

Development of knowledge-based approach scale (KBAS) to some science events in daily life

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ABSTRACT

Science events are encountered in every phase of daily life. These science events can be encountered at home, in business life, or while studying at school. Human beings can learn about these scientific events both informally and formally. Science-related events can often be confusing, even when formally learned. This study, it was aimed to develop a CRPS to investigate whether they learned some science events correctly in daily life. The study was carried out on 313 people from different age and occupational groups living in Edirne, Turkey. To develop a scale, statistical data such as item-total correlation (rit) and item-remainder correlation (rir) coefficients analysis, discrimination analysis, frequency and % values for the answers given by the participants to the items, t-test, Rulon and Cronbach Alpha coefficient transactions have been made. The scale, which started with 35 items, was reduced to 30 items due to the analysis. Cronbach Alpha and Rulon reliability coefficients were found to be 0.85 and 0.87, respectively. It was understood that the scale showed a symmetric-homogeneous distribution. According to these data, it has been determined that some scientific events in daily life can be measured with the knowledge-based approach.

Keywords: Daily life, knowledge-based approach, scale development, science events.

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INTRODUCTION

Learning is a lifelong process. This process sometimes takes place informally planned and programmed environments, and sometimes in all environments where individuals interact informally (Kılıç et al., 2022). In the two millenniums, which we call the information age, we need creative and scientific thinking more than ever. In today's world, where science and technology are developing at a dizzying pace, information is renewed and changed in a short time, and conditions have made it necessary for us to acquire high-level knowledge and skills (Ünal, 2011). Science is part of our life. Everything in the world we live in is related to science (Altun and Olkun, 2005). The foundation of social and environmental development is laid for the first time in primary education institutions with Science courses. In this course, children have the opportunity to scientifically examine and examine the world of science and nature in which they

live (Akgün, 2001). Observation and examination are important processes for science teaching. Teachers should focus on this process (Monk and Dillon, 1995:29). This rapid development and change in science and technology primarily affect individuals, namely us.

Science and science literacy has gained a lot of importance in facilitating our daily lives, producing solutions to the problems we encounter, and making sense of nature and environmental events (Kaya and Bacanak, 2013). For these reasons, developed countries have aimed to raise individuals who are science and science-literate in their policies to keep up with the times and not lag behind the times. The purpose of science lessons is to pave the way for students to acquire basic knowledge as well as adopt this knowledge and adapt it to their daily lives (Yaşar, 2021). For science education to be adopted by students, it should be freed from rote

learning and processed in a student-centered manner based on experimental work, observation, and examination (Ortaş, 2010).

The concept of literacy has different meanings according to the changes that societies have shown over time (Olur and Ocak, 2021). In today's science education, the acquisition of the 21st century as digital-age literacy, exploratory thinking, effective communication, and high productivity is increasingly being discussed in international debates within science curriculum achievements has become a more popular topic (Karademir and Ulucinar, 2017; McGregor and Kearton, 2010). Science and science literacy is needed to be able to perceive what is happening around us, not to stay away from technology, to keep up with the changing and developing world, and to ensure sol development. Every society should give importance to scientific literacy in order not to lag behind the times and to be successful in the technological war (Kılıç et al., 2015).

Recognizing the importance of educating individuals in society as literate, scientists have conducted studies focusing on different aspects of literacy over time. In the field literature, scientists conducted studies on information literacy (Folk, 2021; Gündüzalp, 2021; Özel, 2014; Özmusul, 2012; Shinohara and Horoiwa, 2021), scientific literacy (Cansiz and Cansiz, 2019; Bağcı Kılıç et al., 2008; Tunç Şahin and Say, 2010; Yuliana et al., 2021), technological literacy (Adıguzel, 2014; Çoklar and Şahin 2014; Silik and Aydın, 2021; Taskiran and Salur, 2021), and science and technological literacy (Doğan and Yılmaz 2013; Duban, 2010; Yetişir, 2007), mathematical literacy (Canbazoğlu and Tarım, 2020; Duran and Bekdemir 2013, Kondaş and Özcan, 2022; Özgen, 2021; Özsoy Güneş et al., 2013), and environmental literacy (Lloyd-Strovas et al., 2018; Özgen, 2021; Yılmaz, 2021).

When the literature on science literacy is examined, there are many studies and even prepared scales, as stated above. The scale in this study is the development of a KBAS for science events in daily life by applying it to different people in society. This study is similar to science literacy studies. It is a further developed version of the scale developed by Kilic et al. (2022) on science literacy. The scale developed by these researchers consists of 20 items and the study group is 125 people. In this study, the number of items was increased and the working group was also increased. With this study, a new scale will have entered the literature.

METHOD

This research, which aims to develop a knowledge-based scale to determine how some science events that different age and occupational groups encounter in daily life in society are learned, is a descriptive study and a general screening model was used in the research. In the studies in which this model is used, the opinions of the participants about a subject or event, or their interests,

skills, abilities, attitudes, etc. characteristics are determined (Fraenkel and Wallen, 2009; Karasar, 2015; Salcı and Aydın, 2021).

Sample

A simple random sampling technique, which is one of the most widely known random sampling methods, was used in this study. The sample of the study consists of 313 people of different ages (Table 1) and occupation groups (Table 2), living in the city center of Edirne with a population of 170 thousand in Turkey. For the reliability and validity analysis of the scale, it is stated that the sample size should be at least five times the number of variables (items) and at most ten times (Tavşancıl et al., 2018). Slovin formula was applied to determine the size of the samples and 313 people were obtained as a result of sampling with a 95% confidence level. In this study, it can be said that the size of the study group was sufficient for factor analysis of the scale data. A simple random sampling technique is usually accomplished by assigning a number to each element in the sampling frame and using a process such as a random number generator to select from the frames (Andriani et al., 2022).

Table 1. Distribution of the participants by age.

Age	F	%
20 and younger	96	30.7
Between 21-30	96	30.7
Between 31-40	54	17.3
41 and older	67	21.4
Total	313	100.0

Table 2. Distribution of the participants by occupation.

Occupation	F	%
Student	147	47.0
Unemployed, retired and housewife	28	8.9
Engineer, architect and doctor	18	5.8
Teacher	29	9.3
Officer, worker and small business	91	29.1
Total	313	100.0

Data collection

In the development phase of the data collection tool, firstly, the studies conducted in this field were scanned and the scales used in the related studies were examined. As a result of the literature review, an item pool was created with the help of a group of science

teachers working in secondary schools to develop the data collection tool. Expert opinion on the prepared items was requested and a trial form consisting of items that were determined to be suitable for the research was prepared. The development of the scale consists of three stages.

Data analysis

Before the analysis of the data, the questionnaires applied to the sample group were transferred to the computer environment by giving numbers from 1 to 313. During the analysis of the data, the average scores of the answers given by the participants to the items in the KBAS to some science events in daily life were calculated, and the frequencies and percentages were taken.

Scoring and structure of the scale

For 13 items (1, 6, 7, 12, 17, 19, 20, 23, 24, 26, 27, 29, 30) with correct information in the scale, choosing the correct option is worth 3 points, undecided 2 points, wrong option 1 point. Marking the correct option for 17 items (2, 3, 4, 5, 8, 9, 10, 11, 13, 14, 15, 16, 18, 21, 22, 25, 28) with incorrect information included in the scale 1 point, undecided 2 points, wrong option is worth 3 points. After scoring the items in this way, the overall score of the scale is obtained by taking the average of 30 items. Scores range from a minimum of 1 to a maximum of 3. A score of 3 indicates the maximum level of knowledge-based approach to some science events in daily life.

FINDINGS

In this section, the preparation and development stages of the KBAS for science events in daily life are included.

Scale development

In the development phase of the data collection tool, firstly, the studies conducted in this field were scanned and the scales used in the related studies were examined. As a result of the literature review, an item pool was created with the help of a group of science teachers working in secondary schools to develop the data collection tool. Expert opinion on the prepared items was requested and a trial form consisting of items that were determined to be suitable for the purpose was prepared. The development of the scale consists of four stages.

First of all, there is a scale consisting of 37 items prepared to determine the use of science-related

information in daily life in the developed trial form. This scale, which was intended to be developed, was read to 5 primary school students and 3 adults, and it was tried to determine whether the questions were understandable. As a result of this determination, it was decided that the 2 questions in the scale could not be fully understood and these questions were removed from the scale.

In the second stage, a trial study was conducted to determine the reliability and validity of the measurement tool. The pre-trial study was carried out on 313 people from various age and occupational groups living in Edirne. As a result of the pre-test, item-total correlation (*rit*) and item-remainder correlation (*rir*) coefficients were calculated as scale development statistics on the data obtained from the application of the first draft form (Table 3).

According to these results obtained in Table 3, 1st item "When their roots are cut off, the reason why plants cannot live is that they cannot get nutrients," 16th item "The reason we add the salt to the pot after the water boils is to reduce the boiling time of the water," 20th item "For the healthy storage of foods such as tomato paste and yogurt, the reason why glass and plastic containers are preferred instead of metal containers is that the rust that will form in metal containers passes into the food," and 33rd item "The reason why the stars appear blue, white, yellow and red is the difference in the distances of the stars." The items were excluded from the scale as they were not significant. Items with an item-total correlation between 0.20 and 0.30 can be included in the measurement tool when necessary. Items with an item-total correlation of 0.30 and above are good (Büyükoztürk, 2007).

In the third stage, to test the discrimination power of the items in the scale reduced to 31 items, the t-test between the upper and lower quartiles was applied (Table 4).

When Table 4 is examined; after the t-test was applied between the upper and lower quartiles to test the discrimination power of the items, the 32nd item "The main reason for avalanche in winter months is gravity" was removed from the scale as it was not discriminating.

In the last stage, according to the item analysis made with these two methods, after removing the items not found in Tables 3 and 4, the 30-item scale given in Tables 5 and 6 was created. In line with the purpose of the study, the findings regarding the level of associating the scientific knowledge they have acquired throughout their lives with their daily lives are given in Tables 5 and 6.

When the data in Table 5 are examined, the average rate of the answer that chose the correct information in the scale is $\bar{x} = 70.81\%$, the minimum rate = 42.81%, and the maximum rate = 88.82%.

The 3 items with the highest response rate that chose the correct information on the scale are as follows:

- 17) The reason why the food left outside deteriorates

Table 3. Results of internal consistency analysis of KBAS to science events in daily life.

Items	Item-total correlation			Item- remainder correlation		
	rit	sd	p	rir	sd	p
1* <i>When their roots are cut off, the reason why plants cannot live is that they cannot get nutrients.</i>	0.177	311	*	0.117	311	*
2 The reason why birds fluff their feathers in winter is to insulate them.	0.412	311	p<.01	0.358	311	p<.01
3 The reason we don't sleep in a room with live flowers is that they humidify the air.	0.462	311	p<.01	0.397	311	p<.01
4 The reason why winter shoes are wide-soled is to be able to wear thick socks inside.	0.581	311	p<.01	0.519	311	p<.01
5 The reason we wear light-colored clothes in hot weather is that they don't put too much weight on us.	0.514	311	p<.01	0.465	311	p<.01
6 The reason why we put food in plastic containers in the freezer of the refrigerator is that plastic preserves its nutritional value.	0.543	311	p<.01	0.475	311	p<.01
7 When something starts to burn in our house, the reason we cover it with a thick cover is to prevent the fire from contacting the air.	0.336	311	p<.01	0.288	311	p<.01
8 When sawing wood with a saw, the reason why the wood heats up after a while is the release of energy due to friction.	0.444	311	p<.01	0.399	311	p<.01
9 The reason why the lid of the jar is opened in hot water is the buoyancy of the water.	0.667	311	p<.01	0.620	311	p<.01
10 The reason electrical wires get taut in winter is that more electrical current passes through the wires.	0.635	311	p<.01	0.590	311	p<.01
11 When it snows, salt is thrown on the roads because the salt hardens the snow and prevents slipping.	0.522	311	p<.01	0.451	311	p<.01
12 The reason why the ozone layer is important for human life is that it provides oxygen production.	0.505	311	p<.01	0.433	311	p<.01
13 The reason why city dumps start to burn on their own is that the decaying waste materials produce combustible gas.	0.203	311	p<.05	0.129	311	*
14 The reason why the hand-held part of power tools is plastic is that plastic is cheap.	-0.435	311	p<.01	-0.482	311	p<.01
15 The reason why the wall behind the TV turns black over time is that the moisture on the wall attracts dust more.	0.524	311	p<.01	0.459	311	p<.01
16* <i>The reason we add the salt to the pot after the water boils is to reduce the boiling time of the water.</i>	0.186	311	*	0.098	311	*
17 The reason why traffic policemen wear phosphorescent clothes at night is that phosphorescent clothes raise their body temperature.	0.605	311	p<.01	0.566	311	p<.01
18 The reason we add salt when making pickles is to increase the nutritional value of vegetables.	0.681	311	p<.01	0.632	311	p<.01
19 The reason why the food left outside deteriorates after a while is the growth of bacteria as a result of their contact with the air.	0.321	311	p<.01	0.277	311	p<.01
20* <i>For the healthy storage of foods such as tomato paste and yogurt, the reason why glass and plastic containers are preferred instead of metal containers is that the rust that will form in metal containers passes into the food.</i>	0.194	311	*	0.123	311	*
21 The reason why iron is dyed is to make it look more beautiful.	0.653	311	p<.01	0.604	311	p<.01
22 The reason we hear crackles when we take off our wool sweaters is because of electrification.	0.411	311	p<.01	0.362	311	p<.01
23 The reason why sound does not propagate on the moon is that there is no air on the moon.	0.420	311	p<.01	0.355	311	p<.01
24 Even if the weather is cool, the reason we sweat after running for a while is that our blood pressure drops.	0.521	311	p<.01	0.470	311	p<.01
25 The reason that wood floats on water when dropped into water is that the density of the water is less than the density of the wood.	0.407	311	p<.01	0.327	311	p<.01
26 The reason we use fabric softener while washing the laundry is to prevent the hardening of the laundry by preventing the accumulation of ions that give hardness to the water in the laundry.	0.385	311	p<.01	0.328	311	p<.01
27 The reason for covering the walls in sound recording studios with appropriate materials is to increase the recording quality by absorbing the sound.	0.242	311	p<.05	0.175	311	*

Table 3. Continues.

28	The reason why the light bulbs in our homes are connected in parallel is to save electricity.	0.276	311	p<.01	0.193	311	*
29	The reason we don't use electrical appliances on wet floors is that some solutions such as tap water, conduct electrical energy.	0.404	311	p<.01	0.347	311	p<.01
30	The reason why we can use the remote of our television wirelessly is the use of infrared rays in the remote.	0.388	311	p<.01	0.320	311	p<.01
31	The reason we use sunglasses in sunny weather is to prevent sweating.	0.503	311	p<.01	0.456	311	p<.01
32	The main reason for avalanches in the winter months is gravity.	-0.131	311	*	-0.220	311	p<.05
33*	<i>The reason why the stars appear blue, white, yellow, and red is the difference in the distances of the stars.</i>	0.181	311	*	0.097	311	*
34	The reason why the truck is less damaged than the car and truck colliding with each other while moving at the same speed is that it is made of more durable material.	0.363	311	p<.01	0.279	311	p<.01
35	The reason why the sense of sensing heat is not the same in every part of our skin is that there are not the same amount of sensory receptors in every part of the skin.	0.294	311	p<.01	0.220	311	p<.05

Table 4. The results of the discrimination power analysis of the items in KBAS to some science events in daily life.

Items	Upper Quarter			Lower Quarter			Comparison			
	n	x	s	n	x	s	t	sd	p	
1	When their roots are cut off, the reason why plants cannot live is that they cannot get nutrients.	85	0.871	0.483	85	0.635	0.721	2.485	168	p<.01
2	The reason why birds fluff their feathers in winter is to insulate them.	85	0.918	0.277	85	0.247	0.722	7.948	168	p<.01
3	The reason we don't sleep in a room with live flowers is that they humidify the air.	85	0.871	0.483	85	-0.012	0.852	8.258	168	p<.01
4	The reason why winter shoes are wide-soled is to be able to wear thick socks inside.	85	0.894	0.437	85	-0.282	0.908	10.702	168	p<.01
5	The reason we wear light-colored clothes in hot weather is that they don't put too much weight on us.	85	1.000	0.000	85	0.341	0.894	6.756	168	p<.01
6	The reason why we put food in plastic containers in the freezer of the refrigerator is that plastic preserves its nutritional value.	85	0.788	0.558	85	-0.329	0.808	10.434	168	p<.01
7	When something starts to burn in our house, the reason we cover it with a thick cover is to prevent the fire from contacting the air.	85	0.976	0.217	85	0.553	0.748	4.983	168	p<.01
8	When sawing wood with a saw, the reason why the wood heats up after a while is the release of energy due to friction.	85	1.000	0.000	85	0.482	0.781	6.075	168	p<.01
9	The reason why the lid of the jar is opened in hot water is the buoyancy of the water.	85	0.976	0.152	85	-0.212	0.846	12.662	168	p<.01
10	The reason electrical wires get taut in winter is that more electrical current passes through the wires.	85	0.976	0.217	85	0.024	0.873	9.714	168	p<.01
11	When it snows, salt is thrown on the roads because the salt hardens the snow and prevents slipping.	85	0.765	0.630	85	-0.318	0.876	9.197	168	p<.01
12	The reason why the ozone layer is important for human life is that it provides oxygen production.	85	0.776	0.605	85	-0.365	0.769	10.688	168	p<.01

Table 4. Continues.

13	The reason why city dumps start to burn on their own is that the decaying waste materials produce combustible gas.	85	0.694	0.655	85	0.376	0.831	2.752	168	p<.01
14	The reason why the hand-held part of power tools is plastic is that plastic is cheap.	85	-0.976	0.152	85	-0.424	0.822	-6.062	168	p<.01
15	The reason why the wall behind the TV turns black over time is that the moisture on the wall attracts dust more.	85	0.729	0.585	85	-0.282	0.825	9.165	168	p<.01
16	The reason we add the salt to the pot after the water boils is to reduce the boiling time of the water.	85	0.424	0.864	85	-0.129	0.813	4.270	168	p<.01
17	The reason why traffic policemen wear phosphorescent clothes at night is that phosphorescent clothes raise their body temperature.	85	1.000	0.000	85	0.294	0.843	7.677	168	p<.01
18	The reason we add salt when making pickles is to increase the nutritional value of vegetables.	85	0.941	0.283	85	-0.341	0.839	13.278	168	p<.01
19	The reason why the food left outside deteriorates after a while is the growth of bacteria as a result of their contact with the air.	85	0.976	0.217	85	0.612	0.656	4.835	168	p<.01
20	For the healthy storage of foods such as tomato paste and yogurt, the reason why glass and plastic containers are preferred instead of metal containers is that the rust that will form in metal containers passes into the food.	85	0.659	0.716	85	0.400	0.775	2.248	168	p<.05
21	The reason why iron is dyed is to make it look more beautiful.	85	0.941	0.322	85	-0.212	0.914	10.903	168	p<.01
22	The reason we hear crackles when we take off our wool sweaters is because of electrification.	85	1.000	0.000	85	0.424	0.850	6.213	168	p<.01
23	The reason why sound does not propagate on the moon is that there is no air on the moon.	85	0.859	0.441	85	0.024	0.771	8.620	168	p<.01
24	Even if the weather is cool, the reason we sweat after running for a while is that our blood pressure drops.	85	0.906	0.332	85	0.153	0.852	7.546	168	p<.01
25	The reason that wood floats on water when dropped into water is that the density of the water is less than the density of the wood.	85	0.741	0.675	85	-0.165	0.843	7.687	168	p<.01
26	The reason we use fabric softener while washing the laundry is to prevent the hardening of the laundry by preventing the accumulation of ions that give hardness to the water in the laundry.	85	0.941	0.237	85	0.306	0.787	7.084	168	p<.01
27	The reason for covering the walls in sound recording studios with appropriate materials is to increase the recording quality by absorbing the sound.	85	0.918	0.352	85	0.388	0.725	6.018	168	p<.01
28	The reason why the light bulbs in our homes are connected in parallel is to save electricity.	85	0.353	0.827	85	-0.212	0.818	4.451	168	p<.01
29	The reason we don't use electrical appliances on wet floors is that some solutions such as tap water, conduct electrical energy.	85	0.988	0.108	85	0.318	0.805	7.567	168	p<.01
30	The reason why we can use the remote of our television wirelessly is the use of infrared rays in the remote.	85	0.859	0.467	85	0.141	0.888	6.554	168	p<.01
31	The reason we use sunglasses in sunny weather is to prevent sweating.	85	0.976	0.152	85	0.341	0.839	6.829	168	p<.01
32-	<i>The main reason for avalanches in the winter months is gravity.</i>	85	-0.047	0.987	85	0.059	0.878	-0.735	168	*
33	The reason why the stars appear blue, white, yellow, and red is the difference in the distances of the stars.	85	0.118	0.837	85	-0.224	0.850	2.621	168	p<.01

Table 4. Continues.

34	The reason why the truck is less damaged than the car and truck colliding with each other while moving at the same speed is that it is made of more durable material.	85	0.541	0.810	85	-0.294	0.843	6.550	168	p<.01
35	The reason why the sense of sensing heat is not the same in every part of our skin is that there are not the same amount of sensory receptors in every part of the skin.	85	0.776	0.564	85	0.212	0.860	5.030	168	p<.01

Table 5. Distribution of participants' responses to items in the KBAS to some science events in daily life.

No	Items	True		Undecided		Incorrect		Total		Expected
		f	%	f	%	f	%	n	%	%
1	The reason why birds fluff their feathers in winter is to insulate them.	220	70.29%	71	22.68%	22	7.03%	313	100.00%	70.29%
2	The reason we don't sleep in a room with live flowers is that they humidify the air.	52	16.61%	45	14.38%	216	69.01%	313	100.00%	69.01%
3	The reason why winter shoes are wide-soled is to be able to wear thick socks inside.	74	23.64%	29	9.27%	210	67.09%	313	100.00%	67.09%
4	The reason we wear light-colored clothes in hot weather is that they don't put too much weight on us.	31	9.90%	9	2.88%	273	87.22%	313	100.00%	87.22%
5	The reason why we put food in plastic containers in the freezer of the refrigerator is that plastic preserves its nutritional value.	92	29.39%	51	16.29%	170	54.31%	313	100.00%	54.31%
6	When something starts to burn in our house. The reason we cover it with a thick cover is to prevent the fire from contacting the air.	276	88.18%	18	5.75%	19	6.07%	313	100.00%	88.18%
7	When sawing wood with a saw. The reason why the wood heats up after a while is the release of energy due to friction.	274	87.54%	18	5.75%	21	6.71%	313	100.00%	87.54%
8	The reason why the lid of the jar is opened in hot water is the buoyancy of the water.	52	16.61%	44	14.06%	217	69.33%	313	100.00%	69.33%
9	The reason electrical wires get taut in winter is that more electrical current passes through the wires.	38	12.14%	35	11.18%	240	76.68%	313	100.00%	76.68%
10	When it snows, salt is thrown on the roads because the salt hardens the snow and prevents slipping.	89	28.43%	20	6.39%	204	65.18%	313	100.00%	65.18%
11	The reason why the ozone layer is important for human life is that it provides oxygen production.	90	28.75%	49	15.65%	174	55.59%	313	100.00%	55.59%
12	The reason why city dumps start to burn on their own is that the decaying waste materials produce combustible gas.	228	72.84%	39	12.46%	46	14.70%	313	100.00%	72.84%
13	The reason why the hand-held part of power tools is plastic is that plastic is cheap.	26	8.31%	23	7.35%	264	84.35%	313	100.00%	84.35%
14	The reason why the wall behind the TV turns black over time is that the moisture on the wall attracts dust more.	69	22.04%	74	23.64%	170	54.31%	313	100.00%	54.31%
15	The reason why traffic policemen wear phosphorescent clothes at night is that phosphorescent clothes raise their body temperature.	24	7.67%	21	6.71%	268	85.62%	313	100.00%	85.62%

Table 6. The arithmetic mean and standard deviation values of the answers to the questions on the KBAS to some science events in daily life.

		\bar{x}	sd
1	The reason why birds fluff their feathers in winter is to insulate them.	2.633	0.612
2	The reason we don't sleep in a room with live flowers is that they humidify the air.	2.524	0.764
3	The reason why winter shoes are wide-soled is to be able to wear thick socks inside.	2.435	0.849
4	The reason we wear light-colored clothes in hot weather is that they don't put too much weight on us.	2.773	0.612
5	The reason why we put food in plastic containers in the freezer of the refrigerator is that plastic preserves its nutritional value.	2.249	0.882
6	When something starts to burn in our house. the reason we cover it with a thick cover is to prevent the fire from contacting the air.	2.821	0.519
7	When sawing wood with a saw. the reason why the wood heats up after a while is the release of energy due to friction.	2.808	0.539
8	The reason why the lid of the jar is opened in hot water is the buoyancy of the water.	2.527	0.764
9	The reason electrical wires get taut in winter is that more electrical current passes through the wires.	2.645	0.688
10	When it snows. salt is thrown on the roads because the salt hardens the snow and prevents slipping.	2.367	0.896
11	The reason why the ozone layer is important for human life is that it provides oxygen production.	2.268	0.88
12	The reason why city dumps start to burn on their own is that the decaying waste materials produce combustible gas.	2.581	0.734
13	The reason why the hand-held part of power tools is plastic is that plastic is cheap.	2.760	0.591
14	The reason why the wall behind the TV turns black over time is that the moisture on the wall attracts dust more.	2.323	0.813
15	The reason why traffic policemen wear phosphorescent clothes at night is that phosphorescent clothes raise their body temperature.	2.780	0.571
16	The reason we add salt when making pickles is to increase the nutritional value of vegetables.	2.243	1.19
17	The reason why the food left outside deteriorates after a while is the growth of bacteria as a result of their contact with the air.	2.843	0.471
18	The reason why iron is dyed is to make it look more beautiful.	2.585	0.772
19	The reason we hear crackles when we take off our wool sweaters is because of electrification.	2.805	0.564
20	The reason why sound does not propagate on the moon is that there is no air on the moon.	2.444	0.732
21	Even if the weather is cool. the reason we sweat after running for a while is that our blood pressure drops.	2.652	0.653
22	The reason that wood floats on water when dropped into water is that the density of the water is less than the density of the wood.	2.294	0.886
23	The reason we use fabric softener while washing the laundry is to prevent the hardening of the laundry by preventing the accumulation of ions that give hardness to the water in the laundry.	2.645	0.635
24	The reason for covering the walls in sound recording studios with appropriate materials is to increase the recording quality by absorbing the sound.	2.553	0.678
25	The reason why the light bulbs in our homes are connected in parallel is to save electricity.	2.118	0.852
26	The reason we don't use electrical appliances on wet floors is that some solutions such as tap water conduct electrical energy.	2.681	0.646
27	The reason why we can use the remote of our television wirelessly is the use of infrared rays in the remote.	2.553	0.741
28	The reason we use sunglasses in sunny weather is to prevent sweating.	2.757	0.593
29	The reason why the truck is less damaged than the car and truck colliding with each other while moving at the same speed is that it is made of more durable material.	1.882	0.91
30	The reason why the sense of sensing heat is not the same in every part of our skin is that there are not the same amount of sensory receptors in every part of the skin.	2.460	0.776
\bar{x}		2.534	
min		1.882	
max		2.843	

after a while is the growth of bacteria as a result of their contact with the air (88.82%).

- 19) The reason we hear crackles when we take off our wool sweaters is because of electrification (88.50%).

- 6) When something starts to burn in our house, the

reason we cover it with a thick cover is to prevent the fire from contacting the air (88.18%).

The 3 items with the lowest response rate that chose the correct information on the scale are as follows:

- 14) The reason why the wall behind the TV turns black over time is that the moisture on the wall attracts dust more (54.31%).
- 29) The reason why the truck is less damaged than the car and truck colliding with each other while moving at the same speed is that it is made of more durable material (47.92%).
- 25) The reason why the light bulbs in our homes are connected in parallel is to save electricity. (42.81%).

As seen in Table 6, the general average of the items in the KBAS is $\bar{x}=2.534$, the minimum average of the items is $\bar{x}=1.882$, and the maximum average is $\bar{x}=2.843$.

The 3 items with the highest level of knowledge-based approach to some science events in daily life are as follows:

- 17) The reason why the food left outside deteriorates after a while is the growth of bacteria as a result of their contact with the air ($\bar{x} = 2.843$)
- 6) When something starts to burn in our house, the reason we cover it with a thick cover is to prevent the fire from contacting the air ($\bar{x} = 2.821$)
- 7) When sawing wood with a saw, the reason why the wood heats up after a while is the release of energy due to friction ($\bar{x} = 2.808$)

The 3 items with the lowest level of knowledge-based approach to some science events in daily life are as follows:

- 16) The reason we add salt when making pickles is to increase the nutritional value of vegetables. ($\bar{x} = 2.243$).
- 25) The reason why the light bulbs in our homes are connected in parallel is to save electricity ($\bar{x} = 2.118$).
- 29) The reason why the truck is less damaged than the car and truck colliding with each other while moving at the same speed is that it is made of more durable material ($\bar{x} = 1.882$).

DISCUSSION

In this study, a triple Likert-type scale was developed to determine how individuals of different ages and occupations approach the science events they encounter in daily life based on knowledge. The scale, which was developed by applying to 313 pre-service teachers, consists of 30 items in its final form. The reliability of the scale was found to be 0.85 and 0.87 with Cronbach Alpha and Rulon coefficients, respectively. According to these values, it was understood that the scale showed a symmetric-homogeneous distribution. The science literacy scale developed by Kılıç et al. (2022) consists of 20 items and a sample of 125 people. In this study, this scale was developed by increasing the number of items to 30 and the number of samples to 313. According to Tavsalçıl (2018), it is stated that the sample size should

be at least five times the number of items and at most ten times the number of items for the reliability and validity analysis of the scale at the 95% confidence level. This literature information shows that the developed scale has a sufficient number of items and several people.

Şahin et al. (2010) showed in their research that the science literacy level of both parents has a moderate and positive relationship with the student's success in the science and technology course in the placement test.

According to Kılıç and Ünal (2006), since children spend a long time with their parents, they soon begin to imitate them and act like them. Children have always been curious about science from an early age. In this case, the child's family's interest in science will be effective in determining the child's attitudes towards science activities and science in his future life.

Duruk (2012) found in his research that the science and technology literacy level of the students did not differ between the 6th and 7th grades, but that the 8th-grade students were better science and technology literate than the students in these grades. In their research with secondary school 6th and 7th-grade students, Ozan and Parlak (2018) found that the science literacy averages of the students who took the science applications course were quite close to each other.

Keskin et al. (2016) found in their research that the scientific literacy level of the students is higher than the grade level. According to Novak et al. (2022), science teaching anxiety was significantly and negatively related to science teaching self-efficacy and science interest. In the study conducted by Çetin (2016), it was found that pre-service teachers found themselves at a sufficient level in terms of digital literacy, that male pre-service teachers had higher digital literacy levels than female pre-service teachers and pre-service teachers studying in undergraduate education were higher than pre-service teachers studying in the pedagogical formation program. It was concluded that the frequency of internet use positively affects the level of digital literacy.

CONCLUSION AND RECOMMENDATIONS

With the developed scale, it will be possible to determine how people learn about science events in daily life and eliminate wrong learning. Although the name of the scale is knowledge-based, it can be considered a science literacy scale. In addition, it will be possible to determine how, where and from which source science events in daily life are learned. It can be said that the development of a reliable and high-validity scale within a certain confidence interval will fill the gap in the literature. It will shed light on the science literacy of individuals in that society by applying the scale to different age groups and occupations, as well as to different samples. The scale will be able to apply much more sampling. The science literacy that individuals living in different societies (province, district, village) encounter in daily life will be

investigated or the data will be compared. This scale can be further developed by considering different subjects and science events encountered in daily life. Factor analyzes can be made on these different subjects.

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