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Views of Secondary School Science, Pre-school and Primary School Teachers on Science Education with Intelligence Games

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ABSTRACT

Science education is important at all educational levels, from pre-school to higher education. For this reason, in this study, it is aimed to determine the views of secondary school science, pre-school and primary school teachers on science education with intelligence games. The research was designed as a qualitative method case study. The study group was formed by random sampling method. Accordingly, a total of 131 teachers took part in the study group in 38 secondary school science, 47 pre-school and 46 primary school teaching branches. Semi-structured interview questions were developed by the researchers and teachers' opinions were collected online. The data obtained in this way were analyzed by content analysis. As a result of the analysis, six basic themes were reached: definition, education, belief, preference, and problem and solution proposal. Regarding the science education implemented using intelligence games, most of the teachers pointed out that they did not have any education, they regarded these games as an educational tool and that these games contributed to their vocational developments. It has emerged as a solution that games are entertaining, skill-enhancing, interesting and support permanent learning, cost of games and primary school management are problems, associating games with subjects and eliminating the lack of game materials.

Key words: Science Education, Intelligence Games, Pre-School Education, Basic Education, Teaching

INTRODUCTION

Science education gains importance in all educational levels from pre-school to higher education. Studies are conducted for the preparation of more qualified science education programs together with the significance given to science education (Ayas, 1995). Within this frame, Science Teaching Program was formed in Turkey by the Head Council of Education and Morality (HCEM) together with the educa-tion and teaching reform conducted in 2004 (Balbağ et al., 2016). Ministry of National Education [MoNE] (2018) demands all the individuals to be qualified science literates by taking the student to the center in the vision of this program.

The performance of science education by taking the age and developmental levels of individuals into consideration with convenient methods and techniques contributes to the increase in the awareness of the learner individuals towards the environment they are in and their problem solving skills regarding the daily phenomena develop (Gürdal, 1996; Hançer et al., 2003). Science education is also an area in which reasoning is so frequently used. Getting an answer for learners with the question "why" forms the basis of reasoning. Individuals could comfortably discuss the solution ways of the problems and reach a decision as they gain reasoning skills. Intelligence games are known to develop mainly reasoning and strategic thinking (Bottino & Ott, 2006) and many skills and abilities (logical and strategic thinking, critical thinking and decision making, attention and language development).

To know where, when and how to use information today which is rapidly changing and developing is a result of the cognitive activities such as questioning, reasoning, thinking in a different way and problem solving skills. Upon this, the aim of science education is to contribute to the development of the individuals as science literates (Morin et al., 2013).

Today, basic education is separated into two as pre-school and primary school education and the importance given to this education increases day by day. Pre-school education is the period in which students meet school and the foundations of the first education are laid. Students are supported with the education programs (MoNE, 2013) by pre-school teachers for their social, emotional, physical, linguistic and cognitive developments. Science activities also take an important place

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together with the activities such as mother tongue, math, art, drama etc. in these programs. The students are expected to know the world, environment, living beings and plants and to develop positive attitude towards science education via science activities. In line with the aims of science education in basic education, science education continues in secondary school. Educators have some problems in science education in secondary school. Balbağ et al. (2016) are among the most frequently encountered problems in science education and training; they found that teacher-based teaching methods and techniques lack materials that motivate students.

The main purpose of science lesson designed for the students to know and interpret both themselves and the world and society they live in is to develop their living skills as well as gaining them positive personal qualifications. The skills *critical thinking, entrepreneurship, research, conduction of observation, problem solving, communication, use of information technologies, correct, efficient and well use of Turkish, decision making, efficient use of resources, time management, security and provision of protection, obeying the rules, social participation, leadership and self-management* take place under the headline of living skills in science teaching program (MoNE, 2018). Reasoning skill being one of the main aims of science education takes an important place among superior cognitive skills (Adalar & Yüksel, 2017). These skills could both be transferred to students in many ways and via games with the property of teaching while having fun, which makes them happy.

In their studies, Karakoç et al. (2020) have determined that game based learning is efficient on student success. In science education, the use of the problem-based learning approach was found to be more effective than the traditional method, as it improved the different skills of pre-service teachers (Yaman & Yalçın, 2015). Teachers should make the teaching process entertaining for the students to learn the concepts of science being a part of the daily life in an easier way. The use of intelligence games as an educational material has been thought to be more efficient to ensure permanent learning in science education. Upon this point, the planned study has a great significance in terms of increasing the professional competences, encouraging the opening of undergraduate and graduate courses in the issue of supporting the science education skills with programs based on intelligence games and raising social awareness in the issue of giving students science education with intelligence games based education programs by developing and applying pre-service and in-service education programs related to the science education given by secondary school science, pre-school and primary school primary school teachers.

There are studies conducted related to science education in different educational stages from pre-school to university in the literature. In the literature, studies have been encountered in the subjects of science education carried out using educative games (Akbayrak & Turaşlı, 2017; Kaya & Elgün, 2015) and with game based physical activities (Boyraz & Serin, 2016) for pre-school students, it has also been found that educative games develop the mental lexicon of the 4th grade students (Varan, 2017), intelligence games develop the leadership skills of the students (Zengin, 2018), they enable 3rd grade students to understand the text they read better, to think critically and conduct analysis and synthesis (Aşuluk, 2020) for primary school students; and for middle school students, there are studies conducted with educative games (Gürpınar, 2017; Kahyaoğlu & Elçiçek, 2016; Karamustafaoğlu & Kaya, 2013; Karamustafaoğlu et al., 2018; Korkmaz, 2018; Kurt & Yüksel, 2020; Öcal & Doğan, 2015; Yazıcıoğlu & Çavuş-Güngören, 2019); with word games taking place in the intelligence games (Kefeli et al., 2018) and with an intelligence game (Kirikkaya et al., 2010); by using different methods (Sırakaya & Sırakaya, 2018). Also, there have been studies in the issues of the hardships encountered in pre-school science education (Karamustafaoğlu & Kandaz, 2006), views of pre-school teachers on science education implementations (Akcanca et al., 2017; Yıldız & Tükel, 2018) and their attitudes (Ünal & Akman, 2006); views of science teacher candidates on the use of intelligence games in science education (Bilen, 2012; Çetin & Özbuğutu, 2020) and the impact of intelligence games education on the critical thinking (Savaş, 2019) skills of teacher candidates and the spatial thinking (Demirkaya & Masal, 2017) skills of students. Karamustafaoğlu and Kandaz (2006) have detected that pre-school teachers mostly use the methods of narration, dramatization, model use and experiment in science activities. The aforementioned studies have revealed some detections related to the subjects such as the problems seen in science education, alternative teaching methods and material selection etc. Within the direction of these detections, the determination of the views of pre-school, primary school and science teachers related to intelligence games being an alternative science teaching tool has an importance. No studies conducted with qualitative method have been encountered in the conducted literature view. The study is considered to make great contributions to the literature in the related field and to be a resource for the future studies.

Research Questions

The problem of this research is "Is science education with intelligence games according to the opinions of secondary school science, pre-school and primary school teachers?" poses a question. For this purpose, the following questions were asked to the participating teachers.

1. What are the views of teachers' about intelligence games?
2. What is the status of teachers' about receiving education on intelligence games?
3. What are the beliefs of teachers' about carrying out their science lesson/activity with intelligence games?
4. What are the preferences of teachers' about teaching/ doing science activities with intelligence games?
5. What are the views of teachers' about the problems and solution suggestions they may encounter in the science lesson/activity with intelligence games?

METHOD

Research Model

The study has been designed as qualitative method case study. The determined one or some cases are deeply

examined in case study. The factors affecting the case (place, person/people, process etc.) are searched together and their relations with the related situation is revealed (Yıldırım & Şimşek, 2016, p.73). Before starting the study; ethical clearance was granted by the ethics committee of the second author's university.

Study Group

The study group of this research was formed with random sampling method. The secondary school science, pre-school and primary school teachers voluntarily accepting to attend to this study formed the study group. The personal information of the teachers in the study group is given in Table 1.

According to Table 1, there are 131 teachers in total in the study group and 29% of them (n=38) are in secondary school science branch. A considerable number of them, 35.9% (n=47), are in the pre-school branch and 35.1% of them (n=46) are in the primary school branch. As given in the table, 67.9% of these teachers (n=89) are females and 37.1% of them (n=42) are males. Besides; 73.2% of them are under the age of 40 (n=92) and the majority being 44.3% have a professional experience between 10 and 20 years (n=58). Also, 71.8% of these teachers are undergraduate (n=94). As for graduation, 24.4% of them are graduates (n=32) and only 3.8% of them are graduates of doctorate (n=5).

Table 1. Personal information of the teachers in study group

Variables	n	%
Branch		
Secondary School Science	38	29.0
Pre-school	47	35.9
Primary school	46	35.1
Gender		
Female	89	67.9
Male	42	37.1
Age		
Between 25-30	28	21.3
Between 31-40	68	51.9
Between 41-50	34	25.9
51 and above	1	0.9
Professional Seniority		
1-5 years	24	18.3
6-10 years	20	15.3
11-15 years	38	29.0
16-20 years	20	15.3
21-25 years	20	15.3
26-30 years	7	5.3
30 and above	2	1.5
State of Education		
Undergraduate	94	71.8
Graduate	32	24.4
Doctorate	5	3.8

As seen in Table 1, it is observed that the distribution of teachers according to their branches is in close rate, female teachers are more than male teachers, the majority of teachers have a professional seniority between 1 and 20 years and the majority of them are undergraduate.

Data Collection Tool

Semi-structured interview questions have been developed by the researchers. Views have been taken from three field experts. The views of science, pre-school and primary school teachers related to this situation have been collected online.

Data Analysis

The data obtained from teachers have been analyzed with content analysis. In this analysis, it is aimed to bring similar data together within the frame of certain themes and arrange and interpret these data with a plain language (Yıldırım & Şimşek, 2016). The significant parts have been marked after the data have been read by two researchers for three times and the reached codes have been written opposite the expressions. Themes have been formed by assessing the repeating codes with induction approach.

Reliability and Validity

The reliability of the reached data has been examined with the reliability calculation formula of Miles and Huberman (1994) Agreement=[Number of Agreements/(Number of Disagreements+Number of Agreements)×100]. In this respect, the reliability of the study has been determined to be 86% (43/50=86). The reliability values above 70% are deemed as reliable (Miles & Huberman, 1994). The highness (86%) of the similarity in the attained codes here shows that the codes in the study are reliable. In the presentation of the views of the teachers, secondary school science teachers have been coded as "F", pre-school teachers have been coded as "O" and primary school teachers have been coded as "S". Numbers have been given between "F-1 and F-38" to science teachers, between "O-1 and O-47" to pre-school teachers and between "S-1 and S-46" to primary school teachers. The views of the quoted teachers have been shared in italic. The six themes occurring at the end of the process have been presented and discussed within the frame of the literature.

RESULTS AND DISCUSSION

As a result of the content analysis of the data obtained from teachers, six main themes have been reached as (1) description, (2) education, (3) belief, (4) preference, (5) problem, (6) solution suggestion. There have been different code numbers in the views of teachers on science activity with intelligence games and 50 codes in total have emerged as 6 codes in description theme, 8 codes in education theme, 10 codes in belief theme, 14 codes in problem theme and 12 codes in the theme of solution suggestions. For instance, the description theme has consisted of the codes of game name/

material, skill, education tool, mental activity, development of intelligence and entertainment. The findings and teacher views related to these main emerging themes have been presented and discussed below.

Description Theme of Science Activity with Intelligence Games

The findings attained on the description theme of intelligence games are shown in Table 2.

According to Table 2, the intelligence games related to description theme have been defined as game name/material by 29.1% of secondary school science teachers, 32.1% of pre-school teachers, 43.5% of primary school teachers and 35.6% of all teachers; as skill by 23.6% of secondary school science teachers, 33.9% of pre-school teachers, 25.9% of primary school teachers and 27.6% of all teachers; as mental activity by 20.1% of secondary school science teachers, 9.4% of pre-school teachers, 8.1% of primary school teachers and 12.4% of all teachers and as education tool by 8.8% of all teachers, as entertainment by 6.5% of all teachers and as development of intelligence by 5.9% of all teachers.

The majority of the teachers have defined intelligence games respectively as game name/material, skill and mental activity. The views of secondary school science, pre-school and primary school teachers are close to one another in this theme and the definition of intelligence games as skill by pre-school and primary school teachers; for example, a pre-school teacher expressed her opinion on this as follows;

> *The games enabling the brain to improve and establish new connections. Because it enables the active use of the brain*. (O-11)

In addition, a primary school teacher stated;

> *It comes to me as entertaining activities enabling us to improve our intelligence. It enables us to also have fun while operating our mind because we develop strategies and try to see from different angles.* (S-4)

Also, its definition as mental activity and education tool by secondary school science teachers are higher than other branches. Regarding this, a secondary school science teacher argued;

> *It comes to me as an entertaining activity enabling us to improve our intelligence. It provides opportunities for us to also have fun while operating our mind because we develop strategies and try to see from different angles.* (F-6)

This situation is thought to stem from the fact that pre-school and primary school education have a property of gaining main skills. In contrast; the entertainment code frequency in secondary school science teachers has been the lowest one among other branches. Depending on the expressions given above, the participant teachers defined intelligence games as the name/material of the game, skill, education tool, mental activity, intelligence development, and entertainment.

Education Theme of Theme Related to Intelligence Games

The findings obtained regarding the theme of having education on intelligence games or not are shown in Table 3.

According to Table 3, it has been revealed that 72.5% of teachers have not had any education regarding intelligence games on the education theme; but regarding those who have had, 47.4% of secondary school science teachers, 27.3% of pre-school teachers, 44.8% of primary school teachers and 42.4% of all teachers assess them as teaching tool; 26.3% of secondary school science teachers, 54.5% of pre-school teachers, 31% of primary school teachers and 33.9% of all teachers assess them as personal development; 10.5% of secondary school science teachers, 18.2% of pre-school teachers, 13.8% of primary school teachers and 13.6% of all teachers assess them as entertainment and 1.7% of all teachers assess them as extensification.

As a result of the examination of the data, two categories as "*taken*" and "*not taken*" have emerged regarding the education theme. It is seen that the majority of the teachers have not had any education regarding the intelligence games. In this theme, the views of secondary school science and primary school teachers who have taken education regarding the code of education tool emerging as the highest code are at close ratio to each other. It could be generally said that the view frequencies of the teachers are close to one another.

The expressions of the participant teachers on *education* theme are as follows; for example, a secondary school science teacher stated;

> *Yes. To learn how to play these games and use them in education in a planned and programmed way.* (F-36).

Additionally, a primary school teacher added;

> *Yes, I have had. Both I have an interest and to be able give more efficient place to intelligence games in my lessons. These games make great contribution to the*

Table 2. Description theme of science activity with intelligence games

Theme	Codes	Science		Pre-School		Primary school		Total	
		f	%	f	%	f	%	f	%
Description	Game name/Material	16	29.1	17	32.1	27	43.5	60	35.3
	Skill	13	23.6	18	33.9	16	25.9	47	27.6
	Mental activity	11	20.1	5	9.4	5	8.1	21	12.4
	Education tool	8	14.5	4	7.5	3	4.8	15	8.8
	Entertainment	1	1.8	5	9.4	5	8.1	11	6.5
	Development of intelligence	4	7.3	3	5.8	3	4.8	10	5.9
	Other	2	3.6	1	1.9	3	4.8	6	3.5
	Total	55	100	53	100	62	100	170	100

problem solving skills of my students. They also facilitate learning. (S-25)

Pre-school teachers have assessed intelligence games as personal development and entertainment at a ratio higher than the other two branches.

Regarding this, a pre-school teacher pointed out;

Yes, I have had. I had an interest in them and I thought they would support the learning processes of my students by relating the games to different disciplines in classroom primary school environment. (O-12)

Belief Theme of Related to Conducting Science Lesson/ Activity with Intelligence Games

The findings attained on the belief theme related to conducting science lesson/activity with intelligence games are shown in Table 4.

According to Table 4, 34.4% of secondary school science teachers, 17.1% of pre-school teachers, 24.3% of primary school teachers and 24.3% of all teachers have expressed them as entertainment; 16.2% of secondary school science teachers, 27.6% of pre-school teachers, 24.4% of primary school teachers and 22.4% of all teachers have expressed them as skill; 24.3% of secondary school science teachers, 13.8% of pre-school teachers, 12.2% of primary school teachers and 16.8% of all teachers have expressed them as education and 9.3% of them as benefit, 8.4% of them as development, 3.8% of them as lesson attendance and planning and 1.9% of them as socialization.

The views of the participant teachers on the *belief* theme regarding the conduction of science lesson activity with intelligence games are below. For example, a secondary school science teacher expressed the following opinion;

I believe that I will support the subjects with intelligence games and turn learning into an efficient, pleasurable and permanent state. (F-33)

Additionally, a pre-school teacher stated;

I think that Science, Turkish and Math become more pleasurable and the learnt information is more permanent by playing many intelligence games in my classroom primary school. (O-13)

Furthermore, a primary school teacher expressed the opinion;

Activities could be planned easily in certain lessons such as Math and Science. It enables learning to be more permanent and fun. (S-21)

In a study conducted on science teacher candidates, Gürpınar (2017) concludes that educative games make contributions to the education-teaching process and students and should be used in science education process. In the study conducted by Kula (2020), it is specified that intelligence games gain self-confidence to students and support the development of superior skills such as empathy, motivation, reasoning and communication etc. Similarly, Meluso et al. (2012) stated that games are effective in providing learning and intrinsic motivation. Çetin and Özbuğutu (2020) stated that when students use intelligence games in education, they

Table 3. Education theme of related to intelligence games

Theme		Codes	Science		Pre-School		Primary school		Total	
			f	%	f	%	f	%	f	%
Education	Not taken	------	35	100	36	100	24	100	95	72.5
	Taken	Teaching tool	9	47.4	3	27.3	13	44.8	25	42.4
		Personal development	5	26.3	6	54.5	9	31.0	20	33.9
		Entertainment	2	10.5	2	18.2	4	13.8	8	13.6
		Extensification	1	5.3	0	0	0	0	1	1.7
		Other	2	10.5	0	0	3	10.4	5	8.4
		Total	19	100	11	100	29	100	59	100

Table 4. Belief theme of related to conducting science lesson/activity with intelligence games

Theme	Codes	Science		Pre-School		Primary school		Total	
		f	%	f	%	F	%	f	%
Belief	Entertainment	9	24.3	10	34.4	7	17.1	26	24.3
	Skill	6	16.2	8	27.6	10	24.4	24	22.4
	Education	9	24.3	4	13.8	5	12.2	18	16.8
	Benefit	1	2.7	4	13.7	5	12.2	10	9.3
	Development	4	10.8	1	3.5	4	9.8	9	8.4
	Lesson attendance	2	5.4	0	0	2	4.9	4	3.8
	Planning	3	8.2	1	3.5	0	0	4	3.8
	Socialization	2	5.4	0	0	0	0	2	1.9
	Other	1	2.7	1	3.5	8	19.4	10	9.3
	Total	37	100	29	100	41	100	107	100

stated that it contributes to science and mathematics education, makes students active and improves their mental skills.

Preference Theme of Science Lesson/Activity Preference with Intelligence Games

The findings obtained on the science lesson/activity preference science lesson/activity with intelligence games are shown in Table 5.

According to Table 5, codes have emerged such as drawing attention by 16.9% of secondary school science teachers, 28.3% of pre-school teachers, 18.9% of primary school teachers and 21.3% of all teachers; as development by 14.3% of all teachers; as permanent learning by 13.2% of all teachers; as skill by 10.3% of all teachers; as alternative method by 10.3% of all teachers, as entertainment by 9.5% of all teachers, as learning with fun by 8.8% of all teachers and as readiness by 2.2% of all teachers.

Pre-school teachers have expressed more opinions regarding the codes of drawing attention and entertainment more than other branch teachers. For example, a pre-school teacher expressed her opinion on this;

I can enable the students both to have fun and reach the success step by step. Namely, I can make them reach the target and it is fun. (O-20)

A primary school teacher also mentioned;

I do not prefer them in every subject, but I try them to turn some boring subjects into fun. (S-30)

In addition, secondary school science teachers have expressed more opinions regarding the code of alternative learning more than other branch teachers. For example, a secondary school science teacher expressed her opinion on this;

I think that science activities with intelligence games will help students consider subjects from a different angle and in this way, help them see the questions with a different thinking skill by making brain exercise; and I would prefer using them. (F-12)

In the study conducted by Kula (2020), it has been determined that intelligence games increase the active participation of the students to the lessons. Yazıcıoğlu and Çavuş-Güngören (2019) stated that game-based activities are effective on secondary school students' success, motivation and attitudes towards science learning. Akcanca et al. (2017) examined the views of pre-school teachers on science education implementations, with a focus on the material selection and they also expressed that science activities should arouse curiosity in children, be eye-catching.

Problem Theme of Regarding Science Lesson/Activity with Intelligence Games

The findings obtained on the problem theme regarding science lesson/activity with intelligence games are shown in Table 6.

According to Table 6, codes have emerged such as the costs of the games by 28% of secondary school science teachers, 37.1% of pre-school teachers, 24.4% of primary school teachers and 29.7% of all teachers; as classroom management by 32% of secondary school science teachers, 25.7% of pre-school teachers, 29.3% of primary school teachers and 28.7% of all teachers and as adaptation to subject by 10.9% of all teachers; as readiness by 9.9% of all teachers; as drawing attention by 7.9% of all teachers; as time by 6.9% of all teachers and as health risk by 3% of all teachers.

The majority of teachers have determined the costs of the games and classroom management as problems. The frequency of the codes related to the costs of games by pre-school teachers and the frequency of the codes related to adaptation to subject and readiness by secondary school science teachers are higher than other branches. Regarding this, a pre-school teacher expressed her opinion as follows;

The expensiveness of the intelligence games and especially mechanical games may rather lead to mind and operational games. In this situation, there can be students who cannot participate. We need more cost-effective mechanical games or the converted forms of them. (O-3)

In addition, a secondary school science teacher argued;

The main problem is the deficiency of tools and materials; it would be good to have explanatory videos and to have explanatory information in terms of guiding the teacher, students and the teaching of the lesson. (F-10)

It could be thought that science teachers use intelligence games in teaching subjects and concepts and they have

Table 5. Preference theme of science lesson/activity preference with intelligence games

Theme	Codes	Science		Pre-School		Primary school		Total	
		f	%	f	%	f	%	f	%
Preference	Drawing attention	9	16.9	13	28.3	7	18.9	29	21.3
	Development	8	15.2	7	15.2	4	10.8	19	14.3
	Permanent learning	3	5.7	8	17.4	7	18.9	18	13.2
	Skill	7	13.2	3	6.5	4	10.8	14	10.3
	Alternative method	7	13.2	3	6.5	4	10.8	14	10.3
	Entertainment	4	7.5	8	17.4	1	2.7	13	9.5
	Learning with fun	8	15.1	1	2.2	3	8.2	12	8.8
	Readiness	1	1.9	0	0	2	5.4	3	2.2
	Other	6	11.3	3	6.5	5	13.5	14	10.3
	Total	53	100	46	100	37	100	136	100

Table 6. Problem theme of regarding science lesson/activity with intelligence games

Theme	Codes	Science		Pre-School		Primary school		Total	
		f	%	f	%	f	%	f	%
Problem	Cost	7	28.0	13	37.1	10	24.4	30	29.7
	Classroom management	8	32.0	9	25.7	12	29.3	29	28.7
	Adaptation to subject	4	16.0	2	5.7	5	12.2	11	10.9
	Readiness	4	16.0	2	5.7	4	9.7	10	9.9
	Drawing attention	1	4.0	3	8.6	4	9.7	8	7.9
	Time	0	0	3	8.6	4	9.7	7	6.9
	Health risk	0	0	2	5.7	1	2.5	3	3.0
	Other	1	4.0	1	2.9	1	2.5	3	3.0
	Total	25	100	35	100	41	100	101	100

difficulty in their adaptation, and the need of pre-school teachers for playing different kinds of intelligence games to enrich the education cause cost problem. For example, a primary school teacher stated;

> *I think some students will have difficulties in realizing the connections in the intelligence games and it will harden learning in such kinds of students. The reason for this is the difference in the readiness levels.* (S-34) has expressed an opinion.

Akcanca et al. (2017) have expressed that the science implementations should be convenient for pre-school education program and support the conceptual teaching. Karamustafaoğlu and Kandaz (2006) have stated that pre-school teachers do not find the materials they use sufficient in science education and they give less place to games in conceptual teaching when compared to other teaching methods and they have also cited the problems as the crowdedness of the classrooms, insufficiency of materials and the differences in readiness levels of the students. Gürpınar (2017) have said that the majority of the science teacher candidates see themselves sufficient in preparing educative game materials and applying them in accordance with the lesson plan and as the reason, they have related this to the course of special teaching methods and techniques they have taken in their undergraduate education.

Solution Theme of Suggestions Regarding Science Activity with Intelligence Games

The findings on the theme of solution suggestions regarding science lesson/activity with intelligence games are shown in Table 7.

According to Table 7, codes have emerged as relating games to subjects by 20% of secondary school science teachers, 12.2% of pre-school teachers, 26.6% of primary school teachers and 18.9% of all teachers; as material deficiency by 17.1% of secondary school science teachers, 22% of pre-school teachers, 8.6% of primary school teachers and 16.2% of all teachers and as game selection by levels and teacher education by 10.8% of all teachers; as planned lesson teaching by 7.9% of all teachers; as drawing attention of students by 7.2% of all teachers; as grouping the students and decreasing classroom size by 5.4% of all teachers and as using alternative teaching techniques by 3.6% of all teachers; as providing convenient environment and benefitting from online applications by 2.7% of all teachers and as giving financial return to teacher by 1.8% of all teachers.

Teachers have primarily specified the relation of games with subjects and termination of the deficiency of game materials as solutions. The frequencies of the codes related to the termination of material deficiency are higher in pre-school teachers than other branches, the frequencies of the codes related to the teacher education are higher in science teachers than other branches and the frequencies of the codes related to planned lesson teaching are higher in primary school teachers than other branches.

The expressions of the participant teachers on *solution* theme are as follows. For example, a secondary school science teacher expressed her opinion on this;

> *If the physical environment is arranged, it can be very entertaining for most subjects and it can enable effective lesson teaching; it is also necessary for the students to be informed before the lesson related to what they will do and to understand what is expected from him/her or his/her team.* (F-28)

Also, as a pre-school teacher pointed out;

> *The educator should be knowledgeable in the issue of intelligence games and using them in education and terminate material deficiency.* (O-9)

A primary school teacher added;

> *Preferences of games convenient for their levels to prevent them from taking a dislike due to the failures in intelligence games and game design convenient according to the differences in student levels could be a solution.* (S-17)

The reason for this is thought probably to be the intensive use of game materials in pre-school education and the difficulties experienced by teachers in teaching science subjects with intelligence games.

Upon the aforementioned expressions, the participant teachers present positive solution suggestions as relating to subjects, game selection by levels, teacher education, termination of material deficiency, grouping the students, planned lesson teaching, ensuring it to be eye-catching and forming the convenient game environment as solutions for the problems occurring in conducting science lesson/activity with intelligence games.

As a result of the study conducted by Sırakaya and Sırakaya (2018) by using augmented reality application as a different

Table 7. Solution theme of regarding science/lesson activity with intelligence games

Theme	Codes	Science		Pre-School		Primary school		Total	
		f	%	f	%	f	%	f	%
Solution	Relating games to subjects	7	20.0	5	12.2	9	26.6	21	18.9
	Material deficiency	6	17.1	9	22.0	3	8.6	18	16.2
	Game selection by levels	3	8.6	4	9.8	5	14.2	12	10.8
	Teacher education	5	14.2	4	9.8	3	8.6	12	10.8
	Planned lesson teaching	2	5.7	3	7.4	4	11.4	9	8.1
	Drawing attention of students	3	8.6	4	9.8	1	2.7	8	7.2
	Grouping the students	3	8.6	2	4.8	1	2.7	6	5.4
	Decreasing classroom size	2	5.6	4	9.8	0	0	6	5.4
	Using alternative teaching techniques	1	2.7	1	2.4	2	5.6	4	3.6
	Providing convenient environment for activities	1	2.7	1	2.4	1	2.7	3	2.7
	Benefitting from online applications	0	0	2	4.8	1	2.7	3	2.7
	Giving financial return to teacher	1	2.7	1	2.4	0	0	2	1.8
	Other	1	2.7	1	2.4	5	14.2	7	6.4
	Total	35	100	41	100	35	100	111	100

teaching method, they have found that the attitudes and motivations of students for learning science have increased. Gürpınar (2017) has stated that game-supported teaching applications increase the success and attitudes of students in science lessons and in addition, they become efficient in ensuring permanence in learning science. The pre-school teachers in Yıldız and Tükel's (2018) study stated that they would prefer the experiment method in science education and use materials such as books, etc. In addition, the teachers in Akcanca et al.'s study (2017) stated that they designed their science activities according to the developments of the students. As in this application, it is considered that the use of intelligence games in science teaching will similarly increase the motivations and interests of students in science education and besides, they will help ensure permanence in learning science.

CONCLUSION

According to teachers, the termination of these problems will help achieve success by overcoming the problems in science lessons/activities with intelligence games. When the views of teachers are examined in terms of setting an example for the intelligence games and science education programs needed by teachers giving science education in different educational stages from pre-school to high school, which has been planned in the study, it has been seen that they have dominantly stated views for the fact that it is important to correlate the games with subjects in the theme "*solution suggestions for science activities with intelligence games*".

Upon the investigation of the teacher views regarding the development and application of pre-service and in-service training programs for teachers about science education with intelligence games, teachers have mostly expressed that they have not taken any education and feel themselves lucky in the educational fields in the theme related to "*education with intelligence games*".

As for the teacher views regarding the encouragement of opening undergraduate and post graduate courses to support the science education skills with intelligence games-based programs in increasing the vocational competences of teachers teaching science education at different educational stages varying from preschool to high school levels, as it was planned in the study, it was found that they did not give any opinion in this sense.

It was found that expressions such as 'drawing attention' and 'permanent learning' have dominantly emerged in the theme "*science lesson/activity preference with intelligence games*" due to having a great significance in terms of raising social awareness in the issue of giving science education to students with intelligence games-based education programs.

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