (Purpura et al., 2011). Children employ counting strategies to solve math problems (Butterworth, 2005). Counting requires phonological awareness skills to understand number signs. Geary (1993) reported that when children employ counting strategies to solve math problems, they recall phonological codes for number signs from memory and keep working memory problems. There are several reasons to think that early literacy skills may be associated with early math skills. Numbers and letters share joint physical and visual properties such as similar size and shape, straight-line formations, right angles, sharp angles, discontinuous and continuous curves (e.g., A, 4, E, 3, L, 7, B, 8). Their shape could identify both, and it could be difficult for children to distinguish them. Higher experience, the ability to distinguish between letters and numbers, and understanding that they have different communication functions pave the way for comprehending these representation systems. Thus, when the reasons such as the development of c early number and letter identification skills and the similarity of the cognitive skills employed in early learning of numbers and letters are considered, a correlation between alphabet awareness and numbers would be plausible (Munn, 1994; Scanlon & Vellutino, 1996. Betts, Pickart, and Heistad (2009) concluded that early literacy and early math skills were interrelated, and both skill groups predict future academic achievements. Manolitsis, Georgioub, and Tziraki (2013) reported that literacy and reading skills were significantly associated with early math skills. The findings were consistent with the present study's findings and confirmed that early literacy and early mathematics skills were related.

In conclusion, it was determined that the pretest scores of the experimental and control groups were similar before the application. The application of the Early Literacy Skills Curriculum had a significant positive effect on the early literacy skills of the children in the experimental group. There was a correlation between phonological awareness skills, alphabet awareness skills, and early math skills. The following were recommended based on the study findings and literature:

• The early literacy skill acquisitions and indicators included in the Ministry of National Education General Directorate of Preschool Education, Preschool Education Curriculum for 36-72 months old children, could be improved based on the literature.

• In early literacy skills, goals or objectives should be listed, the required material should be determined, manipulative materials should be adopted or developed in advance. Active participation of children should be ensured in activities. Flexibility should be considered very important in the implementation.

• Parents could guide their children's attention to the texts, signs and logos in the environment and talk about them to support the alphabet awareness skills.

• Similar studies could be conducted with larger groups and advanced analysis techniques in the future.

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Statements of publication ethics

We hereby declare that the study has not unethical issues and that research and publication ethics have been observed carefully.

Researchers' contribution rate

The related study was produced from Asya Çetin's doctoral dissertation. Saniye Bencik Kangal served as the consultant of Asya Çetin in this process and guided the whole work.

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Approval was obtained from Hacettepe University Ethics Committee on 07.11.2017 for the study with application no GO 17/859.

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