

# The Views of Secondary School Students on Entrepreneurship-Assisted Science Course

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## Abstract

The present study aims to investigate the views of secondary school students on an entrepreneurship-assisted science course. The study was carried out with the case study method, one of the qualitative research methods. The study data were collected with qualitative research techniques such as focus group interviews and diaries. The study group included 23 5th-grade students attending a secondary school located in Adıyaman urban center during the 2020-2021 academic year. The data were analyzed with content analysis. The study findings demonstrated that students considered the entrepreneurship-assisted science course and related practices as fun and interesting in the focus group interviews. Similarly, the diary entries revealed that the entrepreneurship-assisted science course and the activities were enjoyable according to the students and they liked these activities. Furthermore, it should be noted that the students mentioned entrepreneurship dimensions in both focus group interviews and diaries.

**Keywords:** entrepreneurship, science education, interview, diary

## 1. Introduction

The rapid population growth, employment needs, technological advances, financial competition, and scientific developments altered the qualified human profile that society requires. Thus, certain skills became increasingly prominent to cope with the challenges of the age. The acquisition of these skills called 21st-century skills is important for the nations to create new jobs and develop national industries; and thus, ensure economic development (National Research Council, 2010). Partnership for 21st Century Skills [P21] (2009) analyzed 21st-century skills in three main categories: Learning and Innovation Skills which include creativity, critical thinking, communication and collaboration, and problem-solving. Information, Media, and Technology Skills that include information, media, information, and communication (ICT) technologies literacy. Life and Career Skills that include entrepreneurship and self-management, flexibility and adaptability, leadership and responsibility, social and intercultural skills, and productivity and responsibility. Thus, for educational and professional achievement in the 21st century, communication, problem-solving, data query, creativity, critical thinking, collaboration, technological, self-management, social, leadership, and innovation skills, and flexibility, adaptability, and productivity are required (Eryılmaz & Uluyol, 2015).

National curricula aim to train open-minded, risk-taking, productive, motivated, creative, and flexible individuals (Turan Özpolat, 2020). Thus, certain skills, covering 21st-century skills, are targeted in the science course curriculum that was revised and implemented in 2018 (MoNE, 2018). The concept of “entrepreneurship”, which is among the above-mentioned skills, has been mentioned in economy, trade, and business since ancient times, although it was recently included in curricula (Deveci, 2018). There is no common definition in the literature; however, several definitions could be encountered. For instance, Muzyka, Koning, and Churchill (1995) defined entrepreneurship as a multidimensional process observed in various settings which could lead to economic changes through innovations developed by individuals that create or respond to valuable individual or social economic opportunities. Huber, Sloof, and Van Praag, (2012) and Arruti, (2016) described it as an individual’s ability to transform ideas into action, solve problems, take risks, innovate, be creative, make decisions, and take initiative. According to Hoit (2006), entrepreneurship is the process of combining creative and innovative ideas and exploring management and organizational skills to corporate individuals, funds, and resources to meet a preidentified need and create wealth. According to the Ministry of National Education (MoNE) Commission

(2012, p. 7), entrepreneurship entails the perception of the opportunities available in the environment, the development of dreams based on intuition, the transformation of the dreams into projects, implementation of these projects, development of innovations to facilitate human life and create wealth, taking risks, and seizing opportunities.

For a nation to be strong, it primarily needs a strong economy. A strong economy is developed and built by strong entrepreneurs. International recognition and prestige of a nation depend on the strength of its economy, which allows better employment, happiness, and quality of life, hence, prosperity (Armut & Kılınç, 2018). Trained entrepreneurs are a prerequisite for these developments. An entrepreneur is an individual, who aims to provide services or manufacture, or trade commodities demanded by society, establish a business for this purpose or committed to doing what is necessary to realize the business idea, and finally acquire the knowledge-skills, equipment, personnel, workplace, machinery, and financing required to achieve these goals (MoNE, 2006, p. 2). In the current competitive market conditions, it has been believed that only entrepreneurs who produce, love competition and implement innovations could achieve success. Thus, in the age of information and technology, several countries prioritize entrepreneurship and spend significant efforts to encourage entrepreneurship, especially among the young population (Çavdar, Cumhuri, Koç, & Doymuş, 2018).

Several studies reported that entrepreneurship is a behavioral change acquired with education and learning, as well as a genetic trait (Akyurt, 2018). Thus, it could be suggested that entrepreneurship could be supported by education or acquired via genetics. Furthermore, Peter Drucker, a prominent management scholar, argued that entrepreneurship was not magic or mystery and had nothing to do with genes. According to Drucker, entrepreneurship is a discipline and could be learned like any other discipline (As cited in Alberti, Sciascia, & Poli, 2004). Thus, it could be argued that entrepreneurship could be learned independently of genetic disposition. Selanik Ay and Acar (2016) reported that the science course was an effective discipline for the acquisition of entrepreneurship skills. Thus, the inclusion of several skills required for success in entrepreneurship in low-level science curricula would help students adopt innovation and creativity skills, and allow them to use science content knowledge to create various jobs in the future independent of their career choices (Mbanefo & Eboka, 2017). In this research, various project-like activities were included within the scope of the entrepreneurship-supported science course. Therefore, the project activities and products in the student statements refer to the activities and products in the entrepreneurship-supported science course in this study.

### *1.1 The Aim of the Study*

The present study aimed to determine the views of 5th-grade students on the entrepreneurship-assisted science course. The literature revealed that it would be important to conduct such a study to fill the gap in the literature since there were no studies on the topic. Thus, the following research questions were determined:

- 1) What are the views of 5th-grade students on the entrepreneurship-assisted science course?
- 2) What are the views of the 5th-grade students on the entrepreneurship-assisted science course based on their diary entries?

## **2. Method**

This section includes information on the research model, study group, data collection instrument, data analysis, data validity and reliability, and limitations.

### *2.1 The Research Model*

Case study, a qualitative research method, was adopted in the current study. Yıldırım and Şimşek (2021) described qualitative research as “a type of research where qualitative data collection techniques such as interviews, observations, and document analysis are employed, and a qualitative process is conducted to reveal the events and perceptions in their natural environment with a real and complete approach”. A case study has been defined as an intensive, systematic investigation of a single individual, group, community, or other units in which the researcher delves into data related to various variables (Heale & Twycross, 2018). In this study, the case study data were collected with focus group interviews and diary techniques.

### *2.2 The Study Group*

The study group included 23 5th-grade students (12 female and 11 male) attending a secondary school in Adıyaman urban center in Turkey during the 2020-2021 academic year. Three male students could not participate in the focus group interviews due to school changes, and the study was concluded with 20 students (12 female and 8 male). The study group was determined with convenience sampling, a purposive sampling method. Convenience sampling problems could be described as the assignment of easily accessible individuals without communication

(Patton, 2005).

### *2.3 Data Collection Instruments*

The study data were collected with focus group interviews and student diaries. Krueger and Casey (2014) described focus group interviews as a carefully designed discussion in an environment where individuals can freely express their views. The first version of the interview questions was based on the literature review. These questions were submitted to four field experts for the determination of scientific relevance, validity, and reliability. Field experts included two science specialists, one measurement and evaluation specialist, and one Turkish language specialist. The interview questions were revised and finalized based on expert opinion. The interviews were conducted in groups of four, with five students in each group. Interviews lasted about 30-35 minutes. Each interview was conducted in a suitable setting at school and all interviews were conducted on the same day. All interviews were recorded on video after the informed consent of the students was received. It was reported that recorded data were better and more beneficial than taking notes in qualitative research (Creswell, 2005). The author could examine the recorded data more carefully by listening to the recordings several times. Interview questions are presented in the appendices (See Appendix A).

Diaries include chronological self-expressions about individual experiences and judgments (Iskender, 2017). Furthermore, student diaries significantly help teachers monitor and evaluate student development and learning (Aydın, 2014). The participating students were asked to keep a diary about the Entrepreneurship-assisted Science Course (EASC) that included weekly entries. It was stated that they were free to write about their classroom experiences during the week, their thoughts on the covered topics, and anything they wanted to write or note. A sample student diary is presented in the appendices (See Appendix B).

### *2.4 Data Analysis*

The interview records were initially transcribed into MS Word documents and then both interview transcripts and student diaries were analyzed with content analysis, a qualitative data analysis method. Content analysis is an in-depth analysis of the collected data and allows the determination of the study themes and dimensions that could not be determined before (Strauss & Corbin, 1990). The study data were categorized into themes and codes. Coding aimed to create meaningful research data (Yıldırım & Şimşek, 2016). Participating students were coded as "S1...S23" for the privacy of the participants.

### *2.5 Validity and Reliability*

To ensure the study's validity, the questions were developed, and the data were presented meticulously. The questions were developed to ensure the trustworthiness of the study, focus group interviews and diaries are presented in detail and expert opinion was obtained to ensure transferability. Direct participant quotes are presented. The focus group interviews were conducted in an ideal length of time to ensure validity.

In the study, first the authors, and a measurement and evaluation expert analyzed the data separately, then compared the codes to reach a consensus. The Miles & Huberman (1994) intercoder reliability formula ( $\text{Reliability} = \frac{\text{Agreement}}{\text{Agreement} + \text{Disagreement}}$ ) was employed and the inter-coder agreement coefficient was determined as 91.9% for the focus group interviews and 94% for the student diaries.

## **3. Findings**

The findings section includes two sub-sections. In the first sub-section, the focus group interview findings are presented, and the student diary findings are presented in the second sub-section.

### *3.1 The Focus Group Interview Findings*

In this sub-section, the views of the participants on entrepreneurship, EASC, the benefits of entrepreneurship, EASC activities, the problems experienced during the EASC activities, the reflection of EASC on their daily lives, the social contribution of EASC, the teamwork activities conducted in the EASC, and themselves as future entrepreneurs are presented. The findings are presented in tables based on the main category, main theme, theme (sub-theme), and participants.

#### *3.1.1 Student Views on Entrepreneurship*

The student views on entrepreneurship are presented in this section based on the focus group interviews. These views are presented in Table 1.

Table 1. Student views on entrepreneurship

Main Theme	Theme	Participants
Entrepreneurship	Not giving up	S5, S7, S8, S9, S12, S13, S14, S15, S17, S18, S19
	Risk-taking	S2, S8, S9, S10, S11, S12, S13, S15, S17, S20
	Innovation	S1, S10, S11, S12, S14, S16, S17, S18, S19
	Creativity	S6, S10, S11, S12, S14, S16, S20
	Self-esteem	S1, S3, S13, S14, S15, S16
	Courage	S1, S12, S16, S17
	Success	S1, S11, S14, S17
	Curiosity	S4, S11, S15
	Opportunism	S9, S15, S19

The codes determined based on the student responses to the question “What is the first thing that comes to your mind about entrepreneurship?” revealed nine sub-themes as seen in Table 1. These sub-themes were not giving up, risk-taking, innovation, creativity, self-esteem, courage, success, curiosity, and opportunism. It was observed that the majority of the students mentioned not giving up and risk-taking, and curiosity and opportunism were the least mentioned traits. It was observed that the students emphasized entrepreneurship traits instead of the definition of entrepreneurship.

Certain views on entrepreneurship were mentioned frequently. Direct student quotes that reflect these views are presented below.

*“I learned to seize opportunities, take risks, never give up and try again and again.” (S9)*

*“I learned to take risks. I can study on my own now. I used to be afraid.” (S15)*

### 3.1.2 Student Views on Entrepreneurship-Assisted Science Course (EASC)

In this sub-section, student views on EASC are presented based on the focus group interviews. These views are presented in Table 2.

Table 2. Student views on the Entrepreneurship-Assisted Science Course (EASC)

Main Theme	Theme	Participants
Entrepreneurship-Assisted Science Course (EASC)	Entertaining	S1, S2, S3, S4, S5, S6, S7, S9, S10, S11, S12, S13, S14, S15, S16, S18
	Great	S1, S2, S3, S4, S8, S11, S13, S15, S18
	Reinforces knowledge	S5, S8, S9, S10, S11, S12, S14, S18
	Interesting	S4, S9, S10, S12, S13, S17
	Exciting	S2, S7, S9, S10, S13, S17
	Confidence building	S5, S6, S12, S19
	Collaborative	S5, S10, S19
	Encouraging	S2, S16
	Promotes risk-taking	S3, S19

The codes determined based on the student responses to the question “What is your view on entrepreneurship-assisted science course?” revealed nine sub-themes as seen in Table 2. These themes were entertaining, great, reinforcing knowledge, interesting, exciting, confidence building, collaborative, encouraging, and promoting risk-taking. It was observed that the majority of the students considered the course entertaining and great, and only a few considered that the course encouraged and promoted risk-taking.

*“...So, it was great and we were not bored in the class, and we had a lot of fun.” (S1)*

*“...I mean, when I did a project or experiment, my mother got angry because I was clumsy. I did not like it either. I like it now.” (S13)*

### 3.1.3 Student Views on the Benefits of Entrepreneurship

In this sub-section, the student views on the benefits of entrepreneurship are presented based on the focus group interviews in Table 3.

Table 3. Student views on the benefits of entrepreneurship

Main Theme	Theme	Participants
Benefits of Entrepreneurship	Not giving up	S4, S7, S8, S9, S11, S14, S19
	Risk-taking	S2, S3, S8, S12, S18, S20
	Self-esteem	S1, S3, S16, S17
	Innovation	S6, S12, S14, S19
	Creativity	S6, S12, S15, S19
	Success	S5, S16, S18
	Opportunism	S9, S17, S20
	Courage	S14, S15, S16

The codes determined based on the student responses to the question “What are the benefits of entrepreneurship?” revealed eight sub-themes as seen in Table 3. These themes were not giving up, risk-taking, self-esteem, innovation, creativity, success, opportunism, and courage. Most of the students mentioned not giving up and risk-taking, while success, opportunism, and courage were mentioned by a few students.

*“When I could not do anything, I used to leave it and give up, I did not take risks in projects, etc. Now I do not give up and take risks.” (S8)*

*“...For example, I normally gave up when I focus on a project or a task, but now I do not give up every time.” (S11)*

*“I learned not to be afraid and trying is better.” (S14)*

#### 3.1.4 Student Views on EASC Activities

In this sub-section, the student views on EASC activities are presented based on the focus group interviews in Table 4.

Table 4. Student views on EASC activities

Main Theme	Theme	Participants
EASC activities	Entertaining	S1, S2, S3, S6, S9, S12, S14, S15, S16, S17, S18, S19, S20
	Interesting	S1, S2, S3, S4, S5, S6, S7, S9, S11, S14, S15, S16, S20
	Reinforces knowledge	S2, S4, S5, S7, S9, S10, S11, S12, S16, S17, S18, S19
	Beneficial	S1, S2, S3, S4, S5, S6, S12, S17, S18, S19, S20
	Challenging	S1, S12, S14, S16, S19

The codes determined based on the student responses to the question “What is your view on the activities conducted in the entrepreneurship-assisted science course?” revealed five sub-themes as seen in Table 4: entertaining, interesting, reinforcing knowledge, beneficial, and challenging. Most of the students considered the EASC activities entertaining and interesting, while only five students considered them challenging.

*“...in parachuting, for example, I did not know how the friction assisted the movement of the parachute. I learned this, the activities were fun.” (S2)*

*“...It was very interesting, very nice, we understood the topic very well and we had a lot of fun.” (S9)*

*“... Well, I am very happy with those that included activities, lots of fun projects, so it helped me learn better. ... I started to warm up to the science course.” (S16)*

*“... The class was quite happy, the projects were better, so my friends were also very happy.” (S20)*

#### 3.1.5 Student Views on the Problems Experienced During EASC Activities

In this sub-section, the student views on the problems experienced during EASC activities are presented based on the focus group interviews in Table 5.

Table 5. Student views on the problems experienced during EASC activities

Main Theme	Theme	Sub-Theme	Participants
Problems experienced in EASC activities	There was a problem, but it was resolved	Occupational accident	S2, S4, S11, S15, S16, S17, S19
		Product damage	S8, S9, S16, S17, S18, S19
		Group members met outside the school	S7, S8, S9, S11, S13, S16
		Absenteeism	S5, S9, S12, S14, S20
		Material shortages	S2, S3, S10, S13, S16
		Design	S6, S16, S20
		Reporting	S4, S12, S20
		Decrease in group member count	S7, S8
	No problem	-	S1

The codes determined based on the student responses to the question “Did you experience any problems during the entrepreneurship-assisted science course activities? If you did, could you solve these problems?” revealed two themes and eight sub-themes as seen in Table 5: “There was a problem, but it was resolved” and “There were no problems” themes, and occupational accident, product damage, meeting of group members outside of school, absenteeism, material shortage, design, reporting, and reduction in group members sub-themes in the “there was a problem, but it was resolved” theme. Most of the students stated that they experienced problems during the entrepreneurship-assisted science activities but these were resolved, while only one student stated that they did not experience any problems. Most of the students stated that they experienced occupational accidents and two students mentioned the reduction in the number of group members.

“... We experienced a problem while writing the report, I mean, during the project. When solving the problems, we developed a business plan, for example, we were supposed to bring cardboard and glue, and we were supposed to glue them, but we end up taping them.” (S4)

“During the parachute project, we could not tie those knots, they had to be equal, so it was not good, but I was very happy when we ranked first. So, I liked the project... We also did it outside of school, but it was very difficult, because we both ate and did it during lunchtime, so it was difficult.” (S9)

### 3.1.6 Student Views on the Impact of EASC on Daily Life

In this sub-section, the student views on the impact of EASC on daily life are presented based on the focus group interviews in Table 6.

Table 6. Student views on the impact of EASC on daily life

Main Theme	Theme	Participants
The impact of EASC on daily life	Self-esteem	S1, S2, S3, S5, S6, S12, S14, S15, S16, S17, S18
	Risk-taking	S3, S6, S8, S9, S17, S20
	Curiosity	S4, S7, S11, S13, S16, S20
	Courage	S1, S2, S5, S12, S16
	Not giving up	S9, S10, S15, S19
	Creativity	S6, S11, S13, S17
	Innovation	S11, S12, S18, S20
	Opportunism	S12, S13, S19

The codes determined based on the student responses to the question “How did the entrepreneurship-assisted science course affect your daily life?” revealed eight sub-themes as seen in Table 6: self-esteem, risk-taking, curiosity, courage, not giving up, creativity, innovation, and opportunism. On the reflection of the entrepreneurship-assisted science course in their daily lives, most of the students mentioned the self-esteem dimension and only 3 students mentioned the opportunism dimension.

“My confidence improved, for example, I thought I could not score a goal, but now I can.” (S1)

“... Yes, there has been a change in my life, I am now confident that I can do it, I believe that I can fulfill my dreams.” (S18)

### 3.1.7 Student Views on Social Contributions of EASC

In this sub-section, the student views on the social contributions of EASC are presented based on the focus group interviews in Table 7.

Table 7. Student views on social contributions of EASC

Main Theme	Theme	Participants
Social contributions of EASC	Production	S5, S6, S7, S8, S9, S10, S12, S13, S14, S15, S16, S17, S19, S20
	Economic contribution	S2, S4, S5, S6, S10, S11, S13, S16, S17, S18, S20
	Idea development	S4, S12, S16, S18, S19

The codes determined based on the student responses to the question “What could be the social contributions of the entrepreneurship-assisted science course?” revealed three sub-themes as seen in Table 6: production, economic contribution, and idea development. Nearly half of the students stated that production was a social contribution of the entrepreneurship-assisted science course, and only five students mentioned idea development.

*“For example, when we start a large company, it would contribute to the national economy.” (S2)*

*“For example, a project would contribute to them because they would benefit from that project.” (S5)*

*“As knowledge and economic value...” (S4)*

### 3.1.8 Student Views on Teamwork in EASC Activities

In this sub-section, the student views on teamwork in EASC activities are presented based on the focus group interviews in Table 8.

Table 8. Student views on teamwork in EASC activities

Main Theme	Theme	Participants
Teamwork in EASC activities	Entertaining	S1, S5, S6, S12, S13, S14, S16, S18, S19, S20
	Instruction of division of labor	S1, S2, S3, S6, S8, S9, S12, S14, S17
	Consensus	S2, S7, S10, S12, S13, S14, S17, S19
	Socialization	S4, S5, S8, S10, S12, S13, S17, S18
	Disagreement among team members	S7, S9, S11, S13, S14, S18, S19
	Problem-solving	S5, S6, S9, S10, S14, S16
	Intra-group competition	S1, S5, S7, S15, S20
	Self-esteem	S2, S3, S9, S12, S19
	Taking responsibility	S1, S3, S9, S13
	Idea sharing	S12, S16, S17, S19

The codes determined based on the student responses to the question “What do you think about teamwork during entrepreneurship-assisted activities?” revealed ten sub-themes as seen in Table 8: entertaining, instruction of the division of labor, consensus, socialization, disagreement among team members, problem-solving, intra-group competition, self-esteem, responsibility-taking, and idea sharing. On teamwork during the activities conducted in the entrepreneurship-assisted science course, most of the students stated that these activities were entertaining and instructed the division of labor, and only four students mentioned that these improved responsibility and idea sharing. Certain student views are presented below:

*“It was fun, we learned about division of labor.” (S6)*

*“In teamwork, it is easier and fun due to division of labor.” (S14)*

*“I learned consensus, collaboration (socializing), and division of labor.” (S17)*

### 3.1.9 Student Views on Being an Entrepreneur in the Future

In this sub-section, the students’ views on being an entrepreneur in the future are presented based on the focus group interviews in Table 9.

Table 9. Student views on being an entrepreneur in the future

Main Category	Categories	Participants
Being an entrepreneur in the future	Yes	S1, S2, S3, S6, S7, S10, S11, S12, S13, S14, S15, S16, S17, S18, S19
	No	S8, S9, S20
	Do not know	S5

The codes determined based on the student responses to the question “Do you think about becoming an entrepreneur in the future?” revealed three sub-themes as seen in Table 9: yes, no, and do not know. Most students stated that they would like to, while 3 students would not and only one student did not know.

“No, there are other professions I would like.” (S9)

“Of course, I want to sell clothing.” (S13)

### 3.2 Student Diaries

In this section, findings determined based on student diaries are presented. These findings are presented in tables in chronological order. The tables include the theme, sub-theme, participant, frequency, and percentage data.

#### 3.2.1 Analysis of the First Week Diary Entries

In this section, the findings associated with the views of the students about the first week of the EASC are presented in Table 10 based on diary entries.

Table 10. Analysis of the first week diary entries

	Theme	Sub-theme	Participants
1st Week	Entrepreneurship definition	-	S1, S2, S5, S6, S7, S8, S9, S10, S11, S12, S13, S14, S15, S16, S18, S19, S20, S21, S22, S23
	Liked the application	-	S10, S12, S15, S16, S17, S19, S20, S21, S22, S23
	Entrepreneurship dimensions	Risk-taking	S5, S10, S22
		Self-esteem	S13, S19, S23
		Success	S10
	Innovation	Innovation	S10
		Creativity	S14
		Guest entrepreneurship expert	-
	Description of an entrepreneur	-	S7, S9, S15, S16, S21, S22
	Fun during the application	-	S7, S12, S15, S18, S22, S23
	Not giving up	-	S9, S10, S14, S19, S22, S23
	Willingness for entrepreneurship	-	S2, S8, S12, S16, S19
	Benefits of entrepreneurship	-	S1, S5
	Discovery of self-entrepreneurship	-	S6
	The belief that everyone could be an entrepreneur	-	S8

As seen in Table 10, the students mentioned eleven themes, namely the definition of entrepreneurship, whether they liked the application, entrepreneurship dimensions, guest entrepreneurship expert, description of an entrepreneur, whether they had fun during the application, not giving up, willingness to be an entrepreneur, the benefits of entrepreneurship, discovering self-entrepreneurship, and the belief that each individual could be an entrepreneur, in their diary entries after the first week. Most students mentioned the definition of entrepreneurship, and whether they liked the application, and only a few students mentioned discovering self-entrepreneurship and the belief that everyone could be an entrepreneur. In the dimensions of entrepreneurship theme, students included risk-taking, self-esteem, success, innovation, and creativity dimensions.

The not giving up dimension was instructed by the author within the “success dimension” of entrepreneurship dimensions during the entrepreneurship-assisted science course; thus, it should be included in the success dimension. However, due to the high frequency of the dimension in the diaries, it was considered a theme and included in Tables 10 and 12.

“Today we learned entrepreneurship in science class. We learned that entrepreneurs take risks and make a lot of



money because they take risks. For example, Hamdi Ulukaya...” (S5)

“Today, the science lesson was great, we learned about entrepreneurship, it was really fun, an expert visited. It was very good. Even if a job is risky, it is worth a try. We learned not to give up on anything, even when it is difficult, and work hard for success.” (S10)

“Today we learned about entrepreneurship in science class. We learned what it takes to be an entrepreneur and the teacher said that every individual could be an entrepreneur and we should never be afraid to try. And we learned about a few entrepreneurs who did all these.” (S19)

### 3.2.2 Analysis of the Second Week Diary Entries

In this section, the findings associated with the views of the students about the second week of the EASC are presented in Table 11 based on diary entries.

Table 11. Analysis of the second week diary entries

	Theme	Participants
2nd week	Entertained during the activities	S2, S3, S4, S5, S6, S7, S8, S9, S10, S12, S13, S14, S15, S16, S17, S18, S19, S21, S23
	Liked the activities	S1, S2, S3, S7, S10, S11, S12, S13, S14, S15, S16, S17, S18
	Happiness	S3, S12, S16, S19
	Considered the activities exciting	S4

As seen in Table 11, the students mentioned four themes, namely the activities were entertaining, whether they liked the activities, happy during the activities, and whether they considered the activities exciting, in their diary entries after the second week. It was observed that more than half of the students considered the activities conducted in the entrepreneurship-assisted science course entertaining, while most students liked these activities, and only one student considered the activities exciting.

“Today we sold nuts in the first hour of the science class and it was a lot of fun, we had a lot of fun. In the last hour, we held a competition and measured weights.” (S2)

“In the class, we were happy that it was a science class. Because it is fun, we love the science course. We played games for two hours. Both were fun. The science class was fun, but we did not win. But it is okay, we will win the next time.” (S10)

### 3.2.3 Analysis of the Third Week Diary Entries

In this section, the findings associated with the views of the students about the third week of the EASC are presented in Table 12 based on diary entries.

Table 12. Analysis of the third week diary entries

	Theme	Participants
3rd week	Entrepreneurship dimensions	S3, S4, S8, S9, S10 (being innovative), S13 (self-confidence), S14, S15, S16, S18 (being innovative), S19, S20, S21, S22, S23
	Liked the activities	S1, S4, S9, S11, S13, S16, S20, S21, S22, S23
	Considered the activities fun	S3, S4, S10, S13, S14, S16, S17, S19, S21, S23
	Considered the activities exciting	S4, S21
	Reinforcement of the topic	S4, S19
	Not giving up	S20
	Adaption of the activities to Daily life	S22
	Happiness	S22

As seen in Table 12, the students mentioned eight themes, namely entrepreneurship dimensions, whether they liked the activities, considered these fun or exciting, reinforcement of the topic, not giving up, the adaption of the activities to daily life, and happiness, in their diary entries after the third week. It was observed that most students mentioned the dimensions of entrepreneurship and whether they liked or considered the activities fun. Only one student mentioned not giving up, the adaptation of these activities to daily life, and happiness. In entrepreneurship

dimensions, most students mentioned the dimensions of entrepreneurship in general, while others mentioned the entrepreneurship dimensions of innovation and self-esteem (S13).

*“In the science class, the teacher handed out papers, we conducted activities. Today we learned how to turn a crisis into an opportunity and take risks. We learned about friction and even parachuted. There was a prize for the winner, the one whose parachute remained in the air the most won the prize. We did not win but the application worked, we understood friction better. I love science class. We learned several things. We learn better and have fun with activities. The class is very exciting...” (S4)*

*“Dear Diary; This week, we conducted very good projects and activities in the science class. We learned about several aspects of entrepreneurship and had fun. And today, we parachuted, and the last one to fall won the competition. Of course, I may have been a little upset because I did not win. But we had a lot of fun. By the way, we parachuted to learn about air friction. We learned entrepreneurship, risk-taking, self-esteem, seizing opportunities, turning crises into opportunities... These applications were very beneficial.” (S13)*

### 3.2.4 Analysis of the Fourth Week Diary Entries

In this section, the findings associated with the views of the students about the fourth week of the EASC are presented in Table 13 based on diary entries.

Table 13. Analysis of the fourth week diary entries

	Theme	Participants
	Creativity	S1, S3, S5, S6, S7, S9, S10, S11, S12, S13, S15, S16, S19, S20, S21, S22, S23
	Innovation	S1, S3, S5, S6, S7, S9, S10, S11, S12, S13, S15, S16, S19, S20, S21, S22, S23
	Problem-solving	S1, S3, S5, S6, S7, S9, S10, S12, S13, S15, S16, S19, S20, S21, S22, S23
	Considering the activities fun	S6, S7, S8, S10, S11, S12, S13, S14, S15, S16, S17, S19, S23
	Happiness	S4, S10, S13, S15, S16
4th week	Guest entrepreneurship expert	S5, S6, S12, S18, S20
	Liked the activities	S15, S16, S23
	Entrepreneurship dimensions	S1, S17, S22
	Entrepreneurship traits	S4, S12, S22
	Collaboration in teamwork	S5
	Curiosity	S5
	Tiresome	S17

As seen in Table 13, the students mostly emphasized the dimensions of entrepreneurship, namely creativity, innovation, and problem-solving in the fourth-week diary entries, and mentioned that the activities were fun, they enjoyed the guest entrepreneurship expert, they were happy, liked the activities, and mentioned entrepreneurship dimensions, entrepreneurial traits, teamwork, and their curiosity. Student views were categorized under twelve themes. Most students mentioned creativity and innovation, followed by problem-solving. Only one student mentioned teamwork, and curiosity and considered the activities tiresome. Since the other dimensions of entrepreneurship are mentioned in the table, the dimensions of entrepreneurship are also included.

*“This week, we learned about problem-solving, innovation, and creativity. I had a lot of fun. I learned how to solve problems and be innovative and creative. When solving a problem, we should first collect information about the problem, find solutions and test the solutions, and finally achieve results...” (S3)*

*Dear Diary; This week we learned problem-solving and innovation, creativity in the science class. We learned the stages of problem-solving. Pictures about innovation and creativity were presented. And we interpreted them. And we did the module, and we had a lot of fun. We developed a project. We had a lot of fun with all projects. The most important thing about creativity was to develop an original and creative project. Problem-solving entails searching for a solution to solve the problem. We became more experienced.” (S19)*

## 4. Discussion, Conclusion, and Recommendations

The present study aimed to determine the views of secondary school students on the entrepreneurship-assisted science course. It has been seen that most of the students mentioned the “not giving up “ and “risk-taking” dimensions, and only a few students mentioned “curiosity” and “opportunism” as the first thing that comes to mind when entrepreneurship is mentioned. Deveci (2016a), in the thesis “Development, Implementation, and Evaluation of Integrated Entrepreneurship Education Modules with the Science Curriculum (5-8)”, reported that the most

emphasized entrepreneurship dimension was risk-taking and awareness and implementation of opportunities. Furthermore, the same study reported that pre-service teachers mentioned determination and curiosity about entrepreneurship (Deveci, 2016a). The entrepreneurship literature indicates that risk-taking is a core element of entrepreneurial orientation (EO), which refers to the “processes, practices, and decision-making activities that lead to new entry” (Lumpkin & Dess 1996, p. 136; as cited in Guo & Jiang, 2020).

Most students considered the entrepreneurship-assisted science course (EASC) “fun” and “great”, and only a few mentioned, it “promoted risk-taking”. Similarly, Deveci (2016a) reported that pre-service teachers considered the entrepreneurship education modules entertaining in their diaries and stated that the course was great due to the activities. Furthermore, pre-service teachers mentioned that their awareness was raised about risk-taking (Deveci, 2016a). Zhou et al. (2019) determined that both schools and enterprises should incorporate innovation and entrepreneurship education into the talent training program so that students can master the basic knowledge needed for entrepreneurship, cultivate entrepreneurship and exercise entrepreneurial ability.

The review of the student views on the benefits of entrepreneurship revealed that the students mentioned the dimensions of “not giving up” and “risk-taking” the most, and “success”, “opportunism,” and “courage” the least. Yüksel (2019) determined the entrepreneurial development levels and risk-taking and opportunity-seizing skills of the students based on the products of secondary school students in STEM activities in the thesis “The Impact of Out-of-Class STEM Applications on Learning Products of Secondary School Science Students,” and reported that these skills improved (Yüksel, 2019).

The student views on the entrepreneurship-assisted science course activities demonstrated that they mostly considered these activities “entertaining” and “interesting”, and they stated that these were “challenging” the least. Thus, they considered projects entertaining and interesting. The students, who stated that the activities were a little challenging, also stated that the projects allowed them to learn the topics better. In the study “The Effect of 6E Learning Model-Based STEM Education on Entrepreneurship, Attitude, Career Interests, and Student Views”, Yazıcı (2019) similarly reported that the participating students considered the activities fun, interesting and challenging, and the students stated that they experienced problems in material selection, and it was difficult to place the lighting in the stadium (Yazıcı, 2019).

Two themes were determined based on the student reviews of the problems experienced during the entrepreneurship-assisted science course activities: “there was a problem, and it was resolved”, and “there were no problems”. The problems mentioned by the students were “occupational accidents, product damage, and meeting of group members outside of the school” the most, and “reduction of the number of group members” the least. Students found certain solutions to overcome these problems during the projects. It could also be suggested that this would help students to find ways to solve problems in the future. Similarly, Yurtseven (2020), investigated the development of entrepreneurship skills in fourth-grade students in the study “Design, Implementation and Analysis of Entrepreneurship in Primary School Curriculum”, and reported that students experienced problems in the determination of the project groups and meeting during the project to conduct project work since they lived far apart (Yurtseven, 2020).

The student views on the reflection of entrepreneurship-assisted science course in daily life emphasized the “self-esteem” dimension, and the “opportunity-seizing” dimension was mentioned the least. Atalay and Anagün (2017) reported similar findings in their study “Efficacy Perceptions of Pre-service Primary School Teachers on Entrepreneurial Skills”. The study findings demonstrated that the participating pre-service primary school teachers mostly mentioned entrepreneurship dimensions of self-esteem and opportunity-seizing.

On the social contributions of the entrepreneurship-assisted science course, almost half of the students mentioned “product development” and the least number of students mentioned “creating ideas”. Yurtseven (2020) also reported that the student skills such as creating original ideas, developing novel projects, and product development improved due to the development of student imagination.

The students fulfilled the project tasks in groups. The students considered the teamwork conducted during the entrepreneurship-assisted science course activities mostly “entertaining” and “allowed the instruction of the division of labor”, and the least as “improved responsibility” and “idea sharing”. Aksoy and Doymuş (2011) also reported that teamwork significantly contributed to the ability of 6th-grade students to share their ideas and their sense of responsibility in the study “The Effect of Collaborative Reading-Writing-Application Technique in Science and Technology Course Activities”.

Most students considered becoming an entrepreneur in the future, while a few were undecided or did not know. It could be suggested that the course activities increased the desire of the students to be entrepreneurs in the future. However, Kroon and Meyer (2001) in their study named “The role of entrepreneurship education in career

expectations of students”; concluded that the entrepreneurship course had no effect on students’ career expectations. They attribute the main reason why the entrepreneurship course was not successful in terms of its impact on the career prospects of the pilot group that taking a one-semester entrepreneurship course failed to provide entrepreneurial orientation. According to them, the transition from a non-entrepreneurial mindset to an entrepreneurial mindset takes longer. Therefore, for entrepreneurship education to have a significant impact on career prospects, it must be implemented earlier in the education system. This highlights the need for entrepreneurship education in primary and secondary schools.

The analysis of the diaries revealed that the students “liked the application” and mentioned the “definition of entrepreneurship” in the first week entries, and a few students mentioned the “entrepreneurship dimensions,” “discovering entrepreneurship,” and “the belief that everyone can be an entrepreneur”.

The second week’s diary entries demonstrated that more than half of the students “considered the activities entertaining”, and nearly half “liked the activities”. A few students stated that they were “happy” and “considered the activities exciting”.

In the third-week diary entries, the students mentioned “entrepreneurship dimensions” the most, and stated that they “liked the activities” and “considered the activities entertaining”. A few students mentioned “not giving up”, “reflection of the activities in daily life” and “happiness”.

In the fourth week’s diary entries, students mostly mentioned “creativity”, “innovation” and “problem-solving”. A few students mentioned “team collaboration,” “curiosity,” and “the visit by an entrepreneurship expert,” and considered the activity “tiresome.” Similarly, Devenci (2016b) reported that pre-service science teachers that most of the pre-service science teachers were creative, innovative, curious, and participated in teamwork.

In the current study, entrepreneurship modules were developed and implemented with 5th-grade students, and projects were developed. In the present qualitative study, the findings demonstrated that the study fulfilled the predetermined aims. Certain suggestions are presented based on the findings and the experiences of the authors acquired as a result and during the process as follows:

- 1) Considering the positive opinions of students on entrepreneurship education, it can be suggested to increase the number of entrepreneurship activities in the science curricula.
- 2) Entrepreneurship courses should be developed in secondary schools, even in primary schools, for the acquisition of entrepreneurship skills.
- 3) The entrepreneurial skills of the students should be revealed with various tests and these skills should be supported with extracurricular or club activities.

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## Note

Note 1. The present study was based on the dissertation of the first author.

## Appendix A

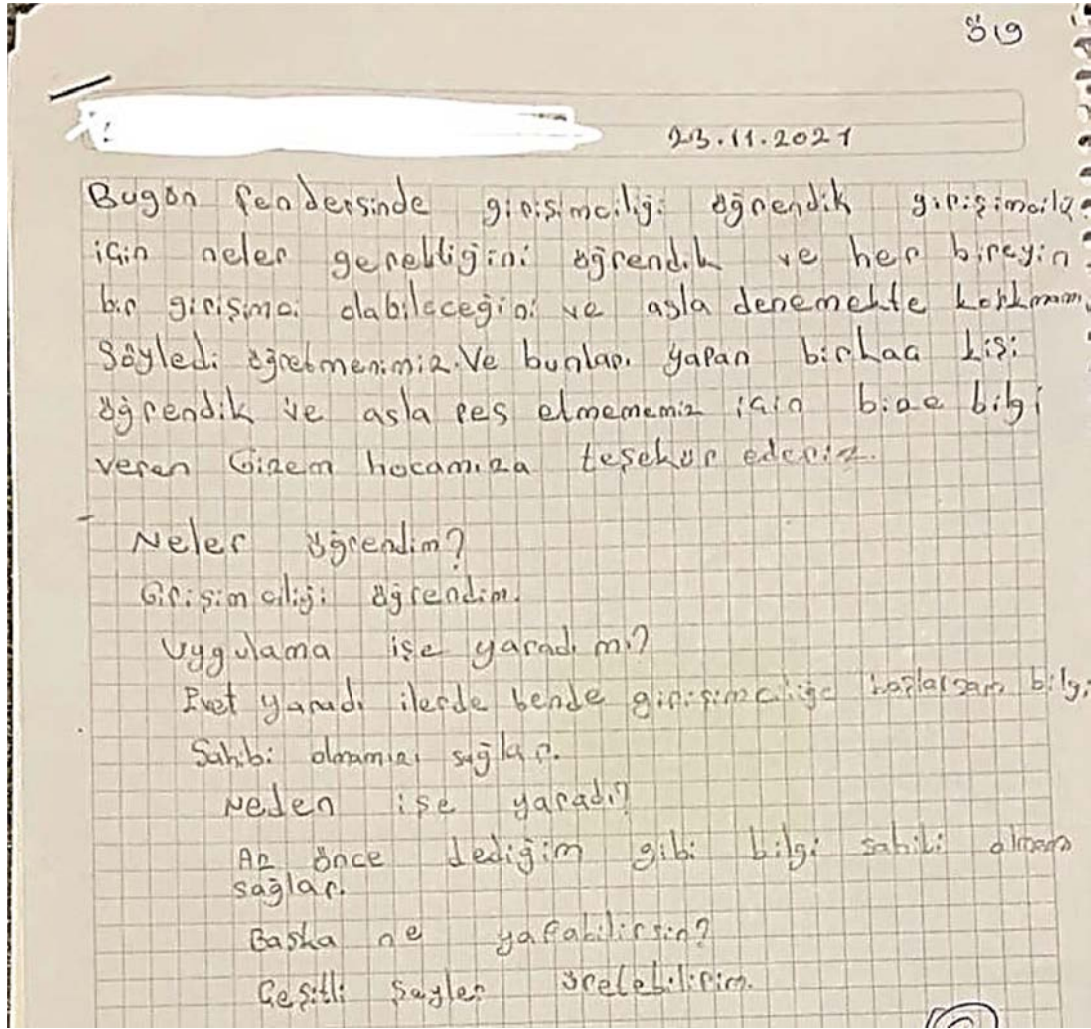
### Focus Group Interview Questions

- 1) What is the first thing that comes to your mind about entrepreneurship?
- 2) What is your view on entrepreneurship-assisted science course?
- 3) What are the benefits of entrepreneurship?
- 4) What is your view on the activities conducted in the entrepreneurship-assisted science course?
- 5) Did you experience any problems during the entrepreneurship-assisted science course activities? If you did, could you solve these problems?
- 6) How did the entrepreneurship-assisted science course affect your daily life?
- 7) What could be the social contributions of the entrepreneurship-assisted science course?
- 8) What do you think about teamwork during entrepreneurship-assisted activities?
- 9) Do you think about becoming an entrepreneur in the future?

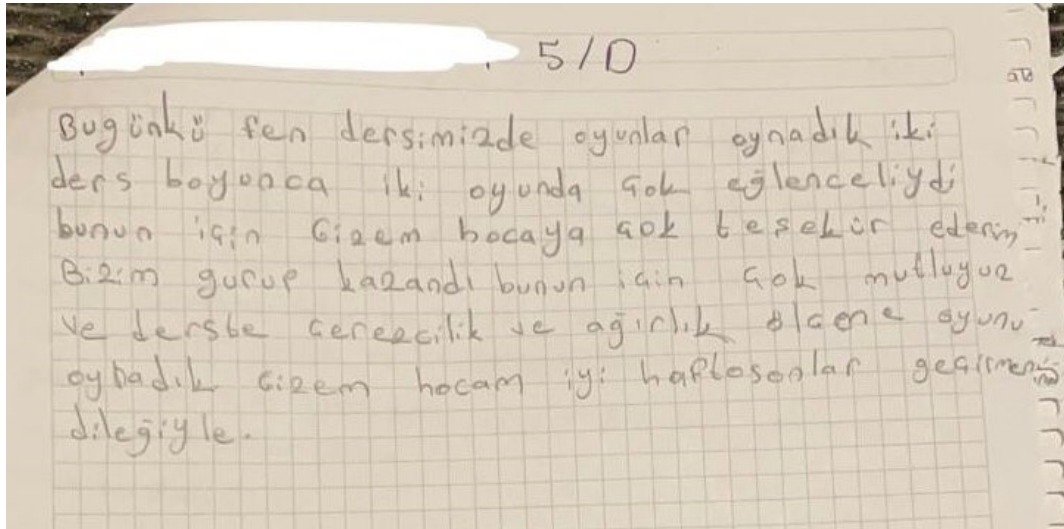
## Appendix B

## Student Diary Samples

## The First Week Diary Sample of a Student



## The Second Week Diary Sample of the Student



## The Third Week Diary Sample of the Student

Bu hafta fen dersinde ağırlık ölçme aleti yaptık. Cerezcilik, balon yaptık bu projede balon projesini kazanamadık ama olsun ağırlık ölçmede ise biz kazandık. Girişimcilik öğrendik girişimcilikle ilgili etkinlikler yaptık. guruplar oluşturarak etkinlikler yaptık. krizleri nasıl fırsata çevireceğimizi risk almayı vb. şeyleri öğrendik bu arada yaptığımız balon projesinde sürtünme kuvvetini daha pekiştirmek için bu deneyi yaptık ve bu deneyler bizim konuyu daha çok anlamamızı sağlıyor ve çok eğleniyoruz bu deneyleri bize yaptıran Gizem Hocaya teşekkür ederim.

5/D sınıfı No/156

## The Forth Week Diary Sample of a Student

**=GÖNLÜK=** **17.12.2021**

Sengili gönlük.

Bu hafta fen dersinde Problem çözme ve yenilikçilik yaratıcılık öğrendik. Problem çözmenin aşamalarını öğrendik. Yenilikçilik ve yaratıcılıkla ilgili resimler verildi ve bunları yorumladık ve model yaptık ve çok eğlendik bunun için proje yaptık. Balon projelerinde çok eğlendik. Yaratıcılıkla ilgili de en az bir şey Projenin özgür ve yaratıcı olmasıyla Problem çözme ise olan dumsuatoğu çözmek için aşamaları anlamaktır bu konu ile ilgili daha tecrübeli olduk bunun için Gizem hocaya teşekkür ederim.

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