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The effect of animations involving role models taking intellectual risks on fourth grade gifted students' intellectual risk-taking behaviors and science learning

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Abstract

The purpose of this study is to investigate effect of animations involving role models taking intellectual risks on fourth grade gifted students' intellectual risk-taking behaviors and learning in science course. The study is a quasi-experimental study with two experimental groups, and a control group. Science achievement test, intellectual risk-taking observation form and reflections of students were used to collect data. The first experimental group involved just gifted students, while experimental group two and control group involved non-gifted students. Experimental applications of the study lasted for eight weeks; two independent observers made observations for intellectual risk-taking behaviors of the participants during the applications in science course. In data analysis, ANOVA and t-test for dependent groups were used to analyze achievement and gain scores. Also, frequencies of the behaviors were represented, and content of reflections form was analyzed by identifying examples of intellectual risk-taking. The result showed that not only the animations including role models provided a positive effect on increasing the frequency of intellectual risk-taking behaviors, but also, they contributed to the learning of gifted and non-gifted fourth-grade students in science.

Keywords: Animations, gifted students, intellectual risk-taking, role models, science learning

1. Introduction

Although their results can be unpredictable, risk taking appears to support students' learning in learning contexts. Byrnes (1998) and Robinson (2011) pointed out that it is essential for students to take risks to ensure necessary interactions for learning. Neihart (1999) categorized risk-taking behaviors as intellectual, social, emotional, physical and

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spiritual. Risk-taking behaviors in the learning environment encompass intellectual processes and both Beghetto (2009) and Neihart (1999) specified them as behaviors towards taking positive risks to increase learning. According to Clifford and Chou (1991), some of the intellectual risk-taking behaviors individuals may encounter in the learning environment are making explanations about the subjects during lesson, asking questions, being inclined to answer questions they do not know well, taking responsibility for situations where the result is not known. Beghetto (2009) gave examples of intellectual risk-taking behaviors as sharing ideas that are suspected about its accuracy, asking questions, and being willing to try previously untested solutions to the problems. Robinson (2011) stated that participating in the learning process by evaluating expected and unexpected results and considering the possible results during the participation are some specific examples of taking intellectual risk in a learning context.

In spite of unpredictability of risk taking as far as it results, many reported that intellectual risk-taking behaviors help students to improve their learning and reach higher-order learning outcomes (Beghetto, 2009; Clifford, 1991; Clifford & Chou, 1991; House, 2002; Meyer, Turner & Spencer, 1997; Peled, 1997; Tay, Özkan & Tay, 2009; Taylor, 2010) as risk-taking behaviors especially the intellectual ones help increasing students' active participation, interest, motivation, and self-efficacy associated with learning (Beghetto, 2009). More specifically, the increase in the level of intellectual risk-taking of the students leads them to become affectively more active, and therefore more successful individuals compare to their counterparts (Beghetto, 2009; House, 2002; Peled, 1997; Tay, Özkan & Tay, 2009). In their study, Tay, Özkan and Tay (2009) found a significant relationship between intellectual risk-taking behaviors of students and their problem solving and decision-making skills. Deveci and Aydın (2018) also found a positive relationship between students' intellectual risk-taking tendencies and their attitudes towards science in their study with 680 secondary school students. Similar results were derived from a study by Çakır and Yaman (2015). They examined the relationship between intellectual risk-taking behaviors and metacognitive awareness and academic achievement of secondary school students in the context of science education. According to their results, there was a positive relationship between the students' intellectual risk-taking behaviors and their academic achievement in science as well as metacognitive awareness levels. By a close look at the science education reform efforts most of them aimed to support each student as scientifically literate citizens who reach and use information, solve the problems encountered, make informed decisions by taking into account of possible risks, benefits, and existing options related to the problems of science related daily-based experiences, and be more effective in developing new knowledge (MEB, 2005, other reform initiatives AAA, NRC, NGSES). To ensure scientific literacy, promoting students to take intellectual risks appears to be crucial.

Based on the relevant literature one important way to increase the level of students' intellectual risk-taking behaviors is to represent intellectual risk-taking behaviors to students through role models in science classrooms. Supporting students to develop target behaviors through role models is a well-supported practice in general as well (Bandura, 1977; Malone, 2002; Rutledge, 2000; Tuckman, 1991). According to social learning theory, models provide vicarious learning opportunity for students (Bandura, 1999) as they can apply experience of models to their future behavioral decisions (Manz & Sims, 1981). The closer the individuals are to the role models, and the more they observe the modeled behavior and thus the more they adopt and conduct the behavior (Bandura, 1986). Therefore, presenting intellectual risk-taking behaviors to the students with role models hold promises to increase the frequency of these behaviors and thus increase learning.

As far as the possible ways of presenting role models to students, it was found that video models observed by the students provided effective results in learning (Kostons, Van Gog &Paas; 2012; Raaijmakers, Baars, Schaap, Paas, van Merrienboer & van Gog, 2018). For example, Raaijmakers et al. (2018) increased self-regulated learning levels of 125 high school students by video models focusing on their self-assessment and task selection activities. Moreover, effective transfer of the behaviors learned to different fields has been ensured by video modeling as well. Raaijmakers, Baars Paas, van Merriënboer and van Gog (2018) found that video modeling made significant contribution to progress in self-regulated learning behaviors in their study with 84 high school students.

It is also reported that presenting role models as video models appears to be an effective approach to support students in developing high-level thinking skills. Giving special attention to the role models being suitable to the student levels, Barak, Ashkar and Dori (2011) found that the role models as animated characters and an animated modeling process enhanced primary school students' learning and their development of higher order thinking skills. However, the features such as attention, recall, reproduction and motivation, which are among the cognitive and affective characteristics of the individual and are needed to comprehend modeling, are not equally found in every individual. From a social learning perspective, there is a group of learners who are superior in terms of these traits and benefit more from modeling. This learning group consists of gifted individuals. As the gifted individuals are better at attention, recall and motivation (Köksal & Akkaya, 2017; Brown, Renzulli, Gubbins, Siegle, Zhang & Chen, 2005; Shi, Tao, Chen, Cheng, Wang & Zang, 2013), it is expected that gifted students should get more benefit from animated models at higher levels compare to their counterparts. Broadening the effectiveness of role models used to support students learning experiences, Kostons, Van Gog and Paas (2012), in their study with high school students, found that video models helped gifted high school students to develop self-regulated learning behaviors.

It is also discussed that gifted children constitute an important group in the educational systems in terms of their needs and existing features as they prefer challenging activities focused on high-level learning outcomes (Pereira, Peters and Gentry; 2010; Wu, Jen and Gentry, 2018). Thus, many argue that these students need active participation in learning activities within school context to sustain their motivation toward achieving higher order outcomes (Diezmann & Watters, 2000; Taber, 2010; Vallerand, Gagné, Senécal, & Pelletier, 1994). Compared to their counterparts, gifted students tend to hold high social value and recognition to be successful as self-regulated learners (Vidergor, 2018a; Vidergor, 2018b). Thus, gained intellectual risk-taking behaviors might support these students to make their own choices and determine their own goals in school context (Neihart, 1999).

However, intellectual risk-taking behaviors of gifted individuals have been given a little attention in the relevant literature (Tay, Özkan & Tay, 2009). One of the rare studies conducted by Tay, Özkan and Tay (2009) examined the intellectual risk-taking behaviors and problem-solving behaviors of gifted students. Results derived from the study indicated a significant relationship between intellectual risk-taking behaviors and problem-solving skills of gifted students. Despite lack of empirical support, this finding speculates that intellectual risk-taking behaviors might be effective on higher-order learning especially in special education. In another study, Akdağ and Köksal (2017) conducted a study with 350 students and compared the intellectual risk-taking levels of gifted students with their peers' intellectual risk-taking levels. Their results showed that the level of intellectual risk-taking of gifted students was not significantly different from their counterparts. Similarly, in this study, there is no empirical evidence for the development of effective intellectual risk-taking levels of gifted students. Therefore, studies on the intellectual risk-taking levels of gifted students are limited and do not include an application to develop this feature experimentally.

All in all, increasing the level of intellectual risk-taking through the role models presented to gifted students with animations has an important potential to achieve high level learning outcomes (Beghetto, 2009; House, 2002; Tay, Özkan & Tay, 2009). Gifted students can achieve such important outcomes thanks to their intellectual risk-taking behaviors through role modelling. As the features such as attention, recall, reproduction and motivation are the main components of role modelling process (Bandura, 1977; Malone, 2002; Rutledge, 2000; Tuckman, 1991) it is necessary to be sufficient in terms of these features in order to benefit from the role modeling process in the most efficient way. Therefore, it is thought that the modeling of intellectual risk-taking behavior, which is an important facet in reaching high level learning outcomes of gifted students, will be effective in increasing both these behaviors of students and increasing the levels of learning outcomes. The purpose of this study to experimentally test the effectiveness of role model animations modeling intellectual risk-taking examples on intellectual risk-taking behaviors and learning outcomes of 4th grade gifted students in science.

2. Method

In this study, the effects of role-model animations on the intellectual risk-taking behaviors and science learning of 4th grade gifted students were investigated on 2016. In the research, experimental research was used with pre-test and post-test, and control group (Frankel and Wallen, 2000). To better understand the cause-effect relationship quasi-experimental design was employed. Quasi-experimental research design was chosen since formal restriction for random assignment of the subjects to the groups urged us to use instant classes. The research design is shown in Table 1.

Table 1. Design of Study

Group	Pre-Experiment	Experimental Process	Post-Experiment
Control (Ordinary students)	Pre-Test (Achievement test)	Teaching the Subject + Student reflection form + In-class intellectual risk-taking observation form	Post-test (Achievement test)
Experimental group 1 (Gifted students)	Pre-test (Achievement test)	Watching Animation + Teaching the Subject + Student reflection form + In-class intellectual risk-taking observation form	Post-test (Achievement test)
Experimental Group 2 (Ordinary students)	Pre-test (Achievement test)	Watching Animation + Teaching the Subject + Student reflection form + In-class intellectual risk-taking observation form	Post-test (Achievement test)

2.1. Participants

The sample of this study consists of 18 4th grade students (9 girls, 9 boys) enrolled in Science and Art Center (BİLSEM) and identified as gifted, and 42 ordinary 4th grade students (21 girls, 21 boys). BİLSEM is a supplementary school where gifted students are educated from elementary to high school. The students in BİLSEM constitute Experimental Group 1 in the study. The 4th grade ordinary students from a public school in the sample consisted of experimental group 2, and the control group consisted of non-gifted 4th graders from the same school where the experimental group 2 was selected. Given the limited number of students attended in BİLSEM, the sampling method used in this research was convenience sampling (Marshall 1996) that does not allow the researcher to have any control over the representativeness of the sample. Table 2 shows that the frequencies of the groups are close to each other.

Table 2. Descriptive Statistics of the Participants

Groups	Females		Males		Total	
	f	%	f	%	f	%
Experimental Group 1 (Gifted students)	9	50	9	50	18	100
Experimental Group 2 (Ordinary students)	11	52.38	10	47.62	21	100
Control Group (Ordinary students)	10	47.62	11	52.38	21	100
Total	30	50	30	50	60	100

2.2. Instruments

In this research, the effects of role-model animations on participating students' science learning assessed by an achievement test. The data used to evaluate the effectiveness of role-model animations on participating students' risk-taking behaviors were derived from observation form for intellectual risk-taking activities and reflection form written by the students focusing on activities centered by the role-model based animations. All the instruments used to collect data were developed and validated by the research team.

Science Achievement Test: Pool of multiple-choice items involving 33 items was prepared by taking into consideration of benchmarks outlined within "Riddle of Our Body" unit in National Science Curriculum to form the first draft of the achievement test. In addition, a table of specifications was prepared for the content validity of the test. The questions were evaluated by 2 science education experts and a science teacher in terms of readability, comprehensibility levels and eligibility to measure science achievement. These 33 items were considered suitable for pilot application by the experts. Before administering the pilot submission of the test, the items were checked for conformity with the figures, sequence of items, grammar and spelling errors. For the pilot round, the items were applied to 140 (74 girls, 66 boys) 4th-grade students who studied on the "Riddle of Our Body" unit. The distribution was tested by the Shapiro-Wilk test and the distribution was found as normal ($p > .05$). The data were then analyzed with ITEMAN program for a detailed item analysis. As a result of the analysis, 31 items were prepared by excluding 2 items determined as item difficulty .94 and .96. The results of the analysis are presented in Table 3.

Table 3. Results of the Analysis on Science Achievement Test

Statistics	Values
Number of Items	31
Number of Participants	140
Mean	20.52
Variance	27.60
Minimum	6
Maximum	31
Alpha (KR-20)	0.82
Mean Difficulty	0.66
Mean Point-biserial correlation	0.57

When we look at the values represented in Table 3, the .82 alpha value, which is an indicator of the internal consistency and reliability of the 31-item measuring instrument, is an acceptable value (Rudner & Schafer, 2002). It was found that the mean discrimination levels (Point bi-serial correlation) of the items of the measurement tool were above .25 as a cut-off for acceptable value (Reckase & McKinley, 1991). Discrimination levels at the item level are between .36 and .87. In addition, the mean difficulty was .66, indicating that the test was an easy but applicable one. When the item difficulty index approaches 0, it indicates that the item becomes difficult, and when it approaches 1, it becomes easier. This width is expected to be between .20 and .80 for achievement tests (Özçelik, 1992; Tekin, 2000). At the item level, the difficulty values were between .21 and .92. Two items with a difficulty index of more than .80 were excluded in the test. In table of specifications, the research team prepared three different items for one objective, hence content validity was assured after the exclusion.

2.2.1. In-class Intellectual Risk-Taking Behavior Observation Form

In-class intellectual risk-taking behavior observation form used in the study was generated by considering of relevant literature focusing on risk-taking behaviors that may occur in the class (Beghetto, 2009; Clifford, 1991; Clifford and Chou, 1991; Keneddy, 1995; Robinson, 2011; Skaar, 2009; Strum, 1971; Taylor, 2010). The final version of the form was validated by the insights derived from two experts if the listed intellectual risk-taking behaviors are appropriately embraced. The observation form aimed to measure the frequency of behaviors and included 14 behaviors focusing on intellectual risk-taking in science classrooms. When one of the behaviors in the observation form was exhibited by the students, how many times the behavior is displayed by the students were determined by marking the column of the behavior by the researchers. The observations were made by two researchers with sufficient amount of research experience in intellectual risk-taking behaviors. The intellectual risk-taking behavior frequencies of each group (Experimental 1, Experimental 2 and Control) were determined by these observers' simultaneous observations in each group during 8 weeks. Then, the validity of the data obtained by exploring the compatibility between the observers who filled the intellectual risk-taking behavior observation form. In this respect, the evaluation of each researcher was computed by taking the total of 14 behaviors, which were determined individually based on 8 weeks. As a result of the computations, the percentage agreement between the researchers was determined as .83. The calculated value was found to be adequate for compliance (Stemler, 2004).

The intellectual risk-taking behaviors in the observation form are the student:

1. performs a new psycho-motor performance in front of the classroom related to a learning situation in the science course (Beghetto, 2009)

2. shares the non-routine evaluations of psycho-motor performance of others in front of the class in relation to a learning situation in science class (Beghetto, 2009; Skaar, 2009)

3. shares different (non-routine) ideas about the subject in science course (Beghetto, 2009)

4. reproduces the different (non-routine) ideas that he / she has shared on the subject in the science class in different ways (Kennedy, 1995)

5. shares the non-routine evaluations about others' ideas related to the subject in the science course, (Beghetto, 2009; Clifford and Chou, 1991; Skaar, 2009).

6. makes different (non-routine) explanations about the subject in science class (Beghetto, 2009)

7. shares the non-routine evaluations related to the assessment of others about the subject in science class (Beghetto, 2009; Robinson, 2011; Skaar, 2009)

8. asks different and non-routine questions about the subject in science class (Beghetto, 2009)

9. shares her/his non-routine evaluations about the questions of others in the course of science, (Beghetto, 2009; Skaar, 2009).

10. undertakes different (non-routine) tasks in the science class

(Clifford, 1991; Clifford and Chou, 1991; Skaar, 2009; Robinson, 2011; Taylor, 2010).

11. shares different (non-routine) materials (books, photographs, technology, etc.) related to the subject with the class (Skaar, 2009).

12. undertakes different (non-routine) assignments on the subject in the science class (Clifford, 1991; Skaar, 2009).

13. participates in the discussions about the subject in science (Beghetto, 2009).

14. can make critics about the subject shared in the science course (Beghetto, 2009).

2.2.2. Student Reflection Form

The purpose of the student reflection form was to enable students to express their thoughts about 8-week applications centering on role model animations modeling intellectual risk-taking behaviors. During the eight-week period, students completed the evaluation form at the end of each lesson. In the form, two parts; personal information part and reflection form part (R), were involved. In the reflection form, four questions were used as facilitator for reflection. The questions were "Did you enjoy the class today?"(Q1), “Did you enjoy the animation you watched today” (Q2), "What behaviors of the characters in the animation attracted you?" (Q3), "Could you tell us what you have done in the classroom in the science course today?” (Q4). While examining these forms, special attention was paid to in-class intellectual risk-taking behaviors. In terms of the increased validity of the study, the student reflection form helped to triangulate the findings derived from in-class observation.

2.3. Application Process of the Study

The Science Achievement Test prepared at the beginning of the research was applied as a pre-test to all groups. After that, in the first three weeks in all groups, only intellectual risk-taking behaviors observation form was completed by experts without any implementation. The observations made during the first 3 weeks were intended to enable the students to get used to the observer and to construct an observation form. In the five-week period following a three-week observation period, the application involving animations was done only in the experimental groups. In the control group, during the 8-week period, the teacher worked incline with the regular teaching based on mandated curriculum. At the end of 8 weeks, the science achievement test was applied to all groups as post-test. In Figure 1, the process of the study carried out in the experimental groups is given.

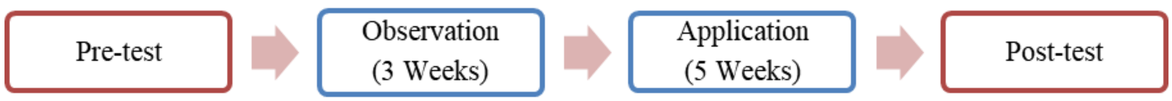

Figure 1. The process of the study carried out in the experimental groups

In the research, previously prepared animations involving role-models were watched by experimental 1 and experimental 2 groups with projector and other necessary sound systems for about ten minutes; all the students were able to see and hear the animation. Afterwards, the lesson was processed according to the teacher's guidance in compliance with the mandated curriculum, and the observation form was filled out by the researchers. Along with the observation forms, the reflection form was completed by the students in the last five minutes of each session. Figure 2 shows the research process for the experimental groups.

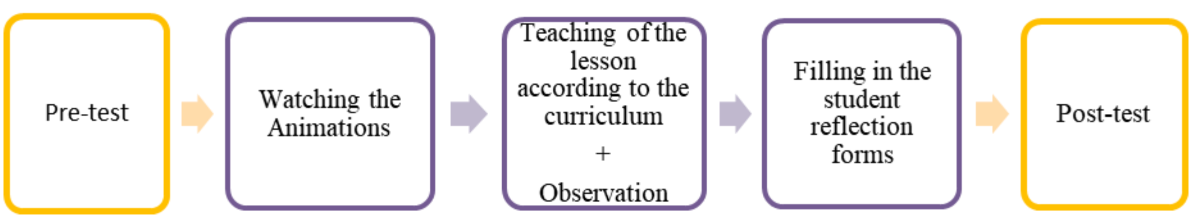

Figure 2. Diagram of the teaching of the lesson in the experimental groups

In the control group, the content was taught by ordinary teaching according to the mandated curriculum, and the observation forms were filled by the researchers and reflection form was completed by the students in the last five minutes of each lesson. In Figure 3, the research process applied to the control group is given.

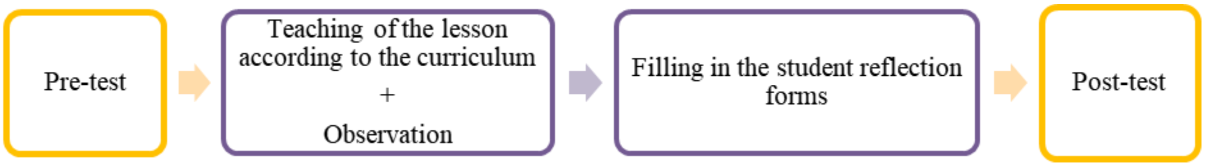

Figure 3. Diagram of the teaching of the lesson in the control group

2.3.1. Preparation Process of the Animations involving Role Models

The content of the role-model animations was prepared by the researchers in accordance with the standards of the unit titled as "Riddle of Our Body" within the mandated science curriculum. Each animation was structured to cover all of the behaviors stated in in-class intellectual risk-taking observation form. The characters used in the animations were formed by the researchers paying special attention to fulfill the eligibility criteria outlined by the relevant literature (Bandura, 1986; Korkmaz, 2006). The main considerations in deciding animation characters were; age, gender, character, similarity, and status. Based on these features, 5 different characters were created by the research team and 5 different names were determined for these characters (Figure 4). For the character selection stage, a short animation was prepared in which the characters introduced themselves to the students. The main characters used in the animations were chosen and named by allowing 40 3rd and 4th graders (16 girls, 24 boys) to fill out a form. The form included several questions including which character the student favor, what name he / she would prefer for the character selected and the reasons of the chosen character which led to be preferred instead of others. The chosen characters and their names are given in Table 4.

Figure 4. The characters presented to the students

Table 4. Results on Character Selection and Name Preference

Gender	Frequency Regarding Characters					Frequency Regarding Name Preference				
	1	2	3	4	5	Berk	Fencan	Ayşegül	Can	Fengül
Girls (16)	-	1	-	15	-	-	1	14	1	-
Boys (24)	18	-	2	-	4	16	1	-	7	-

Table 4 illustrated that female students focused on character 4 while male students preferred character 1 (Figure 4) over others. As for the name, girls were concentrated on C (Ayşegül-a traditional female name in the context of the study), while boys were concentrated on A (Berk-a popular name in the context of the study). The students expressed the factors in determining the character in general as; the chosen characters' speech style, hairstyle, hair color, tone of voice, eye color, height, clothes and accessories.

After the character selection, the content of the animations suitable for the objectives of "Riddle of Our Body" unit was written by two researchers with a review of another field expert. A total of 5 animations were prepared for a period of 5-8 minutes in length. Experimental 1 and experimental group 2 watched the animations for five weeks after a three-week of preview with no animations.

2.4. Rigor of the Research

Internal and external validity threats were taken into consideration to minimize researchers' bias during data collection and analysis stages. One of the measures was to eliminate the selection bias of the groups (Experimental 2 and Control Groups). In this stage of the study, pre-test results were examined to ensure homogeneity of the groups consisting of non-gifted students and no significant difference was found between the two groups. At the same time, this result supported the hypothesis that the non-gifted students in different groups were similar in terms of their knowledge of "Riddle of Our Body" unit. Furthermore, the time interval between pre-test and the post-test applications of the achievement test was also equal for all the groups. The students in both groups had the similar opportunities in terms of accessing the resources, therefore this contributed to elimination of the maturation effect. Another condition that may be mentioned in terms of validity was that the length between the pre and the post test was 8 weeks and this time frame was considered to be sufficient to remove the testing effect over the students. Additionally, when structuring the data collection tools and analysis, additional experts and their insights were sought to assure the rigor of the research by attempting to eliminate preliminary judgment of the researchers during the different stages of the research including structuring the data collection tolls and the analysis of the data derived from these tools.

2.5. Data Analysis

In this research, the data of the science achievement test were analyzed by using SPSS package program. ANOVA and dependent t-test were used to compare achievement and gain scores of the students in the different groups. The analysis of the data from in-class intellectual risk-taking behavior observations form was done by computing the frequency of the behaviors observed. For each of the 14 behaviors in the form of in-class intellectual risk-taking behavior, the frequencies were examined and a comparison was made between the groups. Then, the total frequency value derived from the observation forms was examined and then, the frequency values of the groups were compared among the groups. Data from student reflection forms were thoroughly explored and analyzed by extracting examples regarding the intellectual risk taking behaviors also used for classroom observations and were represented as quotations.

3. Results

3.1. Results on Intellectual Risk-taking

3.1.1. Results of In-class Intellectual Risk-Taking Behavior Observations

Frequencies of in-class intellectual risk-taking behaviors was transformed into graphics by examining each behavior separately. Intergroup comparisons and weekly changes were interpreted on graphics. Finally, the overall change of intellectual risk-taking behaviors of the whole class and the comparison in terms of the groups were also obtained from the graphics (Figure 5, Figure 6).

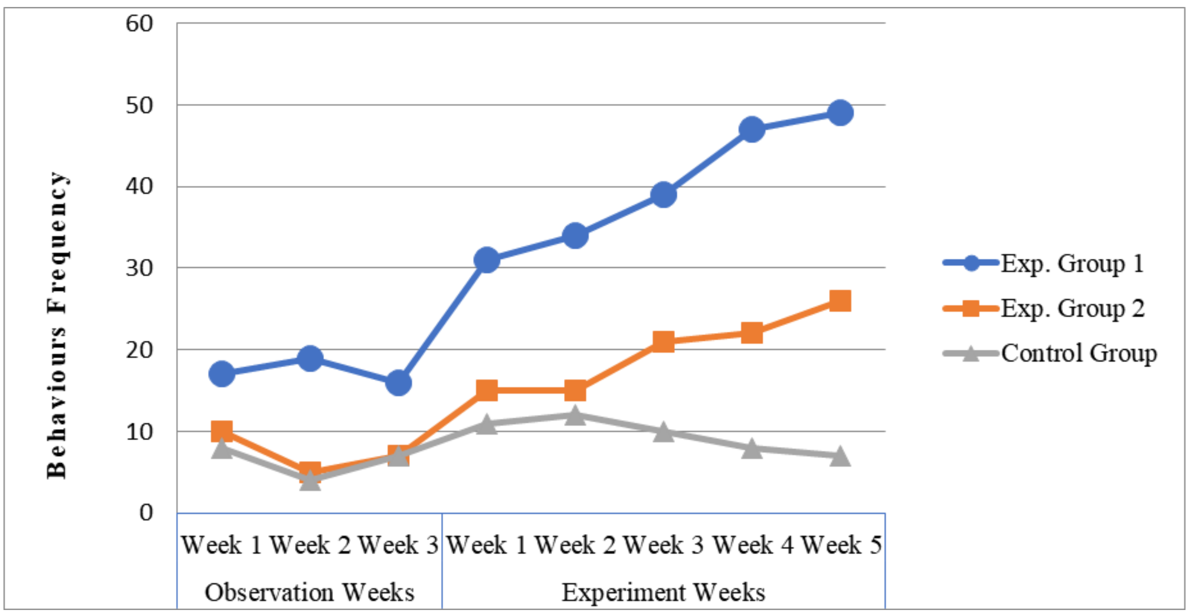

Figure 5. Total frequencies of in-class intellectual risk-taking behaviors per weeks in the groups

In Figure 5, when the graph of total frequencies of the intellectual risk-taking behaviors in weeks is examined, it is clear that the frequency of the intellectual-risk-taking behaviors of the experimental group 2 and the control group in the first three-week period is similar. As the experimental group 1 consisted of gifted students whereas experimental group 2 and control group included students with no diagnosis of being gifted, this finding appears to be a critical one. In terms of the intellectual risk-taking behaviors observed in these groups during the first three weeks with no animations, the similarity of the experimental group 2 and the control group in three weeks is an important finding since both groups were consisted of non-gifted students. This result would allow us to compare the effectiveness of the animations on intellectual risk taking in the remaining five weeks involving animations with role models taking intellectual risks. Figure 6 represents that increases in frequency of 12 out of 14 intellectual risk-taking behaviors are clearly seen in Experimental group 1 while increases in frequency of 8 intellectual risk taking behaviors are clearly observed in Experimental group 2. In spite of absence of any application, increases in frequency of 4 intellectual risk-taking behaviors are also observed in the control group.

When the results are examined in detail, “performing a new pscyho-motor performance”, “sharing non-routine ideas”, “reproducing non-routine ideas”, “sharing non-routine evaluations”, “making non-routine explanations”, “asking non-routine questions”, “undertaking non-routine assignments”, “participating in the discussions” and “making critics” behaviors are obviously improved after experimental applications however, other five behaviors remained relatively stable in spite of experimental applications. Actually some improvements were observed in these five behaviors, but they were insignificant to make a decision about teaching effect. Meanwhile, we have to explain that the participants were already performing some intellectual risk taking in terms of “performing a new pscyho-motor performance”, “sharing non-routine ideas”, “reproducing non-routine ideas”, “sharing non-routine evaluations”, “making non-routine explanations”, “sharing non-routine evaluations about others’ questions”, “participating in the discussions” and “making critics” behaviors before the experimental applications. However, the experimental applications increased frequencies of these behaviors more than their initial frequencies at the beginning of the study.

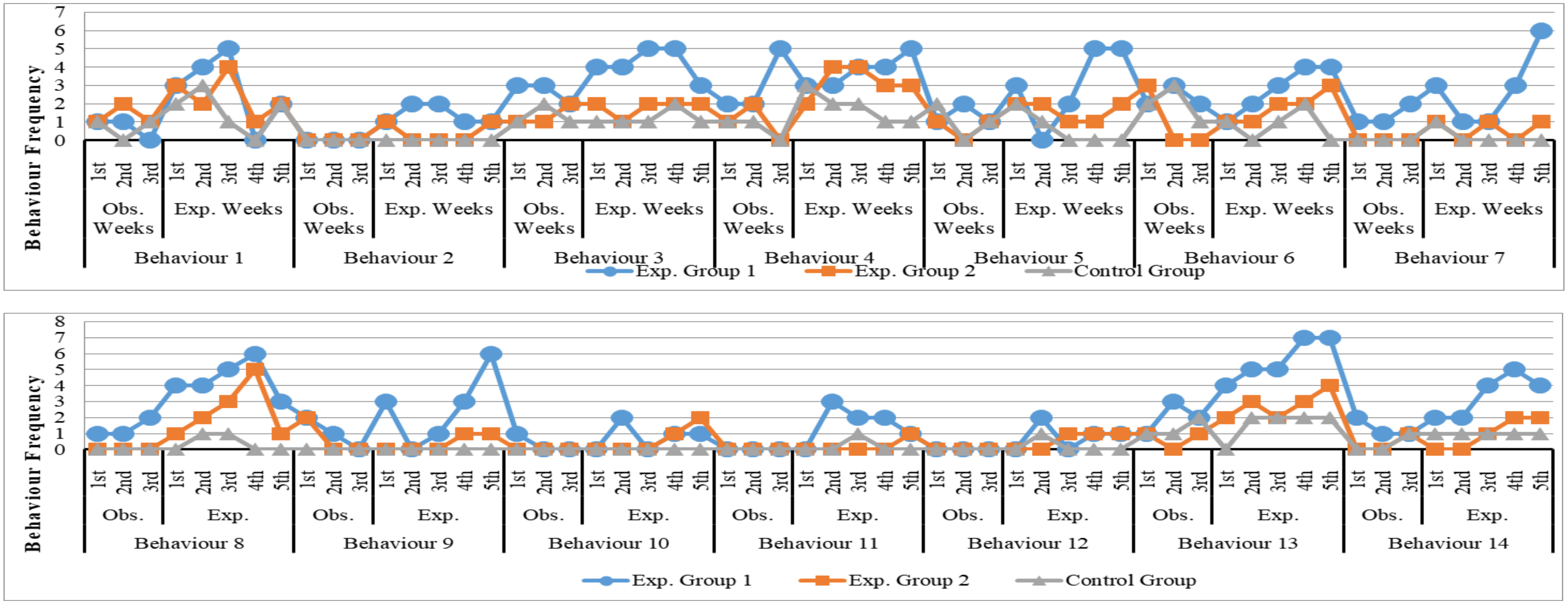

Figure 6. In-class intellectual risk-taking behavior distribution (B1: psycho-motor performance, B2: making non-routine evaluations, B3: sharing non-routine idea, B4: reproducing non-routine ideas, B5: sharing non-routine evaluations, B6: making non-routine explanations, B7: sharing non-routine evaluations about assessment of others, B8: asking non-routine questions, B9: sharing non-routine evaluations about questions of others, B10:undertaking non-routine tasks, B11:sharing non-routine materials, B12: undertaking non-routine assignments, B13:participation in discussions, B14: making critics)

3.1.2. Results of Student Reflection Forms

The findings obtained from the reflection forms were examined by two experts. The obtained findings were compared with the help of the in-class intellectual risk-taking observation form and thus the validity of the form was increased. The sentences containing intellectual risk-taking behaviors in the form prepared by the students were examined by the experts and some of these sentences were classified separately according to the groups.

3.1.2.1. Findings on Reflections Forms of Experimental Group 1:

The experimental group 1, which includes the gifted children, filled the reflection form (R) at the end of each course. The first questions in the form, "Did you enjoy the class today?" (Q1), "Did you enjoy the animation you watched today?" (Q2) were responded as "Yes" by almost all students for five weeks contained animations. This is an indication that the animations were enjoyed by the students. It is thought that it will be easier for the students to adopt the animations they follow with interest. Responses to the other two questions (What behaviors of the characters in the animation attracted you?" (Q3) and "Could you tell us what you have done in the science course today?" (Q4)) are as follows:

Participant 1 (P1) stated "Animated characters question themselves before they raise their hands". "At first they think their friends are going to make fun, but then they get encouraged and ask questions in class" (P1-R-Q3). Moreover, participant 6 (P6) gave an example from the classroom as "Y asked an interesting question and some answered the question incorrectly. I made a statement that my teacher asked about an interesting topic." (P1-R-Q4). Similarly, participant 17 participated in the activity involving learning by taking intellectual risk and she expressed "I have clearly expressed my thoughts on the subject. I shared the questions I had in mind regarding the lesson" (P17-R-Q4). The participant showed that she shared her ideas with the class and asked questions about the subject. The statements belonging to Participant 1, 6 and 17 showed the effect of intellectual risk-taking behaviors in the animations encouraging students to ask their questions in front of the class. In these behaviors, the individuals stated that they observed intellectual risk-taking behaviors such as evaluating their own ideas and asking questions. Therefore, it is seen in the experimental group 1 that participant 1 and 6 gained awareness about importance of "asking questions" during learning after watching the role model. This finding appeared to be relevant to the finding derived from the observation data.

Participant 7 (P7) revealed about extra-homework activity as "It was interesting for me that the characters [in the animation] prepared and presented posters by themselves though the teacher assigned no homework"(P7-R-Q3). The expression of participant 7 is the statement that specifies the intellectual risk-taking behavior being in parallel with in-class intellectual risk-taking observation form. The student observed this behavior in the animation she watched. Participant 7 in the experimental group 1 represented an awareness about value of "undertaking non-routine assignments" behavior after watching the role model, it might be claimed that this awareness was a reason of increasing frequency of the behavior observed in the classroom. Other participants also added examples from the applications made in their classrooms as well. Participant 8 (P8) asserted "I presented the slide I prepared to my friends. I listened to my friends and then thought about how little information they had, but I didn't talk about it." (P8-R-Q4). The participant presented a slide which he prepared to his classmates and shared an extra-curricular material with the class and thus performed a non-routine task. She/he also stated that his/her friends took some intellectual risk-taking behaviors by evaluating their knowledge levels. Similarly, participant 14 (P14) shared her/his experience by "We are bored by the fact that R [one of her friends] brought the "Science & Children" magazine to the class and read it many times. Because I'm reading it, too. Then, we discussed why there are joints in our skull". (P14-R-Q4). The participant stated that all her peers shared extra-curricular materials in the classroom and that they had discussed a non-routine problem. Participant 4 (P4) also expressed "X [one of the classmates] said my answer was wrong, I thought that it was wrong while responding but I still argued. We said that we don't like Ayşegül's lung model [Ayşe, one of the animation models]. Tomorrow I will make a better model." (P4-R-Q4). In the explanations of Participant 4 and 14, it was obvious that the students carried out the discussion and had a willingness to do an extra-homework activity and to share extra-curricular materials to the class. The most important aspect of these explanations is that the existence of an awareness about the risk-taking behaviors and the application in line with this awareness, leading to increase in frequencies of the behaviors in the experimental group 1.

Participant 17 (P17) expressed "The characters frankly criticize their friends' ideas" (P17-R-Q3). This statement appears to be a clear example of criticism. Additionally, participant 18 (P18) shared her experience as "I did my task by criticizing my friend's misconception" (P18-R-Q4). Participant 18 criticized her/his friends' ideas and then decided that they were wrong. These expressions show that the students observed this behavior by watching the animation. These two students' responses to questions three and four exemplifies how the animations encouraged participants to implement intellectual risk-taking behavior. Increase in frequency of in-class observation regarding "making critics" behavior in the experimental group 1 was also determined by examining the observation data (See Figure 6).

When the given sample expressions are examined, it is clear that intellectual risk-taking behaviors exhibited by the role models in the animations attracted students' attention and allowed them to implement similar behaviors. Expressions supporting the findings obtained in in-class observation form constituted evidence for the validity of this form. The statements by the participating students appeared to be aligned with observation data and supported the perception that the animations contributed gifted students to gain intellectual risk-taking behaviors in science classrooms.

3.1.2.2. Findings on Reflections Forms of Experimental Group 2

Similar reflection questions were also used to seek out the thoughts of the participants in the experimental group 2 regarding the use of animations embracing intellectual risk-taking behaviors in science teaching. Experimental group 2 students were ordinary 4th graders and they filled out the reflection forms at the end of each course during the treatments. The first two questions in the form, "Did you enjoy the class today?" and "Did you enjoy the animation you watched today?" were responded as "Yes" by almost all students during the five-week application term. This is an indication that the animations were enjoyed by the students. Reflection questions in the student assessment form were "What behaviors of the characters in the animation attracted you?" (Q3) and "Could you tell us what you have done in the science course today?" (Q4). Representative responses to the questions are as follows:

In response to third question in the reflection form, participant 20 (P20) stated "The students in the animation found very good ideas about the lesson which didn't come to my mind before. They get prepared for the class without being assigned by the teacher." (P20-R-Q3). This statement indicates that the student observes the behavior of non-routine questioning from intellectual risk-taking behaviors of the characters in the animation. Participant 24 (P24) also expressed "Children in the animation have different questions. They decided to answer the questions on their own" (P24-R-Q3). Based on her statement, participant 24 observed intellectual risk-taking behaviors such as asking different questions and evaluating individuals' own opinions. Specifically, asking questions and evaluating opinions, two critical intellectual risk-taking behaviors listed in the observation form, Participant 23 (P23) noted the following statement illustrating how the treatment yielded rich scaffolding to base and support these two behaviors as "The question I asked my friend today created a different question in my mind". "I shared the question I had with my friends". "I liked some of my friends' ideas" (P23-R-Q4). This statement of the participant 23 showed that she created a new question, and shared the question she/he created with her friends, and lastly evaluated her friends' ideas. Moreover, participant 26 (P26)' experience appeared to be a clear example of how the animations triggered and supported the participant 26 to implement these two named intellectual risk-taking behaviors. He noted "I thought well before I asked the question like the student in the animation I watched today in science, but I was not as shy as he was when asking the question". "We had a very enjoyable discussion." (P26-R-Q4). In terms of evaluating opinions behavior, being reflective to his classmates' opinions and actions, participant 29 (P29) stated her opinion as "I did not like M's [a classmate] explanations about the topic very much". "S [another classmate] answers all questions without thinking over." "My friends laughed at the question I asked, but I thought it wasn't a laughable one" (P29-R-Q4). It was seen from these statements that the student evaluated the explanations of others and was able to share the different questions with the class. These behaviors were also among the intellectual risk-taking behaviors observed to be significantly increased by the 5-week treatment in the observation data.

As far as psycho-motor behavior, another key intellectual risk-taking behavior listed on the observation form, the participant 21 (P21) pointed out her/his experiences as following; "During the break, they talk about the lesson. I was interested in Berk [one of the animation models] when he tried to experiment the things in the garden he learnt during lesson (P21-R-Q3). This statement of participant 21 noticeably indicated that the student evaluated the psycho-motor behavior performed by the animation character. Thus, like other intellectual risk-taking behaviors named above, implementation of psycho-motor behavior was also supported by the animations based on both observation and the reflection data.

Aligned with the findings derived from observation forms, taking on a different task was another intellectual risk-taking behavior that student were reflected on. For instance, participant 27 explained “They are preparing a poster without being assigned by the teacher" (P27-R-Q3). This statement implied that taking on a different task was displayed by the students during the applications.

Besides, blend of different risk-taking behaviors enlisted in the observation form were also derived from student reflections. For instance, participant 29 (P29)’s following statement was a clear example of various risk-taking behaviors evoked by the animations with risk-taking models. “They listened and answered respectfully while discussing. Ayşegul was criticizing Berk's expressions [Ayşegul and Berk are the models in animations]. They expressed their ideas without any fear.” (P29-R-Q3). Based on participant 29’s statement, discussion, criticism and explaining ideas are the intellectual risk-taking behaviors captured her attention while watching the animation. Participant 31 (P31) also explained "It took my attention that they [animation figures] prepared and shared nice presentations with their friends, and they criticized their friends"(P31-R-Q3). This statement was associated with the presentation of a different material related to the subject matter and several other intellectual risk-taking behaviors such as criticism. Moreover, Participant 35 (P35) stated his experience as "I took advantage of my friends' ideas". "I expressed my ideas without shame" (P35-R-Q4). Based on participant 35’s statement, intellectual risk-taking behaviors such as evaluating others' ideas and sharing their own ideas are some of the key risk-taking behaviors exhibited. Participant 38 (P38) also mentioned "My friend explained my answer differently. Both of our answers were correct, but her answer was very complicated” (P38-R-Q4). Participant 38’s statement also reflected to two distinct intellectual risk-taking behaviors such as expressing an idea differently and evaluating another person's opinion performed in one of the treatment sessions.

When the experimental group 2 students' reflections to each session was examined, it is seen that intellectual risk-taking behaviors that the students were reflected on were among the behaviors that attract the attention of the students. This is in compliance with the experimental observations of our study. Student reflections supporting the findings obtained from in-class observation form constituted a separate evidence for the validity of this form. Actually, the participants in the experimental group 2 represented increase in limited number of intellectual risk-taking behaviors compare to those of the experimental group 1.

3.1.2.3. Findings of Student Reflection Form for the Control Group

The control group filled out the student assessment form at the end of each course. The first question in the student evaluation form, "Did you enjoy the class today?" was responded as "Yes" by almost all students for five weeks, as in the experimental groups. The one question, which was answered by the control group in the student evaluation form, was "Could you tell us what you have done at the science course today?" (Q4). Some of the students' answers including intellectual risk-taking behaviors to this question are:

Participant 42 (P42) stated "I asked my teacher a question I had in mind". “We discussed the question with the class” (P42-R-Q4). In the statement of Participant 42, it was seen that intellectual risk-taking behaviors such as questioning and discussion were performed. Similarly, participant 53 (P53) explained "We had a discussion and produced new ideas today". "The lesson was a lot of fun" (P53-R-Q4). The 'discussion' in the statement of participant 53 and the behaviors such as discussion, sharing new ideas with the class were considered to be aligned with intellectual risk-taking behaviors.

Participant 46 (P46) gave another example of experience about intellectual risk taking as "I answered correctly the question that M asked". "It was already an easy question for me". "As M [a classmate] did not understand my answer, my teacher wanted me to paraphrase my answer ". "And, I explained it again"(P46-R-Q4). The participant 46 expressed in her statement that she repeated her response in different ways and evaluated her/his friend's question. The behaviors included in the student's statements included intellectual risk-taking behaviors. Similarly, participant 50 (P50) stated "My friend's answer was not complete". "So, I said that she/he gave an incomplete answer" (P50-R-Q4). Participant 50 evaluated his/her friend's response. It is clear that this behavior of the student included intellectual risk-taking behavior as well. Reviewing the control group students' reflections, participant 58 (P58) stated her/his experience as "During science class today, I asked the questions I had in mind". "I discussed my ideas by sharing them with my friends” (P58-R-Q4). In the statement made by Participant 58, the student fulfilled intellectual risk-taking behaviors such as asking questions and sharing ideas.

When the expressions belonging to the control group were examined, it was observed that the control group performed some intellectual risk-taking behaviors, too. The behaviors mentioned are already in line with the behaviors stated in in-class intellectual risk-taking form. However, when the figure belonging to the form filled by the experts were examined, it was seen that they frequently had less intellectual risk-taking behaviors compare to their counterparts (Experimental group 1 and 2).

3.2. Results of Science Achievement Test

For the analysis of science achievement test scores in pre and post testing, t-test for dependent groups and ANOVA test were used and the findings were tabulated.

3.2.1. Results about Analysis of Pre-Test Scores of the Groups on Science Achievement Test

After the assumptions of ANOVA were checked, the pre-test scores of the groups were analyzed with ANOVA test. For pre-tests, the normality of the groups was tested with Kolmogorov-Smirnov. The groups had a normal distribution (p> .05) for pre-tests. It was investigated whether there was any significant difference between the groups. Afterwards, it was investigated whether there was a statistically significant difference between the two groups with multiple comparison tests.

Table 5. ANOVA Results of Pre-Test Scores of the Groups on Science Achievement Test

Source of Variance	Sum of squares	sd	Average of Squares	F	p	Levene Test F	Levene Test p	ηp^2
Group	762.19	2	381.10	38.07	.00	2.46	.09	.57
Error	570.66	57	10.01					
Total	1332.85	59						

*There is a significant difference at 0.05 level.

According to Table 5, a statistically significant difference was found between the groups in terms of pre-test scores (F (2, 57) = 38.07 p <.05). In addition, the partial eta square value showed that the test had a large effect size. In terms of the homogeneity of variance, the results illustrated that the groups were homogeneous (F (2, 57) = 2.46 p> .05). Hence the results of the Bonferroni test was chosen for follow-up multiple comparisons, the results of multiple comparisons are presented in Table 6.

Table 6. Results of the Follow-up Analysis Applied to Pre-Test Scores of the Groups on Science Achievement Test

Follow-up Test	Groups (I)	Groups (J)	Mean Diff. (I-J)	Standard Error	p
Bonferroni	Experimental Group 1	Experimental Group 2	7.96	1.02	.00*
		Control Group	7:58	1.02	.00*
	Experimental Group 2	Experimental Group 1	-7.96	1.02	.00*
		Control Group	-.38	.98	.99
	Control Group	Experimental Group 1	-7.58	1.02	.00*
		Experimental Group 2	.38	.98	.99

* There is a significant difference at 0.05 level.

According to the results, statistically significant differences were found between experimental group 1 and the experimental group 2 and the control group (p <.05). The difference is in favor of experimental group 1. Another important finding derived from multiple comparisons is that there is no significant difference between the experimental group 2 and the control group (p> .05).

3.2.2. Results about Analysis of Post-Test Scores of the Groups on Science Achievement Test

The post test results of the groups on the science achievement test were analyzed with ANOVA. Findings derived from post test results helped understanding whether there was a significant difference between the groups. Before the computations, the normality of the groups was tested with Kolmogorov-Smirnov. Groups were found to be normally distributed (p> .0 5) for the post-tests.

Table 7. ANOVA Results of Post-Test Scores of the Groups on Science Achievement Test

Source of Variance	Sum of squares	sd	Average of Squares	F	p	Levene Test F	Levene Test p	Levene Test ηp^2
Group	1305.17	2	652.59	30.51	.00*	6.8	.00	.52
Error	1219.23	57	21.39					
Total	2524.40	59						

* There is a significant difference at 0.05 level.

A statistically significant difference was found among the post-test scores of the groups (F (2, 57) = 30.51 p <.05). The partial eta square value showed that the test had a large effect size. However, in order to see the source of difference more clearly, the results of Games-Howell test were applied. The reason for applying this test was that the variances of the groups were not homogeneous (F (2 , 57) = 6.8 p <.05).Table 8 presents the results of the Games-Howell test.

Table 8. Results of the Games-Howell Test Applied to Post-test Scores of the Groups on the Science Achievement Test

Folow-up Test	Groups (I)	Groups (J)	Mean Diff. (I-J)	Standard Error	p
Games-Howell	Experimental Group 1	Experimental Group 2	8.01	1.25	.00*
		Control Group	11.39	1.29	.00*
	Experimental Group 2	Experimental Group 1	-8.01	1.25	.00*
		Control Group	3,39	1.65	.11
	Control Group	Experimental Group 1	-11.39	1.29	.00*
		Experimental Group 2	-3.38	1.65	.11

*.There is a significant difference at 0.05 level.

According to the final test results given in Table 8, there was a significant difference between experimental group 1 and both experimental group 2 and control group. The differences are in favor of experimental group 1. In addition, there was no statistically significant difference between the experimental group 2 and the control group. To seize this finding in detail, the pre-test and post-test scores of the groups were compared and the analysis of the achievement scores were examined.

3.2.3. Results of Comparisons of Pre and Post Test Scores of the Groups on Science Achievement Test

To compare the pretest and posttest scores of the groups on the science achievement test per group, t-test for dependent groups was implemented to the scores. First of all, it was determined that normality assumption (p> .05) was assured by Kolmogorov-Smirnov test and then the further analyses were conducted.

Table 9. Dependent Groups t-test Results of Experimental Group 1

Measurement	N	X	SS	Sd	t	p	Cohen d
Pre-test	18	17.39	3.87	17	9.35	.00*	3.64
Post-test	18	28.39	2.17				

* There is a significant difference at 0.05 level.

According to Table 9, there was a statistically significant difference between the pre and post test scores for experimental group 1 (t (17) = - 9.35 p <.05). This difference was in favor of the post test scores. Also, when Table 9 is taken into consideration, it could be said that while the mean of pre-test for group 1 was 17.39, it was 28.39 for the post test. Cohen d value also showed that the test had a large effect size (d = 3.64).

Table 10. Dependent Groups t-test Results of Experimental Group 2

Measurement	N	X	SS	Sd	t	p	Cohen d
Pre-test	21	9.43	2.42	20	8.73	.00*	2.85
Post-test	21	20.38	5.25				

* There is a significant difference at 0.05 level.

According to Table 10, there was a statistically significant difference between the pre- and post-test scores for experimental group 2 (t (20) = - 8.73 p <.05) as well. This difference is in favor of the post test scores. In addition, the mean of the pre-test scores of the experimental group 2 was 9.43 while the mean of the post-test scores was 20.38. Cohen d value also showed that the test had a large effect size (d = 2.85).

Table 11. Dependent Groups t-test Results of the Control Group

Measurement	N	X	SS	Sd	t	p	Cohen d
Pre-test	21	9.81	3.16	20	5.35	.00*	1.59
Post-test	21	17.00	5.42				

* There is a significant difference at 0.05 level.

Also, based on the results, the pre and post test scores of the control group according to Table 11 (t (20) = - 5.35 p <.05) were significantly differed. The observed difference was in favor of the post-test scores. In addition, the mean of the pre-test scores was 9.81 according to the table and the mean of the post-test scores was found to be 17. Cohen d value also showed that the test had a large effect size (d = 1.59).

When the t-test results and ANOVA results were compared, there was no significant difference between the results of experiment 2 and the control group, but there was a 3-point difference between the means, which showed that the animations watched by the experimental group 2 had a positive effect on their science learning. Furthermore, the difference between the effect sizes of the groups showed the practical importance of the statistical difference between the pre-test and post-test results of the groups. However, to test the differences in the level of learning between the groups' gain scores on the achievement scores had to be analyzed.

3.2.4. Results of the Analysis on Gain Scores of the Groups on Science Achievement Test

Among the analyzing methods to be used in the comparison of two different groups, one of the approaches that provide a more detail is the analysis of the achievement (gain) scores. Gain scores are the scores obtained by subtracting the pre-test scores from the post- test scores of the individuals. The contribution of the gain scores is simply to help seeing performance change during the experimental applications.

Table 12. ANOVA results of gain scores of the groups on science achievement test

Source of Variance	Sum of squares	sd	Average of Squares	F	p	Levene Test		
						F	p	ηp^2
Group	195.46	2	97.73	10.96	.00*	.11	.89	.28
Error	508.19	57	8.92					
Total	703.65	59						

* There is a significant difference at 0.05 level.

Table 12 shows a statistically significant difference between the gain scores (F (2, 57) = 10.96 p <.05, ηp 2 = .28). The partial eta square value showed that the difference had a large effect size. The Bonferroni test was applied to clearly determine the source of the difference by taking into consideration the Levene test scores. The Bonferroni test results regarding to gain scores are given in Table 13.

Table 13. Results of the Bonferroni Test Applied to Gain Scores of the Groups on Science Achievement Test

Follow-up Test	Groups (I)	Groups (J)	Mean Difference (I-J)	Standard Error	*p*
Bonferroni	Experimental Group 1	Experimental Group 2	.05	.96	.99
		Control Group	3.81	.96	.00*
	Experimental Group 2	Experimental Group 1	.05	.96	.99
		Control Group	3.76	.92	.00*
	Control Group	Experimental Group 1	3.81	.96	.00*
		Experimental Group 2	3.76	.92	.00*

* There is a significant difference at 0.05 level.

There was no statistically significant difference between the experimental group 1 and the experimental group 2 (p> .05), while there was a statistically significant difference between the experimental group 1 and the control group (p <.05). The difference is in favor of experimental group 1. A statistically significant difference was found between experimental group 2 and control group (p <.05). The difference was in favor of experimental group 2.

When the findings from the analysis of the gain scores are examined, a number of remarkable results emerges. While there was a significant difference between the experimental group 1 and the experimental group 2 especially in the analysis of the post test scores, there was no statistically significant difference between the gain scores of these groups. This shows that the increase in the achievements of the gifted students and the ordinary students in the experimental group are not different. Another noteworthy point derived from the analysis of gain scores is the difference between the experimental group 2 and the control group, which do not differ in the post tests. This finding shows that the increase in the experimental group 2 is more than the control group in terms of increase observed in science learning performance.

4. Discussion, Conclusion and Suggestions

4.1. Discussion and Conclusions

In this study, the effects of animations involving role-models on the intellectual risk-taking behaviors and learning of the 4th grade gifted students were investigated. One of the results reached is the positive contribution of the animations including role models to the achievement and learning of the fourth-grade students specifically gifted ones. This finding is in parallel with some previous studies (Abdüsselam, 2013; Çelik,2015). Çelik (2015) and Abdüsselam (2013) studied the effects of the animations they structured on the students' attitudes towards science course and their achievement in science. These studies confirmed that animations increased the students' attitudes and achievements towards science. Dalacosta (2009) found that, when the animations are not used, while the subjects were difficult for the students to understand under normal circumstances or the misunderstandings occurred, the inclusion of animations in the learning process increased the rate of understanding the subjects. This results in the fact that animations provide students with an effective learning environment by removing the intellectual barriers in the learning environment. As discussed earlier, several studies also indicated that animated cartoon films also contributed to achievement. Hence it can be said that animations might be considered to be proper tolls for increasing quality of students' learning processes. When this situation is examined in terms of gifted students, with their high level of intrinsic motivation towards learning (Yaman & Köksal, 2014), ability to be intensified and easily concentrated on the subject (Çağlar, 2004; Tucker & Hafenstein, 1997), and to observe (Davis & Rimm, 1998), these individuals get more benefit from the animated cartoons. Furthermore, when talking about the contribution of animations to learning, it is necessary to consider the modeling of intellectual risk-taking behaviors placed in animations as the main purposes of our research were to assess possible changes in the intellectual risk-taking behaviors of the students and to explore any changes in their science learning by the use of animation models with intellectual risk-taking behaviors.

One of the critical findings of the study is that role-model animations increased the frequency of exhibiting intellectual risk-taking behaviors. Thanks to the role model animations with intellectual risk-taking behaviors, a significant increase in the frequency of intellectual risk-taking behaviors of especially gifted individuals was observed. When the studies are examined, a number of conclusions can be drawn regarding the effectiveness of animations as a role model. Baron (2000) observed that watching role models in TV programs for 3 hours a day affect human behavior, and Villani (2001) observed that if the role models on TV have negative features, the people who watch them develop similar negative features in time. İşsever (2008) found that watching cartoons including violence behaviors increased child violence. The studies of Baron (2000), Villani (2001) and İşsever (2008) showed that the programs that are watched and the negative characteristics of the characters within the characters can be taken as a model. In fact, this inference shows how effective the role models are. This finding should be evaluated in terms of teaching process and development of positive behaviors. Alan (2009) stated that there may be positive changes in the characters of children when the characters in the films are positive. Oruç, Tezim and Özyürek (2011) stated that children watching cartoons and taking the animated characters as models, developed positive behavior features rather than negative ones. This finding appears to be deviant compared to others. The studies of Alan (2009) and Oruç, Tezim and Özyürek (2011) suggest that students can adopt positive behaviors from role models in animations. In this context, it can be concluded that intellectual risk-taking behaviors that have a positive contribution to the learning process can also be learned from role models. The studies given in this respect (Alan, 2009; Oruç, Tezim & Özyürek, 2011) supported our finding that role-models in animations provide a change in intellectual risk-taking behavior in science classrooms. When this situation is examined in terms of the gifted students, they are better than their ordinary peers at exhibiting the behaviors which are important for role modelling such as the power of effective observation, the long-term attention, the inner motivation and memory of the subject they are interested in (Bandura, 1977; Malone, 2002; Rutledge, 2000; Tuckman, 1991) (Çağlar, 2004; Davis & Rimm, 1998; Tucker & Hafenstein, 1997; Yaman & Köksal, 2014).These implications prove that the role-model animations are more effective on the intellectual-risk-taking behaviors of the gifted students than ordinary teaching process. As another issue, the finding that animations cause a change in intellectual risk-taking behavior and its positive effect on learning also relates to the fact that intellectual risk-taking has an effect on learning. When the literature is examined, it seen that intellectual risk-taking behavior is positively related to learning process and its outputs such as academic achievement (Avcı & Özenir, 2016; Çakır & Yaman, 2015; Deveci & Aydın, 2018; Erbaş & Baş, 2015; Gündoğdu, Korkmaz & Karakuş 2005; Tan, Lim & Manalo, 2017; Yıldız, 2012). The animations increase the in-class intellectual risk-taking behavior made a positive contribution to the learning process. Kaptan and Korkmaz (2002) suggested that in addition to the positive contribution of intellectual risk-taking to the achievement, the achievement also has a positive contribution to the intellectual risk-taking process. This, in fact, leads to the conclusion that achievement is interrelated with intellectual risk-taking behavior. While the effects of intellectual risk-taking behavior on the learning process and achievement are examined, the characteristics of the individuals in this process are also important. In this study, intellectual risk-taking behaviors of the gifted people and the effect of these behaviors on their academic achievement were examined and frequency of their high-level intellectual risk taking was also increased and supported by animations. This finding might also be related to gifted students' high motivation and interest. Since Yaman and Köksal, (2014) revelated that there is a positive correlation between interest, motivation and intellectual risk taking. Animations with role models might have contributed more to gifted students due to their high interest and motivation.

The findings of our study should be examined in terms of their importance as well as their compatibility with the relevant literature. In Henriksen and Mishra's (2013) study, supporting the importance of our research, it was stated that students' levels of intellectual risk-taking behaviors are not as high as expected; therefore, their performance could be enhanced with various improvements and regulations in their learning environment to take intellectual risks. Also, Gupta, Kavita and Pasrija (2016) stated that risk-taking behaviors in the learning process help to overcome the problems involving intellectual difficulties. The studies of Henriksen and Mishra (2013) and Gupta, Kavita and Pasrija (2016) point out both the importance of taking intellectual risk in teaching process and also emphasize the importance of our study. The content of the prepared animations includes the intellectual risk-taking behaviors that can be taken in the classroom and the fact that they can be easily integrated into the teaching environments, reveal the usefulness of these animations. It is also known that the use of animations in learning environments has a positive effect on the learning process (Banchonhattakit, et al., 2015; Matsuzuno et al., 2014; Sakamato, et al., 2014; Shigehatake, et al., 2014; Sohn, Kil, So & Yeau, 2013). Another point that explores the importance of the study is that the animations must be prepared according to the curriculum and include the objectives in the curriculum. In his study, Turan (2014) evaluated the views of teachers about the effects of cartoons on learning. The teachers in the study stated that cartoon characters would contribute positively to the achievement of the students in the lessons and therefore the integration of these into the education process would yield a positive result. Another feature of our study in terms of usability and convenience is that the characters in animations are suitable for creating behavioral changes. Yavuzer (2004) and Rai et al. (2017), argue that children watching cartoons, take cartoon heroes/heroines as a model and act like them. In this respect, Oruç, Tezim and Özyürek (2011) observed in their studies that children adopt the heroes/heroines of their gender and adopt them more positively. In fact, this situation corresponds to reallife model acquisition. The fact that we have a girl and a male character as the main characters in the animations we have prepared and that the character is a peer in the 4th grade students made it easier for the students to take them as role models. Another factor that increases the usefulness of our study is the existence of ordinary students in the application process whose intellectual risk-taking behaviors also increased and their learning process was contributed by the animations they watched. In conclusion, animations involving role-models were effective to increase frequency of the intellectual risk-taking behaviors and science achievement of the 4th grade gifted students.

4.2. Suggestions

The findings of this study provide important evidence about the idea that role-model animations contribute to the intellectual-risk-taking behaviors and learning in science classroom. Our study is especially important for the education of the gifted students, who are important for the future of our society. The study provides an idea of how to take intellectual risk-taking behavior which is not performed much in science classrooms. It is thought that it will contribute to future studies to increase intellectual risk-taking behaviors in class. For this reason, the current study should be repeated by random assignment. Another suggestion we can make concerning the study is that, based on our findings, further studies should be carried out with larger samples in which the positive contribution of animations to learning and intellectual risk-taking behaviors are investigated. In our study, animation characters were used as role models and in accordance with the student's cognitive features. However, if the intellectual risk-taking behavior with role models is to be increased in future studies, real persons can also be utilized.

The study has some limitations as well as its contributions. While evaluating in-class intellectual risk-taking behaviors, only the behaviors within the science course were evaluated and the effects of the animations on the other courses were not examined. Our study is only about the gifted 4th grade students. In this respect, it prevents the generalization of animations to be given as role models to other groups. Our study is also limited to only 2 animation characters. Since the effect of other role models on intellectual risk-taking behavior is not known, it cannot be generalized that role-models change the intellectual risk-taking behaviors.

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