

## Designing Argumentation-Supported Cooperative Reading Writing Application Activities for the 6th Grade Sound and Features Unit

Neslihan Yağer<sup>1</sup>, Seda Okumuş<sup>2</sup>

### Abstract

The aim of this research is to design argumentation-supported cooperative reading-writing-application (RWA) activities that are suitable for the gains of the 6th- grade science course "Sound and Features" unit. Design- Based Research (DBR) method was used. The original argumentation-supported RWA activities were designed for the 6th- grade students' science course "Sound and Features" unit in the first stage. The activities were re-designed by taking the opinions and suggestions of the faculty members and science teachers through the Argumentation Activity Evaluation Form (AAEF) in the second stage. Finally, the students' opinions were taken according to re-designed activities via the Semi-Structured Interview Form (SSIF) in the third stage. According to the findings, the designed activities can improve the students' learning levels of the concepts in the "Sound and Features" unit, and it can provide students with the desired behaviors predicted by innovative learning methods. In addition, the use of argumentation-supported RWA activities can support students learning science. For data obtained from the AAEF, argumentation-supported RWA activities were suitable for the level of the student in terms of content and design, and were related to the content, interesting, instructive, and suitable for the nature of argumentation and RWA. Also, the activities can trigger effective teaching, enable students to express themselves in a discussion environment by actively participating in the lesson, make teaching orderly, planned, and dynamic, and facilitate classroom management. Additionally, this method can help students gain reasoning, inquiry, critical thinking, effective communication, and some other relevant skills.

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## Introduction

Nowadays, modern societies aim to raise individuals who can not only fulfill the given tasks but also act with social consciousness, research, criticize, and use information in the desired direction. To realize this aim, students must know how to construct scientific knowledge and adapt to contemporary scientific culture (Türkoğuz & Cin, 2013). According to the contemporary understanding of education, it is not enough for individuals to have standard thought patterns; on the contrary, individuals who can think scientifically, have developed analytical thinking skills, and can determine the relationships between concepts should be educated (Kırıkkaya, 2010).

Scientific knowledge is not absolute and unchanging; it can change according to possibilities and conditions. Scientific knowledge can be constructed through scientific discussions (Kuhn, 1992). Through scientific discussions, it is ensured that individuals learn the ways of accessing knowledge, apply what they know, and use scientific language. Students can truly have scientific knowledge when they learn to construct their views by engaging in science, conducting scientific inquiries, describing phenomena and events, giving explanations for them, presenting evidence, or refuting ideas. This is achieved by students explaining their ideas through scientific discussions, sharing their views, and informing others using scientific language (Lee, 1997). One of the most important ways is argumentation to achieve this.

Argumentation involves the process of proving a claim by supporting it with data (Toulmin, 1958). To be able to actively participate in decision-making in daily life problems and to understand science-related phenomena, it is necessary to have the ability to debate and to find claims based on appropriate evidence among opposing arguments (Kaya & Kılıç, 2008). In the argumentation process, students usually discuss a view or idea in small groups. Arguments can be created individually or group members can create a joint argument. In this respect, argumentation is suitable for individual or collaborative work. The first

thing that comes to mind when it comes to cooperation is cooperative learning. Cooperative learning is a teaching model in which students fulfill a common task together in small groups, making the student active (Johnson, Johnson & Holubec, 2013; Johnson, Johnson & Smith, 1998; Slavin, 2015). There are many methods/techniques of cooperative learning such as learning together (LT), jigsaw, and Student- Teams- Achievement -Divisions (STAD). Among these, Reading-Writing-Application (RWA) is a method that has gained importance recently, has not been studied much, and can be applied at all levels of education. In the reading phase of the RWA, group members are given a certain amount of time to read the lesson topic together. In the writing phase, students summarize what they have understood from what they have read in the previous phase by writing in groups. For the abstracts to be sufficient, they must contain at least 70% of the subject. If the content of the summary is not sufficient, the groups are given additional time to complete the deficiencies in their reports. In the application phase, it is aimed that students learn by doing and experiencing. For this purpose, the reports prepared by the groups on the subject are presented in front of the class, if there are parts that require practice, the experiments are carried out by the group members, or the students are enabled to participate in the process through other activities (Okumuş, 2017).

The fact that cooperative learning is carried out in small group work and students actively participate in the process is common with argumentation. It is thought that the application of cooperative learning together with argumentation will contribute both to the development of students' reasoning and discussion skills and to positive dependency, face-to-face interaction, and individual responsibility, which are the basic features of cooperative learning. In this context, it can be said that the activities in which cooperative learning and argumentation are integrated will positively affect students' achievement. In the literature, argumentation improves students' academic achievement (Okumuş, 2012; Zohar & Nemet, 2002), conceptual understanding (Okumuş, 2012; Tippett, 2009), critical thinking (Jiménez- Alexandre & Erduran, 2008; Okumuş, 2020), reasoning (Jiménez-

Aleixandre & Erduran, 2008; Ro & Arnesen, 2020; Topcu et al., 2010) and argumentation skills (Aufschnaiter et al., 2008; Chin et al., 2016; Erduran et al., 2004; Martins & Justi, 2019; Osborne et al., 2016; Simon et al., 2006; Song & Sparks, 2019; Zohar & Nemet, 2002) in science courses. Similarly, cooperative learning improved academic achievement (Amirianzadeh, 2012; Hwang & Park, 2011; Koç & Şimşek, 2016; Lewis, Treagust & Chandrasegaran, 2012; Mehta & Kulshrestha, 2014; Okumuş, 2017; Slavin, 2010, 2013; Webb, 2008), conceptual understanding (Belge Can & Boz, 2014; Benny & Beckford, 2014; Fung & Lui, 2016; Lewis et al., 2012; Tsaparlis & Papaphotis 2009; Warfa, Roehrig, Schneider, & Nyachwaya, 2014), attitude and motivation (Hwang & Park, 2011; Sung & Hwang, 2013; Thurston et al., 2010; Umdu Topsakal, 2010) and cooperation skills (Mehta & Kulshrestha, 2014; Topping et al., 2011; Young et al., 2012). In addition, cooperative learning was found to improve students' inquiry skills (So & Ching, 2011). In this context, considering that argumentation improves inquiry skills (Öztürk & Okumuş, 2022), it is predicted that the integration of cooperative learning and argumentation will increase students' inquiry and critical thinking. There are some studies in which cooperative learning is applied together with argumentation in the literature (Liu, Liu & Lin, 2019). For example, Liu et al. (2019) revealed that students' argumentation skills improved in collaborative environments even if they lacked prior knowledge. In another study, collaborative reasoning strategies in the argumentation process were effective in developing the argumentative decision-making skills of primary school students (Bayat et al., 2022). In the study of Li et al. (2023), the social dimension was addressed and the social regulation of learning in the process of collaborative argumentation between high and low-performing groups was investigated. In the process, low-performing students were found to face cognitive and socio-emotional difficulties. Based on the examples in the literature, when it is considered that the application of argumentation together with cooperative learning will have significant effects, it is important to design activities according to the levels and characteristics of

the students by integrating the methods. It has been stated that there are some studies on the application of argumentation together with cooperative learning. However, a study in which the cooperative RWA method and argumentation are handled together, and activity integration is made has not been seen in the literature. Unlike the studies in the literature, it was aimed to design argumentation-supported RWA activities in this study.

This study was aimed to design original argumentation-supported RWA activities that are suitable for the acquisitions of the "Sound and Features" unit of 6th grade and that will enable to teaching of many abstract concepts in the unit by concretizing them.

The research question is as follows: "Do the argumentation-supported RWA activities designed for the "Sound and Features" unit show sufficient features?"

The sub-problems are as follows:

1. What are the experts' opinions about argumentation-supported RWA activities?
2. What are the students' opinions about argumentation-supported RWA activities?

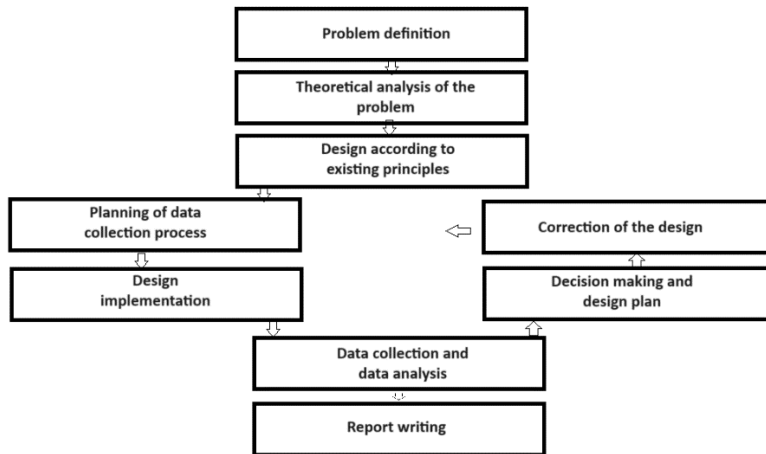
## Method

### Research Design

Design-based research (DBR) was used in this research. DBR is defined as the development of new designs to ensure that knowledge is created, developed, accepted, and sustained in learning environments (Edelson, 2001). Richey & Klein (2005) stated that DBR can be developed in two different ways, Type 1 and Type 2, according to the purpose and objective of the study. Type 1 involves processes such as product design, development, and evaluation, while Type 2 involves model development and evaluation. In this study, product design, development, and evaluation phases were included and since stakeholders such as students, designers, developers, and researchers were involved, Type 1 DBR was preferred.

**Figure 1**

*Research Process*



In this process, firstly, the problem was defined. After, a theoretical analysis of the problem was performed. Then, the design was prepared according to existing principles. After, the following steps were followed in order: planning of the data collection process, design implementation, data collection and data analyses, decision making, and design plan, correction of the design. After corrections were made, the following steps were followed in order: planning of the data collection process, design implementation, data collection and data analyses, and report writing.

**Study Group**

Two different groups were studied in the research. A purposive sampling method was used to determine the participants. The purposive sampling method is a probabilistic and non-selective method that allows in-depth research by selecting situations rich in information depending on the purpose of the study and enables the selection of the most ideal sample in the research (Büyüköztürk et al., 2019). In this study, the purposive sampling method was chosen because DBR was carried out in detail and it was a long-term study. The study was conducted with 10 academicians working in different universities in science education and 19 science teachers working in different schools. In addition, semi-structured interviews were conducted with four students after the activities were designed.

**Data Collection Tools**

Argumentation Activity Evaluation Form (AAEF) was used for teachers and academicians and Semi-Structured Interview Form (SSIF) was used for students. While preparing the questions in the forms, previously prepared evaluation forms, literature, and semi-structured interview forms were utilized. The opinions of science education experts were taken for the developed forms, the deficiencies of the forms were completed and the questions in the forms were finalized.

**Development the AAEF**

Firstly, to evaluate the activities in the AAEF, the criteria of the appropriateness of the content to argumentation and RWA method, appropriateness in terms of design, its contribution to the lesson and teaching, and its contribution to the teacher/student were determined.

There are 56 items and three sections in the form: "suitability to the method", " design/contribution to the process", and "contribution to the teacher/student".

- Section 1: Relevance of activities to argumentation and RWA (10 items)
- Section 2: Suitability of the activities in terms of design and their contribution to the course/teaching (19 items)

### Section 3: Contribution of the activities to the teacher and students (27 items)

Control items were added to each section to ensure the high validity and reliability of the form. Care was taken to ensure that the items did not contain direction, were easy to understand by the participants, and had a positive sentence structure. These items helped to increase the scope of the criteria and thus to obtain reliable and valid results in the evaluation of the activities. Expert opinion was taken for the validity of the form and the form was finalized by making the necessary arrangements. While the rows of the form consisted of the criteria and the items belonging to the criteria, the columns of the form consisted of the names of the activities prepared related to the 6th grade Sound and Features unit. The participants were asked to give one of the scores "1, 2, 3, 4, 5" to evaluate each activity according to the sub-items of the determined criterion. In addition, four open-ended questions were added to the last part of the form to get more detailed opinions from the participants about the prepared activities. In this section, the use of the activities, advantages, disadvantages, and any comments that the participants would like to add about the activities, are included.

### *Development the SSIF*

The SSIF was prepared to obtain 6th-grade students' opinions about the activities designed with the argumentation-supported RWA method. Firstly, in the introduction part of the form, brief information about the study was given and the reason why the opinions were taken was mentioned. The interviews were designed to last 15-20 minutes. In the SSIF, seven open-ended questions were included to determine their opinions about the content, comprehensibility, and visualization, whether they attracted interest, whether they were useful or not, how they affected their willingness to participate in the lesson, and the missing parts of the designed activities. Expert opinion was taken for the validity of the form and the form was finalized by making the necessary arrangements.

### Procedure

Firstly, the argumentation and RWA activities in the literature were examined. Then, the topics, content, achievements, and objectives of the Sound and Features unit in the science textbook prepared according to the 2018 Science Curriculum were examined in detail. Afterward, a plan was made for which activity could be used for which topic among the activities designed in the process of applying argumentation in science lessons. Later, argumentation-supported RWA activities were designed by utilizing the textbook and the literature. While designing the activities, features such as student level, achievements, being related to daily life, being clear and understandable, being original, being related to the concepts in the Sound and Features unit, being applicable, encouraging students to think and work in cooperation, and not taking much time were taken into consideration.

Afterward, the experts were asked to evaluate the activities for their suitability to the purpose, scope, design, and student level. Deficiencies in the activities were eliminated in line with the feedback and evaluations of the experts. This process was repeated several times until the activities were finalized to include the desired features. When the activities were ready, they were presented to 6th-grade students. The activities were presented to students who had already learned about the topic. Then, the opinions of the students were taken with the SSIF and the activities were finalized by making some arrangements in the activities. In total, six activities were designed. An example of the argumentation activities developed in the study is given in Figure 2.

**Figure 2**

*An Example of Argumentation Activities*

Activity-1: Competing theories

Group number:

Group members:



State the correct explanations for the facts given below and discuss with your group why you think this way.

**1. Sounds emanating from a sound source can be heard by anyone within the reach of sound. Which of the following best explains this situation?**

- a. Sound can be heard because it spreads linearly in all directions.
- b. Sound produced by the vibration of particles in the sound source can be heard because it spreads in waves in all directions.
- c. Sound can be heard because there are no factors preventing the sound from traveling in a straight line.

If none of the explanations given above explain your thoughts or explain them incompletely, please state your own thoughts below.

.....

.....

**2. Sound does not spread in all environments. Which of the following best explains this situation?**

- a. Sound needs a material medium to spread.
- b. Sound does not need to encounter matter to spread.
- c. There must be nothing in the environment for sound to spread.

If none of the explanations given above explain your thoughts or explain them incompletely, please state your own thoughts below.

.....

.....

**3. Particles are needed for sound to spread. Which of the following best explains this situation?**

- a. Particles are necessary because they spread with the sound.
- b. Particles are necessary because they spread sound by moving.
- c. Particles are necessary because they transmit the sound waves emanating from the sound source by vibrations.

If none of the explanations given above explain your thoughts or explain them incompletely, please state your own thoughts below.

.....

.....

**4. Sound spreads best and fastest in solids. Which of the following best explains this situation?**

- a. Since the particles in solids are immobile, it spreads best and fastest in solids.
- b. Since the distance between particles in solids is less than in liquids and gases, it spreads best and fastest in solids.
- c. Since the particles in solids are not separated from each other, they spread best and fastest in solids.

If none of the explanations given above explain your thoughts or explain them incompletely, please state your own thoughts below.

.....

.....

This designed argumentation activity was integrated into the implementation phase of the RWA method to be carried out as a group work.

**Data Analysis**

Descriptive analysis and content analysis methods were used for the data obtained from AAEF and content analysis was used for the data obtained from SSIF. After the teachers and academicians examined the activities designed for the implementation of the argumentation-supported RWA method, they were asked to score the activities by giving AAEF. The forms obtained were analyzed by the descriptive analysis method. The activities were finalized by making arrangements on the low-rated features of the activities. The data obtained from open-ended questions of the AAEF were content analyzed and themes and codes were created.

The data obtained from the interviews were grouped according to the emerging codes. The answers with the same meaning were grouped under a common code. The answers given by the students to the questions were given as direct quotations to reflect their views on the activities more effectively. While these quotations were given, the students were coded as S1, S2, S3, ... For reliability of the AAEF and SSIF, agreement analysis was done and a consensus was reached.

**Validity and Reliability**

- It was ensured that the questions contained a single judgment so that the participants would not misunderstand the questions and answer them incompletely.
- The forms were purified from language errors by taking expert opinion.
- The questions in the forms were prepared to cover the research questions.
- It was ensured that the research questions were associated with the data collection process and data analysis process.

**Findings**

**The Findings Obtained from the AAEF**

Participants' (teachers and academicians) opinions about the suitability of the content of the activities for argumentation which integrated the RWA process are presented in Table 1.

**Table 1**

*Participant Opinions on the Suitability of the Content of the Activities for Argumentation*

| *Item | Point** | Activity 1 |       | Activity 2 |       | Activity 3 |       | Activity 4 |       | Activity 5 |       | Activity 6 |       |
|-------|---------|------------|-------|------------|-------|------------|-------|------------|-------|------------|-------|------------|-------|
|       |         | f          | %     | f          | %     | f          | %     | f          | %     | f          | %     | f          | %     |
| 1     | 1       | -          | -     | -          | -     | -          | -     | -          | -     | -          | -     | -          | -     |
|       | 2       | 2          | 6.88  | 2          | 6.88  | 2          | 6.88  | 2          | 6.88  | 2          | 6.88  | 2          | 6.88  |
|       | 3       | 1          | 3.44  | 2          | 6.88  | 1          | 3.44  | 2          | 6.88  | 1          | 3.44  | 1          | 3.44  |
|       | 4       | 11         | 37.84 | 10         | 34.4  | 8          | 27.52 | 10         | 34.4  | 11         | 37.84 | 11         | 37.84 |
|       | 5       | 15         | 51.6  | 15         | 51.6  | 18         | 61.92 | 15         | 51.6  | 15         | 51.6  | 15         | 51.6  |
| 2     | 1       | -          | -     | -          | -     | -          | -     | -          | -     | -          | -     | -          | -     |
|       | 2       | 3          | 10.32 | 1          | 6.88  | 2          | 6.88  | 2          | 6.88  | 2          | 6.88  | 1          | 3.44  |
|       | 3       | 7          | 24.08 | 1          | 6.88  | 4          | 13.76 | 4          | 13.76 | 3          | 10.32 | 1          | 3.44  |
|       | 4       | 8          | 27.52 | 10         | 34.4  | 12         | 41.28 | 9          | 30.96 | 9          | 30.96 | 8          | 27.52 |
|       | 5       | 11         | 37.84 | 17         | 58.48 | 11         | 37.84 | 14         | 48.16 | 15         | 51.6  | 19         | 65.36 |
| 3     | 1       | -          | -     | -          | -     | -          | -     | -          | -     | -          | -     | -          | -     |
|       | 2       | 3          | 10.32 | 2          | 6.88  | 2          | 6.88  | 2          | 6.88  | 2          | 6.88  | 2          | 6.88  |
|       | 3       | 3          | 10.32 | 1          | 3.44  | 3          | 10.32 | 1          | 3.44  | 1          | 3.44  | 1          | 3.44  |
|       | 4       | 10         | 34.4  | 11         | 37.84 | 8          | 27.52 | 9          | 30.96 | 8          | 27.52 | 7          | 24.08 |
|       | 5       | 13         | 44.72 | 15         | 51.6  | 16         | 55.04 | 17         | 58.48 | 18         | 61.92 | 19         | 65.36 |
| 4     | 1       | -          | -     | -          | -     | -          | -     | -          | -     | -          | -     | -          | -     |
|       | 2       | 1          | 3.44  | 2          | 6.88  | 1          | 3.44  | 1          | 3.44  | 1          | 3.44  | 1          | 3.44  |
|       | 3       | 4          | 13.76 | 1          | 3.44  | 4          | 13.76 | 2          | 6.88  | 3          | 10.32 | 3          | 10.32 |
|       | 4       | 11         | 37.84 | 15         | 51.6  | 12         | 41.28 | 11         | 37.84 | 12         | 41.28 | 16         | 55.04 |
|       | 5       | 13         | 44.72 | 11         | 37.84 | 12         | 41.28 | 15         | 51.6  | 13         | 44.72 | 9          | 30.96 |
| 5     | 1       | -          | -     | -          | -     | -          | -     | -          | -     | -          | -     | -          | -     |
|       | 2       | 2          | 6.88  | 1          | 3.44  | 2          | 6.88  | 2          | 6.88  | 2          | 6.88  | 1          | 3.44  |
|       | 3       | 3          | 10.32 | 1          | 3.44  | -          | -     | 1          | 3.44  | 1          | 3.44  | -          | -     |
|       | 4       | 11         | 37.84 | 16         | 55.04 | 12         | 41.28 | 12         | 41.28 | 12         | 41.28 | 14         | 48.16 |
|       | 5       | 13         | 44.72 | 11         | 37.84 | 15         | 51.6  | 14         | 48.16 | 14         | 48.16 | 14         | 48.16 |

Note. \*Shows the items in the rubric: 1. The activity enables students to make claims and counterclaims about the subject. 2. The activity allows students to make observations while trying to prove their claims about the subject. 3. The activity enables students to reason by basing their claims about the subject on data. 4. The activity enables students to use scientific language while defending their claims about the subject. 5. The activity enables students to refute opposing claims while defending their claims about the subject.

\*\* Indicates a rating of the designed activity on a scale of 1-5.

In terms of the suitability of the content of the activities for argumentation, the participants' opinions were generally good. It is seen that the rate of giving 5 points is the highest for all activities designed. According to this, the activities enable students to make claims and counterclaims about the subject, allow students to make observations while trying to prove their claims about the subject, enable students to reason by basing their

claims about the subject on data, to use scientific language while defending their claims about the subject and to refute opposing claims while defending their claims about the subject.

In Table 2, participant opinions about the suitability of the content of the activities to the RWA method are presented.

**Table 2**

*Participant Opinions on the Compliance of the Content of the Activities with RWA*

| *Item | Point** | Activity 1 |       | Activity 2 |       | Activity 3 |       | Activity 4 |       | Activity 5 |       | Activity 6 |       |
|-------|---------|------------|-------|------------|-------|------------|-------|------------|-------|------------|-------|------------|-------|
|       |         | f          | %     | f          | %     | f          | %     | f          | %     | f          | %     | f          | %     |
| 6     | 1       | -          | -     | -          | -     | -          | -     | -          | -     | -          | -     | -          | -     |
|       | 2       | -          | -     | -          | -     | -          | -     | -          | -     | -          | -     | -          | -     |
|       | 3       | 4          | 13.76 | 2          | 6.88  | 2          | 6.88  | 1          | 3.44  | 2          | 6.88  | 3          | 10.32 |
|       | 4       | 10         | 34.4  | 10         | 34.4  | 10         | 34.4  | 13         | 44.72 | 10         | 34.4  | 9          | 30.96 |
|       | 5       | 15         | 51.6  | 17         | 58.48 | 17         | 58.48 | 15         | 51.6  | 17         | 58.48 | 17         | 58.48 |
| 7     | 1       | -          | -     | -          | -     | -          | -     | -          | -     | -          | -     | -          | -     |

|    |   |    |       |    |       |    |       |    |       |    |       |    |       |
|----|---|----|-------|----|-------|----|-------|----|-------|----|-------|----|-------|
|    | 2 | -  | -     | -  | -     | -  | -     | -  | -     | -  | -     | -  | -     |
|    | 3 | 2  | 6.88  | 2  | 6.88  | 2  | 6.88  | 1  | 3.44  | 2  | 6.88  | 1  | 3.44  |
|    | 4 | 11 | 37.84 | 11 | 37.84 | 12 | 41.28 | 14 | 48.16 | 12 | 41.28 | 14 | 48.16 |
|    | 5 | 16 | 55.04 | 16 | 55.04 | 15 | 51.6  | 14 | 48.16 | 15 | 51.6  | 14 | 48.16 |
| 8  | 1 | -  | -     | -  | -     | -  | -     | -  | -     | -  | -     | -  | -     |
|    | 2 | -  | -     | -  | -     | -  | -     | -  | -     | -  | -     | -  | -     |
|    | 3 | 2  | 6.88  | 2  | 6.88  | 4  | 13.76 | 2  | 6.88  | 1  | 3.44  | 2  | 6.88  |
|    | 4 | 12 | 41.28 | 13 | 44.72 | 10 | 34.4  | 14 | 48.16 | 13 | 44.72 | 10 | 34.4  |
|    | 5 | 15 | 51.6  | 14 | 48.16 | 15 | 51.6  | 13 | 44.72 | 15 | 51.6  | 17 | 58.48 |
| 9  | 1 | -  | -     | -  | -     | -  | -     | -  | -     | -  | -     | -  | -     |
|    | 2 | -  | -     | -  | -     | 1  | 3.44  | 1  | 3.44  | 1  | 3.44  | -  | -     |
|    | 3 | 4  | 13.76 | 2  | 6.88  | 2  | 6.88  | 1  | 3.44  | 1  | 3.44  | 1  | 3.44  |
|    | 4 | 8  | 27.52 | 13 | 44.72 | 9  | 30.96 | 11 | 37.84 | 12 | 41.28 | 13 | 44.72 |
|    | 5 | 17 | 58.48 | 14 | 48.16 | 17 | 58.48 | 16 | 55.04 | 15 | 51.6  | 15 | 51.6  |
| 10 | 1 | -  | -     | -  | -     | -  | -     | -  | -     | -  | -     | -  | -     |
|    | 2 | 1  | 3.44  | -  | -     | 1  | 3.44  | 1  | 3.44  | 1  | 3.44  | -  | -     |
|    | 3 | 3  | 10.32 | 2  | 6.88  | 2  | 6.88  | 3  | 10.32 | 3  | 10.32 | 3  | 10.32 |
|    | 4 | 7  | 24.08 | 9  | 30.96 | 11 | 37.84 | 7  | 24.08 | 6  | 20.64 | 7  | 24.08 |
|    | 5 | 18 | 61.92 | 18 | 61.92 | 15 | 51.6  | 18 | 61.92 | 19 | 65.36 | 19 | 65.36 |

Note. \* Shows the items in the rubric: 6. The activities in the reading, writing, and application stages draw the student's attention to the subject. 7. The activities in the reading, writing, and application steps help students to realize their prior knowledge. 8. The activities at the reading, writing, and application stages provide students with the opportunity to organize, understand, and express their knowledge and to create new products. 9. The activities in the implementation step provide students with the opportunity to communicate within and between groups and to encourage each other. 10. The activities carried out at the implementation stage allow students to examine their concept learning levels and create a discussion environment in the classroom. \*\* Indicates a rating of the designed activity on a scale of 1-5.

In terms of the suitability of the content of the activities to the RWA method, it is seen that the general opinions of the participants are good in Table 2. It is seen that the rate of giving 5 points is the highest for all activities designed. According to this, the activities in the reading, writing, and application stages drew the student's attention to the subject, helped students to realize their prior knowledge, and, provide students with the opportunity to organize, understand and express their knowledge and to create new

products. The activities in the implementation step provide students with the opportunity to communicate within and between groups to encourage each other allow students to examine their concept learning levels and create a discussion environment in the classroom.

The participant opinions about the suitability of the activities in terms of design are presented in Table 3.

**Table 3**

*Participant Opinions on the Appropriateness of the Activities in Terms of Design*

| *Item | Point** | Activity 1 |       | Activity 2 |       | Activity 3 |       | Activity 4 |       | Activity 5 |       | Activity 6 |       |
|-------|---------|------------|-------|------------|-------|------------|-------|------------|-------|------------|-------|------------|-------|
|       |         | f          | %     | f          | %     | f          | %     | f          | %     | f          | %     | f          | %     |
| 11    | 1       | -          | -     | -          | -     | -          | -     | -          | -     | -          | -     | -          | -     |
|       | 2       | -          | -     | -          | -     | -          | -     | -          | -     | -          | -     | -          | -     |
|       | 3       | 2          | 6.88  | 2          | 6.88  | 1          | 3.44  | 1          | 3.44  | 1          | 3.44  | 2          | 6.88  |
|       | 4       | 10         | 34.4  | 12         | 41.28 | 12         | 41.28 | 12         | 41.28 | 9          | 30.96 | 8          | 27.52 |
|       | 5       | 17         | 58.48 | 15         | 51.6  | 16         | 55.04 | 16         | 55.04 | 19         | 65.36 | 19         | 65.36 |
| 12    | 1       | -          | -     | -          | -     | -          | -     | -          | -     | -          | -     | -          | -     |
|       | 2       | 2          | 6.88  | 2          | 6.88  | 2          | 6.88  | 2          | 6.88  | 2          | 6.88  | 2          | 6.88  |
|       | 3       | 2          | 6.88  | 3          | 10.32 | 1          | 3.44  | 1          | 3.44  | 1          | 3.44  | 1          | 3.44  |
|       | 4       | 8          | 27.52 | 7          | 24.08 | 9          | 30.96 | 10         | 34.4  | 9          | 30.96 | 8          | 27.52 |
|       | 5       | 17         | 58.48 | 17         | 58.48 | 17         | 58.48 | 16         | 55.04 | 17         | 58.48 | 18         | 61.92 |
| 13    | 1       | -          | -     | -          | -     | -          | -     | -          | -     | -          | -     | -          | -     |
|       | 2       | 1          | 3.44  | -          | -     | 1          | 3.44  | 1          | 3.44  | 1          | 3.44  | 1          | 3.44  |
|       | 3       | 1          | 3.44  | 3          | 10.32 | 2          | 6.88  | -          | -     | 1          | 3.44  | 3          | 10.32 |
|       | 4       | 10         | 34.4  | 8          | 27.52 | 9          | 30.96 | 11         | 37.84 | 10         | 34.4  | 8          | 27.52 |



|    | 5 | 17 | 58.48 | 18 | 61.92 | 17 | 58.48 | 17 | 58.48 | 17 | 58.48 | 17 | 58.48 |
|----|---|----|-------|----|-------|----|-------|----|-------|----|-------|----|-------|
| 14 | 1 | -  | -     | -  | -     | -  | -     | -  | -     | -  | -     | -  | -     |
|    | 2 | -  | -     | -  | -     | -  | -     | 1  | 3.44  | -  | -     | -  | -     |
|    | 3 | 1  | 3.44  | 1  | 3.44  | -  | -     | -  | -     | 1  | 3.44  | 1  | 3.44  |
|    | 4 | 10 | 34.4  | 11 | 37.84 | 10 | 34.4  | 10 | 34.4  | 9  | 30.96 | 10 | 34.4  |
|    | 5 | 18 | 61.92 | 17 | 58.48 | 19 | 65.36 | 18 | 61.92 | 19 | 65.36 | 18 | 61.92 |
| 15 | 1 | -  | -     | -  | -     | -  | -     | -  | -     | -  | -     | -  | -     |
|    | 2 | -  | -     | 1  | 3.44  | -  | -     | 1  | 3.44  | -  | -     | -  | -     |
|    | 3 | 4  | 13.76 | 3  | 10.32 | 4  | 13.76 | 4  | 13.76 | 5  | 17.2  | 5  | 17.2  |
|    | 4 | 13 | 44.72 | 12 | 41.28 | 11 | 37.84 | 11 | 37.84 | 11 | 37.84 | 12 | 41.28 |
|    | 5 | 12 | 41.28 | 13 | 44.72 | 14 | 48.16 | 13 | 44.72 | 13 | 44.72 | 12 | 41.28 |
| 16 | 1 | -  | -     | -  | -     | -  | -     | -  | -     | -  | -     | -  | -     |
|    | 2 | -  | -     | 1  | 3.44  | -  | -     | -  | -     | -  | -     | -  | -     |
|    | 3 | 4  | 13.76 | 3  | 10.32 | 4  | 13.76 | 3  | 10.32 | 3  | 10.32 | 5  | 17.2  |
|    | 4 | 13 | 44.72 | 11 | 37.84 | 11 | 37.84 | 14 | 48.16 | 14 | 48.16 | 12 | 41.28 |
|    | 5 | 12 | 41.28 | 14 | 48.16 | 14 | 48.16 | 12 | 41.28 | 12 | 41.28 | 12 | 41.28 |
| 17 | 1 | -  | -     | -  | -     | -  | -     | -  | -     | -  | -     | -  | -     |
|    | 2 | -  | -     | -  | -     | -  | -     | 1  | 3.44  | 1  | 3.44  | 1  | 3.44  |
|    | 3 | 6  | 20.64 | 7  | 24.08 | 5  | 17.2  | 3  | 10.32 | 3  | 10.32 | 5  | 17.2  |
|    | 4 | 13 | 44.72 | 10 | 34.4  | 13 | 44.72 | 15 | 51.6  | 15 | 51.6  | 12 | 41.28 |
|    | 5 | 10 | 34.4  | 12 | 41.28 | 11 | 37.84 | 10 | 34.4  | 10 | 34.4  | 11 | 37.84 |
| 18 | 1 | -  | -     | -  | -     | -  | -     | -  | -     | -  | -     | -  | -     |
|    | 2 | -  | -     | -  | -     | -  | -     | -  | -     | -  | -     | 1  | 3.44  |
|    | 3 | 2  | 6.88  | 1  | 3.44  | 1  | 3.44  | -  | -     | 1  | 3.44  | 1  | 3.44  |
|    | 4 | 10 | 34.4  | 11 | 37.84 | 9  | 30.96 | 9  | 30.96 | 9  | 30.96 | 10 | 34.4  |
|    | 5 | 17 | 58.48 | 17 | 58.48 | 19 | 65.36 | 20 | 68.8  | 19 | 65.36 | 17 | 58.48 |
| 19 | 1 | -  | -     | -  | -     | -  | -     | -  | -     | -  | -     | -  | -     |
|    | 2 | -  | -     | -  | -     | -  | -     | -  | -     | -  | -     | -  | -     |
|    | 3 | 3  | 10.32 | 4  | 13.76 | 2  | 6.88  | 2  | 6.88  | 3  | 10.32 | 4  | 13.76 |
|    | 4 | 9  | 30.96 | 7  | 24.08 | 9  | 30.96 | 9  | 30.96 | 9  | 30.96 | 7  | 24.08 |
|    | 5 | 17 | 58.48 | 18 | 61.92 | 18 | 61.92 | 18 | 61.92 | 17 | 58.48 | 18 | 61.92 |

Note. \* Shows the items in the rubric: 11. The colors used in the activity are exaggerated and harmonious in a way to attracts students' attention. 12. Pictures, colors, signs, etc. were used in the activity where they should be emphasized. 13. The images used in the activity are clear and understandable. 14. The images used in the activity are suitable for the student level. 15. The images used in the activity are interesting. 16. The images used in the activity are in integrity with the subject. 17. The images used in the activity help to understand the subject. 18. The language used in the activity is appropriate to the student level, clear, and understandable. 19. The texts used in the activity are appropriate and legible in terms of font, font type, etc. \*\* Indicates a rating of the designed activity on a scale of 1-5.

According to Table 3, the general opinions of the participants about the suitability of the activities in terms of design are good. It is seen that the rate of giving 5 points is the highest for all activities designed. According to this, the colors used in the activities are exaggerated and harmonious in a way to attracts students' attention, and pictures, colors, signs, etc. were used in the activities where they should be emphasized. The images used in the activities are clear and understandable, suitable for the student level, interesting, in integrity with the subject, and, help to understand the subject. The language used in the activities is appropriate to the student's level, clear, and understandable. The texts used in the activities are appropriate and legible in terms of font, font type, etc. Some

suggestions of the participants about the suitability of the activities in terms of design are as follows:

*T12: If the number of pictures used in the activities is increased, the activity will be more interesting and it will be easier for the student to make comments.*

*T18: (For item 15) The texts can be reduced and more animated with pictures.*

*A7: I suggest that the sentences in the first paragraph of Activity 6 should be edited. As it is, it is difficult to understand. "When Damla was doing*

*her research, she noticed that the books usually had pictures of rooms with lots of furniture or bathrooms covered with tiles. However, she learned that when sound meets matter, the same things do not always*

*happen." these two sentences should be edited. Especially the first sentence.*

The participants' opinions about the contribution of the activities to the lesson/teaching are presented in Table 4.

**Table 4**

*Participant Opinions on the Contribution of Activities to The Lesson/Teaching*

| *Item | Point** | Activity 1 |       | Activity 2 |       | Activity 3 |       | Activity 4 |       | Activity 5 |       | Activity 6 |       |
|-------|---------|------------|-------|------------|-------|------------|-------|------------|-------|------------|-------|------------|-------|
|       |         | f          | %     | f          | %     | f          | %     | f          | %     | f          | %     | f          | %     |
| 20    | 1       | -          | -     | -          | -     | -          | -     | -          | -     | -          | -     | -          | -     |
|       | 2       | -          | -     | -          | -     | -          | -     | -          | -     | -          | -     | -          | -     |
|       | 3       | 1          | 3.44  | 1          | 3.44  | 1          | 3.44  | -          | -     | -          | -     | -          | -     |
|       | 4       | 12         | 41.28 | 8          | 27.52 | 10         | 34.40 | 11         | 37.84 | 12         | 41.28 | 11         | 37.84 |
|       | 5       | 16         | 55.04 | 20         | 68.8  | 18         | 61.92 | 18         | 61.92 | 17         | 58.48 | 18         | 61.92 |
| 21    | 1       | -          | -     | -          | -     | -          | -     | -          | -     | -          | -     | -          | -     |
|       | 2       | 1          | 3.44  | -          | -     | -          | -     | -          | -     | -          | -     | -          | -     |
|       | 3       | 5          | 17.2  | 3          | 10.32 | 4          | 13.76 | 2          | 6.88  | 3          | 10.32 | 3          | 10.32 |
|       | 4       | 9          | 30.96 | 6          | 20.64 | 7          | 24.08 | 10         | 34.4  | 9          | 30.96 | 7          | 24.08 |
|       | 5       | 14         | 48.16 | 20         | 68.8  | 18         | 61.92 | 17         | 58.48 | 17         | 58.48 | 19         | 65.36 |
| 22    | 1       | -          | -     | -          | -     | -          | -     | -          | -     | -          | -     | -          | -     |
|       | 2       | -          | -     | -          | -     | -          | -     | -          | -     | -          | -     | -          | -     |
|       | 3       | 1          | 3.44  | 1          | 3.44  | -          | -     | 1          | 3.44  | 1          | 3.44  | 1          | 3.44  |
|       | 4       | 11         | 37.84 | 9          | 30.96 | 11         | 37.84 | 8          | 27.52 | 8          | 27.52 | 7          | 24.08 |
|       | 5       | 17         | 58.48 | 19         | 65.36 | 18         | 61.92 | 20         | 68.8  | 20         | 68.8  | 21         | 72.24 |
| 23    | 1       | -          | -     | -          | -     | -          | -     | -          | -     | -          | -     | -          | -     |
|       | 2       | 1          | 3.44  | -          | -     | 1          | 3.44  | 1          | 3.44  | 1          | 3.44  | -          | -     |
|       | 3       | 1          | 3.44  | 2          | 6.88  | 1          | 3.44  | 1          | 3.44  | 1          | 3.44  | -          | -     |
|       | 4       | 7          | 24.08 | 7          | 24.08 | 8          | 27.52 | 10         | 34.4  | 7          | 24.08 | 9          | 30.96 |
|       | 5       | 20         | 68.8  | 20         | 68.8  | 19         | 65.36 | 17         | 58.48 | 20         | 68.8  | 20         | 68.8  |
| 24    | 1       | -          | -     | -          | -     | -          | -     | -          | -     | -          | -     | -          | -     |
|       | 2       | -          | -     | -          | -     | -          | -     | -          | -     | -          | -     | -          | -     |
|       | 3       | 1          | 3.44  | 1          | 3.44  | 1          | 3.44  | 1          | 3.44  | -          | -     | -          | -     |
|       | 4       | 11         | 37.84 | 12         | 41.28 | 12         | 41.28 | 13         | 44.72 | 12         | 41.28 | 12         | 41.28 |
|       | 5       | 17         | 58.48 | 16         | 55.04 | 16         | 55.04 | 15         | 51.6  | 17         | 58.48 | 17         | 58.48 |
| 25    | 1       | -          | -     | -          | -     | -          | -     | -          | -     | -          | -     | -          | -     |
|       | 2       | -          | -     | -          | -     | -          | -     | -          | -     | -          | -     | -          | -     |
|       | 3       | 2          | 6.88  | 1          | 3.44  | -          | -     | 1          | 3.44  | 2          | 6.88  | 1          | 3.44  |
|       | 4       | 7          | 24.08 | 9          | 30.96 | 10         | 34.4  | 9          | 30.96 | 8          | 27.52 | 8          | 27.52 |
|       | 5       | 20         | 68.8  | 19         | 65.36 | 19         | 65.36 | 19         | 65.36 | 19         | 65.36 | 20         | 68.8  |
| 26    | 1       | -          | -     | -          | -     | -          | -     | -          | -     | -          | -     | -          | -     |
|       | 2       | -          | -     | -          | -     | -          | -     | -          | -     | -          | -     | -          | -     |
|       | 3       | 2          | 6.88  | 2          | 6.88  | 2          | 6.88  | 1          | 3.44  | 1          | 3.44  | 2          | 6.88  |
|       | 4       | 12         | 41.28 | 11         | 37.84 | 12         | 41.28 | 14         | 48.16 | 13         | 44.72 | 10         | 34.4  |
|       | 5       | 15         | 51.6  | 16         | 55.04 | 15         | 51.6  | 14         | 48.16 | 15         | 51.6  | 17         | 58.48 |
| 27    | 1       | -          | -     | -          | -     | -          | -     | -          | -     | -          | -     | -          | -     |
|       | 2       | -          | -     | -          | -     | -          | -     | -          | -     | -          | -     | -          | -     |
|       | 3       | 2          | 6.88  | 2          | 6.88  | 3          | 10.32 | 2          | 6.88  | 1          | 3.44  | 1          | 3.44  |
|       | 4       | 10         | 34.4  | 8          | 27.52 | 7          | 24.08 | 8          | 27.52 | 7          | 24.08 | 9          | 30.96 |
|       | 5       | 17         | 58.48 | 19         | 65.36 | 18         | 61.92 | 18         | 61.92 | 20         | 68.8  | 19         | 65.36 |
| 28    | 1       | -          | -     | -          | -     | -          | -     | -          | -     | -          | -     | -          | -     |
|       | 2       | -          | -     | -          | -     | -          | -     | -          | -     | -          | -     | -          | -     |
|       | 3       | 2          | 6.88  | 3          | 10.32 | 2          | 6.88  | -          | -     | 1          | 3.44  | -          | -     |
|       | 4       | 6          | 20.64 | 5          | 17.2  | 7          | 24.08 | 7          | 24.08 | 6          | 20.64 | 7          | 24.08 |

|    |   |    |       |    |       |    |       |    |       |    |       |    |       |
|----|---|----|-------|----|-------|----|-------|----|-------|----|-------|----|-------|
|    | 5 | 21 | 72.24 | 21 | 72.24 | 20 | 68.8  | 22 | 75.68 | 22 | 75.68 | 22 | 75.68 |
|    | 1 | -  | -     | -  | -     | -  | -     | -  | -     | -  | -     | -  | -     |
|    | 2 | -  | -     | -  | -     | -  | -     | -  | -     | -  | -     | -  | -     |
|    | 3 | -  | -     | -  | -     | 1  | 3.44  | 1  | 3.44  | -  | -     | -  | -     |
|    | 4 | 8  | 27.52 | 9  | 30.96 | 9  | 30.96 | 9  | 30.96 | 10 | 34.4  | 8  | 27.52 |
| 29 | 5 | 21 | 72.24 | 20 | 68.8  | 19 | 65.36 | 19 | 65.36 | 19 | 65.36 | 21 | 72.24 |

Note. \* Shows the items in the rubric: **20.** The activity increases interest in the lesson. **21.** The activity concretizes abstract concepts related to the subject. **22.** The activity makes the lesson more efficient. **23.** The questions used in the activity provide a discussion environment in the classroom on scientific issues. **24.** The activity makes the lesson more organized and planned. **25.** The activity contributes to the more dynamic progress of the lesson. **26.** The activity creates rich learning experiences. **27.** The activity provides learning with real-life events. **28.** The activity provides an active classroom environment. **29.** The activity increases in-class communication. \*\* Indicates a rating of the designed activity on a scale of 1-5.

According to Table 4, the opinions of the participants about the contribution of the activities to the course/teaching are good. It is seen that the rate of giving 5 points is the highest for all activities designed. According to this, the activities increase interest in the lesson, concretize abstract concepts related to the subject, and, make the lesson more efficient. The questions used in the activities provide a discussion environment in the classroom on scientific issues. The activities make the lesson more organized and planned, contribute to more dynamic progress of the lesson, create rich learning experiences, provide learning with real-life events and an active classroom environment, and increase in-class communication. A suggestion about the

suitability of the activities in terms of design is as follows:

Suggestion for item 21;

*A3: In activity 2, when I read the first paragraph, I thought that he/she would combine the pieces in the set and make a musical instrument (I think you gave a visual of it, I think they call it a percussion instrument), but I did not see such a statement. I think you can mention this.*

Table 5 presents the opinions of the participants about the contribution of the activities to the teacher.

**Table 5**

*Participant Opinions on the Contribution of Activities to the Teacher*

| *Item | Point** | Activity 1 |       | Activity 2 |       | Activity 3 |       | Activity 4 |       | Activity 5 |       | Activity 6 |       |
|-------|---------|------------|-------|------------|-------|------------|-------|------------|-------|------------|-------|------------|-------|
|       |         | f          | %     | f          | %     | f          | %     | f          | %     | f          | %     | f          | %     |
| 30    | 1       | -          | -     | -          | -     | -          | -     | -          | -     | -          | -     | -          | -     |
|       | 2       | -          | -     | -          | -     | -          | -     | -          | -     | -          | -     | 1          | 3.44  |
|       | 3       | 2          | 6.88  | 1          | 3.44  | 2          | 6.88  | 1          | 3.44  | 1          | 3.44  | 1          | 3.44  |
|       | 4       | 10         | 34.4  | 11         | 37.84 | 9          | 30.96 | 10         | 34.4  | 9          | 30.96 | 9          | 30.96 |
|       | 5       | 17         | 58.48 | 17         | 58.48 | 18         | 61.92 | 18         | 61.92 | 19         | 65.36 | 18         | 61.92 |
| 31    | 1       | -          | -     | -          | -     | -          | -     | -          | -     | -          | -     | -          | -     |
|       | 2       | -          | -     | -          | -     | -          | -     | -          | -     | -          | -     | -          | -     |
|       | 3       | 4          | 13.76 | 4          | 13.76 | 4          | 13.76 | 4          | 13.76 | 4          | 13.76 | 4          | 13.76 |
|       | 4       | 14         | 48.16 | 13         | 44.72 | 12         | 41.28 | 12         | 41.28 | 11         | 37.84 | 12         | 41.28 |
|       | 5       | 11         | 37.84 | 12         | 41.28 | 13         | 44.72 | 13         | 44.72 | 14         | 48.16 | 13         | 44.72 |
| 32    | 1       | -          | -     | -          | -     | -          | -     | -          | -     | -          | -     | -          | -     |
|       | 2       | 1          | 3.44  | 1          | 3.44  | 1          | 3.44  | 1          | 3.44  | 1          | 3.44  | 1          | 3.44  |
|       | 3       | 2          | 6.88  | 3          | 10.32 | 2          | 6.88  | 3          | 10.32 | 4          | 13.76 | 4          | 13.76 |
|       | 4       | 13         | 44.72 | 12         | 41.28 | 14         | 48.16 | 12         | 41.28 | 11         | 37.84 | 10         | 34.4  |
|       | 5       | 13         | 44.72 | 13         | 44.72 | 12         | 41.28 | 13         | 44.72 | 13         | 44.72 | 14         | 48.16 |
| 33    | 1       | -          | -     | -          | -     | -          | -     | -          | -     | -          | -     | -          | -     |
|       | 2       | -          | -     | -          | -     | -          | -     | -          | -     | -          | -     | -          | -     |
|       | 3       | 3          | 10.32 | 3          | 10.32 | 2          | 6.88  | 1          | 3.44  | 3          | 10.32 | 3          | 10.32 |
|       | 4       | 11         | 37.84 | 10         | 34.4  | 11         | 37.84 | 10         | 34.4  | 8          | 27.52 | 9          | 30.96 |
|       | 5       | 15         | 51.6  | 16         | 55.04 | 16         | 55.04 | 18         | 61.92 | 18         | 61.92 | 17         | 58.48 |
| 34    | 1       | -          | -     | -          | -     | -          | -     | -          | -     | -          | -     | -          | -     |

|    |   |    |       |    |       |    |       |    |       |    |       |    |       |
|----|---|----|-------|----|-------|----|-------|----|-------|----|-------|----|-------|
|    | 2 | -  | -     | -  | -     | -  | -     | -  | -     | -  | -     | -  | -     |
|    | 3 | 3  | 10.32 | 2  | 6.88  | -  | -     | -  | -     | 2  | 6.88  | 1  | 3.44  |
|    | 4 | 8  | 27.52 | 9  | 30.96 | 9  | 30.96 | 9  | 30.96 | 9  | 30.96 | 10 | 34.4  |
|    | 5 | 18 | 61.92 | 18 | 61.92 | 20 | 68.8  | 20 | 68.8  | 18 | 61.92 | 18 | 61.92 |
| 35 | 1 | -  | -     | -  | -     | -  | -     | -  | -     | -  | -     | -  | -     |
|    | 2 | -  | -     | -  | -     | -  | -     | -  | -     | -  | -     | -  | -     |
|    | 3 | 1  | 3.44  | 1  | 3.44  | 2  | 6.88  | -  | -     | 1  | 3.44  | 1  | 3.44  |
|    | 4 | 10 | 34.4  | 12 | 41.28 | 11 | 37.84 | 13 | 44.72 | 10 | 34.4  | 11 | 37.84 |
|    | 5 | 18 | 61.92 | 16 | 55.04 | 16 | 55.04 | 16 | 55.04 | 18 | 61.92 | 17 | 58.48 |
| 36 | 1 | -  | -     | -  | -     | -  | -     | -  | -     | -  | -     | -  | -     |
|    | 2 | -  | -     | -  | -     | -  | -     | -  | -     | -  | -     | -  | -     |
|    | 3 | 4  | 13.76 | 3  | 10.32 | 4  | 13.76 | 2  | 6.88  | 4  | 13.76 | 2  | 6.88  |
|    | 4 | 7  | 24.08 | 8  | 27.52 | 8  | 27.52 | 10 | 34.4  | 8  | 27.52 | 10 | 34.4  |
|    | 5 | 18 | 61.92 | 18 | 61.92 | 17 | 58.48 | 17 | 58.48 | 17 | 58.48 | 17 | 58.48 |
| 37 | 1 | -  | -     | -  | -     | -  | -     | -  | -     | -  | -     | -  | -     |
|    | 2 | -  | -     | -  | -     | -  | -     | -  | -     | -  | -     | -  | -     |
|    | 3 | 2  | 6.88  | 2  | 6.88  | 1  | 3.44  | 2  | 6.88  | 2  | 6.88  | 2  | 6.88  |
|    | 4 | 8  | 27.52 | 8  | 27.52 | 10 | 34.4  | 8  | 27.52 | 10 | 34.4  | 9  | 30.96 |
|    | 5 | 19 | 65.36 | 19 | 65.36 | 18 | 61.92 | 19 | 65.36 | 17 | 58.48 | 18 | 61.92 |

Note. \* Shows the items in the rubric: **30.** The activity makes it easier for the teacher to get feedback from the students. **31.** With the activity, the teacher makes an accurate measurement and evaluation. **32.** The activity helps the teacher to use time effectively. **33.** The activity helps the teacher to conduct the lesson in a planned way. **34.** The activity acts as an auxiliary tool that the teacher can use in the lesson. **35.** The activity enables the teacher to conduct the lesson more effectively. **36.** The activity creates a resource that the teacher can use again. **37.** The activity helps the teacher in classroom management by facilitating students' participation in discussions and enabling cooperative work. \*\* Indicates a rating of the designed activity on a scale of 1-5.

According to Table 5, the opinions of the participants about the contribution of the activities to the teacher are good. It is seen that the rate of giving 5 points is the highest for all activities designed. According to this, the activities make it easier for the teacher to get feedback from the students, help the teacher to use time effectively, in classroom management by facilitating students' participation in discussions and enabling cooperative work, and conduct the lesson in a planned way, act as an auxiliary tool that the teacher can use in the lesson, enable the teacher to conduct the lesson more effectively and create a resource that the teacher can use again. With the activities, the

teacher makes an accurate measurement and evaluation. A suggestion about the suitability of the activities in terms of the contribution of the teacher is as follows:

Suggestion for item 32;

*T5: To avoid time problems, some activities can be done at home in advance and opened for discussion in the classroom. If they were done in the form of discussing and writing, the lesson time would be a problem.*

The participants' opinions about the contribution of the activities to the students are presented in Table 6.

**Table 6**

*Participant Opinions on the Contribution of Activities to Students*

| *Item | Point** | Activity 1 |       | Activity 2 |       | Activity 3 |       | Activity 4 |       | Activity 5 |       | Activity 6 |       |
|-------|---------|------------|-------|------------|-------|------------|-------|------------|-------|------------|-------|------------|-------|
|       |         | f          | %     | f          | %     | f          | %     | f          | %     | f          | %     | f          | %     |
| 38    | 1       | -          | -     | -          | -     | -          | -     | -          | -     | -          | -     | -          | -     |
|       | 2       | -          | -     | -          | -     | -          | -     | -          | -     | -          | -     | -          | -     |
|       | 3       | 2          | 6.88  | 2          | 6.88  | -          | -     | 1          | 3.44  | 1          | 3.44  | 1          | 3.44  |
|       | 4       | 10         | 34.4  | 11         | 37.84 | 12         | 41.28 | 13         | 44.72 | 12         | 41.28 | 10         | 34.4  |
|       | 5       | 17         | 58.48 | 16         | 55.04 | 17         | 58.48 | 15         | 51.6  | 16         | 55.04 | 18         | 61.92 |
| 39    | 1       | -          | -     | -          | -     | -          | -     | -          | -     | -          | -     | -          | -     |
|       | 2       | -          | -     | -          | -     | -          | -     | -          | -     | -          | -     | -          | -     |
|       | 3       | 1          | 3.44  | 1          | 3.44  | -          | -     | 1          | 3.44  | 1          | 3.44  | 1          | 3.44  |
|       | 4       | 9          | 30.96 | 8          | 27.52 | 11         | 37.84 | 9          | 30.96 | 10         | 34.4  | 9          | 30.96 |
|       | 5       | 19         | 65.36 | 20         | 68.8  | 18         | 61.92 | 19         | 65.36 | 18         | 61.92 | 19         | 65.36 |

|    |   |    |       |    |       |    |       |    |       |    |       |    |       |
|----|---|----|-------|----|-------|----|-------|----|-------|----|-------|----|-------|
| 40 | 1 | -  | -     | -  | -     | -  | -     | -  | -     | -  | -     | -  | -     |
|    | 2 | -  | -     | -  | -     | -  | -     | -  | -     | -  | -     | -  | -     |
|    | 3 | 1  | 3.44  | 1  | 3.44  | 1  | 3.44  | -  | -     | 1  | 3.44  | 2  | 6.88  |
|    | 4 | 11 | 37.84 | 9  | 30.96 | 12 | 41.28 | 13 | 44.72 | 13 | 44.72 | 8  | 27.52 |
|    | 5 | 17 | 58.48 | 19 | 65.36 | 16 | 55.04 | 16 | 55.04 | 15 | 51.6  | 19 | 65.36 |
| 41 | 1 | -  | -     | -  | -     | -  | -     | -  | -     | -  | -     | -  | -     |
|    | 2 | -  | -     | -  | -     | -  | -     | 1  | 3.44  | 1  | 3.44  | 1  | 3.44  |
|    | 3 | 3  | 10.32 | 3  | 10.32 | 3  | 10.32 | 2  | 6.88  | 2  | 6.88  | 3  | 10.32 |
|    | 4 | 7  | 24.08 | 7  | 24.08 | 7  | 24.08 | 8  | 27.52 | 8  | 27.52 | 7  | 24.08 |
|    | 5 | 19 | 65.36 | 19 | 65.36 | 19 | 65.36 | 18 | 61.92 | 18 | 61.92 | 18 | 61.92 |
| 42 | 1 | -  | -     | -  | -     | -  | -     | -  | -     | -  | -     | -  | -     |
|    | 2 | -  | -     | -  | -     | -  | -     | 1  | 3.44  | -  | -     | -  | -     |
|    | 3 | 1  | 3.44  | 1  | 3.44  | -  | -     | -  | -     | -  | -     | 1  | 3.44  |
|    | 4 | 11 | 37.84 | 11 | 37.84 | 13 | 44.72 | 11 | 37.84 | 11 | 37.84 | 10 | 34.4  |
|    | 5 | 17 | 58.48 | 17 | 58.48 | 16 | 55.04 | 17 | 58.48 | 18 | 61.92 | 18 | 61.92 |
| 43 | 1 | -  | -     | -  | -     | -  | -     | -  | -     | -  | -     | -  | -     |
|    | 2 | -  | -     | -  | -     | -  | -     | 2  | 6.88  | 1  | 3.44  | 1  | 3.44  |
|    | 3 | 2  | 6.88  | 1  | 3.44  | 1  | 3.44  | 3  | 10.32 | 2  | 6.88  | 2  | 6.88  |
|    | 4 | 13 | 44.72 | 12 | 41.28 | 11 | 37.84 | 7  | 24.08 | 10 | 34.4  | 8  | 27.52 |
|    | 5 | 14 | 48.16 | 16 | 55.04 | 17 | 58.48 | 17 | 58.48 | 16 | 55.04 | 18 | 61.92 |
| 44 | 1 | 1  | 3.44  | 1  | 3.44  | 1  | 3.44  | 1  | 3.44  | 1  | 3.44  | 1  | 3.44  |
|    | 2 | -  | -     | -  | -     | -  | -     | 1  | 3.44  | 1  | 3.44  | 1  | 3.44  |
|    | 3 | 1  | 3.44  | 1  | 3.44  | 1  | 3.44  | -  | -     | -  | -     | 1  | 3.44  |
|    | 4 | 10 | 34.4  | 9  | 30.96 | 11 | 37.84 | 12 | 41.28 | 11 | 37.84 | 9  | 30.96 |
|    | 5 | 17 | 58.48 | 18 | 61.92 | 16 | 55.04 | 15 | 51.6  | 16 | 55.04 | 17 | 58.48 |
| 45 | 1 | -  | -     | -  | -     | -  | -     | -  | -     | -  | -     | -  | -     |
|    | 2 | -  | -     | -  | -     | -  | -     | 1  | 3.44  | -  | -     | 1  | 3.44  |
|    | 3 | -  | -     | 1  | 3.44  | 1  | 3.44  | 1  | 3.44  | 1  | 3.44  | 1  | 3.44  |
|    | 4 | 12 | 41.28 | 10 | 34.4  | 11 | 37.84 | 11 | 37.84 | 11 | 37.84 | 9  | 30.96 |
|    | 5 | 17 | 58.48 | 18 | 61.92 | 17 | 58.48 | 16 | 55.04 | 17 | 58.48 | 18 | 61.92 |
| 46 | 1 | -  | -     | -  | -     | -  | -     | -  | -     | -  | -     | -  | -     |
|    | 2 | -  | -     | -  | -     | -  | -     | 1  | 3.44  | 1  | 3.44  | -  | -     |
|    | 3 | 1  | 3.44  | 1  | 3.44  | 1  | 3.44  | 1  | 3.44  | 2  | 6.88  | 2  | 6.88  |
|    | 4 | 16 | 55.04 | 16 | 55.04 | 17 | 58.48 | 18 | 61.92 | 16 | 55.04 | 16 | 55.04 |
|    | 5 | 12 | 41.28 | 12 | 41.28 | 11 | 37.84 | 9  | 30.96 | 10 | 34.4  | 11 | 37.84 |
| 47 | 1 | -  | -     | -  | -     | -  | -     | -  | -     | -  | -     | -  | -     |
|    | 2 | 1  | 3.44  | 1  | 3.44  | 1  | 3.44  | 2  | 6.88  | 2  | 6.88  | 1  | 3.44  |
|    | 3 | 2  | 6.88  | 2  | 6.88  | 2  | 6.88  | 1  | 3.44  | 2  | 6.88  | 2  | 6.88  |
|    | 4 | 11 | 37.84 | 10 | 34.4  | 13 | 44.72 | 12 | 41.28 | 11 | 37.84 | 10 | 34.4  |
|    | 5 | 15 | 51.6  | 16 | 55.04 | 13 | 44.72 | 14 | 48.16 | 14 | 48.16 | 16 | 55.04 |
| 48 | 1 | -  | -     | -  | -     | -  | -     | -  | -     | -  | -     | -  | -     |
|    | 2 | 2  | 6.88  | 1  | 3.44  | 1  | 3.44  | 3  | 10.32 | 3  | 10.32 | 2  | 6.88  |
|    | 3 | 7  | 24.08 | 6  | 20.64 | 7  | 24.08 | 8  | 27.52 | 7  | 24.08 | 5  | 17.2  |
|    | 4 | 10 | 34.4  | 12 | 41.28 | 14 | 48.16 | 13 | 44.72 | 14 | 48.16 | 11 | 37.84 |
|    | 5 | 10 | 34.4  | 10 | 34.4  | 7  | 24.08 | 5  | 17.2  | 5  | 17.2  | 11 | 37.84 |
| 49 | 1 | -  | -     | -  | -     | -  | -     | -  | -     | -  | -     | -  | -     |
|    | 2 | -  | -     | -  | -     | 1  | 3.44  | -  | -     | -  | -     | -  | -     |
|    | 3 | 1  | 3.44  | 1  | 3.44  | -  | -     | -  | -     | 1  | 3.44  | 1  | 3.44  |
|    | 4 | 12 | 41.28 | 11 | 37.84 | 9  | 30.96 | 10 | 34.4  | 9  | 30.96 | 10 | 34.4  |
|    | 5 | 16 | 55.04 | 17 | 58.48 | 19 | 65.36 | 19 | 65.36 | 19 | 65.36 | 18 | 61.92 |
| 50 | 1 | -  | -     | -  | -     | -  | -     | -  | -     | -  | -     | -  | -     |
|    | 2 | -  | -     | -  | -     | -  | -     | -  | -     | -  | -     | -  | -     |
|    | 3 | 1  | 3.44  | 1  | 3.44  | 1  | 3.44  | 4  | 13.76 | 4  | 13.76 | 2  | 6.88  |
|    | 4 | 13 | 44.72 | 12 | 41.28 | 12 | 41.28 | 9  | 30.96 | 10 | 34.4  | 11 | 37.84 |
|    | 5 | 15 | 51.6  | 16 | 55.04 | 16 | 55.04 | 16 | 55.04 | 15 | 51.6  | 16 | 55.04 |
| 51 | 1 | -  | -     | -  | -     | -  | -     | -  | -     | -  | -     | -  | -     |
|    | 2 | 1  | 3.44  | 1  | 3.44  | 1  | 3.44  | 1  | 3.44  | 1  | 3.44  | 1  | 3.44  |
|    | 3 | 2  | 6.88  | 1  | 3.44  | 2  | 6.88  | 2  | 6.88  | 1  | 3.44  | 1  | 3.44  |

|    |   |    |       |    |       |    |       |    |       |    |       |    |       |
|----|---|----|-------|----|-------|----|-------|----|-------|----|-------|----|-------|
|    | 4 | 9  | 30.96 | 10 | 34.4  | 9  | 30.96 | 9  | 30.96 | 10 | 34.4  | 8  | 27.52 |
|    | 5 | 17 | 58.48 | 17 | 58.48 | 17 | 58.48 | 17 | 58.48 | 17 | 58.48 | 19 | 65.36 |
| 52 | 1 | -  | -     | -  | -     | -  | -     | -  | -     | -  | -     | -  | -     |
|    | 2 | -  | -     | -  | -     | -  | -     | 1  | 3.44  | 1  | 3.44  | -  | -     |
|    | 3 | 1  | 3.44  | 1  | 3.44  | -  | -     | 1  | 3.44  | 1  | 3.44  | 1  | 3.44  |
|    | 4 | 12 | 41.28 | 11 | 37.84 | 13 | 44.72 | 11 | 37.84 | 9  | 30.96 | 10 | 34.4  |
|    | 5 | 16 | 55.04 | 17 | 58.48 | 16 | 55.04 | 16 | 55.04 | 18 | 61.92 | 18 | 61.92 |
| 53 | 1 | -  | -     | -  | -     | -  | -     | -  | -     | -  | -     | -  | -     |
|    | 2 | 1  | 3.44  | 1  | 3.44  | 2  | 6.88  | 3  | 10.32 | 3  | 10.32 | 1  | 3.44  |
|    | 3 | 1  | 3.44  | -  | -     | 2  | 6.88  | 2  | 6.88  | 1  | 3.44  | 1  | 3.44  |
|    | 4 | 14 | 48.16 | 12 | 41.28 | 12 | 41.28 | 12 | 41.28 | 10 | 34.4  | 10 | 34.4  |
|    | 5 | 13 | 44.72 | 16 | 55.04 | 13 | 44.72 | 12 | 41.28 | 15 | 51.6  | 17 | 58.48 |
| 54 | 1 | -  | -     | -  | -     | -  | -     | -  | -     | -  | -     | -  | -     |
|    | 2 | -  | -     | -  | -     | -  | -     | 1  | 3.44  | 1  | 3.44  | -  | -     |
|    | 3 | 2  | 6.88  | 2  | 6.88  | 2  | 6.88  | 3  | 10.32 | 2  | 6.88  | 2  | 6.88  |
|    | 4 | 11 | 37.84 | 10 | 34.4  | 11 | 37.84 | 9  | 30.96 | 9  | 30.96 | 10 | 34.4  |
|    | 5 | 16 | 55.04 | 17 | 58.48 | 16 | 55.04 | 16 | 55.04 | 17 | 58.48 | 17 | 58.48 |
| 55 | 1 | -  | -     | -  | -     | -  | -     | -  | -     | -  | -     | -  | -     |
|    | 2 | -  | -     | -  | -     | -  | -     | 1  | 3.44  | 1  | 3.44  | -  | -     |
|    | 3 | 2  | 6.88  | 1  | 3.44  | 2  | 6.88  | 3  | 10.32 | 3  | 10.32 | 2  | 6.88  |
|    | 4 | 12 | 41.28 | 13 | 44.72 | 13 | 44.72 | 11 | 37.84 | 10 | 34.4  | 10 | 34.4  |
|    | 5 | 15 | 51.6  | 15 | 51.6  | 14 | 48.16 | 14 | 48.16 | 15 | 51.6  | 17 | 58.48 |
| 56 | 1 | -  | -     | -  | -     | -  | -     | -  | -     | -  | -     | -  | -     |
|    | 2 | -  | -     | -  | -     | -  | -     | 1  | 3.44  | 1  | 3.44  | -  | -     |
|    | 3 | 2  | 6.88  | 1  | 3.44  | 2  | 6.88  | 2  | 6.88  | 1  | 3.44  | 2  | 6.88  |
|    | 4 | 11 | 37.84 | 12 | 41.28 | 11 | 37.84 | 10 | 34.4  | 11 | 37.84 | 10 | 34.4  |
|    | 5 | 16 | 55.04 | 16 | 55.04 | 16 | 55.04 | 16 | 55.04 | 16 | 55.04 | 17 | 58.48 |

Note. \* Shows the items in the rubric: 38. Activities at the reading, writing, and application stages allow students to work collaboratively with positive dependency, face-to-face interaction, and individual responsibility. 39. The activity ensures the active participation of students in the lesson. 40. The activity increases students' interest and curiosity towards the lesson and the subject. 41. The activity helps to reveal students' prior knowledge. 42. The activity strengthens communication among students. 43. The activity helps students to access information on their own. 44. The activity supports students to do cooperative work. 45. The activity enables students to complete the work with positive dependency and face-to-face interaction. 46. The activity increases students' sense of responsibility towards each other. 47. The activity encourages students to use scientific discussion methods. 48. The activity enables students to produce an original product. 49. The activity helps students to improve the subject. 50. The activity provides permanent learning in students. 51. The activity helps students to use the information they have learned in their daily lives. 52. The activity removes the student from memorization. 53. The activity provides students with the opportunity to learn by doing and experiencing. 54. The activity increases students' inquiry skills. 55. The activity increases students' critical thinking skills. 56. The activity increases students' reasoning skills.\*\* Indicates a rating of the designed activity on a scale of 1-5.

According to Table 6, the participants gave mostly high scores about the contribution of the activities to the lesson/teaching. It is seen that the rate of giving 5 points is the highest for all activities designed. According to this, the activities at the reading, writing, and application stage allow students to work collaboratively with positive dependency, face-to-face interaction, and individual responsibility, ensure active participation of students in the lesson, increase students' interest and curiosity towards the lesson and the subject, help to reveal students' prior knowledge and students to access information on their own. In addition, the activities strengthen communication among students, support students to do cooperative work, enable students to complete the work with positive dependency and face-to-face

interaction, and increase students' sense of responsibility towards each other. Also, the activities encourage students to use scientific discussion methods, enable students to produce an original product, help students to improve the subject and use the information they have learned in their daily lives, provide permanent learning in students, and students the opportunity to learn by doing and experiencing, remove the student from memorization, and increase students' inquiry, critical thinking and reasoning skills. The answers given by the participants to the open-ended questions in the EAF were also analyzed. In the first question, the participants were asked "Would you like to use these activities prepared by the argumentation-supported RWA method in your lesson? Why?" question was asked. The opinions of

the participants about the first question are given in Table 7.

**Table 7**

*The Views of the Participants on the First Question*

| Answers    | Participants   | Some explanations  |
|------------|--|--|
| Yes        | A1, A2, A3, A4, A7, A10, T1, T2, T3, T4, T5, T6, T7, T8, T10, T11, T12, T13, T14, T15, T16, T17, T18 | <i>A1: If I had been a science teacher, I would want to use it. Argumentation is a model emphasized in the 2018 curriculum. Teachers do not know much about the implementation process. For this reason, I think ready-made materials would also facilitate the lesson process.</i><br><i>T1: Yes, I would like to use it because it provides students with the opportunity to learn by doing and experiencing, increases their reasoning skills, and creates different approaches to the events taking place around them in a sense of curiosity.</i><br><i>T5: I would like to use it in general. Because we can encourage students to participate in lessons. It contributes to students in terms of reasoning, self-expression, and speaking bravely in public. First of all, I think that judgment skills should be developed at a young age.</i><br><i>T8: Yes. Because I think it will make a great contribution to students' permanent learning.</i> |
| No         | A5   | <i>A5: No</i>  |
| Unanswered | A6, A9, T9   | -  |

It is understood that the vast majority of the participants liked the activities and wanted to use them in their lessons from Table 7. According to the opinions of the participants, the designed activities will provide permanent learning and reinforcement of what has been learned, facilitate the teaching and understanding of the lesson, improve students' reasoning skills, provide students with the opportunity to participate actively in the lesson and express

themselves comfortably, and enrich students' learning experiences and increase their desire to learn.

In the second question, the participants were asked "What do you think are the advantages of teaching activities prepared according to argumentation-supported RWA?" The opinions of the participants about the second question are given in Table 8.

**Table 8**

*The Views of the Participants on the Second Question*

| Themes           | Codes                     | Participants                                       | Some explanations   |
|------------------|---------------------------|--|---|
| Thinking skills  | Reasoning                 | A1   | <i>A1: Argumentation increases students' reasoning, inquiry, and critical thinking skills.</i>  |
|                  | Critical thinking         | A1, A2   |   |
|                  | Inquiry                   | A1, A2, A8, A10, T15                               | <i>A8: Argumentation allows students to present evidence-based ideas and to support or refute different ideas. Thus, they can make a scientific inquiry and especially develop their thinking skills.</i> |
|                  | Decision-making           | A2   | <i>A2: Argumentation supports critical and inquiry thinking, scientific thinking, and multi-criteria decision-making skills.</i>  |
| Working together | Scientific thinking       | A2, A3   | <i>A3: The most important advantage is that it includes a lot of questions and activities that encourage students to think scientifically.</i>  |
|                  | Cooperation/communication | A1, A3, A5, A7, A8, A10, T1, T5, T6, T15, T16, T17 | <i>T1: It helps students to work together and increase their academic knowledge by making use of each other's ideas.</i>  |
|                  | Respect                   | A8, A10  | <i>T8: Group work and cooperation help students learn from each other, learn that not everyone has the same opinion, and learn to respect others' opinions.</i>   |

|             |                               |  |   |
|-------------|-------------------------------|--|---|
|             | Empathy                       | T16, T17                               | <i>T16: Provides communication, and empathy and facilitates learning.</i>   |
| Participate | Responsibility                | A1, A3, T4                             | <i>T4: Students take responsibility.</i>  |
|             | Active                        | A4, T2, T5, T8, T11, T12, T13, T15     | <i>T15: Students being active both individually and in the group increases efficiency.</i>  |
|             | Daily life                    | A3, T8, T18                            | <i>T8: Advantages such as permanent learning, learning by doing, learning by doing, suitability to our daily life, and concretization.</i>  |
|             | Interest                      | A7, T2, T5                             | <i>A7: Helping students to see the main framework of the subject, serving to eliminate misunderstandings in the subject by focusing on them, being organized in a way to attract students' interest, helping permanent learning of the subject, saving the lesson from monotony, and increasing the interaction between students.</i> |
|             | Motivation                    | A4                                     | <i>A4: Provide permanent learning, motivate learning, provide learning by doing and experiencing, provide active participation</i>  |
| Learning    | Concrete                      | A3, T8                                 | <i>T8: Advantages such as permanent learning, learning by doing, learning by doing, suitability to our daily life, and concretization.</i>  |
|             | Permanent                     | A3, A4, A7, T7, T8, T10, T12, T14, T17 | <i>T12: Permanence, effective learning, and keeping students active in the course</i>   |
|             | Learning/ Conceptual learning | A7, T7, T16                            | <i>T16: Provides communication, and empathy and facilitates learning.</i>   |
| Unanswered  |                               | A6, A9, T3, T9                         | -   |

According to Table 8, the most important points emphasized by the participants about the features of the designed activities were cooperation, active learning, inquiry, and permanent learning. In the third question, the participants were asked "What

do you think are the disadvantages of teaching activities prepared according to the argumentation-supported RWA method?". The opinions of the participants about the third question are given in Table 9.

**Table 9**

*The Views of the Participants on the Third Question*

| Themes      | Codes               | Participants     | Some explanations   |
|-------------|---------------------|------------------|---|
| Arrangement | In RWA              | A1               | <i>A1: For RWA, you can reorganize the reading and writing parts. When we get the activities ready from a source, sometimes it may not be the way we want.</i>  |
|             | Groups              | T1               | <i>T1: If it is not well organized, a learning environment cannot be created with incompatible groups and students cannot actively participate.</i>   |
|             | Long texts          | T18              | <i>T18: There are very long texts.</i>  |
| Process     | Argumentation       | A1               | <i>A1: Argumentation is a difficult model. Students should be well-monitored during the implementation process. It should be ensured that the discussions progress without getting stuck at a point.</i>  |
|             | RWA                 | A1, A10, T7, T15 | <i>T7: The fact that cooperation cannot be ensured sufficiently, that there is not enough information about the formation of groups, that the leading students in the class will try to answer the questions in some activities alone, and that other students will be negatively affected by this situation.</i> |
| Skills      | Higher order skills | A2               | <i>A2: Since it predicts predominantly high-level skills, students may get bored and develop a negative attitude in the process.</i>  |



|                      |  |  |
|----------------------|--|--|
| Time                 | A3, A7, A8, T4, T5, T6, T8, T10, T11, T16, T17 | A8: <i>If the activities require students to provide evidence based on data, it may require time for students to collect the data. For students who are not used to these activities, it may be useful to do an orientation exercise at the first stage.</i><br>T5: <i>The biggest problem in doing these activities is the duration of the lesson, which may not be sufficient for each student to speak effectively.</i> |
| Planning             | A4, T1   | A4: <i>If not implemented in a planned manner, it can create chaos.</i>  |
| Classroom management | A7, T2, T13, T15                               | T13: <i>It is difficult to implement in crowded classes. In addition, it may cause problems in classroom management while teaching in classes with heterogeneous readiness levels.</i>   |
| Knowledge            | Prior knowledge                                | A7: <i>Students' prior knowledge about the subject should be taken into consideration.</i>   |
|                      | Generating ideas                               | T15: <i>In the discussion part, they may have difficulty producing ideas that will ensure the continuation of the process.</i>   |
| Unanswered           | A5, A6, A9, T3, T9, T14                        |  |

A significant number of the participants thought that the activities were disadvantageous in terms of taking time. In addition, the participants stated that there may be disadvantages such as difficulty in class control in the activities, boredom of the students because it predicts high-level skills, some students being too active and some

students being passive as a result of not forming and organizing the groups well.

In the fourth question, the participants were asked "Is there anything you would like to state or add about the activities you evaluated?". The opinions of the participants about the fourth question are given in Table 10.

**Table 10**

*The Views of the Participants on the Fourth Question*

|                | Themes    | Codes          | Participants   | Some explanations  |
|----------------|-----------|----------------|--|--|
| Suggestions    | Stylistic | Figures        | A1, A3, A7, T12, T18   | T12: <i>If the pictures used in the activities are increased, it will be more interesting and it will be easier for the student to make comments.</i>  |
|                |           | Images         | A1, A3, A7   | A1: <i>The shapes and pictures in the activities could be better.</i>  |
|                |           | Shape<br>Color | A3<br>A3   | A3: <i>Outer frame not centered on the page.</i><br>A3: <i>In activity 4, make the frame of the speech bubble magenta, and erase the inner filling color (it will be dark when printed out).</i> |
|                | Spelling  | Semantic       | A1, A3, A7, T7   | A1: <i>In activity 6, in the last paragraph, the sentence beginning with "As a result of this" should be removed.</i>  |
|                |           | Explanations   | A1, A3   | A1: <i>In activity 4, there is a column "Why do I think like this?". In the continuation of the instruction, the statement "and write why you think so" can be added.</i>                        |
| Implementation |           | T5             | T5: <i>To avoid time problems, some activities can be done at home in advance and discussed in the classroom. Time is a problem in the form of discussing and writing.</i> |  |

|               |               |  |   |
|---------------|---------------|--|---|
|               | Another       | A8, T15                                    | <i>T15: In the activities, students may be given some scientific information that they do not know and they may be interested in researching and discussing them.</i> |
| No suggestion | Well prepared | A2, A8, A10, T1, T2, T4, T6, T10, T11, T17 | <i>A2: There is no need to make any additions. It is very well prepared.</i>  |
|               | Empty         | A5, A6, A9, T3, T8, T9, T14, T16           | -   |

According to the answers of the participants, it is understood that most of them liked the activities, thought that they were prepared by their purpose, and that they would benefit from using them in the lesson. It was determined that there were some formal and semantic errors in the activities and there were sentences that needed to be corrected in some parts of the content.

**Findings Obtained from the SSIF**

Four 6<sup>th</sup>- grade students were interviewed about the argumentation-supported RWA activities designed for the 6th-grade "Sound and its Features" unit.

In the first question, the students were asked "What do you think about the content of the activity?". The answers of the students are given in Table 11

**Table 11**

*Students' Answers to the First Question*

| Activities | Themes   | Codes       | Participants   | Some explanations  |
|------------|----------|-------------|----------------|--|
| Activity 1 | Positive | Good        | S1,            | <i>S1: The content of the event was good. The content was as rich as possible. It was a bit similar to the skill-based questions, but it was easier than them.</i> |
|            |          | Detailed    | S2, S3         | <i>S3: The content describes the sound spreading in detail.</i>  |
|            |          | Compatible  | S4             | <i>S4: I liked the content because the subject and questions were compatible.</i>  |
| Activity 2 | Positive | Enjoyable   | S1             | <i>S1: The content was beautiful and entertaining. I enjoyed reading it.</i>   |
|            |          | Interesting | S2, S4         | <i>S2: I liked the content very much and found it interesting.</i>   |
|            |          | Detailed    | S3             | <i>S3: The content is good and the subject is conveyed in detail.</i>  |
| Activity 3 | Positive | Good        | S1, S2, S3, S4 | <i>S2: The content is good. I like it.</i>   |
| Activity 4 | Positive | Detailed    | S1, S2, S3     | <i>S2: Yes, the content is very detailed.</i>  |
|            |          | Good        | S4             | <i>S4: Including both correct and incorrect information in the content of the activity has improved the content.</i>   |
| Activity 5 | Positive | Enjoyable   | S1, S4         | <i>S1: I found the content of the activity very entertaining and did not want it to end while solving it.</i>  |
|            |          | Informative | S2             | <i>S2: The content is very informative.</i>  |
|            |          | Detailed    | S3             | <i>S3: The content is good because it gives the subject in detail.</i>   |
|            |          | Interesting | S4             | <i>S4: The content is entertaining and interesting.</i>  |
| Activity 6 | Positive | Enjoyable   | S1, S4         | <i>S4: The presentation of the content in the form of a story increased my desire to learn and I found it fun.</i>   |
|            |          | Good        | S2, S3         | <i>S2: The content is very good. I especially liked it because it was like a story.</i>  |

It is seen that the students' opinions about the activities were positive, and they found the activities beautiful, fun, detailed, interesting, informative, and compatible.

In the second question, the students were asked "Is the activity sufficiently clear and understandable? Explain". The answers of the students are given in Table 12.

**Table 12**

*Students' Answers to the Second Question*

| Activities | Answers    | Participants   | Some explanations  |
|------------|------------|----------------|--|
| Activity 1 | Yes        | S1, S2, S3, S4 | S1: I think it's clear and understandable enough.  |
|            | Suggestion | S2             | S2: It is clear and understandable enough. In question 2, in choice c, it would be better to write "no matter" instead of "nothing".   |
| Activity 2 | Yes        | S1, S2, S3, S4 | S3: Yes, it is understandable. No part's not clear.  |
| Activity 3 | Yes        | S2, S3, S4     | S2: Yes, it is understandable. Everything is clear thanks to the images and content.   |
|            | Partly     | S1             | S1: It is clear and understandable. Only the text given for the space is not very clear because it is like a riddle.   |
| Activity 4 | Yes        | S1, S2, S3, S4 | S4: It is sufficiently clear and understandable. I understood the content and all the questions.   |
| Activity 5 | Yes        | S1, S2, S3, S4 | S4: No part's not clear.   |
| Activity 6 | Yes        | S1, S2, S3, S4 | S1: Yes, it is understandable.   |
|            | Suggestion | S2             | S2: It is very clear and understandable. In the 1st paragraph, I could not understand the part called "covered with tiles", but it can be understood upon the teacher's explanation. |

Table 12 shows that the students found the activities clear and understandable. In the third question, the students were asked "What

do you think about the visuality of the activity?". The answers of the students are given in Table 13.

**Table 13**

*Students' Answers to the Third Question*

| Activities | Themes      | Codes       | Participants   | Some explanations   |
|------------|-------------|-------------|--|---|
| Activity 1 | Positive    | Good        | S1, S3, S4   | S4: Beautiful visuals.  |
|            |             | Interesting | S2   | S2: The visual is interesting.  |
|            |             | Simple      | S3   | S3: The visuals are good, but the picture is a bit below our age level.   |
|            | Encouraging | S4          | S4: The visuality is beautiful and encouraging to do the activity. |   |
| Negative   | Images      | S1          | S1: Overall good, but I found the images a bit scarce.             |   |
| Activity 2 | Positive    | Good        | S1, S2, S3, S4   | S1: I think the visuals are beautiful and relevant.   |
|            |             | Interesting | S1, S2, S3   | S2: The visual is interesting and encourages participation in the lesson.   |
|            |             | Encouraging | S2   |   |
|            |             | Compatible  | S4   | S4: The visuals are beautiful and in harmony with the content.  |
| Activity 3 | Positive    | Good        | S1, S2, S3, S4   | S2: The overall look is very good.  |
|            |             | Enjoyable   | S1, S2, S4   | S1: The visuals are very nice and the pictures are fun.   |
|            |             | Interesting | S2   | S2: The visuals are very fun and interesting.   |
|            |             | Compatible  | S3   | S3: The visuals are beautiful and in harmony with the content.  |
| Activity 4 | Positive    | Good        | S1, S2, S3, S4   | S4: Visuality is generally good. In the visual, the children standing side by side without any gaps reminded me of the information that sound spreads |

|            |          |             |                |   |
|------------|----------|-------------|----------------|---|
|            |          | Interesting | S2             | <i>faster in solids.</i><br><i>S2: The visuals are good, the picture is interesting and encourages cooperation.</i> |
| Activity 5 | Positive | Good        | S1, S2, S3, S4 | <i>S2: The visuals are beautiful.</i>   |
|            |          | Enjoyable   | S1             | <i>S1: The visuals are beautiful and the images make it fun.</i>  |
|            |          | Thinking    | S2, S3, S4     | <i>S3: Its visuality is beautiful and provides thinking on the subject.</i>   |
| Activity 6 | Positive | Good        | S1, S3, S4     | <i>S1: The visuals are very nice, fun, and related to the content.</i>  |
|            |          | Enjoyable   | S1             |   |
|            |          | Interesting | S2             | <i>S2: The visuals are interesting and relevant to the content.</i>   |
|            |          | Compatible  | S3, S4         | <i>S3: The visuals are beautiful and related to the subject.</i>  |

According to Table 13, the students found the visuals in the activities beautiful, fun, interesting, and compatible with the subject. In

the fourth question, the students were asked "Did the activity interest you? Which part attracted your attention the most?" The answers of the students are given in Table 14.

**Table 14**

*Students' Answers to the Fourth Question*

| Activities | Answers    | Participants   | Some explanations  |
|------------|------------|----------------|--|
| Activity 1 | Yes        | S1, S2, S3, S4 | <i>S2: Yes, I'm interested. I'm most interested in question 1.</i><br><i>S4: Yes, I'm interested. I was most interested in question 4. I was also interested in the fact that the questions encouraged thinking to find the most accurate information.</i>       |
|            | Suggestion | S3             | <i>S3: Yes, I was interested, but the visuals could have been a little more.</i>   |
| Activity 2 | Yes        | S1, S2, S3, S4 | <i>S3: Yes, I'm interested. I was especially interested that it was in the form of a story.</i><br><i>S4: Yes, I was interested. Zehra and Neslihan Hanım's explanation of the subject by designing an experiment, i.e. paragraph 3, attracted my attention.</i> |
|            | Yes        | S1, S2, S3, S4 | <i>S1: Yes, I'm interested. I was especially interested in making the substances talk.</i><br><i>S4: Yes, I'm interested. I was most interested in the questions related to the subject. I liked to think to find the answers while examining them.</i>          |
| Activity 4 | Yes        | S2, S3, S4     | <i>S2: Yes, I was interested. I was most interested in the fact that it was in the form of a "True-False" question and that it asked our opinion.</i>  |
|            | Partly     | S1             | <i>S1: It's not very interesting, but it's instructive.</i>  |
| Activity 5 | Yes        | S1, S2, S3, S4 | <i>S4: Yes, I was interested. I was especially interested in the 6th question, the question about ultrasound and sonar devices.</i>  |
| Activity 6 | Yes        | S1, S2, S3, S4 | <i>S3: Yes, I was interested. Especially in the last paragraph, I was interested in learning by living, that is, being in an environment related to the subject of sound.</i>  |

According to Table 14, the students mostly found the activities interesting. In the fifth question, students were asked "Does the

activity help you learn the subject? Why?" The answers of the students are given in Table 15.

**Table 15**

*Students' Answers to the Fifth Question*

| Activities | Themes | Codes         | Participants | Some explanations  |
|------------|--------|---------------|--------------|--|
| Activity 1 | Yes    | Content       | S1, S2       | <i>S1: Yes, it is useful. Because it has as rich a content as possible and the concepts of the subject are stated in a way that we can easily understand.</i>          |
|            |        | Thinking      | S3           | <i>S3: Yes, it is useful. Because it makes you think about the subject.</i>  |
|            |        | Reinforcement | S4           | <i>S4: Yes, it is useful. Because the subject is reinforced and learned better with activities.</i>  |
| Activity 2 | Yes    | Content       | S1, S2       | <i>S1: It helps me to learn the subject. Because the subject is summarized shortly and concisely with stories.</i>   |
|            |        | Explanatory   | S3           | <i>S3: Yes, it is useful. Because it was a very explanatory activity.</i>  |
|            |        | Enjoyable     | S4           | <i>S4: Yes, it is useful. She explained that different sounds come out of different substances like a story, and this enables the subject to be learned enjoyably.</i> |
| Activity 3 | Yes    | Enjoyable     | S1           | <i>S1: It helps me learn the subject. Because the visuals are fun and instructive.</i>   |
|            |        | Tutorial      | S1, S2       | <i>S2: Yes, it is useful. Both visuals and content explain how sound spreads in solid-liquid gas and space. Having true and false information made me think.</i>       |
|            |        | Thinking      | S3, S4       | <i>S3: Yes, it helps. Because the exercises encourage thinking.</i>  |
| Activity 4 | Yes    | Thinking      | S1, S2       | <i>S1: I think it will help me learn the subject because we determine whether some concepts in the activity are true or false.</i>                                     |
|            |        | Reinforcement | S2, S3, S4   | <i>S3: It is useful for learning as it provides repetition with "True-False" questions.</i>  |
|            |        | Enjoyable     | S4           | <i>S4: Yes, it is useful. Because doing activities is very enjoyable and helped me to improve the subject.</i>   |
| Activity 5 | Yes    | Thinking      | S1           | <i>S1: It helps me to learn the subject. Because she asked us to evaluate some concepts given in the activity.</i>   |
|            |        | Reinforcement | S3           | <i>S3: Yes, it is beneficial for learning as it reinforces the end of the subject.</i>   |
|            |        | Tutorial      | S2, S4       | <i>S2: Yes, it helps me to learn because it makes us think and includes information about the subject.</i>   |
| Activity 6 | Yes    | Reinforcement | S1           | <i>S1: It helps me to learn the subject. Because the story provided the subject to be repeated.</i>  |
|            |        | Tutorial      | S2, S4       | <i>S2: Yes, it is useful. Explaining the subject in the form of a story and giving detailed information in the last paragraph makes it easier to learn.</i>            |
|            |        | Examples      | S3           | <i>S3: Yes, it is useful because it includes examples related to the subject.</i>  |

According to Table 15, the students mentioned that the developed activities helped them to understand the subject, were informative, provoking, entertaining, and helped to reinforce the subject.

In the sixth question, the students were asked "Do you think that the activity will increase your willingness to participate in the lesson?". The answers of the students are given in Table 16.

**Table 16**

*Students' Answers to the sixth question*

| Activities | Themes | Codes       | Participants   | Some explanations   |
|------------|--------|-------------|--|---|
| Activity 1 | Yes    | Interesting | S2   | <i>S2: I was interested because it was so comprehensive.</i>  |
|            |        | Enjoyable   | S3, S4   | <i>S4: Yes, I was interested. Because I find it very entertaining to teach the lessons with activities.</i> |
|            | Partly | S1          | <i>S1: Yes, it did, but there was not much change.</i> |   |
| Activity 2 | Yes    |             | S1, S2   | <i>S1: Yes, it made me want to attend the lesson.</i>   |
|            |        | Enjoyable   | S3, S4   | <i>S4: Increased because the event was so much fun.</i>   |
| Activity 3 | Yes    | Enjoyable   | S1   | <i>S1: Yes, it increased my desire to attend the lesson. Because it was very fun.</i>                       |
|            |        | Active      | S2   | <i>S2: Yes. Because it makes me actively participate in the lesson.</i>                                     |
|            |        | Interesting | S3, S4   | <i>S3: Increased because it is presented differently.</i>   |
| Activity 4 | Yes    |             | S1, S2, S3   | <i>S1: Yes, it increased my willingness to participate in the lesson.</i>                                   |
|            |        | Enjoyable   | S4   | <i>S4: Yes, it increased because it made it fun.</i>  |
| Activity 5 | Yes    |             | S2   | <i>S2: Yes, it increased.</i>   |
|            |        | Opinion     | S1   | <i>S1: Yes, it made me want to attend the lesson. Because our thoughts were asked.</i>                      |
|            |        | Thinking    | S3   | <i>S3: Yes, it increased because it encouraged thinking.</i>  |
|            |        | Enjoyable   | S4   | <i>S4: Yes, it increased because it was fun.</i>  |
| Activity 6 | Yes    | Enjoyable   | S1, S4   | <i>S1: It made me want to participate in the lesson. Because it was very fun.</i>                           |
|            |        | Interesting | S2   | <i>S2: Yes, I was interested in the story form and the rich visuals.</i>                                    |
|            |        | Encourage   | S3   | <i>S3: Yes, it increased my desire for the lesson with its story form and encouraging discussion.</i>       |

According to the opinions of the students given in Table 16, the activities developed attracted the attention of the students, they found the activities fun and interesting, and they increased the students' willingness to participate in the lesson because they encouraged them to think.

In the seventh question, the students were asked "Are there any parts that you find missing in the activity? If yes, what are they?" The answers of the students are given in Table 17.

**Table 17**

*Students' Answers to the Seventh Question*

| Activities | Themes     | Participants   | Some explanations  |
|------------|------------|----------------|--|
| Activity 1 | No         | S1, S2, S3, S4 | <i>S4: Nothing is missing. I like it very much.</i>  |
|            | Suggestion | S1             | <i>S1: Nothing is missing, but there could have been a few more questions.</i>                     |
| Activity 2 | No         | S1, S2, S3, S4 | <i>S2: Nothing is missing. It was a very entertaining activity.</i>                                |
| Activity 3 | No         | S1, S2, S3, S4 | <i>S4: There are no deficiencies. It is sufficiently instructive and informative.</i>              |
| Activity 4 | No         | S1, S2, S3, S4 | <i>S2: No. Nothing is missing.</i>   |
| Activity 5 | No         | S1, S2, S3, S4 | <i>S4: No, it doesn't. It's very detailed and well-prepared.</i>                                   |
|            | Suggestion | S1             | <i>S1: There is no part that I find missing, but the number of questions may be a little high.</i> |
| Activity 6 | No         | S1, S2, S3, S4 | <i>S4: Everything is explained in the activity. Nothing is missing.</i>                            |

According to Table 17, the students found the activities sufficient. In addition, S1 had an opinion about increasing the number of questions in the first and fifth activities.

**Discussion on the Content of Activities**

According to the findings obtained from AAEF, the content of the activities was generally at a good level in terms of its

**Discussion and Conclusion**

suitability for argumentation and the RWA method. The contents of the activities were generally compatible with the sub-topics of the unit and appropriate to the nature of argumentation and RWA methods. In addition, the activities were designed in a way to encourage students to discuss and to provide observation opportunities while students were trying to make claims about the subject and prove these claims. Also, it was concluded that the activities developed are capable of enabling students to make reasoning by using scientific language. In addition, it is thought that the content of the activities developed can attract students' attention to the subject, help them to notice their prior knowledge, enable them to express their knowledge by organizing it and enable them to create new products while continuing their discussions with their groupmates. It is thought that this situation is because the subjects become more detailed, understandable, and interesting with the designed activities and encourage students to think scientifically.

The participants also expressed that the content of the designed activities should be more compatible with the visuals, different types of activities should be included, students should be encouraged to do more research and discussion by including scientific information that they do not know as well as information that they can easily access in daily life, and students should form theories by obtaining data themselves rather than asking their opinions about ready-made information. The idea that the harmony of the content and visuals of the activities is important for understanding the subject is similar to the studies of Akdeniz (2019), Kızırdırcı (2017), and Yıldırım (2014). Some changes were made to the content of the activities based on the recommendations received. Thanks to these changes, the contents of the activities have been made more interesting for the students. In this way, students can concentrate more on the subject and express their thoughts better.

Then, semi-structured interviews were conducted to obtain the opinions of the students. As a result of these interviews, it was concluded that the contents of the activities are compatible with the subject and

visuals, the contents are suitable for the level of the student, will increase the desire to participate in the lesson by attracting the student's interest, and will facilitate the learning of the subject by making learning fun. The well-planned content motivates students to participate actively in the lesson and contributes to the increase of course success. Some studies in the literature also support these results (Akdeniz, 2019; Erümit, 2016; Kızırdırcı, 2017; Taşpınar Şener, 2017; Yıldırım, 2014).

### Discussion on the Design of Activities

According to the findings obtained from AAEF, the activities were largely suitable for argumentation and the RWA method in terms of design. In addition, within the framework of the feedback of the participants, the designs of the activities were generally suitable and interesting for the level of the students, the visuals were designed in integrity with the subject, the visuals helped to understand the subject and the language used was clear and understandable. It is predicted that this situation will help students to establish a connection between the images and the subject, to focus on the subject better, to understand the concepts related to the subject easily, and to learn the subject both by having fun and permanently. In addition, some participants suggested that the images in the activities should be clear and understandable, the font should be appropriate for the age level, the images should be increased in some activities and some sentences in the activities should be in a way that students can understand more easily. By considering these suggestions, the page color, page frame, font, images, fill colors of the images, amount of images were changed and sentences that were difficult to understand in some activities were corrected. As a result of these changes, the activities were completed in terms of integrity, continuity, emphasis, alignment, and harmony, which are design principles. With this change, it was ensured that all the elements of the activities were related to each other, that the line, shape, form, structure, and color elements in the activities complemented each other, and that the elements in the activities were in a certain order and that the color, shape, and appearance were compatible with each other.

Similar results regarding the evaluation of activities in terms of design were also reached by Akdeniz (2019), Güler (2010), Yıldırım (2014) and Taşpınar Şener (2017).

Then, the opinions of the students were taken. As a result of these interviews, it was concluded that the designs of the activities were compatible with the content, the visuals were suitable for the student level, they would increase the student's desire to participate in the lesson by attracting the student's attention, and they would facilitate the learning of the subject by making learning fun. It is thought that students generally liked the activities in terms of design because of their visual and remarkable content. According to the feedback of the students, it is seen that they especially liked the designs. It is thought that the designed activities will increase the active participation of the students in the lesson, encourage discussion and co-operation, keep their curiosity alive, provide easier understanding of the concepts as they associate the concepts of the subject with the visuals, and facilitate their access to new information by using their prior knowledge.

### **Discussion on the Contribution of the Activities to the Lesson/Teaching**

According to the findings obtained from AAEF, it was seen that the activities were generally rated high in terms of their contribution to the lesson/teaching. According to the feedback, it was concluded that the 6th activity would contribute the most to the lesson. It is thought that this situation may be because visual elements were used more predominantly while designing the 6th activity, the content of the activity was more related to daily life and the content was given in the form of a story.

In addition, it was understood from the feedback that the activities would generally increase students' interest in the lesson, make the lesson efficient, regular, planned, and dynamic by concretizing abstract information about the subject, enable scientific discussion with the questions it contains, actively involve students in the lesson and provide a classroom environment where effective communication is established. This situation can be because the age level of

the students is more suitable for learning by seeing and doing, that they comprehend the subject better when the lesson is taught with activities, and that establishing effective communication and giving instant feedback facilitates focusing on the lesson. In addition to these, the activities created will contribute to the achievement of the course with both real-life events and rich learning experiences thanks to different activities. It is thought that the basis of this situation is that the contents of the activities are associated with the concepts used in daily life, the subject is explained in the form of a story, the subject is supported by known visuals, and it is presented in a simple and understandable language in a way that directs students to make comments. These results are supported by some studies examining the contribution of the designed activities to the lesson and teaching process. (Akdeniz, 2019; Erümit, 2016; Taşpınar Şener, 2017).

Then the opinions of the students were taken. As a result of these interviews, the students considered the contribution of the activities to the lesson/teaching positively. It was concluded that the developed activities would attract the students' attention, increase their willingness to participate in the lesson, and make learning fun. In addition, the activities will facilitate the learning of the subject and increase the success of the lesson. It is foreseen that these activities, which are developed at the student level and are remarkable, will contribute to the student's enjoyment of doing activities, expressing their ideas, expressing their thoughts freely without anyone's restriction and pressure, and teaching in communication with their friends.

### **Discussion on the Contribution of the Activities to the Teacher**

According to the findings obtained from AAEF, the activities were rated high in terms of their contribution to the teacher. Within the framework of the participants' opinions, it was predicted that the activities would make it easier for the teacher to receive feedback from the students and evaluate the students accurately and would enable the teacher to use time effectively by conducting the lesson in a planned manner. In addition, it was concluded that the activities will serve as



an auxiliary material that the teacher can use repeatedly in the lesson and facilitate classroom management by enabling students to participate in the discussion and work in cooperation. It is predicted that this situation will contribute to the teacher saving time, not having problems in classroom management, teaching the lesson without making a separate plan, realizing effective learning, and evaluating students easily in the process. Some participants suggested that the implementation of the activities may take a long time, the teacher may experience time constraints and the time should be planned very well. The reason for these thoughts may be that students should actively participate in the lessons in which activities will be used, each student's speed of understanding and doing the activity is different from the other, and teachers think that each topic will take more time than normal because it contains more activities compared to other methods. In addition, high-class size can be seen as an important problem for methods that require active participation. To prevent this situation, it is thought that well-planned lesson plans that take into account the achievements and duration of the lesson, students' levels, and class size will be effective.

### **Discussion on the Contribution of The Activities to the Students**

According to the findings obtained from AAEF, the activities developed were generally rated high in terms of their contribution to the students. According to the opinions of the participants, it was concluded that the 2nd and 6th activities would contribute more to the students. The reason for this situation may be that students have more fun while learning the subject in the form of real-life stories, they can express their thoughts better in these activities and these activities attract students' attention more and keep their curiosity alive.

It is thought that the activities increase students' active participation in the lesson and encourage discussion and cooperation. In this way, it is predicted that students' skills such as positive addiction, face-to-face interaction, individual responsibility, effective communication, collaborative work, inquiry, critical thinking,

and reasoning will increase. This situation is due to the use of argumentation and the RWA method together when designing the activities. Because argumentation and RWA not only facilitate the understanding of the lesson but also increase students' willingness to participate in the lesson and their sharing in the process of group work. Argumentation and cooperative learning are also important in gaining skills such as inquiry, critical thinking, and reasoning (Jiménez- Aleixandre & Erduran, 2008; Mehta & Kulshrestha, 2014; Öztürk & Okumuş, 2022; Ro *et al.*, 2020; So & Ching, 2011; Topping *et al.*, 2011; Young *et al.*, 2012). Some studies in the literature also support these results (Akönder, 2019; Altun, 2010; Balcı, 2015; Doğan *et al.*, 2015; Genç & Şahin, 2013; İnel, 2012; Kaplan Parsa, 2016; Kılıç *et al.*, 2016; Okumuş, 2017; Topping *et al.*, 2011; Young *et al.*, 2012). In addition, it is thought that the activities will help students to reveal their prior knowledge by keeping their curiosity alive, will provide permanent learning by reinforcing the subject, and will enable them to both move away from memorization and use the information they have learned in daily life as it provides learning by doing and experiencing. Similar results were also reached by Akönder (2019), Balcı (2015), Doğan *et al.* (2015), Erümit (2016), Kılıç *et al.* (2016), Kızırdırcı (2017), Maden (2019), Okumuş (2017), Taşpınar Şener (2017), Topping *et al.* (2011), Yıldırım (2014) and Young *et al.* (2012).

The argumentation-supported RWA activities designed in this study were organized within the framework of the opinions received from experts and students, and as a result, they were brought to the desired level in terms of content, design, suitability to the course/teaching, teacher, and student. It is thought that the designed activities can be successfully applied in the 6th grade "Sound and Features" unit.

### **Limitations and Implications**

Since this research was conducted during the pandemic and the education was online during the process, it was not possible to apply it in a large classroom environment. It is thought that repeating the study on a

student group for further research will give healthier results.

For further research, it would be effective to design and implement argumentation-supported RWA activities in different subjects and instructional levels. In addition, it is thought that the development and implementation of activities for different teaching methods and techniques that develop students' inquiry, critical thinking, and reasoning skills and enable them to relate to daily life within the framework of a design-based approach will contribute to the development of students' high-level thinking skills. Again, applied training can be given or action research studies can be designed to facilitate teachers to develop activities that they can apply in their lessons for methods such as argumentation that develop higher-order thinking skills.

#### Data Availability

The datasets generated during and/or analyzed during the current study are available from the corresponding author upon reasonable request.

#### Conflict of Interest

None

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