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A Study on Basic Process Skills of Turkish Primary School Students[1]

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ABSTRACT

Purpose: The purpose of this study was to find out primary school students' basic process skills (BPSs) in terms of select variables. In addition, this study aims to investigate the relationship between BPSs and academic achievement. **Research Methods**: The study had a survey design and was conducted with 1272 primary school students. The study data were obtained from the "Test of Basic Process Skills—BAPS." BAPS was originally developed by Padilla, Cronin and Twiest (1985) and adapted to Turkish by Aydogdu and Karakus (2015). **Findings:** The results indicated that the BAPS scores of primary school students are not at a satisfactory level. Moreover, results indicated that the BAPS scores of primary school students were higher among the upper grades than the lower grade levels. Other results indicated that the BAPS scores of primary school students were higher among students coming from better socio-economic levels than those with low level socio-economic backgrounds. Furthermore, the BAPS scores of primary school students were higher among primary school students in urban areas than those living in rural areas. Finally, the results indicated that a positively significant relationship was found between primary school students' basic process skills and achievement in science courses. **Implications for Research and Practice**: Teachers have the great responsibility to develop the BPSs of students. The socio-economic levels of students must be taken into account during in-class activities that are the focus of BPSs. The results suggest that the more BPSs primary school students acquire, the more academically successful they will be.

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Introduction

Students must know how to access information. In order to do so, they are asked to use their science process skills (SPSs) (Taconis, Ferguson-Hessler & Broekkamp, 2000). Therefore, it is essential for them to gain the required level of SPSs (Aydogdu, 2015). The acquisition of SPSs is one of the most important aims of science teaching (Bybee & Deboer, 1993). Some studies analyzed the SPS levels of primary school students in Turkey in accordance with certain variables (Aydogdu, 2006; Dokme & Aydinli, 2009; Hazir & Turkmen, 2008; Tan & Temiz, 2003). However, such studies are few and need to be increased.

The ability to use SPSs for everyday problems is important for individuals living in a rapidly developing society. Individuals with SPSs have the ability to make a major contribution to the improvement of society. Zeitoun and Hajo (2015) state that using SPSs is an important indicator for problem-solving ability. Rillero (1998) emphasizes that individuals who cannot use SPSs will have difficulty succeeding in daily life as the development at SPSs enables students to gain the skills necessary to solve everyday problems (Kazeni, 2005). Thus, SPSs used in science teaching are important for primary school students.

SPSs are defined as the tools that students use to investigate the world around them and to construct science concepts (Ostlund, 1992). SPSs make learning permanent and make it possible for them to use the skills in daily life. Instruction of SPSs also promotes positive attitudes toward science among students (Bilgin, 2006). Students with such skills comprehend how to conduct a scientific study and may solve the problems they face using the scientific method (Cepni & Cil, 2009:46). Therefore, it is vital to offer the students a proper environment in which to acquire these skills. For this reason, science teachers must understand how to teach SPSs.

SPSs are handled in two categories in the related literature. These categories are basic and integrated process skills (Chiappetta & Koballa, 2002; Germann, 1994; Martin, 2003; Saat, 2004). Generally, basic process skills (BPSs) can be acquired beginning in the preschool period (Ergin, Sahin-Pekmez & Ongel-Erdal, 2005:7). BPSs consist of observing, classifying, communicating, measuring, using space/time relationships, using figures, inferring and predicting (Germann, Aram & Burke, 1996; Padilla, 1990). The definitions and examples given below are related to the BPS subthemes (Table 1).

Table 1

Definitions and Examples of the BPS Subthemes

BPS subtheme	*Definition and examples*
Observation	Abruscato (2000:40) defines observation as the use of senses to gain information or data about objects and events. Observation is one of the most significant SPSs (Martin, 2003:66) because much research begins with observations.
Classification	Events or objects can be classified based on their characteristics (Martin, 2003:74). Ostlund (1992) defines classification as categorization of objects or events based on a schema. One of the most important features of the classification process is that it facilitates easier understanding of events classified (Akdeniz, 2006:116).
Communication	Communication is defined as a way or ways of better knowing the views of others (Martin, 2003:86). Communication includes both verbal and written modes of reporting information (Ostlund, 1992). Scientists report their information through written and verbal communication as well as diagrams, maps, graphics, math formulas and visuals (Abruscato, 2000:43).
Measurement	Ostund (1992) defines measurement as a comparison to standard and nonstandard units. Without measurement, no conclusion can be reached (Ergin et al., 2005:49). The skill of measurement requires not only the skill to properly use measurement tools, but also the skill to make calculations with these tools (Abruscato, 2000:42).
Using space/ time relationships	The skill of using space/time relationships is based on the ability to define and make distinctions about direction, space arrangements, movement, speed, symmetry and change (Abruscato, 2000:40). Scientific activities significantly improve the use of space and time relationships.
Using figures	Numbers are needed for manipulating measurements and organizing and categorizing objects. The time allocated for activities is mostly dependent on the use of numbers. Children should recognize the fact that the ability to use numbers is a BPS (Abruscato, 2000:41) and must use numbers in answering problems in science (Tan & Temiz, 2003).
Inference	Abruscato (2000:44) defines making inferences as the use of reasoning in shaping the conclusions resulted from observations. The only rule for making inferences is being rational (Ramig, Bailer, & Ramsey, 1995). Martin (2003:114) argued that making inferences is the best prediction of why something occurs. However, such predictions should be based on evidence.
Prediction	Padilla (1990) defines prediction as stating the outcome of a future event based on observations. Predictions should be based on observations; otherwise, they would be just interpretations. Correct predictions may result in careful observations and valuable measurements (Abruscato, 2000:43). At this step, teachers may ask students such questions as: "If…, then what occurs?" Such questions require answers (Martin, 2003:106).

BPSs are the basis for integrated process skills (Padilla, 1990; Rambuda & Fraser, 2004). Therefore, it is necessary to study at which level primary school students can acquire these skills. By analyzing studies conducted in Turkey, it can be seen that there are very few studies (Arslan, 1995; Hazir & Turkmen, 2008) on the BPS levels of primary school students. Therefore, studies on the BPS levels of primary school students are necessary.

The literature states that primary school students need to improve their BPSs and that those who fail to do so will have problems in their future lives. It is especially important to determine the BPS levels of primary school students. Consequently, the aim of this study is to examine the BPSs of primary school students in terms of certain variables (gender, grade level, residential area and socio-economic status of school environments). In addition, this study aims to investigate the relationship between BPSs and academic achievement of primary school students in science courses.

Method

Research Design

This quantitative study was carried out as a survey, which possesses three basic characteristics: (1) the collection of data (2) from a sample (3) by asking questions, in order to describe its aspects (Fraenkel & Wallen, 2006).

Research Instruments and Procedures

"Test of Basic Process Skills—BAPS," which was developed by Padilla, Cronin and Twiest (1985) for primary students and adapted to Turkish by Aydogdu and Karakus (2015), was used as the data collection instrument. To ensure language validity, forward and backward translations of the original scale of the BAPS were done, and its convergent validity was calculated as 0.92 (Aydogdu & Karakus, 2015). The original version of BAPS consists of 36 multiple choice items, i.e. observation, inference, prediction, measurement, communication and classification (each of six questions). After excluding five items below the criterion level, the reliability for the Turkish version of the BAPS with the remaining 31 items was (KR–20) 0.83. BAPS is composed of two parts. The first part is composed of information determining students' demographic features. The second part is composed of 31 multiple choice items. Students were given 40 minutes to answer the BAPS.

Research Sample

The study population consisted of 1272 primary school students in the Aegean region of Turkey. The participants were selected through stratified sampling. Stratified sampling involves dividing the population into homogeneous groups, wherein each group contains subjects with similar characteristics (Cohen, Manion, & Morrison, 2007). All participants voluntarily participated in this study. Demographic characteristics of participants are presented in more detail in Table 2.

Table 2
Demographic Characteristics of Participants

Variables					**N**	**%**
Gender	Male				625	49
	Female				647	51
	Total				1272	100
Grade	3				472	37
	4				352	28
	5				448	35
	Total				1272	100
		Socio-economic status of school environment				
		Low	Middle	High		
Residential area	Village (16 villages)	312*	-	-	312	25
	Town (16 towns)	-	308*	-	308	24
	District (16 schools from 8 districts)	110	104	102	316	25
	City (16 schools from city center)	114	112	110	336	26
	Total	536	524	212	1272	100

* All schools in the villages are assumed to have low socio-economic school environments, and all schools in the towns are assumed to have middle socio-economic school environments.

Data Analysis

The SPSS packet program was used for the analysis of data gained after the applications. Data analysis was done with a one-way MANOVA procedure. Prior to the MANOVA analysis, the normality tests were conducted and the distribution of all variables were found to be normal.

Results

This study examined in detail primary school students' BPSs regarding six subthemes (observation, classification, measurement, prediction, inference and communication). Furthermore, this study examined the BPS levels of primary school students in terms of some variables (gender, grade level, residential area and achievement in science course) with a one-way MANOVA procedure. The scores that primary students obtained from BAPS are presented in Table 3.

Table 3

Scores that Primary School Students Obtained from BAPS

Test	6 Subthemes	*N*	*Max. Score*	*M*	*Success percentage*	*SD*
BAPS	Observation	1272	5	3.11	62%	1.46
	Classification	1272	5	3.27	65%	1.30
	Measurement	1272	5	2.67	53%	1.30
	Prediction	1272	6	4.18	69%	1.46
	Inference	1272	5	2.00	40%	1.10
	Communication	1272	5	3.01	60%	1.48
	Total	1272	31	18.26	58%	6.03

In Table 3, it is seen that primary students gained the highest success percentage in "prediction" (69%), and the list goes down with "classification" (65%), "observation" (62%), "communication" (60%), "measurement" (53%) and "inference" (40%). It is clearly seen from these results that the success rates of BPSs among primary students are not at a satisfactory level. In particular, the "inference" skills of primary students are low. The results of the one-way MANOVA test performed to determine whether there was a difference between the BAPS scores of primary students according to their gender are presented in Table 4.

Table 4

The Results of the One-Way MANOVA Test on Whether There Was a Difference between the BAPS Scores of Primary Students according to Their Gender

Effect		*Value*	*F*	*Hypothesis df*	*Error df*	*P*	η^2
Gender	Wilks' Lambda	0.995	0.858	7	1264	0.539	0.005

As seen Table 4, there was no significant difference between the BAPS scores of primary students according to their gender [Wilks Lambda (ʌ) = 0.995, F(7, 1264)=0.858, p=0.539, η2=0.005]. A one-way MANOVA analysis for the BAPS scores of primary students according to their gender is presented in Table 5.

Table 5
A One-Way MANOVA Analysis for the BAPS Scores of Primary Students according to Their Gender

BAPS	Gender	*n*	*M*	*SD*	*df*	*F*	*p*	η^2
Observation	Female	647	3.18	1.46	1270	2.542	0.111	0.002
	Male	625	3.04	1.47				
Classification	Female	647	3.32	1.29	1270	2.327	0.127	0.002
	Male	625	3.21	1.31				
Measurement	Female	647	2.70	1.28	1270	0.477	0.490	0.000
	Male	625	2.64	1.32				
Prediction	Female	647	4.25	1.40	1270	3.506	0.061	0.003
	Male	625	4.10	1.52				
Inference	Female	647	2.00	1.09	1270	0.006	0.938	0.000
	Male	625	2.00	1.11				
Communication	Female	647	3.04	1.45	1270	0.334	0.563	0.000
	Male	625	2.99	1.51				
Total	Female	647	18.50	5.84	1270	2.09	0.149	0.002
	Male	625	18.01	6.22				

As seen in Table 5, there was no significant difference between the BAPS scores of primary students according to their gender. However, it was found that female primary students had higher BPSs, but these differences were not statistically significant in any of the groups. The results of the one-way MANOVA test on whether there was a difference between the BAPS scores of primary students according to their grade level are presented in Table 6.

Table 6

The Results of the One-Way MANOVA Test on Whether There Was a Difference between the BAPS Scores of Primary Students according to Their Grade Level

Effect		*Value*	*F*	*Hypothesis df*	*Error df*	*p*	η^2
Grade level	Wilks' Lambda	0.949	4.826	14	2526	0.000*	0.026

*p<0.05

As seen in Table 6, there was a significant difference between BAPS scores of primary students according to their grade level [Wilks Lambda (ʌ) = 0.949, F(14, 2526)=4.826, p=0.000, η2=0.026]. A one-way MANOVA analysis for the BAPS scores of primary students according to their grade level are presented in Table 7.

Table 7

A One-Way MANOVA Analysis for the BAPS Scores of Primary Students according to Their Grade Level

BAPS	Grade	N	M	SD	df	F	p	η^2	Sig.
Obser.	3	472	2.92	1.46	1269	8.720	.000*	.014	5-3
	4	352	3.11	1.43					
	5	448	3.32	1.47					
Classi.	3	472	3.04	1.30	1269	19.557	.000*	.030	5-3
	4	352	3.21	1.27					5-4
	5	448	3.56	1.26					
Measu.	3	472	2.40	1.29	1269	23.406	.000*	.036	5-3
	4	352	2.64	1.27					5-4
	5	448	2.98	1.27					4-3
Predict.	3	472	4.00	1.42	1269	6.222	.002*	.010	5-3
	4	352	4.21	1.43					
	5	448	4.34	1.52					
Inferen.	3	472	1.88	1.08	1269	6.161	.002*	.010	5-3
	4	352	1.99	1.10					
	5	448	2.13	1.11					
Comm.	3	472	2.75	1.49	1269	16.921	.000*	.026	5-3
	4	352	2.99	1.46					5-4
	5	448	3.31	1.44					4-3
Total	3	472	17.00	5.70	1269	23.113	.000*	.035	5-3
	4	352	18.17	5.88					5-4
	5	448	19.66	6.21					4-3

As seen Table 7, there was a significant difference between the six subthemes (observation, classification, measurement, prediction, inference and communication) in the BAPS of primary students according to their grade level. The results of the one-way MANOVA test on whether there was a difference between the BAPS scores of primary students according to their residential area are presented in Table 8.

Table 8

The Results of the One-Way MANOVA Test for the BAPS Scores of Primary Students according to Their Residential Area

Effect		Value	F	Hypothesis df	Error df	p	η^2
Residential area	Wilks' Lambda	0.941	3.691	21	3624	0.000*	0.020

*p<0.05

As seen in Table 8, there was a significant difference between the BAPS scores of primary students according to their residential area [Wilks Lambda (λ) = 0.941, F(21, 3624)=3.837, p=0.000, η2=0.020]. A one-way MANOVA analysis for the BAPS scores of primary students according to their residential areas are presented in Table 9.

Table 9
A One-Way MANOVA Analysis for BAPS Scores of Primary Students according to Their Residential Area

BAPS	Resident. area	*n*	*M*	*SD*	*df*	*F*	*p*	η^2	*Sig.*
Obser	1.Village	312	2.77	1.44	1268	10.213	.000*	.024	3-1 4-1.
	2.Town	308	3.02	1.49					
	3.District	316	3.31	1.41					
	4.City C..	336	3.32	1.46					
Class	1.Village	312	3.11	1.37	1268	4.353	.005*	.010	4-1. 4-2
	2.Town	308	3.19	1.31					
	3.District	316	3.30	1.24					
	4.City C..	336	3.46	1.26					
Meas	1.Village	312	2.43	1.35	1268	5.445	.001*	.013	2-1 3-1 4-1
	2.Town	308	2.70	1.33					
	3.District	316	2.70	1.26					
	4.City C..	336	2.83	1.24					
Predi	1.Village	312	4.09	1.47	1268	5.228	.001*	.012	4-2
	2.Town	308	4.01	1.57					
	3.District	316	4.25	1.39					
	4.City C..	336	4.34	1.41					
Infer	1.Village	312	1.78	1.07	1268	3.308	.020*	.008	2-1 3-1 4-1
	2.Town	308	2.06	1.13					
	3.District	316	2.08	1.07					
	4.City C..	336	2.06	1.11					
Com	1.Village	312	2.80	1.47	1268	11.082	.000*	.026	3-1 4-1 3-2 4-2
	2.Town	308	2.75	1.51					
	3.District	316	3.14	1.44					
	4.City C..	336	3.32	1.43					
Total	1.Village	312	17.00	5.87	1268	9.924	.000*	.023	3-1 4-1 4-2
	2.Town	308	17.77	6.40					
	3.District	316	18.81	5.70					
	4.City C..	336	19.35	5.91					

As seen in Table 9, there was a significant difference between the six subthemes in the BAPS of primary students according to their residential area. In terms of residential areas, there were significant differences in the BAPS scores, with higher scores among primary students in the city center or a district than in a village or town.

The results of the one-way MANOVA test on whether there was a difference between the BAPS scores of primary students according to the socio-economic status of school environments are presented in Table 10.

Table 10
The Results of the One-Way MANOVA Test for the BAPS Scores of Primary Students according to the Socio-Economic Status of School Environments

Effect		Value	*F*	*Hypothesis df*	*Error df*	*p*	η^2
Socio-economic status	Wilks' Lambda	0.945	5.143	14.000	2524.000	0.000	0.028

As seen in Table 10, there was a significant difference between the BAPS scores of primary students according to the socio-economic status of school environments [Wilks Lambda (ʌ) = 0.945, F(14, 2524)=5.143, p=0.000, η2=0.028].

A one-way MANOVA analysis for the BAPS scores of primary students according to their socio-economic school environment are presented in Table 11.

Table 11
A One-Way MANOVA Analysis for the BAPS Scores of Primary Students according to Their Socio-Economic School Environment

BAPS	Socio econ.	N	M	SD	Df	F	p	η^2	Differ.
Obser	1.Low	536	2.82	1.50	1269	21.886	0.000*	0.033	3-2. 3-1 2-1
	2.Middle	524	3.23	1.39					
	3.High	212	3.54	1.40					
Class	1.Low	536	3.08	1.40	1269	10.574	0.000*	0.016	3-2 3-1 2-1
	2.Middle	524	3.36	1.23					
	3.High	212	3.51	1.12					
Meas	1.Low	536	2.45	1.35	1269	13.198	0.000*	0.020	3-1 2-1
	2.Middle	524	2.83	1.26					
	3.High	212	2.83	1.19					
Predi	1.Low	536	3.95	1.56	1269	12.321	0.000*	0.019	3-1 2-1
	2.Middle	524	4.29	1.42					
	3.High	212	4.47	1.23					
Infer	1.Low	536	1.78	1.10	1269	20.339	0.000*	0.031	2-1 3-1
	2.Middle	524	2.09	1.08					
	3.High	212	2.30	1.05					
Com	1.Low	536	2.81	1.50	1269	9.061	0.000*	0.014	2-1 3-1
	2.Middle	524	3.12	1.48					
	3.High	212	3.24	1.37					
Total	1.Low	536	16.92	6.29	1269	25.509	0.000*	0.039	2-1 3-1
	2.Middle	524	18.96	5.73					
	3.High	212	19.91	5.41					

*p<0.05

As seen in Table 11, there was a significant difference between the six subthemes (observation, classification, measurement, prediction, inference and communication) in the BAPS of primary students according to their socio-economic school environment. These differences in BAPS scores were higher among primary school students from better socio-economic school environments compared with the students from low-level socio-economic school environments.

The relationship between primary students' BPSs and their achievement in the course are presented in Table 12.

Table 12
Relationship between Primary Students BPSs and Their Achievement in the Course

		Academic achievement in science course
BPSs	Pearson correlation	0.598**
	Sig. (2-tailed)	0.000
	N	1272

**p<0.01

The coefficient of correlation in Table 8 shows that there exists a positive and significant relationship (r = .598) between BPSs and Academic Achievement in the science course.

Discussion and Conclusion

The results of the study showed that the BPSs of primary school students are not at a satisfactory level. In particular, the BPS subcategory of "inference" (40 %) among primary school students is at a low level. Similarly, in a study done by Ozturk, Tezel and Acat (2010), it was found that the inference skills (31%) of 7th-grade students are too low. Furthermore, a study done by Rabacal (2016), found that the inference skills (39%) of biology students were low. In addition, a study done by Chabalengula, Mumba and Mbewe (2012), found that pre-service teachers' conceptual understanding of inference skills (25%) were too low. TIMSS-1999, TIMSS-2007 and TIMSS-2011 results indicate that in Turkey primary students' knowledge of SPSs is low (NCES, 1999; 2007; 2011). Similar findings were observed in some studies of primary students' knowledge of SPSs in Turkey (Aydogdu, 2006; Dokme & Aydinli, 2009; Hazir & Turkmen, 2008; Saban, 2015; Senturk, 2012; Tan & Temiz, 2003). Teachers have a great responsibility to develop the BPSs of primary school students. For this reason, teachers should develop students' BPSs by requiring the active use of these skills in the classroom. Furthermore, course contents should be organized with the aim of improving the BPSs of primary school students.

The results of the study revealed that there was no significant difference between the BAPS scores of primary school students according to their gender. Yet it was found that female primary school students had higher BPSs; however, these differences were not statistically significant in any of the groups. In some studies, it was reported that there was no significant difference between the SPS scores of primary school students according to their gender (Arslan, 1995; Hazir & Turkmen, 2008; Ong, Ramiah, Ruthven, Salleh, Yusuff & Mokhsein, 2015; Rabacal, 2016; Senturk, 2012). Similar findings were observed in other studies of elementary school students (Aydogdu, 2006; Ozturk, 2008). Nonetheless, in studies of secondary school students, results showed that there was a significant difference favoring female students according to their gender (Dokme & Aydinli, 2009; Zeidan & Jayosi, 2015; Zorlu, Zorlu & Sezek, 2013). It is seen in the studies conducted on BPSs that gender has an impact on some of the studies and not on others. According to a recent study, gender does not have an impact on BPSs. The reason for that is that female students who have a particular ability in BPSs might also have a strong ability in self-regulation.

The results of the study revealed that there was a significant difference between the BPSs of primary school students according to their grade level. In terms of grade level, significant differences in the BPS scores showed higher scores in the 5th grade than in the 3rd and 4th grades, and higher scores in the 4th grade than in the 3rd grade. In a study done by Arslan (1995), it was found that significant differences in SPSs showed higher scores in 5th grade students compared to 4th grade students.

Similarly, in a study done by Ong et al. (2015), it is found that significant differences in BPSs showed higher scores among 6th-grade students than among 4th-grade students. Furthermore, in a study done by Ozgelen (2012), it was found that significant differences in SPSs showed higher scores among 7th-grade students than 6th-grade students. Ozgelen (2012) stated that SPSs are related to cognitive development. These significant differences in the current study can be explained by primary school students' cognitive development levels according to Piagetian theory. Piaget claimed a positive correlation between children's mental capacity and their grade level.

Other results revealed that there was a significant difference between the BPSs of primary school students according to their residential area. These differences in BPSs showed higher scores in primary school students in urban areas than in rural areas. In a study done by Mohamad and Ong (2013) it was found that those primary students' BPSs in urban areas were significantly higher than students in the rural regions. Similarly, in a study done by Ong et al. (2015), it was found that urban students' achievements were significantly higher than rural students when it came to the acquisition of BPSs. Furthermore, in another study done by Raj and Devi (2014), it was found that significant differences in SPSs showed higher scores among high school students in urban areas compared to those in rural areas. But, in a study done by Zeidan and Jayosi (2015), it was found that there were significant differences in SPSs showing higher scores among secondary school students in villages than those in city centers. Consequently, these studies indicated that residential area is an effective variable on students' SPSs. In the present study, the reason for the low percentage in the BPSs of students living in rural areas might be their socio-economic level. As is known, the socio-economic level of students in rural areas in Turkey is lower.

Furthermore, the results in the current study revealed that there was a significant difference between the BPSs of primary school students according to the socio-economic status of school environments. These differences in BPSs showed higher scores among primary school students from better socio-economic school environments than students from low-level socio-economic school environments. Some researchers indicated that students from better socio-economic school environments have significantly higher SPS capacity than students from low-level socio-economic school environments (Hazir & Turkmen, 2008; Saracoglu, Boyuk & Tanik, 2012). Hereafter, the socio-economic levels of students must be taken into account during in-class activities focus on BPSs.

Finally, the results indicated that a positively significant relationship (r=0.598) was found between primary school students' BPSs and their achievement in the science course. Some researchers found that there were positive and significant correlations between students' SPSs and their academic achievement (Aydogdu, 2006; German, 1994; Ozturk, 2008; Sittirug, 1997). Guevara (2015) reported that the acquisition of SPSs can have a profound impact on student success in science classes. Overall, the results suggest that the more BPSs primary school students acquire, the more academically successful they will be. Therefore, we can conclude that having a

high-level BPS/socio-economic background has a significant effect on acquiring knowledge. Consequently, primary school students need assistance in acquiring BPSs. Furthermore, they must be provided with an opportunity to use these skills in a teaching and learning environment.

Based on all these results, the reason why the BPSs of primary students are not at a satisfactory level might be examined in a further study. In addition, any variables that may have an impact on the development of BPSs might be studied. The reason behind the higher BPS scores of female primary students should also be analyzed in a more detailed way in a further study. The BPS levels of primary students regarding both grade level and residential area should be studied further and in more detail. The effect on acquiring academic achievement from BPSs should be analyzed in more detail in a further study. Studies analyzing the BPSs of primary school students might be more deeply studied through larger sample groups and different data-gathering tools (observation, interview, survey, etc.). In future studies, materials might be prepared for instructors about how to prepare activities to improve the BPSs of students as well as how to effectively use their BPSs in a class environment.

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3., 4. ve 5. Sınıf Öğrencilerinin Temel Becerileri Üzerine Bir Çalışma

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Özet

Problem durumu: Bilimsel süreç becerileri, öğrenmenin kalıcı ve yaşamda kullanılır olmasını sağlar. Bilimsel süreç becerilerini kazanan öğrenciler bilimsel bir araştırmanın nasıl yapıldığını anlar ve karşılaştıkları sorunları bilimsel yöntemler kullanarak çözebilirler. Bu nedenle, öğrencilere bilimsel süreç becerilerini kazandıracak ortamların sunulması son derece önemlidir. Temel beceriler üst düzey becerilerin temelini oluşturmaktadır. Başka bir ifadeyle; temel becerilerin öğrenilmesi üst düzey bilimsel süreç becerilerinin geliştirilmesi için ön koşuldur. Bu nedenle, temel becerilerin öğrencilere kazandırılması son derece önemlidir. Bu becerilerin ilköğretim öğrencilerine hangi düzeyde kazandırıldığı ve bu beceriler üzerinde hangi değişkenlerin etkili olduğu, araştırılması gereken konular arasında yer alır.

Araştırmanın Amacı: Bu çalışmanın amacı, 3., 4. ve 5. sınıf öğrencilerinin temel beceri düzeylerini belirlemek ve bu beceri düzeylerini öğrencilerin cinsiyetine, sınıf düzeyine, yaşadıkları yere ve okulun bulunduğu sosyo-ekonomik çevreye göre incelemektir. Ayrıca, öğrencilerin temel beceri düzeyleri ile fene yönelik başarı puanları arasındaki ilişkiyi belirlemektir.

Araştırmanın Yöntemi: Çalışma tarama modeline göre tasarlanmıştır. Çalışmaya 3., 4., ve 5. sınıf düzeyinden toplam 1272 ilköğretim öğrencisi katılmıştır. Çalışmaya katılan öğrencilerin demografik özellikleri incelendiğinde, 3.sınıftan 472 öğrenci, 4. sınıftan 352 öğrenci ve 5. sınıftan 448 öğrenci olmak üzere toplamda 625 erkek ve 647 kız öğrenciden oluştuğu görülmektedir. Ayrıca, çalışmaya katılan öğrencilerin, 16 farklı

köyde yer alan 16 okuldan 312 öğrenci, 16 farklı kasabada yer alan 16 farklı okuldan 308 öğrenci, 6 farklı ilçede yer alan 16 farklı okuldan 318 öğrenci ve şehir merkezinde yer alan 16 farklı okuldan 336 öğrenci olacak şekilde dağılması sağlanmıştır. Buradaki amaç, öğrencilerin temel beceri puanları üzerinde kırsal ve merkezin etkisini daha net görebilmek içindir. Ayrıca, öğrencilerin örnekleme seçiminde okulların bulunduğu sosyo-ekonomik düzeyin az, orta ve yüksek şeklinde çeşitli düzeylerde olmasına dikkat edilmiştir. Çalışmada veri toplama aracı olarak "Temel Beceri Ölçeği (Test of Basic Process Skills-BAPS)" kullanılmıştır. Temel Beceri Ölçeği, Padilla, Cronin ve Twiest (1985) tarafından geliştirilmiş ve Türkçeye Aydoğdu ve Karakuş (2015) tarafından uyarlanmıştır. Temel Beceri Ölçeği, gözlem, sınıflama, çıkarım yapma, ölçme, tahmin ve iletişim kurma becerilerinin her birine yönelik altışar sorudan ve toplamda 31 sorudan oluşan çoktan seçmeli bir ölçektir. Aydoğdu ve Karakuş (2015) Temel Beceri Ölçeğinin uyarlanması çalışmasında, dil geçerliği için öncelikle ölçeği uzmanlar tarafından Türkçeye çevrildiğini belirtmişlerdir. Araştırmacılar, üç uzman çevirisinin ortak noktaları dikkate alarak ortaya çıkan Türkçe taslak ölçekte yer alan maddelerin bir dil uzmanı tarafından tekrar İngilizceye çevrildiğini belirtmişlerdir. Sonuç olarak araştırmacılar ölçeğin orijinali ile İngilizceye tekrar çevrilmiş halini karşılaştırılarak ölçeğe son halini verilmişlerdir. Araştırmacılar, ölçeğin orijinali ile İngilizceye tekrar çevrilmiş hali arasındaki uyuşum yüzdesinin 0.92 olduğunu belirtmişlerdir. Araştırmacılar, temel beceri ölçeğinin başlangıçta 36 maddeden oluştuğunu geçerlik ve güvenirlik analizleri sonucunda 31 maddeye düştüğünü belirtmişlerdir. 31 maddelik temel beceri ölçeğinin beşi gözlem, beşi sınıflama, beşi ölçme, altısı tahmin, beşi çıkarım yapma ve beşi iletişim yapma olmak üzere dağılmıştır. 31 maddelik temel beceri ölçeğinin KR-20 değeri 0.83 olarak hesaplanmıştır.

Araştırmanın Bulguları: Araştırma bulguları, ilköğretim öğrencilerinin temel beceri düzeylerinin istenen düzeyde olmadığını göstermiştir. Ayrıca bulgular, ilköğretim öğrencilerinin temel becerilerinin cinsiyetlerine göre anlamlı farklılaşmadığını ancak kız öğrencilerin daha yüksek aritmetik ortalamalara sahip olduğunu göstermiştir. Bir diğer bulgu ise, ilköğretim öğrencilerinin temel becerilerinin sınıf düzeylerine göre anlamlı farklılaştığıdır. Bu anlamlı farklılıkların ise genelde üst sınıflar lehine olduğu görülmüştür. Bunların yanı sıra, elde edilen bulgular incelendiğinde daha üst düzey sosyo-ekonomik okul çevresinden gelen öğrencilerinin düşük sosyo-ekonomik okul çevresinden gelen öğrencilere göre istatistiksel olarak anlamlı olacak şekilde daha yüksek temel beceri düzeylerine sahip oldukları görülmüştür. Bir diğer bulguda ise, merkezdeki öğrencilerin kırsaldaki öğrencilere göre istatistiksel olarak anlamlı olacak şekilde yüksek temel beceri puanlarına sahip olduklarını göstermiştir. Bunlara ilaveten, ilköğretim öğrencilerinin temel beceri düzeyleri ile fene yönelik akademik başarı puanları arasında orta düzey pozitif bir ilişkinin ($r = 0.598$) olduğu belirlenmiştir.

Araştırmanın Sonuçları ve Önerileri: Araştırma sonuçlarına göre, ilköğretim öğrencilerinin temel beceri düzeylerinin istenen düzeyde olmadığı görülmüştür. İlkokul öğrencilerinin temel becerilerini istenen düzeye getirebilmede öğretmenlerin büyük rolü vardır. Bu anlamda öğretmenlere daha fazla görev düşmektedir. Ayrıca

elde edilen sonuçlardan, ilköğretim öğrencilerinin temel becerilerinin cinsiyetlerine göre anlamlı farklılaşmadığını ancak kız öğrencilerin daha yüksek aritmetik ortalamalara sahip olduğu görülmüştür. Bir diğer sonuç ise, ilköğretim öğrencilerinin temel becerilerinin sınıf düzeylerine göre anlamlı farklılaştığıdır. Bu anlamlı farklılıkların ise genelde üst sınıflar lehine olduğu görülmüştür. Bu anlamlı farklılıklar ise öğrencilerin bilişsel gelişimden kaynaklanmış olabilir. Bunların yanı sıra, elde edilen sonuçlar incelendiğinde daha üst düzey sosyo-ekonomik okul çevresinden gelen öğrencilerinin düşük sosyo-ekonomik okul çevresinden gelen öğrencilere göre istatistiksel olarak anlamlı olacak şekilde daha yüksek temel beceri düzeylerine sahip oldukları görülmüştür. Bu durumda özellikle düşük sosyo-ekonomik düzeydeki okulların özellikle öğrencilerin temel becerilerini geliştirecek şekilde daha çok desteklenmesi gerektiği düşünülmektedir. Bir diğer sonuç ise, merkezdeki öğrencilerin kırsaldaki öğrencilere göre istatistiksel olarak anlamlı olacak şekilde yüksek temel beceri puanlarına sahip olmalarıdır. Bu sonuca dayalı olarak özellikle kırsaldaki okulların fizik durumlarının (fen laboratuvarı, ders araç-gereçleri vb.) daha iyi desteklenmesi sağlanabilir. Bunlara ilaveten, ilköğretim öğrencilerinin temel beceri düzeyleri ile fene yönelik akademik başarı puanları arasında orta düzey pozitif bir ilişkinin ($r = 0.598$) olduğu belirlenmiştir. Bu sonuçlara dayalı olarak ilköğretim öğrencileri ne kadar çok temel beceri düzeyine sahip olurlarsa o kadar fene yönelik olarak akademik başarılarının artacağı söylenebilir.

Anahtar Sözcükler: ilköğretim öğrencileri, fen bilimleri dersi, bilimsel süreç becerileri, fene yönelik akademik başarı.