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Examination of the Science Education Curriculum (5–8 grades) in terms of Entrepreneurial Characteristics[1]

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ABSTRACT

This study aimed to investigate acquisitions, textbooks, and workbook activities in the science curriculum for the 5–8 grades in terms of entrepreneurial characteristics. It has been designed as a qualitative research study that uses data obtained via course documents, composed from textbooks and workbooks. The results show that the fifth-grade science curriculum included more acquisitions related to entrepreneurial characteristics compared to other curriculums. However, it has been determined that the number of fifth-grade acquisitions, such as taking risks, teamwork, using time well, and adapting to change, that would enable the improvement of their entrepreneurial characteristics, were quite limited. When they considered textbook acitivities, no activity was seen to improve the enabling characteristics of students, such as taking risks and adapting to change. Moreover, it was found that textbook acitivities are insufficient in terms of characteristics, like being innovative, using time well, and providing for acting independently. Moreover, it was determined that workbook activities are aimed at improving the creativity of students. Furthermore, a small part of workbook activities considered characteristics such as seeing opportunities and being innovative and self-confident. The biggest deficiency in workbook activities is not taking into account characteristics such as taking risks, using time well, teamwork, effective communication, and adapting to change. It is thought that these results will shed light on curriculum development studies planned to be implemented after the 2013 science curriculum.
Keywords: Science Curriculum, Entrepreneurial Characteristics, Acquisitions, Textbook Activities, Workbook Activities

1. INTRODUCTION

We live in a time when the world's population is increasing rapidly. In 2015, the increase in the unemployment rates for countries, both developed and developing, such as South Africa, Turkey, Malaysia, France, and Nigeria due to rapid population growth and limited employment was noteworthy (Trading Economics, 2015). To overcome this problem, these countries are aiming to equip their citizens with skills that will help them employ themselves. This situation reflects on the educational curriculums of these countries, as seen in Finland, Nigeria, and France, and that can be seen in European Commission reports (European Commission, 2011; European Comission, 2013).Thus, in recent years, it has been witnessed that the concept of entrepreneurship is often pronounced in the field of education. In this sense, it has emphasized that entrepreneurship is not only for economists but it is also a topic to be studied in other fields (Gibb, 2002).

Continued population growth and the proportion of the younger population to the elderly population is high in Turkey; recent data shows that the increase in unemployment rates is slightly higher (Türkiye İstatistik Kurumu [TÜİK], 2015). The quality of the work force in a country has been related to the life skills of the individuals living in that country (Ememe, Ezeh & Ekemezie, 2013).

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Entrepreneurship has been expressed as one of the important life skill concepts (Çetintaş & Bektaş, 2008; Van den Berg & Lewer, 2007). When we consider the concept of entrepreneurship as an ability, it is defined as an individual's ability to trasform an idea into practice (European Commission, 2011). When viewed as a process, it is defined as a process that begins with the entrepreneur identifying or recognizing opportunities for creating a new product and service (Fisher & Reuber, 2010).

In recent years, it has been seen that the concept of "entrepreneurship" has been introduced among the skills intended to be gained by students in some instruction schedules from primary school to high school level in Turkey. For example, the primary education life sciences curriculum is integrated with entrepreneurship (1–3 grades) in 2009 (Milli Eğitim Bakanlığı [MEB], 2009a). Similarly, in the mathematics curriculum (6–8 grades), the concept of entrepreneurship is among the common skills intended to be gained by students (MEB, 2009b). At the high school level, it seems that there is an instruction schedule entitled "Secondary Education Entrepreneurship Teaching Curriculum" (MEB, 2009c). These new developments have been supplemented by the renewed middle school science curriculum (5–8 grades) in 2013 (MEB, 2013). Thus, especially, it is important to understand how entrepreneurship has been integrated with the science curriculum because entrepreneurship in science education has been much emphasised in literature.

Considering the related literature, science, technology, and mathematics education has been recommended to be restructured in terms of entrepreneurship (Ezeudu, Ofoegbu & Anyaegbunnam 2013). Bolaji (2012) investigated science teachers' opinions regarding the integration of entrepreneurship education with the science curriculum and found that they are positive about it. Buang, Halim and Meerah (2009) pointed out an appropriate learning model in which innovative technological thinking can also be integrated into the field of science education. In addition, Ugwu La'ah and Olotu (2013) highlighted the importance of entrepreneurship from the standpoint of being innovative and creating new business opportunities in science and technology education. Moreover, it has been stated that sudents' entrepreneurial mindset could be developed in STEM (science, technology, engineering, and mathematics) education, which has a dimension related to science education (Jin, Li, Yang & Son, 2015). In this respect, it can be said that the concept of entrepreneurship has an important place in terms of the science curriculum. At this point, it is necessary to look at what the entrepreneurship concept means for early-age students.

When children under the ages of five and six are considered carefully, several entrepreneurial characteristics can be found; however, these characteristics become blind or forgotten with the inclusion of students in the school education process (Löbler, 2006). It is emphasized that the primary and middle school age is very important in the education process because these principles and values are acquired at an early age (Vadi, 2004). Furthermore, it is stated that knowledge, skills, attitudes, and values are better formed and strengthened at these ages since primary school students are in the most sensitive age range (Torokoff, 2006). As a matter of fact, it has been indicated that students' perceptions and skills about creating business ideas can be developed (Morrison, 2000) and their entrepreneurial attitudes can be enhanced (Florin, Karri & Rossiter, 2007). It is therefore stated that it is important to increase activities that develop entrepreneurial characteristics to strengthen students' entrepreneurial attitudes before they move on to higher education (Fakharzadeh, 2012). At this point, the important question is which entrepreneurial characteristics should be acquired by students at the secondary school level.

Entrepreneurship is the study of opportunity sources comprising the process of discovery, evaluation, and use of opportunities (Shane & Venkataraman, 2000). Entrepreneurship education is defined as the process that provides more individual, social, and economic returns by which people acquire a range of skills that can be applied in all areas of their lives (European Commission, 2011). It could be emphasized that entrepreneurial characteristics can be gained through education. Entrepreneurial characteristics are ranked as adapting to change, being ambitious and self-confident, being disciplined, being determined, being innovative, and taking risks, and these can be gained by middle school students (California Department of Education, 2013). Besides these

characteristics, it is stated that entrepreneurial characteristics, such as self-confidence, social skills, a strong learning desire, and skilfulness can be gained by middle school students (McKinney, 2013). Moreover, it is possible to gain characteristics, such as self-confidence, self-esteem, encouraging students into upper secondary education, developing academic skills, increasing the number of students who perceive entrepreneurship as a career option, encouraging risk taking and taking a lesson from failures, increasing awareness of the entrepreneur's role in society, and ensuring that they see the available opportunities (National Content Standards for Entrepreneurship Education, 2004). Also, Güven (2009) ranked the entrepreneurial characteristics of decision making, problem solving, creativity, critical thinking, teamwork, effective communication, using time well, creating a new product (being innovative), the effective and efficient use of resources, and recognition in the business world as those that should be found in primary school curriculum acquisitions. Therefore, within the scope of current research are discussed entrepreneurial characteristics, including seeing opportunities, taking risks, being innovative, teamwork, acting independently, effective communication, creative thinking, adapting to change, self-confidence, and using time well Descriptions of these characteristics are given in Table 1 (California Department of Education, 2013; Güven, 2009; McKinney, 2013; National Content Standards for Entrepreneurship Education, 2004).

Table 1. Entrepreneurial characteristics

Seeing opportunities	Acquisitions or activities to enable students to carefully observe or identify the events and problems happening in the environment.
Taking risks	It is possible to fail in the end when results from acquisitions or activities are implemented.
Being innovative	Acquisitions or activities aimed at creating a new design or product for students. In this research, it is thought that science experiment design, model building, and project development processes have developed students' innovative characteristics as a result of creative thinking. However, it has been decided that all educational processes that depend on creativity cannot be based on being innovative. This difference can be clearly seen in the sample activity given in the Findings section.
Teamwork	Acquisitions or activities to enable students to work in cooperation with their friends.
Acting independently	Acquisitions and activities to enable students to individually perform one task from its beginning to its end.
Effective communication	Acquisitions or activities to enable students to explain their feelings and thoughts and help in communication with others.
Creative thinking	Thinking processes that enable students to use their imagination.
Adapting to change	Acquisitions and activities to enable students to make a change in their lives and adapt to this change.
Self-confidence	Acquisitions or activities to enable students to gain a sense of accomplishment.
Using time well	Acquisitions or activities needed to be performed at specific time intervals or within a specific time period.

Most of the studies conducted on entrepreneurship in education examined the opinions of participants such as students, teachers, and lecturers (Bacanak, 2013; Baranovıc, Stıbrıc & Domovıc, 2007; Bolaji, 2012; Chukwurah, 2010; Mattila, Rytkölä & Ruskovaara, 2009; Pistorius, 2011; Seikkula-Leino, Ruskovaara, Ikavalko, Mattila & Rytkola, 2010). Furthermore, Amos and Onifade (2013) aimed to examine prospective teachers' opinions on the necessity of entrepreneurship education in teacher education. In the literature, theoretical and compilation type studies were found. For example, Fagan

(2006) proposed to inform teachers about entrepreneurship education; Caseiro and Alberto (2013) probed the problems and some important dimensions of entrepreneurship education; in some studies, researchers provided ways of better understanding entrepreneurship in science education (Adeyemo, 2009; Deveci & Çepni, 2014); and Borase (2014) introduced the concept of the entrepreneurial teacher. In addition to these, it is possible to view studies about how entrepreneurship occurs in educational curriculums and how it should be placed in educational curriculum. For instance, Ruskovaara, Pihkala, Rytkölä and Seikkula-Leino (2010) made a statement about how entrepreneurship was included in the teaching process in elementary and high school curricula. Besides, Hannula (2011) examined how curriculum and strategies included entrepreneurship education vocational teacher training units. Furthermore, Seikkula-Leino (2011) clarified how entrepreneurship education is integrated into general education using the partnership model. Seikkula-Leino, Ruskovaara, Hannula and Saarivirta (2012) investigated how entrepreneurship education was implemented in the teacher education curriculum.

When considering literature in a subject area, the number of studies specific to science education is considerably higher in the teaching field than in other fields such as mathematics, music, language, etc. Deveci and Çepni (2014) offered basic insights into how entrepreneurial characteristics can be developed in science education. Buang, Halim, and Malaysia (2007) shed light on how entrepreneurial characteristics can be gained through an entrepreneurial process as an advanced stage of scientific process skill in science education. Adeyemo (2009) explained how entrepreneurial characteristics can be improved with in-class activities. Furthermore, in the literature, studies examining science teachers' views are available (Bacanak, Üküdür & Öner, 2012; Banacak, 2013; Bolaji, 2012; Hsiao, 2010; Koehler, 2013).

When examining the studies applied for the document analysis, for example, Koehler (2013) explored the documents used by two science teachers who created entrepreneurial learning opportunities for students in the teaching process. Hannula (2011) benefited from curriculums and written documents to demonstrate how entrepreneurship education is included in curriculums and strategies in the vocational teacher training units; results showed that Finnish vocational teacher education curricula provide at least the opportunity to develop a good partnership with entrepreneurs. Žibėnienė (2012) used documents to determine the place of entrepreneurship in teacher education, with examples of practice and the situation of entrepreneurship education in Europe; the research shows that the best entrepreneurial teacher training practices are those in the UK, Norway, Austria, and Belgium. Güven (2009) examined, in terms of entrepreneurial characteristics, the acquisitions of renewed curricula such as those of life sciences, Turkish, mathematics, science, and social science in primary education in 2004; the research shows that entrepreneurship acquisitions in the primary education curriculum were directed to developing some entrepreneurial characteristics, but these were insufficient in the facilitation of some entrepreneurial characteristics. Güven (2010) reviewed, in terms of entrepreneurial characteristics, the life science curricula (1926, 1930, 1948, 1968, 1995, 1998 & 2005) developed for 1–3 grades by the Ministry of National Education and found that acquisitions achieved using the 2005 life sciences curriculum were clearer as compared wih those achieved using the previous years' curricula. Fakharzadeh (2012) determined the extent to which all textbooks possessed cognitive, emotional, and behavioural characteristics related to entrepreneurship, that these textbooks are for five grades at elementary level published in 2010; he found that 24.8% of all reading textbooks consider entrepreneurial attitude. In the textbooks, this rate is equal to 54.9%. Polat, Koçak, Çermik, Meral, and Boztaş (2015), using teachers' opinions, evaluated rimary school social science textbooks in terms of the acquisition of curricula related to entrepreneurship and found that the course books extensively include entrepreneurship. Brown (2000) conducted curriculum discussions for entrepreneurship education in secondary and higher education and examined the course samples for these educational levels. She/he stated that entrepreneurship is often integrated into curricula as a social studies unit in elementary and middle schools. Baysal and Özkul (2009) examined Turkish and

social science textbooks in terms of concepts related to entrepreneurship from the third to fifth grades, and only the fifth-grade social studies book included the entrepreneurship concept. From national and international studies stated in the preceding paragraphs, none of the studies examined, in terms of entrepreneurial characteristics, the curriculum acquisitions, textbook activities, and workbook activities included in science curricula (5–8 grades). Therefore, this research will fill this gap and the determination of whether or not there are any entrepreneurial characteristics in the science curriculum will shed light on subsequent science curriculum developments. Thus, this study aims to investigate, in terms of entrepreneurial characteristics, the science curriculum acquisitions, textbook activities, and workbook activities for the 5–8 grades. Therefore, the problem statements of the research are as follows:

- Which entrepreneurial characteristics are involved in science curriculum acquisitions?
- Which entrepreneurial characteristics are intended to be improved in science textbook activities?
- Which entrepreneurial characteristics are intended to be improved in science workbook activities?

2. METHOD

In this research, we used the preferred document analysis method, including qualitative research methods. A document review is a systematic process used to examine both printed and electronic documents (Bowen, 2009; Corbin & Strauss, 2008). In the process of document analysis, the researcher supplies resources, carefully examines them, takes notes, and tries to evaluate (Çepni, 2014). This method has some advantages, such as taking less time than other methods and low cost. Furthermore, many documents can be accessed through libraries and e-resources, and documents can be repeatedly evaluated. Besides, it has some disadvantages, such as the inability to provide detailed information about the research problem; sometimes, it is not possible to access the desired documents and there is the possibility of being prejudiced in investigated sources (Bowen, 2009).

2.1.Documents as data sources

The documents used as the data source in this study contained science curriculum acquisitions, textbook activities, and workbook activities. All the acquisitions are included in the science curriculum renewed in 2013. The distribution of acquisitions is as follows: 44 in the fifth grade, 52 in the sixth grade, 78 in the seventh grade, and 78 in the eighth grade. The textbook activities were composed of activities given in grade 5–8 textbooks. The distribution of the textbook activities was 57 in the fifth grade, 76 in the sixth grade, 76 in the seventh grade, and 71 in the eighth grade. The workbook activities were only composed of activities given in grade 6–8 workbooks because the workbook was not used in the fifth grade. The distribution of the workbook activities was 175 in the sixth grade, 194 in the seventh grade, 187 in the eighth grade, and there is no workbook in the fifth grade.

In this study, the documents that have been examined were published by the Turkish Ministry of National Education, which includes experts from different fields, in order to prepare textbooks or workbooks. Thus, these documents are assumed to be valid and reliable. The publications of the Ministry of Education are preferred as they are the most widely used books in Turkey.

2.2.Data Collection Tool

The data collection tool was created by researchers utilizing entrepreneurial characteristics that can be gained by middle school students according to the literature. Morever, the development process of the data collection tool benefited from the views and suggestions of three academics. One of these academics is an expert in measurement and evaluation in science education; another is an expert in curriculum development in science education; and the third is a curriculum development

specialist in the educational sciences. The steps followed during the development of the data collection tool are as follows:

- First, the researchers examined the acquisitions and activities one by one. A pilot study had been conducted to determine which acquisitions and activities had the potential to develop what kind of entrepreneurial characteritic(s). The pilot study was conducted to evaluate only sixth-grade acquisitions and activities.
- In the pilot study, acquisition-code matches and activity-code matches were made. The number of characteristics appeared in matches, and these were presented to three expert academicians. Experts suggested limiting these characteristics based on the literature. This way, it is believed that valid and reliable results will be obtained.
- Furthermore, as a result of these matches, experts decided that an activity or acquisition can develop more than one entrepreneurial characteristic. Experts suggested that this situation should be considered.
- In the decision-making stage of entrepreneurial characteristics, the entrepreneurial characteristics that can be gained by middle school students have been considered in the literature.
- It was decided to be composed of entrepreneurial characteristics such as seeing opportunities, taking risks, being innovative, teamwork, acting independently, effective communication, creative thinking, adapting to change, self-confidence, and using time well.
- Table 2 was created to locate these entrepreneurial characteristics emphasized in the literature in the direction of the experts' suggestions after determining the meaning of these characteristics.
- This measuring tool that has been created is named the "Entrepreneurial Characteristics Determination Form for Science Curriculum."

Table 2. An example of the form evaluating acquisitions or activities

Science Curriculum Unit: 3 Grade: 8	Activity/Acquisition Number	Seeing opportunities	Taking risks	Being innovative	Teamwork	Acting independently	Effective communication	Creative thinking	Adapting to change	Self-confidence	Using time well
Structure and Properties of Matter	1	x									x
	2		x							x	
	3			x				x			
	4				x	x					

2.3. Analysis of Data

In the process of document analysis, the researcher(s) first examined the documents superficially and then thoroughly examined them by repeatedly reading them; after this, the researcher(s) tried to interpret the data (Bowen, 2009). The content analysis technique is frequently used for analyzing documents (Robson, 2002). It was decided that the appropriate analysis technique for this research was content analysis and subsequent descriptive analysis. The two-stage pathway followed in the analysis process is given below.

Stage one:

- First, content analysis was done. In this process, all the activities and acquisitions included in the science curriculum were superficially examined and, thus, the codes for entrepreneurial characteristics were uncovered. This process was performed by one of the researchers.

- The codes generated from the activities and acquisitions have been examined in detail for the science curriculum according to their entrepreneurial characteristics.
- During the detailed review process, the acquisitions and activities were read more rigorously and carefully to determine which of them can develop what type of entrepreneurial characteristic. This is the first step of the encoding process.

Stage two:

- The second stage of the analysis is descriptive analysis, which was conducted to eliminate any doubts about whether the codes really belong to the relevant acquisition or activity uncovered.
- The second researcher writer again performed code–activity and code–acquisition matches, similar to the researcher who performed the first stage using the "Entrepreneurial Characteristics Determination Form for Science Curriculum."
- In this way, prejudice, which is the main criticism referred to in qualitative research, has been reduced.
- When contradictory matches were encountered in codes performed by both the first researcher writer and the second researcher writer, then both researchers came together and the codes agreed upon in the last case were preferred.
- Therefore, both researchers, by examining the acquisitions and activities, have checked the codes.
- Percentages were given on the graphs of the acquisitions and activities to make it clearer and to facilitate data interpretation.
- Moreover, the Cohen Kappa coefficient was calculated to provide credibility in coding. Thus, the forms coded by both the author and a different researcher were considered in terms of the section including the creativity characteristic of sixth-grade acquisitions. This coefficient was found at 0.68, and in Table 3 the codes belonging to researchers are given.

Table 3. Acquisitions are coded by author and a different researcher

Acquisition	Author	Different Researher	Acquisition	Author	Different Researher	Acquisition	Author	Different Researher	Acquisition	Author	Different Researher
1	–	–	15	–	–	29	–	–	43	–	–
2	–	–	16	–	–	30	+	+	44	+	–
3	–	–	17	–	–	31	–	–	45	+	+
4	–	+	18	–	–	32	–	–	46	+	–
5	+	+	19	–	–	33	+	+	47	–	–
6	+	–	20	–	+	34	–	–	48	–	–
7	+	+	21	–	–	35	–	–	49	+	+
8	–	–	22	–	–	36	–	–	50	–	–
9	–	–	23	–	–	37	–	–	51	+	+
10	–	–	24	–	–	38	–	–	52	–	–
11	–	–	25	+	+	39	–	–			
12	–	–	26	+	+	40	+	–			
13	–	–	27	–	–	41	+	+			
14	–	–	28	–	–	42	–	–			

"+":creative thinking, "–":no creative thinking

3. FINDINGS

In this part of the study, the findings obtained from the acquisitions, the course textbook acitivities, and the workbook activities are displayed under separate headings.

3.1. The findings obtained from the acquisitions

This section gives the acquisitions that have the potential to improve the entrepreneurial characteristics in the science curriculum. In Figure 1, the percentages of entrepreneurial characteristics of the acquisitions according to the grade level are given.

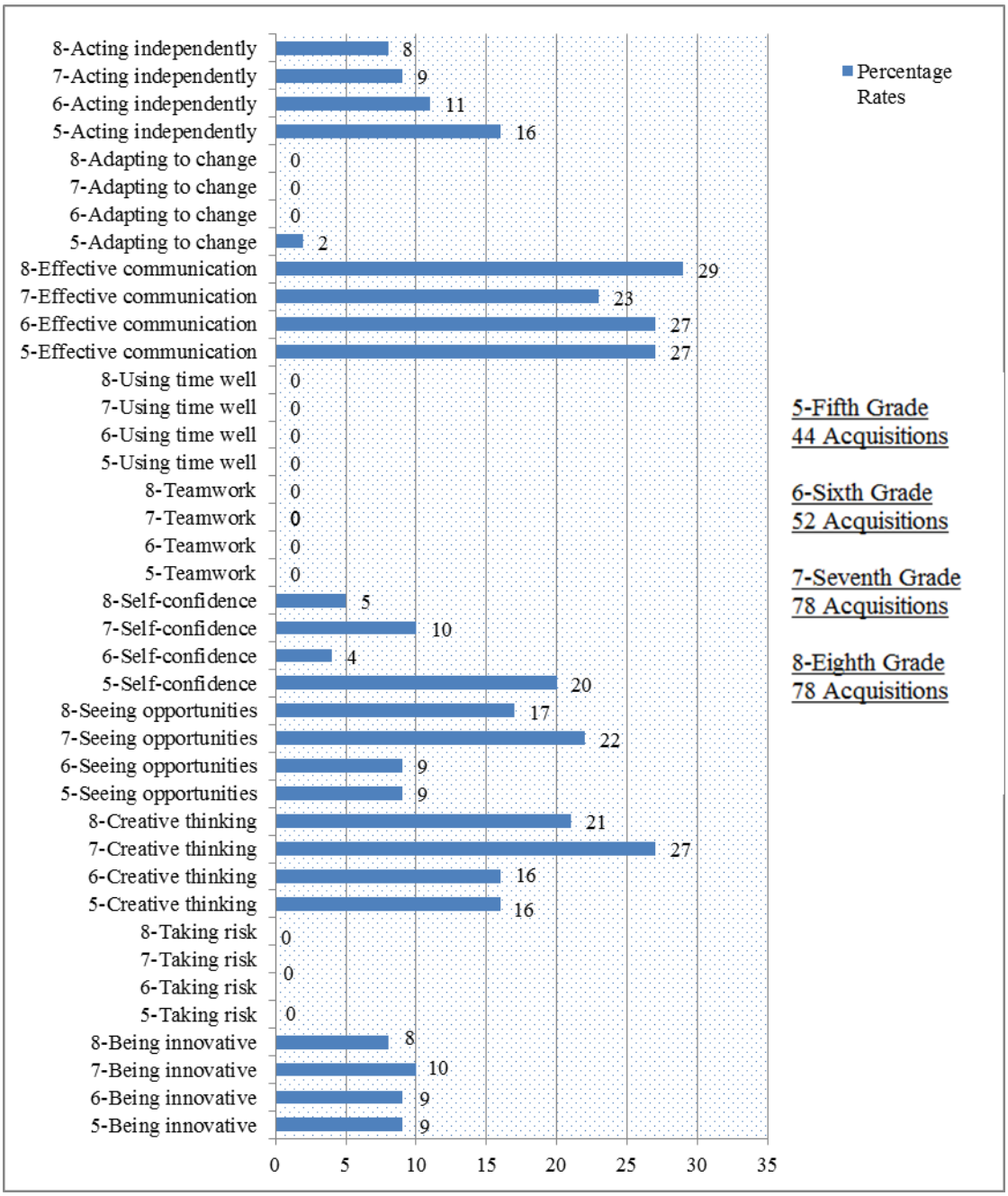

Figure 1. Findings related to acquisition

As shown in Figure 1, there are 44 acquisitions in the fifth-grade science curriculum. The acquisitions were composed of 27% effective communication, 20% self-confidence, 16% creative thinking, and 11% acting independently. The percentage of acquisitions for both seeing opportunities and being innovative is 9%. Although there are fewer acquisitions toward adapting to change, it seems that there are no acquisitions regarding characteristics such as taking risks, teamwork, and using time well. Some examples of the acquisition-code matches are given below. In the coding process, some acquisitions are considered to meet more than one entrepreneurial characteristic. Representation is in the form of "...sample acquisition..." (grade level - code).

- "to research and present effects of balanced nutrition on human health" (Fifth grade - acting independently)
- "takes care of feeding, cleaning, and regular teeth control for dental health" (Fifth grade - adapting to change)
- "to notice the relationship between expansion and contraction events with examples from everyday life" (Fifth grade - seeing opportunities)

As seen in Figure 1, the sixth-grade science curriculum was composed of 52 acquisitions. The acquisitions were composed of 27% effective communication, 16% creative thinking, and 11% acting independently. Characteristics such as being innovative, seeing opportunities, and having self-confidence are less than 10%. Additionally, the acquisitions are not intended to improve characteristics such as taking risks, teamwork, using time well, and adapting to change in the sixth-grade science curriculum. Some example acquisitions are given below.

- "to explain the structures of support and movement system and to give examples by specifying tasks" (Sixth grade - effective communication).
- "to notice the importance of blood donation in terms of society by researching" (Sixth grade - effective communication - seeing opportunities).
- "to compare the densities of liquids which are insoluble in each other by carrying out an experiment" (Sixth grade - self confidence).

There are 78 acquisitions in the seventh-grade science curriculum. These acquisitions consisted of 27% creative thinking, 23% effective communication, and 22% seeing opportunities. Moreover, it has been determined that these acquisitions are composed of 9% acting independently, 10% being innovative, and 10% self-confidence. In addition, it is noteworthy that there are no acquisitions to improve the characteristics that contain taking risks, teamwork, using time well, and adapting to change, just like the sixth-grade science curriculum. Some acquisition examples are given below.

- "to develop a project that enables stuff to be reused by people who need it" (Seventh grade - creative thinking, being innovative).
- "to demonstrate relation between smell and taste senses with a designed experiment" (Seventh grade - self-confidence).
- "to discuss factors that threaten biodiversity based on research data and to suggest solutions" (Seventh grade - creative thinking).

The eighth-grade science curriculum had 78 acquisitions. These acquisitions consisted of 29% effective communication, 21% creative thinking, and 17% seeing opportunities. In addition, 8% acquisitions included acting independently, 8% being innovative, and 5% self-confidence. However, the eighth-grade science curriculum does not include characteristics related to taking risks, teamwork, using time well, and adapting to change. Some acquisition examples are given below.

- "to form a model of the wandering motion around the sun considering the inclination of the earth's rotational axis" (Eighth grade - being innovative, creative thinking).

- to perform experiments related to types of electrification and observing the results" (Eighth grade - acting independently, self-confidence).
- "to design a mechanism that will provide job convenience in daily life utilizing simple machines" (Eighth grade - being innovative, creative thinking, self-confidence).

As a matter of fact, to make a general comment on the acquisitions given in the science curriculum, it can be said that the acquisitions included in the fifth-grade science curriculum have more entrepreneurial characteristics than those of other grade levels. Moreover, it is noteworthy that there are no entrepreneurial characteristics such as taking risks, teamwork, using time well, and adapting to change in the science curricula of the 5–8 grades.

3.2. The findings obtained from textbook activities

In this part of the study, findings from activities included in the 5–8 grade science textbooks are included. In Figure 2, the activities included in the textbooks include percentages that meet entrepreneurial characteristics.

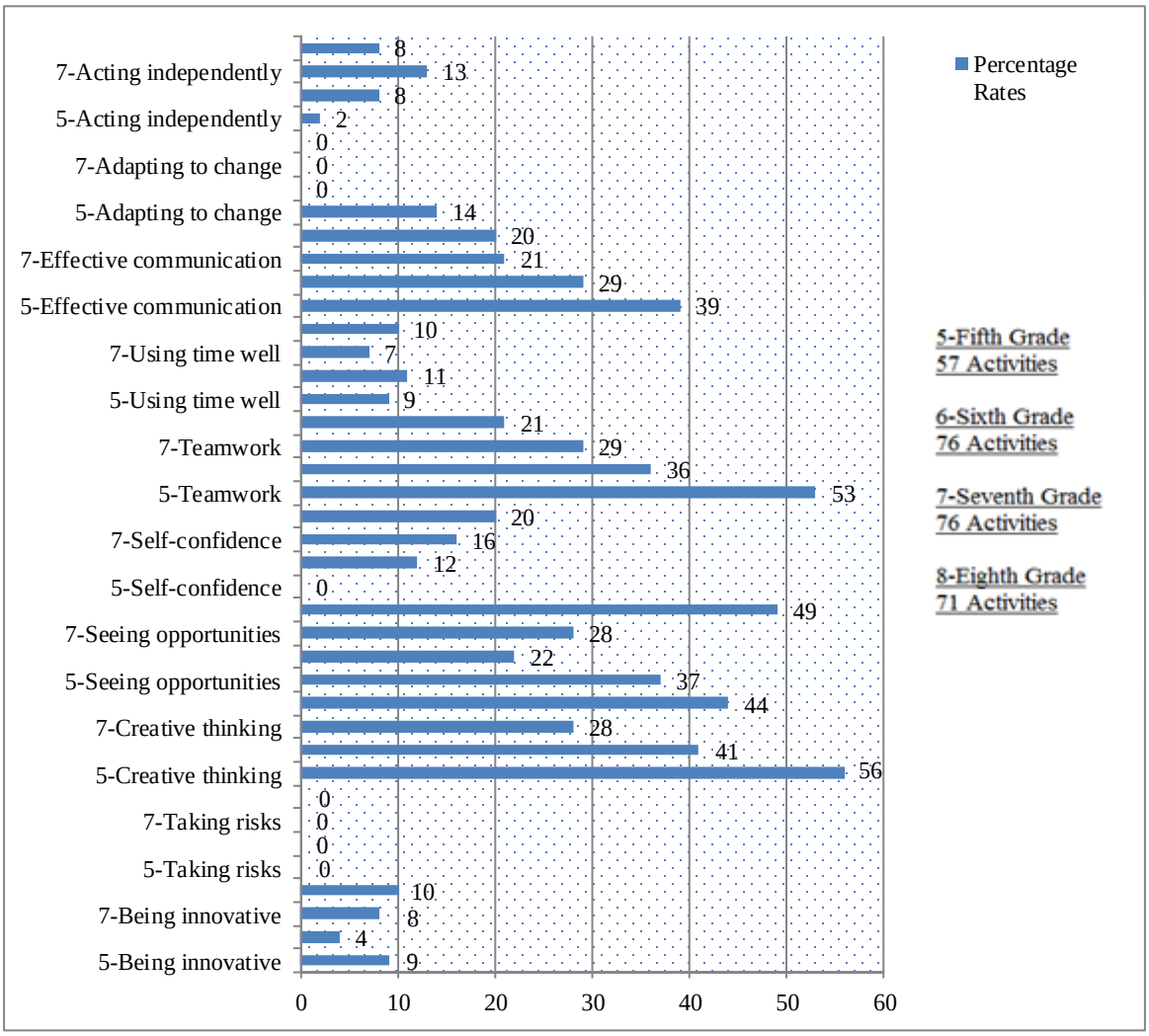

Figure 2. Findings related to textbook activities

As seen in Figure 2, the fifth textbook contains 57 activities. Thus, in the textbook activities, entrepreneurial characteristics can be developed, of which 56% were creative thinking, 52% were teamwork, 37% were seeing opportunities, and 14% were adapting to change. In addition, some entrepreneurial characteristics seem to occur at a low percentage; for example, 9% were being

innovative, 9% were using time well, and 2% were acting independently. However, it was to draw attention to the activities that do not include any entrepreneurial characteristics that would allow students to take risks and be self-confident. Two sample activities and codes are given below. For each, the activity, expressions, and steps reflecting the entrepreneurial characteristics are shown by the arrow mark.

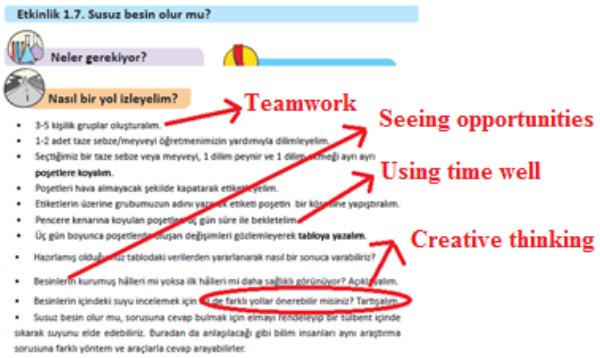

Figure 3. Activity: Does it become food without water? (Fifth-grade science curriculum, 1st Unit)

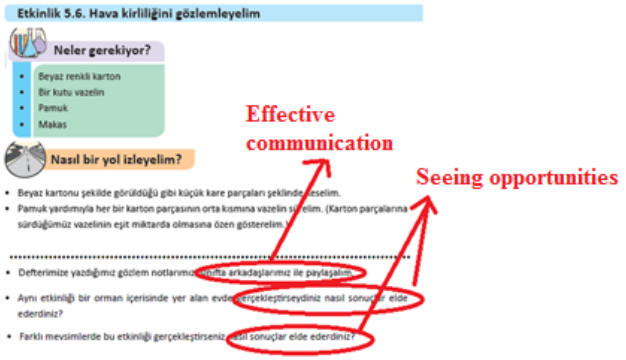

Figure 4. Activity: Observing air pollution (Fifth-grade science curriculum, 5th Unit)

Figure 2 shows that there are 76 activities in the sixth-grade textbook. Thus, 41% of these activities were creative thinking, 36% were teamwork, 29% were effective communication, and 22% were seeing opportunities. Moreover, 12% of the activities were self-confidence, 11% were using time well, 8% were acting independently, and 4% were being innovative. It has been determined that entrepreneurial characteristics, such as taking risks and adapting to change, are not reflected in the activities. Two examples of coded activities are given below:

Figure 5. Activity: Let's make a cell model (Sixth-grade science curriculum, 1st Unit)

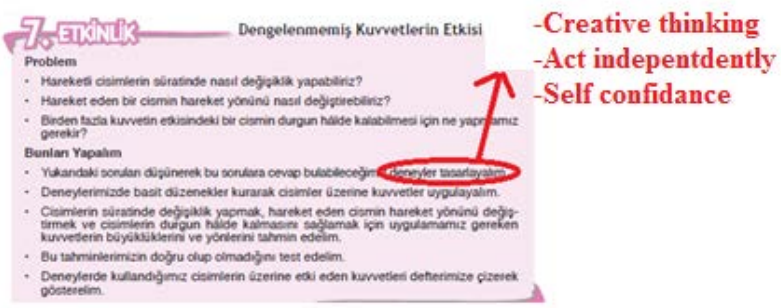

Figure 6. Activity: The effect of unbalanced forces (Sixth-grade science curriculum, 2nd Unit)

The seventh-grade textbook includes 76 activities: 29% development teamwork, 28% creative thinking, 28% seeing opportunities, 21% effective communication, 16% self-confidence, and 13% self-confidence. In addition, 8% of these activities were for development to be innovative and 7% were for using time well. Lastly, it seems that there are no activities to improve the ability for taking risks and adapting to change. The sample activities are given below:

Figure 7. Activity: Warning-Response (Seventh-grade science curriculum, 1st Unit)

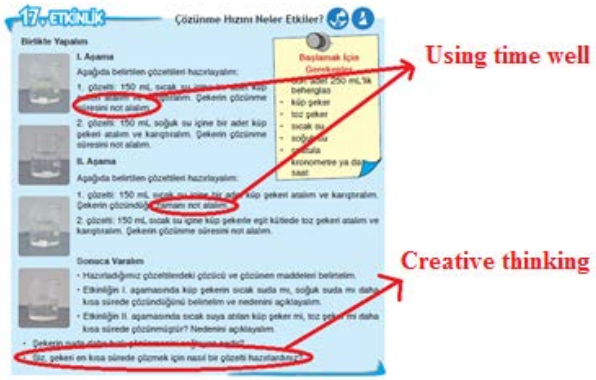

Figure 8. Activity: What affects the rate of dissolution? (Seventh-grade science curriculum, 4th Unit)

When Figure 2 is examined, it is observed that the eighth-grade textbook includes 71 activities. These activities are provided to improve some entrepreneurial characteristics of students; for example, 49% of these activities were for seeing development opportunities, 44% were for creative thinking, 21% were for teamwork, 20% were for self-confidence, and 20% were for effective communication. Besides that, 10% were for development in being innovative, 10% were for using

time well, and 10% were for acting independently. Moreover, no activities were found for development of characteristics such as taking risks and adapting to change, as in the seventh-grade textbook activities. The two sample activities are given below:

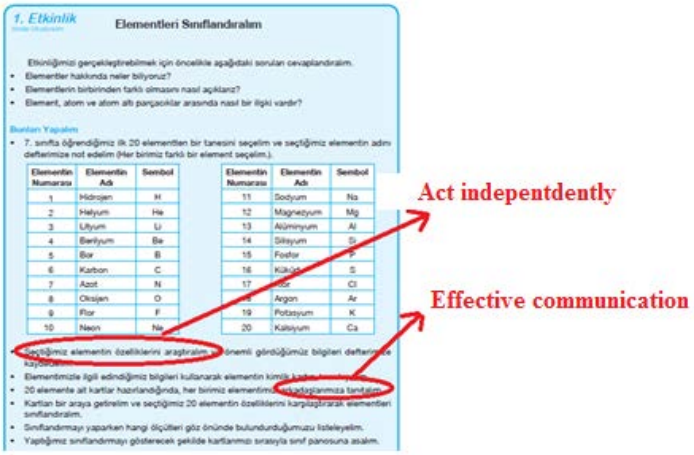

Figure 9. Activity: Let us classify the elements. (Eighth-grade science curriculum, 3rd Unit)

Figure 10. Activity: Is the heating of each item the same? (Eighth-grade science curriculum, 5th Unit)

In general, when examining the textbook activities, the most dominant entrepreneurial characteristics are creative thinking, seeing opportunities, teamwork, and effective communication. Additionally, the textbook activities are insufficient in the development of entrepreneurial characteristics that are composed of being innovative, using time well, and acting independently. Moreover, the characteristic of adapting to change has only been encountered in fifth-grade science textbook activities. In addition, at any grade level, any activities aimed at improving risk taking characteristics were not encountered.

3.2. The findings obtained from workbook activities

This section contains the findings obtained from science workbook activities for 6–8 grades. In Figure 11 the percentage of entrepreneurial characteristics in the workbook activities are given.

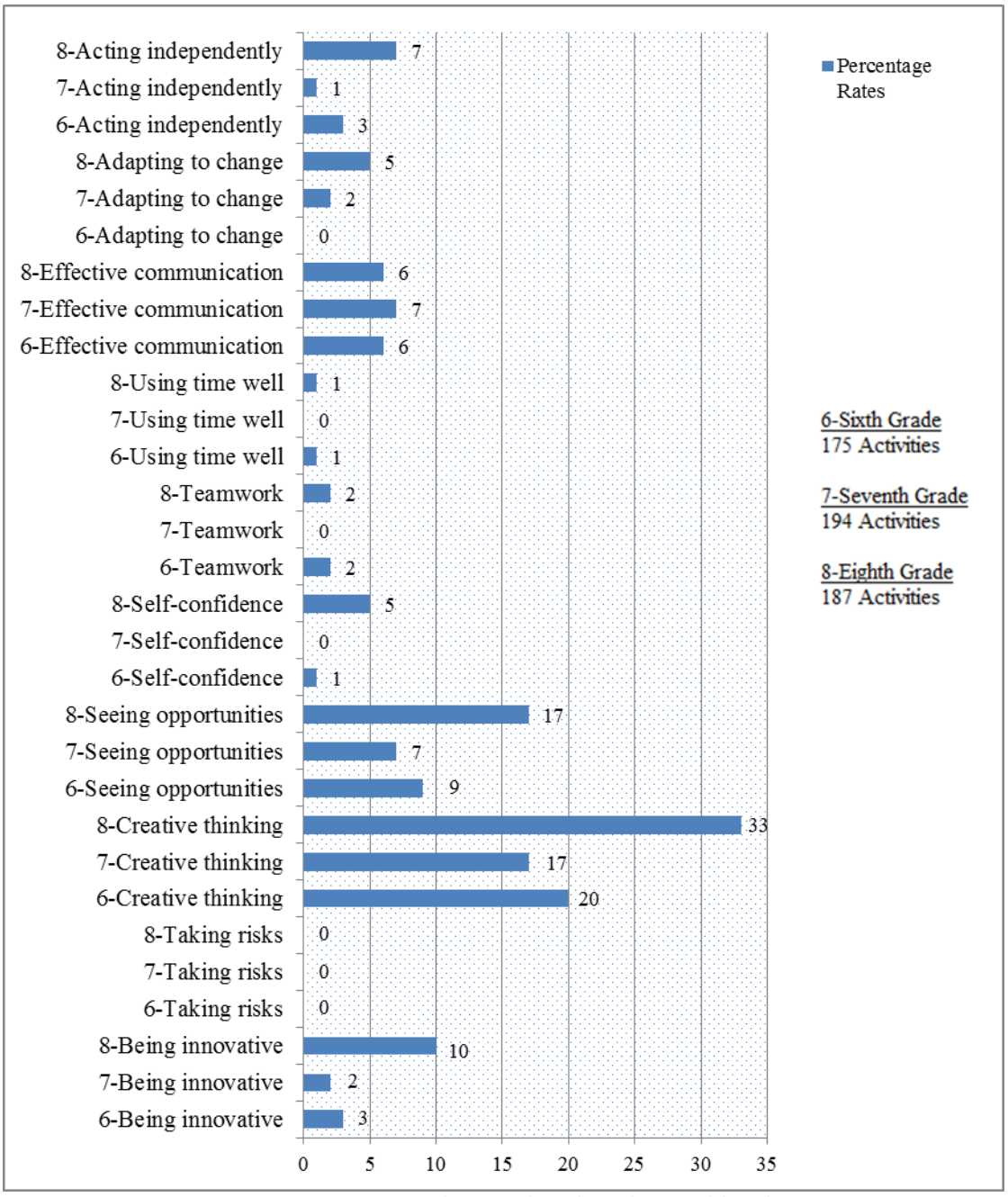

Figure 11. Findings related to the workbook activities

As can be understood from Figure 11, the sixth-grade workbook involves 175 activities: 9% seeing opportunities, 6% effective communication, 3% being innovative, 3% acting independently, 2% teamwork, 1% self-confidence, and 1% using time well. In addition, it has been determined that there are no characteristics related to taking risks and adapting to change in the sixth-grade workbook acitivities. Two activity examples are given below:

Figure 12. Activity: Put my hat on, I'm saying my opinion. (Sixth-grade science curriculum, 1st Unit)

Figure 13. Activity: Is the glass full or empty? (Sixth-grade science curriculum, 3rd Unit)

In the seventh-grade workbook including 194 activities, 17% were for developing creative thinking, 7% were for seeing opportunities, 7% were for effective communication, 2% were for being innovative, 2% were for adapting to change, and 1% were for acting independently. Moreover, it can be said that there is no activity for the development of entrepreneurial characteristics such as taking risks, self-confidence, teamwork, and using time well. Two sample activities are given below:

Figure 14. Activity: What does friction depend upon? (Seventh-grade science curriculum, 2nd Unit)

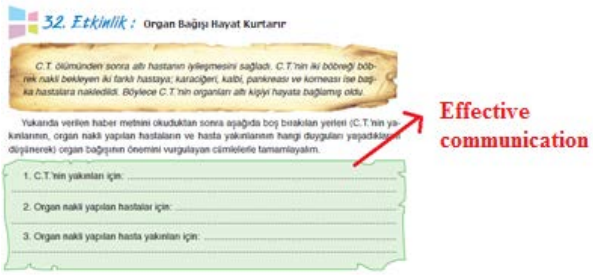

Figure 15. Activity: Organ donation saves lives. (Seventh-grade science curriculum, 1st Unit)

When Figure 11 is considered, it can be seen that the eighth-grade workbook contained 187 activities: 33% creative thinking, 16% seeing opportunities, 10% being innovative, 7% acting independently, 6% effective communication, 5% self-confidence, 5% adapting to change, 2% teamwork, and 1% using time well. It is understood, from Figure 11, that there is no activity to improve the characteristics of taking risks for students. Two sample activities are given below:

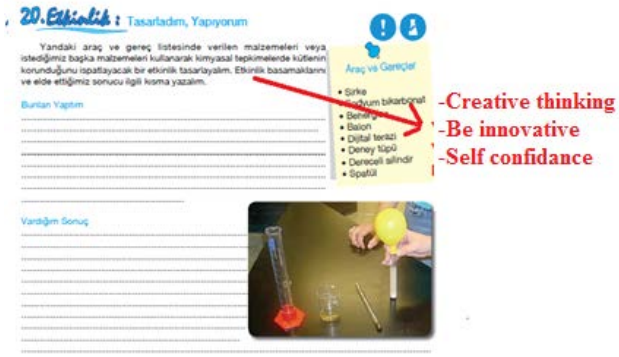

Figure 16. Activity: I designed, I am doing. (Eighth-grade science curriculum, 3rd Unit)

Figure 17. Activity: Let's do indicator. (Eighth-grade science curriculum, 3rd Unit)

In general, the workbook activities have deficiencies in terms of characteristics such as taking risks, using time well, teamwork, self-confidence, adapting to change, effective communication, acting independently, and being innovative.

4. DISCUSSION AND CONCLUSIONS

Based on the research findings related to acquisitions, the most considered entrepreneurial characteristics in acquisitions given in science curricula are effective communication and creative

thinking. In addition, with some acquisitions, a few entrepreneurial characteristics can be developed, such as seeing opportunities, self-confidence, and acting independently. In the literature, in research by Akyürek and Şahin, primary school teachers stated acquisitions that enable the development of a sense of self-confidence contribute positively to the development of entrepreneurial characteristics. On the other hand, in the current research, it was observed that the current acquisitions did not enable the development of entrepreneurial characteristics such as taking risks, teamwork, and using time well. Moreover, in the fifth-grade science curriculum a few acquisitions that develop the characteristics of adapting to change have been found. When the acquisitions are examined according to the grade levels, the entrepreneurial characteristics are found, at least in the acquisitions of the sixth and eighth grades. When the aquisitions are generally evaluated, it has been determined that most of the entrepreneurial characteristics cannot be improved with the current aquisitions. Similar to these results, Güven (2009) emphasized that the acquisitions are inadequate for the development of entrepreneurial characteristics, that the acquisitions get involved in curriculums such as life science, Turkish, mathematics, science, and social science in primary education renewed in 2004. In fact, these results can be attributed to educators or policy makers who do not know what acquisitions related to entrepreneurship are for middle school students. Moreover, curriculum development specialists have faced difficulties in creating course content for the development of entrepreneurial characteristics, both nationally and internationally. Thus, it has been emphasized that teachers do not know how entrepreneurship education has been integrated into the education process (European Commission, 2009). Moreover, teachers have faced problems in finding methods and contents related to entrepreneurship (Seikkula-Leino, 2008). In this sense, it is crucial that the acquisitions related to the entrepreneurial characteristics are given more in science curricula. For example, Erarslan (2011) stated that acquisitions related to entrepreneurship in the teaching curriculum may be effective in improving the entrepreneurial characteristics of students. When considered, the concept of entrepreneurship was included in the year 2005 in the social science teaching curriculum (5–8 grades), wherein a research study conducted in the 2013–2014 academic year (Polat et al. 2015) found that teachers meet positive social science textbooks in terms of acquisitions related to entrepreneurship.

Textbook activities are aimed at improving entrepreneurial characteristics such as creative thinking, effective communication, teamwork, and seeing opportunities. In addition, it has been found that there are also a few activities that are aimed at developing entrepreneurial characteristics such as acting independently, using time well, being innovative, and self-confidence. In addition, it is observed that the activities aimed at developing the characteristics of adaptation, to change students, are only included in fifth-grade textbook activities. However, no activity purposed to improve the characteristics of taking risks for students has been found. Fakharzadeh (2012), in a research study on primary school textbooks, specified that the entrepreneurial characteristics were observed more in third-grade textbooks and less in first-grade textbooks. Similarly, Baysal and Özkul (2009) examined Turkish and social science textbooks in terms of concepts related to entrepreneurship (1–5 grades) and found that the concepts of entrepreneurship are included and encountered; however, entrepreneurship was found only in the fifth-grade social science textbook. This situation can be interpreted in the form of the more common entrepreneurial characteristics in textbooks as the grade level increases. However, according to Figure 2, entrepreneurial characteristics have an irregular distribution in the current study. There are some more entrepreneurial characteristics in fifth-grade textbook activities, although these are expected to be more in the eighth-grade textbook activities. This could be because the fifth-grade textbooks are of the most recent edition. However, some entrepreneurial characteristics have still not been reflected in or been reflected less in the activities of the fifth-grade textbook, despite it being the most up-to-date edition; these characteristics included adapting to change, self-confidence, taking risks, acting independently, and being innovative. Thus, generally, the findings show that the entrepreneurial characteristics are not yet fully reflected in textbook activities. In this sense, it could be important to

enable students to acquire entrepreneurial characteristics by reading materials and textbook activities at the elementary level. Yusuf (2013) emphasized that the entrepreneurial characteristics may be placed in the core curriculum through reading tasks and activities that will encourage students to engage in a business idea or inspire it. Otherwise, Brown (2000) indicated that, in middle school textbooks, students were intended to gain the necessary information about entrepreneurship.

In general, it seems to be aimed more at improving students' characteristics such as creative thinking, seeing opportunities, and effective communication in the workbook activities. Otherwise, it has been found that workbook activities are insufficient in improving students' characteristics of being innovative, self-confident, teamwork, using time well, adapting to change, and acting independently. In addition, it seems that there is no activity aimed at improving the characteristic of taking risks in students in the workbook activities. When figure 11 is examined carefully, it shows that workbook activities are very weak in developing entrepreneurial characteristics, apart from creative thinking, according to the acquisitions and textbook activities. In relation to this issue, a study investigating primary school books by Fakharzadeh (2012) drew attention to the fact that 24% of all reading books have an entrepreneurial attitude, and this ratio is 54% for workbooks. Moreover, Brown (2000) asserted that the emphasis was on how students can develop their own business ideas in the workbooks at the middle school level. Besides, when compared to the international literature, it can be seen that the workbook activities examined in the current research are quite inadequate (Brown, 2000; Fakharzadeh, 2012). Actually, the workbooks are invaluable for the development of students' entrepreneurial characteristics because the workbooks focus on the development of the social skills of students rather than on theoretical knowledge about any topic. Unfortunately, the workbooks have been prepared only for repeating the subjects in Turkey. Therefore, it could be said that using the workbooks does not enable the development of students' entrepreneurial characteristics.

Therefore, the acquisitions, the coursebook activities, and the workbook activities are generally sufficient in terms of reflecting creative thinking and effective communication in the science curriculum for students in grades 5–8. However, they are insufficient in terms of taking risk, adapting to change, being innovative, seeing opportunities, self-confidence, teamwork, and acting independently, which are basic entrepreneurial characteristics. Fakharzadeh (2012) stated that the most dominant entrepreneurial characteristics in all the primary school books are creative thinking and being innovative, whereas seeing opportunities occurs rarely in books. In this sense, the results obtained in current research are in parallel with this result in terms of creative thinking; however, the current research shows that the science curriculum is inadequate in terms of being innovative. We know that the essence of innovation includes problem solving, and the nature of science education is appropriate for problem solving. Thus, it has been stated that the links between science, entrepreneurship, innovation, and creativity should be strengthened (European Commission, 2015). In the same way, it is possible to find more entrepreneurial characteristics in other education curricula in recent years in Turkey. For example, Güven (2010) analyzed life sciences (1–3 grades) curricula developed in various periods (1926, 1930, 1948, 1968, 1995, 1998, and 2005) in primary education and found that the life sciences curriculum developed in 2005 has many more entrepreneurial characteristics. Moreover, Gömleksiz and Kan (2009) revealed that the social sciences curriculum is effective in improving entrepreneurial characteristics using the opinions of fifth-grade students. Thus, it could be said that entrepreneurial characteristics have begun to find a place in teaching curricula in recent years in Turkey, in parallel with other countries. However, there are still serious shortcomings about entrepreneurial characteristics in the middle school science curriculum for grades 5–8 in Turkey. This was encountered with some of the entrepreneurial characteristics. Although these have not been directly reflected in the new science curricula, we know that the concept of entrepreneurship is one of the life skills intended to be taught in the science curriculum published in 2013. However, it was determined that the entrepreneurial

characteristics are still not adequately reflected in the science curriculum. Based on these results, the following suggestions have been made.

5. RECOMMENDATIONS

- Textbooks may include activities to improve students' taking risk characteristic. This can also be achieved by changing the structure of existing activities. For example, in a laboratory environment consisting of five groups of three students, there are five different conductor wires. In this case, the five different conductors are not easily predictable in their electrical conductivity. The conductor wires are presented to the groups, and each group is asked to select one of the conductor wires. The groups only have one chance to select a wire. The groups take risks and set hypotheses, choose a wire, and perform experiments.
- While planning the activities, tasks with time definition should be given to students for the characteristic of using time well.
- Opportunities to enable students to think about the economic dimension of the subjects in the activities should be recognized. For example, in the eighth-grade workbook, 22nd activity, the teacher could add some steps. To prepare a research project in which a new animal is brought to the zoo, educators should enable students to find an interesting animal and students must prepare the appropriate living conditions for this animal by doing research. Finally, students should present their project as a recommendation to the zoo manager.
- Economic dimensions should be included in these activities. For this, a simple activity related to the topic should be planned. A problem should be identified. A product or service should be planned to solve any problem and to prepare a product they want to sell; how much does the product cost? How much are they going to sell? Who does this product appeal to? How are they planning to sell it?
- Workbook activities should also include situations that will enable students to work with others. It should enable students to play different roles in the group. They should be given the opportunity to do exercises that make them feel as if they are group leaders.
- In group work in the science laboratory, some students in the group should be able to work with other groups. For this, the teacher could enable a student to changes places with a student from another group. In this way, the teacher can observe students' characteristic of adapting to change and whether a student is experiencing discomfort over a certain period of time.
- A commercial dimension can be given to the activities. For example, eighth-grade workbook, Activity 39. The teacher could add some steps. How to get the best foam from the soap? What kind of variables can facilitate the sale of soaps (colour, smell, etc.)?
- More opportunities should be given to students to develop entrepreneurial projects in activities.
- A re-examination of entrepreneurial characteristics in the acquisitions, textbook, and workbook activities renewed after 2013 may be recommended. It is also believed that it will be useful to review the contents (subject explanations) of the textbooks that cannot be covered in the scope of this research in terms of economy, entrepreneurship, and entrepreneurial characteristics.

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Dünya'da nüfusun hızla arttığı bir zaman diliminde yaşamaktayız. Hızlı nüfus artışı karşısında sınırlı sayıda meslek dalı olmasından dolayı bireylerin işsizlik sorunu yaşadığı bilinmektedir. Bu sorunun üstesinden gelebilmek için birçok ülke artık vatandaşlarını, kendilerini istihdam edebilecek düzeyde yetiştirmeyi amaçlamaktadır. Sürekli nüfus artışının olduğu ve genç nüfusun yaşlı nüfusa oranın fazla olduğu Türkiye'de diğer ülkelerle aynı amacı gerçekleştirmeye çalışmaktadır. Bir ülkedeki iş gücü niteliği, bireylerin sahip olduğu yaşam becerileri ile ilişkilendirilmektedir (Ememe, Ezeh ve Ekemezie, 2013). Yaşam becerileri arasında en dikkat çekici olan kavramın, ekonomi ile doğrudan ilişkili olan "girişimcilik" kavramı olduğu söylenebilir. Çünkü son yıllarda Ülkemizde ilkokuldan yükseköğretime kadar bazı eğitim programlarında kazandırılması amaçlanan beceriler arasında "girişimcilik" kavramının yer aldığını görmekteyiz. 2013 yılında yenilenen ortaokul fen bilimleri programında yaşam becerileri adı altında "girişimcilik" kavramı yer almakta ve öğrencilere girişimci özelliklerin erken yaşlardan itibaren kazandırılması hedeflenmektedir. Bu araştırmada fen bilimleri programında yer alan kazanımlar, ders ve çalışma kitabı etkinliklerinin girişimci özelliklerden hangilerini geliştirme potansiyeline sahip olduğunun belirlenmesi amaçlanmıştır. Bu amaçla 5-8 fen bilimleri programında yer alan kazanımlar, ders ve öğrenci çalışma kitabı etkinlikleri incelenmiştir. Araştırmada analiz işlemleri iki aşamada gerçekleştirilmiştir. Önce içerik analizi ile kodlar ortaya çıkarılmış daha sonra ortaya çıkan kodlara bağlı olarak betimsel bir yol izlenerek kod – veri karşılaştırması yapılmıştır. Sonuç olarak 5-8 fen bilimleri programında yer alan kazanım, ders kitabı ve çalışma kitabı etkinliklerinin öğrencilere girişimci özellikleri kazandırma konusunda etkili iletişim

kurma, yaratıcı düşünme özellikler açısından yeterli olduğu, ancak temel girişimci özellikler olan risk alma, değişime uyum sağlama, yenilikçi olma, fırsatları görme, kendine güven, takım halinde çalışma, bağımsız hareket edebilme özellikleri açısından ise yetersiz olduğu sonucuna ulaşılmıştır. Fakharzadeh (2012) İran'daki ilköğretim kitaplarını incelediği araştırmasında kitapların tamamında da en fazla baskın olan girişimci özelliklerin yaratıcılık ve yenilikçi olma özellikleri olduğu belirtilirken, fırsatları görme özelliğinin ise çok az yer aldığı vurgulamaktadır. Bu anlamda yaratıcılık konusunda bu araştırmada elde edilen sonuçlar ile paralel sonuçlar elde edilsede, fen bilimleri derslerinin doğasına uygun olan problem çözmeye dayalı yenilikçi olma özelliğinin gelişimine bizim programlarımızda yeterince yer verilmediği söylenebilir. Güven (2010) yaptığı araştırmasında 1926, 1930, 1948, 1968, 1995, 1998 ve 2005 hayat bilgisi öğretim programlarını girişim özellikler açısından incelemiş ve girişimci özellikleri öğrencilere kazandırmada en iyi programın 2005 hayat bilgisi öğretim programı olduğunu belirtmektedir. Dolayısıyla 2004-2005 yıllarında yenilenen eğitim programlarında girişimci özelliklere ait izlere rastlandığı söylenebilir. Benzer şekilde Gömleksiz ve Kan (2009) beşinci sınıf öğrencilerinin görüşleriyle sosyal bilgiler dersi öğretim programının girişimci özellikleri geliştirmede etkili olduğu sonucuna ulaşılmıştır. Bu anlamda yeni programlarda doğrudan girişimci özellikleri kazandırmak amaçlanmasa da, girişimci özelliklerden bir bölümüne rastlandığını görmekteyiz. Bu sevindirici bir tespit olsa da, şuanda girişimcilik kavramı fen bilimleri programlarında kazandırılması düşünülen özellikler arasında yer aldığı için, fen bilimleri programının mevcut durumunun girişimci özellikleri kazandırma konusunda yetersiz olduğu söylenebilir. Nitekim Bacanak (2013) yaptığı çalışmasında fen bilimleri öğretmenlerinin girişimcilik kavramı hakkındaki yetersiz bilgi ve deneyimlerinden dolayı, girişimci özelliklerin öğrencilere kazandırılması konusunda farklı anlayış ve uygulamaları sahip olduklarını belitmektedir. Bacanak'ın bulduğu sonuç bu araştırmanın sonuçlarını destekler niteliktedir. Diğer taraftan Fakharzadeh (2012) ilköğretim kitaplarını incelediği araştırmasında genel olarak duyuşsal girişimci özelliklere okuma kitaplarında, davranışsal girişimci özelliklere çalışma kitaplarında yer verildiğini, bunun yanında kitaplarda girişimci bilişsel özelliklere fazla yer verilmediğini ileri sürmektedir. Buradan da anlaşılacağı kitabı ders, çalışma ve okuma kitaplarında girişimci özelliklere daha belirgin bir şekilde yer verilmesi gerektiği söylenebilir. Bunun yanında kazanım, ders ve çalışma kitabı etkinliklerin ekonomi, iş dünyası, mevcut ve gelecekti meslek dalları hakkında farkındalık yaratmaya yönelik olmaması eksiklik olarak görülen hususlardan biridir. Öğrencilerin risk alma özelliğini geliştirilmeye yönelik etkinliklere yer verilebilir. Bu mevcut etkinliklerin yapısı değiştirilerek de sağlanabilir (Örneğin; 3'er kişilik beş gruptan oluşan bir laboratuvar ortamında, amacın farklı iletken tellerin elektrik iletkenliği olduğunu düşünelim, bu durumda sonucu hemen tahmin edilemeyen beş farklı iletken tel gruplara sunularak iletken tellerden birini seçmeleri istenir, yalnızca bir tel seçme şansı olan gruplar risk alarak tellerden birini seçer ve elektrik devresine bağlayarak ampulün parlaklığını diğer gruplarınki ile karşılaştırır ve en iyi iletken telin hangi grupta olduğunu bulmaya çalışır).