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KNOWLEDGE AND IMAGES OF PRE-SERVICE ELEMENTARY MATHEMATICS TEACHERS ABOUT ENTREPRENEURSHIP AND ENTREPRENEURSHIP SKILLS

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Abstract:
Entrepreneurship is related to awareness, ideas, imagination, and effort. Entrepreneurship training is now being carried out in order to increase the extent of entrepreneurial activities. In this regard, when entrepreneurship education practices are examined in many countries, it is seen that students are introduced to entrepreneurship and entrepreneurship education before they reach high school. In Turkey, entrepreneurship skills are among the basic skills in all curriculum programs since 2005. By establishing relations through images, people build stronger and understandable connections when they encounter a new concept or new knowledge. In this respect, the aim of this study is to reveal pre-service elementary mathematics teachers' perceptions of entrepreneurship and the skills of the concept from freshmen to seniors in terms of what they know from their previous and current educational experiences and their perceptions about the importance of the concept of entrepreneurship. Twelve pre-service elementary mathematics teachers (6 women and 6 men) from each grade level for a total of 48 pre-service teachers (24 women and 24 men) studying at Bolu Abant Izzet Baysal University participated in the study. During the selection process of the participants, only voluntary participants were considered. As a data collection tool, the interview protocol, which included 6 questions and was based on the literature, was prepared by the researcher. Data were collected through interviews, and interviews took approximately 40 minutes for each participant. The content analysis technique was used in the analysis of the collected data. The data were analyzed under headings of the prior knowledge and perceptions of entrepreneurship and entrepreneurship skills, the importance of entrepreneurship and entrepreneurship skills, the place of entrepreneurship in daily life, and findings about images of entrepreneurship skills. According to the findings of the research, it is concluded that the concepts of entrepreneurship and entrepreneurship skills are not sufficiently heard of or recognized among pre-service elementary mathematics teachers. As the image categories of entrepreneurship and entrepreneurship skills, 4 image categories and related subcategories were determined for

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entrepreneurship. For "entrepreneurship skills," 3 image categories and related subcategories were determined. Entrepreneurship training can be given in entrepreneurship courses or teaching courses in faculties of education. In these courses, not only theoretical knowledge about entrepreneurship skills, which are among the skills that should be acquired by individuals within the scope of lifelong learning, but also studies involving applications can be applied for pre-service teachers. There is no previous study in the literature that reveals the knowledge and images of pre-service elementary mathematics teachers regarding the concepts of entrepreneurship and entrepreneurship skills. Therefore, other studies that support the results of this study should be pursued.

Keywords: entrepreneurship, entrepreneurship skills, pre-service elementary mathematics teachers

1. Introduction

The concept of entrepreneurship is defined as "*designing and organizing the production process as a production factor by bringing together labor, capital and nature and undertaking all its risks*" (Turkish Language Society, 2011). As can be understood from the definition, it can be thought of as an action carried out by people who have an enterprise by putting capital in production areas. For Mueller and Thomas (2001), entrepreneurship is defined as "*perceiving an opportunity*" or a "*behavioral process*." From these definitions, it can be understood that entrepreneurship will not occur in every individual, nor will it occur in every entrepreneurial individual. Entrepreneurship, which has many definitions by different authors, is generally defined as the process of establishing a new business for profit, expanding a business, or creating a new product or service (Bird, 1989: 16). When the definitions of the past are examined, although entrepreneurship was defined as establishing and expanding a business for profit, this idea has rapidly transformed in recent years and it has been suggested that the concept of entrepreneurship can be used outside of the business context (Tiernan, 2016). Today, entrepreneurship is defined as the process of taking more risks, undertaking innovations, taking advantage of opportunities, and finally putting them into practice (Bozkurt, 2007). Education is one of the areas where these steps can be taken.

Entrepreneurship training, which is carried out to increase entrepreneurial activities, is transferred to individuals within the framework of each country's unique cultural context (Lee & Peterson, 2000). When entrepreneurship education practices are examined in many countries, it is seen that students have encountered entrepreneurship and entrepreneurship education before they reach high school (Tarhan, 2019). Entrepreneurship education was initiated by Shigeru Fijii in Kobe University in Japan in 1938. The beginning of entrepreneurship education in the United States dates back to 1876, while it became more widespread being taught as a course in universities in the 1970s (Hood & Young, 1993). In Turkey, the concept of entrepreneurship has been on the

agenda of both the Ministry of Education and the business sector. Considering the general competencies of the teaching profession, it is emphasized that teachers and pre-service teachers have entrepreneurial characteristics and can integrate this process into the curriculum (Ministry of Education, 2013). Thus, entrepreneurship is a concept encountered in all levels of education, from elementary school to secondary education, in Turkey (Ministry of Education, 2018).

Entrepreneurship skill is expressed as "*all learning activities related to personal, social and working life of the individual in order to advance the knowledge, skills and competencies of the individual and take it one step further*," or, in other words, as a lifelong learning process (European Commission, 2006). Entrepreneurial skill, which is among the eight basic competencies, is a necessary skill to put into action the feelings and thoughts of the individual, to plan to achieve targeted goals, to manage processes, and to realize risk-taking, creative, and innovative skills (Figel, 2007: 3-12). Entrepreneurship training is provided to realize this skill. The main purpose of entrepreneurship training is the acquisition of both entrepreneurship awareness and entrepreneurship skills (Ağca, 2007). In a study conducted in the United States, it was concluded that people who received entrepreneurship education were three times more inclined to start a new business, seemed three times more likely to work in their own businesses, earned 27% more profits annually, had 62% more assets, and were more satisfied with their work (Özdemir, 2016). Entrepreneurship and entrepreneurship skills are relevant for individuals in many parts of their lives, including education, social life, and economics. Therefore, entrepreneurship and entrepreneurship skills are very important and individuals should not only be given training in classrooms in the school environment; the focus on entrepreneurship skills should continue outside the classroom and should be a part of daily life (Selanik Ay & Acar, 2016). There are also some factors affecting the formation of entrepreneurial individuals. Among these factors, having an entrepreneurial personality is defined as being internal, while the family and cultural structure, social and administrative conditions, and the education system are defined as external factors (Aytaç & İlhan, 2007). Thus, entrepreneurship skill can be considered as the process that triggers the combination of these factors existing in the individual and brings the individual to achieve results.

People can make new concepts that they encounter more concrete and understandable by establishing relationships between previously learned information by analogy (Senemoğlu, 2007). This process is realized more easily with the help of images. Images affect and enrich individuals' meaning-making processes (Wulf & Dudis, 2005). The essence of an image is to understand and experience one thing from the perspective of another (Lakoff & Johnson, 1980). No study has been found in the national or international literature on how entrepreneurship and entrepreneurship skills are defined in people's images. In the literature, these concepts are mostly explored in areas such as the social sciences, economics and administrative sciences, and engineering, while in the field of education, studies have been conducted with teachers in the fields of entrepreneurship education and levels (Wang & Wong, 2004; İşcan & Kaygın, 2011;

Uygun, Mete, & Güner, 2012; Bilge & Bal, 2012; Korkmaz, 2012; Deveci & Çepni, 2014; Pan & Akay, 2015; Deveci & Seikkula-Leino, 2016). It is believed that this study will make important contributions to the literature due to the reasons listed. First of all, it is seen that the concepts of entrepreneurship and entrepreneurship skills are mostly studied with science and social studies teachers and pre-service elementary mathematics teachers in the field of education, while image studies with elementary mathematics teachers and pre-service elementary mathematics teachers have never been conducted before. Thus, it will be examined how these concepts are perceived in the minds of pre-service elementary mathematics teachers who will be newly employed. Based on these definitions, the needs in the education process will be determined and the way will be paved for using entrepreneurship and entrepreneurship skills more frequently in daily life and mathematics education. In addition, it is thought that this study will guide future developmental studies to be carried out on entrepreneurship in teacher education by determining the perceptions of pre-service elementary mathematics teachers about the concepts of entrepreneurship and entrepreneurship skills.

The aim of this study is to examine the knowledge and images of pre-service elementary mathematics teachers regarding entrepreneurship and entrepreneurship skills. In line with this purpose, the study sought answers to the following questions:

1) Have pre-service elementary mathematics teachers previously heard about the concepts of entrepreneurship and entrepreneurship skills in their educational life?
2) Are entrepreneurship and entrepreneurship skills different concepts according to pre-service elementary mathematics teachers? If they are different, what are the definitions?
3) Why are these concepts important to those who think that entrepreneurship and entrepreneurship skills are important concepts?
4) What initiatives and examples are considered important in daily life according to pre-service elementary mathematics teachers?
5) According to pre-service elementary mathematics teachers, what is entrepreneurship like in mathematics education? What situations cause it to be simulated?
6) According to pre-service elementary mathematics teachers, what are entrepreneurship skills in mathematics education? What situations cause them to be simulated?

2. Methodology of the Research

2.1. Research Design

In this study, it is aimed to reveal what pre-service elementary mathematics teachers know about the concept of entrepreneurship skills from the first to the last year of their education, what they know about the concept of entrepreneurship skills from their previous and current educational life, and what their images of the concept of entrepreneurship are. A qualitative research phenomenology design was used since the

purpose of the phenomenology design is to reveal the experiences and perceptions of individuals regarding a phenomenon and the meanings they attribute to them (Creswell, 1998).

2.2. Participants

Participants of the study included a total of 48 pre-service elementary mathematics teachers (24 women and 24 men), 12 of whom (6 women and 6 men) were pre-service elementary mathematics teachers from each grade level, who were studying in an education faculty. The reason for choosing pre-service teachers from each grade level was to determine whether the knowledge, perception, and meanings attributed to entrepreneurship and entrepreneurship skills differed at each grade level, and, if so, to examine this situation according to grade levels. Pre-service elementary mathematics teachers were selected by the maximum diversity sampling method from among the purposeful sampling types. Since the diversity of individuals is important in maximum diversity sampling, the pre-service elementary mathematics teachers' years of education and genders were taken into consideration. All of the individuals enrolled in this study participated voluntarily.

2.3. Data Collection

Data were collected using a semi-structured interview form. While preparing the interview form, the literature was consulted, and 6 questions were prepared to reveal the knowledge and images of pre-service elementary mathematics teachers about entrepreneurship and entrepreneurship skills. The prepared interview form was first sent to a language expert and evaluated in terms of Turkish language usage. The interview form, which was arranged according to the feedback, was then presented to four pre-service teachers who were studying in the 1st, 2nd, 3rd, and 4th years, and the pilot study of the interview form was carried out. After the pilot interviews, the final version of the interview form was determined. The questions on the interview form consist of two parts. The four questions in the first part address the pre-knowledge of pre-service elementary mathematics teachers about entrepreneurship and entrepreneurship skills, their senses, and their knowledge about the importance and place of entrepreneurship and entrepreneurship skills in daily life. The two questions in the second part are aimed at revealing their images of entrepreneurship and entrepreneurship skills.

Before the interviews, the researcher noted the willingness of each pre-service elementary mathematics teacher to voluntarily participate and informed the participants that she would record the interviews with audio recording. Before conducting the interviews, the researcher also explained that the interviews were not exams and were only being conducted to obtain information. The interviews lasted approximately 40 minutes for each pre-service elementary mathematics teacher. The order of presentation of the questions on the interview form was the same for each pre-service teacher.

2.4. Data Analysis

The content analysis technique was used in the analysis of the collected data. The basic process in content analysis is to gather similar data within the framework of certain concepts and themes and to interpret them in a way that the reader can understand (Şimşek & Yıldırım, 2006). The analysis was carried out in three stages. First of all, the data obtained with audio recordings were analyzed and the analyses were checked by a person outside the research. The data were then coded by the researcher. Separately, the data were analyzed by a different researcher, and 90% agreement was found between the coding. In the separate codings, the data and codes were revisited and rearranged according to the consensus reached between the researchers. Since a percentage of agreement of 70% or higher was deemed sufficient, reliability was provided in terms of data analysis (Türnüklü, 2000).

2.5. Reliability and Validity

Some precautions were taken to increase the validity and reliability of the study. In order to increase the internal validity of the research, the literature was taken into consideration while preparing the interview questions. Integrity was ensured by checking the compatibility of codes and themes obtained from the data. It was taken into account that the teacher candidates participating in the study were voluntary participants. In order for the pre-service elementary mathematics teachers to be able to express their opinions without any worries, the researcher gave information about the content of the research and stressed that the interview was not an exam before the interviews with the teacher candidates. Thus, it was ensured that the data collected during the interview process reflected the real situation. In order to increase the external validity of the research, the research design, participants, data collection tool and process, and analysis and interpretation of the data were specified in detail. In order to increase the internal reliability of the research, the findings are given directly without any comments. After the coding of the data was performed by the researcher, another researcher was allowed to code the data, and the percentage of compliance was calculated by combining the resulting codes. In order to increase the external reliability of the research, the work done during the research process has been specified in detail. The data constituting this research have been kept by the researcher for possible future examination.

3. Findings

In this study, which investigates the knowledge and images of pre-service elementary mathematics teachers on entrepreneurship and entrepreneurship skills, the data were analyzed under two headings: first, the prior knowledge and senses of entrepreneurship and entrepreneurship skills, the importance of entrepreneurship and entrepreneurship skills, and their place in daily life, and second, findings about images of entrepreneurship skills. As a result of the analysis, the knowledge and images of the pre-service elementary

mathematics teachers regarding entrepreneurship and entrepreneurship skills were analyzed with specific codes and frequency tables.

3.1. Entrepreneurship and prior knowledge and senses of entrepreneurship skills, the importance of entrepreneurship and entrepreneurship skills, and findings about their place in daily life

In the interview questions, the first thing asked of the pre-service elementary mathematics teachers was "Have you heard about the concepts of entrepreneurship and entrepreneurship skills in your educational life before today?" The answers given to this question by the pre-service elementary mathematics teachers are presented in Table 1.

Table 1: Pre-service elementary mathematics teachers' perceptions of entrepreneurship and entrepreneurship skills in their educational life according to their education levels

		1st year	2nd year	3rd year	4th year	Total	
Entrepreneurship	I have heard	4	4	8	11	27	48
	I have not heard	8	8	4	1	21	
Entrepreneurship skills	I have heard	1	4	7	11	23	48
	I have not heard	11	8	5	1	25	

When Table 1 is examined, it is seen that the concepts of entrepreneurship and entrepreneurship skills are not sufficiently heard of in the educational experiences of pre-service elementary mathematics teachers. It was determined that 27 of 48 elementary mathematics teachers had heard of the concept of "entrepreneurship" while 21 had not, and 23 of them had encountered the concept of "entrepreneurship skills" while 25 had never heard of it. However, it is clearly seen that these concepts started to be heard of more from the first year of their education to the fourth.

Secondly, the pre-service elementary mathematics teachers were asked the following set of questions: "Is there a difference between entrepreneurship and entrepreneurship skills?" "What is entrepreneurship?" "What is entrepreneurship skill?" Fifteen of the 48 pre-service elementary mathematics teachers (11 from the 1st year, 2 from the 2nd year, 1 from the 3rd year, and 1 from the 4th year) stated that there was no difference between entrepreneurship and entrepreneurship skills. The remaining 33 pre-service teachers stated that they are different, and the reasons for the difference are presented in Table 2.

When Table 2 is analyzed, it is seen that in all three ways of defining the differences between entrepreneurship and entrepreneurship skills, entrepreneurship remains passive compared to entrepreneurship skills; entrepreneurship skills come to mind in terms of taking action and engaging in concrete activities. These definitions do not differ sharply according to year of study. Below are examples of the answers of 1st year and 4th year pre-service elementary mathematics teachers.

Table 2: Differences between entrepreneurship and entrepreneurship skill according to pre-service elementary mathematics teachers

	Frequency				
	1st year	**2nd year**	**3rd year**	**4th year**	
Entrepreneurship is abstract; entrepreneurship skills are concrete	1			1	
Entrepreneurship is passive; entrepreneurial skills are active		4	4		
Entrepreneurship is theoretical knowledge; entrepreneurship skills are a practical application		6	7	10	
There is no difference between them	11	2	1	1	
Total	12	12	12	12	48

> *"When I think of entrepreneurship, I first think of abstract thinking and design, while concrete things like opening a shop come to my mind for entrepreneurship skills; the difference is, I think, abstract versus concrete…."* (1st year pre-service mathematics teacher).

> *"First you think about entrepreneurship, in other words abstract things, but then we call it a skill, so something has occurred, it seems, something concrete, you know…"* (4th year pre-service mathematics teacher).

Among the 33 pre-service elementary mathematics teachers who stated that there was a difference between entrepreneurship and entrepreneurship skills, 12 pre-service teachers defined entrepreneurship, excluding 21 who had stated that they had not heard of the concept before in reply to the first question of the study. These definitions are given in Table 3. For entrepreneurship skills, 8 pre-service teachers defined the concept, excluding 25 pre-service teachers who had stated that they had not heard of entrepreneurship skills before. A striking finding that emerged here was that 4 pre-service teachers who had heard of the concept of entrepreneurship but had not heard of entrepreneurship skills before made inferences to interpret the differences between the two concepts based on their definitions of entrepreneurship. The descriptions of the four pre-service teachers who defined entrepreneurship skills according to these inferences are given in Table 4, their years of education and numbers are shown in the same table, and they are denoted with a "+" sign.

Table 3: Entrepreneurship definitions of teacher candidates who think that entrepreneurship and entrepreneurship skills are different from each other

Entrepreneurship definitions	**Frequency**			
	1st year	**2nd year**	**3rd year**	**4th year**
A concept that exists in every individual but awaits action	1	2	1	
The process of using resources, intelligence, and courage		1	1	4
The appropriate mood for creating a new product			1	1
Total	1	3	3	5
	12			

When Table 3 is examined, it is seen that the details that emerge in the differences between entrepreneurship and entrepreneurship skills are also included in these definitions. For example, thinking of entrepreneurship as an abstract activity in terms of differences is consistent with "awaiting action" in the definitions.

Table 4: Entrepreneurship skill definitions of teacher candidates who think entrepreneurship and entrepreneurship skills are different from each other

Entrepreneurial skill definitions	**Frequency**			
	1st year	**2nd year**	**3rd year**	**4th year**
Starting production	1+1	1	1+1	
Solving an existing problem, reaching a result	+1		1	1
Invention made by using the mind, courage, discovery		1		2+1
Total	3	2	3	4
	8+4=12			

When Table 4 is examined, entrepreneurship skill is defined as a concrete activity, which involves starting production, reaching a result, making something new, inventing, and discovering. Explanations of the pre-service teachers who explained the difference between entrepreneurship and entrepreneurship skills are as follows:

> *"When I think of entrepreneurship, I first think of abstract thinking and design, while I think of concrete things such as opening a shop for entrepreneurship skills. The difference is, I think, the difference is abstract versus concrete; entrepreneurship is something that exists in every individual but needs a spark for a design. Entrepreneurship skill, I think…is like opening a shop, starting production, applying what you have in mind…"* (1st year pre-service mathematics teacher).

> *"They are different, I think there is one thing in entrepreneurship that requires you to use your mind, or it is like dreaming, Entrepreneurship is the process of using the mind; entrepreneurship skill is the ability to transform this process into invention and exploration..."* (2nd year pre-service mathematics teacher).

"Entrepreneurship, I think we all have it, we just can't get it into action. Frankly, I hadn't heard of entrepreneurship skills, but when you think about it now, entrepreneurial skills seem more tangible. In other words, if entrepreneurship is waiting for movement, I think entrepreneurship skill is starting to produce…" (3rd year pre-service mathematics teacher).

"In fact, entrepreneurship has always come to me as a mood. How can I say this, it's such a mood that you are ready to create a new product. I've never heard of entrepreneurial skill before. But…to actually invent [laughs], that's the difference. If I define it, entrepreneurship is a spirit, a mind ready for innovation. The skill of entrepreneurship is to put [the mood] into [action], that is, to invent it by using the spirit of the mind…" (4th year pre-service mathematics teacher).

The third set of questions asked of pre-service elementary mathematics teachers in this study to reveal their thoughts on the importance of entrepreneurship and entrepreneurship skills was: "Are entrepreneurship and entrepreneurship skills important? If important, why? If not, why?" All 48 pre-service elementary mathematics teachers stated that it was important. When the question of "why" is examined, however, 21 pre-service teachers (all in the 1st and 2nd years of their education) stated that they had not heard of the concept of entrepreneurship before, while 25 pre-service teachers (again in the 1st and 2nd years) stated that they had not heard of entrepreneurship skills before. It was observed that pre-service elementary mathematics teachers in the 3rd and 4th years of their education tried to explain the importance of these concepts. A striking finding here is that the two concepts were not considered separately in terms of importance; explanations were made jointly. These explanations and the categories of importance that they are related to are given in Table 5.

Table 5: Why are entrepreneurship and entrepreneurship skills important? Findings based on the explanations given to the question

Why is it important?	**Importance categories**		**Frequency**	
			3rd year	**4th year**
Brings success	Success in life	Social success, dignity	2	
		Business success	2	1
Innovation, making a difference	The ability to open new doors			2
	Being able to bring the mind to the fore		2	
	Being different from other people		1	
	Taking risks		3	4
Other	Allowing talent to be promoted (with determination, work, discipline)		2	5
Total			12	12
			24	

When Table 5 is examined, it is seen that entrepreneurship and entrepreneurship skills are thought to be important because they bring success, allow for differences and innovation, and promote talent together with perseverance, work, and discipline. When the explanations of the pre-service elementary mathematics teachers were examined, taking risks and emphasizing talent were more frequently stated from among the importance categories. Explanations of two pre-service teachers regarding these findings are given below.

> *"In entrepreneurship, entrepreneurship skill is also very important. Now they are creating innovations like this, so you take risks, for example, you will open a new shop, which is not available to everyone..."* (3rd year pre-service mathematics teacher).

> *"I think they are very important, let's think about it now…you highlight your talent, that is, perseverance…when you use them together, you realize what you can do, exhibit it, you do it, I think..."* (4th year pre-service mathematics teacher).

In this study, after the third question about the importance of entrepreneurship and entrepreneurship skills, pre-service elementary mathematics teachers were asked the fourth set of questions, related to daily life: "In which fields do you care about such initiatives in daily life? Can you give an example of entrepreneurship in your daily life?" Table 6 presents the results of the analysis of their replies.

Table 6: Initiatives that are important in daily life according to pre-service teachers

Entrepreneurship Fields/ Examples				**Frequency**			
				1st year	**2nd year**	**3rd year**	**4th year**
Business sector	Opening a new business	Courses	Social media	4	2	1	5
Education	Designing a program that will make you love mathematics	A new teaching method	Creating an app that will increase students' participation in the lesson		1	2	2
Scientific developments	New vaccine studies	Out-of-hospital treatment practices	Artificial intelligence		1	4	1
Military field	New projects for the defense industry	Creating leadership programs				1	3
Since I haven't heard of the concept of entrepreneurship before, I can't give an example				8	8	4	1
Total				12	12	12	12
				48			

In Table 6, the initiatives stated as being important in daily life by the pre-service elementary mathematics teachers were examined according to four categories with relevant subcategories. Within the category of "business sector," they mentioned opening a new business, courses, and social media. Within the category of "education," they mentioned designing a program that would make people love mathematics, new teaching methods, and applications to increase the participation of students in lessons. Within the category of "scientific developments," they mentioned new vaccination studies, out-of-hospital treatment practices, and artificial intelligence, and within the category of "the military field," they mentioned creating new projects and new programs for the defense industry. Twenty-one pre-service teachers who had stated that they had not heard of the concept of entrepreneurship before did not answer this question. These pre-service teachers are also shown in Table 6. Answers of these pre-service teachers regarding the initiatives that they consider important in daily life are given below.

> *"My mother sells what she produced in her course elsewhere…"* (3rd year pre-service mathematics teacher).
>
> *"People opening a new business with a small budget, such as livestock, a factory..."* (4th year pre-service mathematics teacher).
>
> *"Mark Zuckerberg establishing Facebook…"* (1st year pre-service mathematics teacher).
>
> *"The Fatih project implemented in order to try a new teaching method in our country..."* (4th year pre-service mathematics teacher).
>
> *"Prediction of epidemic diseases and vaccination work on it..."* (2nd year pre-service mathematics teacher).
>
> *"Developing new weapons and defense tools against possible wars in order to strengthen the defense industry..."* (4th year pre-service mathematics teacher).

3.2. Images of entrepreneurship and entrepreneurship skills

The last two interview questions (the fifth and sixth questions) were asked to reveal the pre-service elementary mathematics teachers' images of entrepreneurship and entrepreneurship skills in mathematics education. In the first of these questions, the pre-service teachers were asked to fill in the gaps in the following statement: "Entrepreneurship in mathematics education is like … because …" Twenty-one pre-service teachers who had stated that they had not heard of the concept of entrepreneurship before did not answer this question. The images obtained from the answers of the remaining 27 pre-service teachers are presented in Table 7.

Table 7: Image categories and subcategories for entrepreneurship in mathematics education according to pre-service elementary mathematics teachers

Entrepreneurship images in mathematics education		**Frequency**			
		1st year	**2nd year**	**3rd year**	**4th year**
Can be used in all areas of life	Numbers	2	1	1	
	Addition and extraction		3		
	Problem-solving	1		1	2
Perseverance, courage	Participation in the lesson			2	
	Solving the problem on the board	1			3
Innovation	Finding a new formula			1	2
	Finding a new solution			2	3
Establishing multifaceted relationships	Equations			1	1
Total		4	4	8	11
		27			

When Table 7 is examined, the answers obtained from pre-service elementary mathematics teachers can be assigned to four categories with corresponding subcategories. Aspects of entrepreneurship in mathematics education like numbers, addition/subtraction, and problem-solving can be used in all areas of life. Activities such as "participating in the lesson and solving the problem on the board" also require decisive and courageous action and initiative. Entrepreneurship was also associated with innovation, as in the stages of finding a new formula or a new solution, and finally with the opportunity to establish multifaceted relationships, such as in the case of equations. The answers of some of the pre-service teachers regarding images are as follows:

> *"I think entrepreneurship in mathematics education is like numbers, because we can use entrepreneurship just like numbers in every field of life..."* (1st year pre-service mathematics teacher).

> *"I think entrepreneurship in mathematics education is like addition and subtraction, that is, we always calculate, increase, decrease in entrepreneurship, we can always use it in life like this …"* (2nd year pre-service mathematics teacher).

> *"Entrepreneurship in mathematics education is similar to finding a new solution to a question, because entrepreneurship requires innovation, making a difference, and finding a new solution to a question in mathematics is innovation, it makes a difference…"* (3rd year pre-service mathematics teacher).

"Entrepreneurship in mathematics education is like equations, because you have to establish a multifaceted relationship in equations, and also in entrepreneurship… " (4th year pre-service mathematics teacher).

The second of the image questions was asked to reveal the images of pre-service elementary mathematics teachers in terms of entrepreneurship skills. With this question, pre-service teachers were asked to fill in the gaps again: "Entrepreneurial skills in mathematics education are like … because…" Twenty-five pre-service teachers who had stated that they had not heard of the concept of entrepreneurship skills before did not answer this question. The images from the answers of the remaining 23 pre-service teachers are presented in Table 8.

Table 8: Image categories and subcategories for entrepreneurship skills in mathematics education according to pre-service mathematics teachers

Entrepreneurship skills images in mathematics education		**Frequency**			
		1st year	**2nd year**	**3rd year**	**4th year**
Determination, putting effort into action	Pencil		1		1
	Hardworking students		1	1	
Innate talent, skill	Students with math skills			3	4
	Teachers who teach mathematics well	1			3
Continuity, innovation, production	New curriculum to teach mathematics better		2	1	
	A clock that doesn't run out of battery				2
	Factory			2	1
Total		1	4	7	11
		23			

When Table 8 is examined, the answers obtained from the pre-service elementary mathematics teachers can be explored within three categories and corresponding subcategories. In mathematics education, images of entrepreneurship skills can be seen in "using a pencil" and "hardworking students," or putting effort into action. They were also associated with innate talent or skill, such as "a student with math skills," and with continuity, innovation, and production, such as "new curriculum to teach mathematics better," "a clock that doesn't run out of battery," and "a factory." The answers of some of the pre-service elementary mathematics teachers about these images are as follows:

"Entrepreneurship skill in mathematics education is like a teacher who teaches mathematics well, because both require skills and thus this skill is taught…" (1st year pre-service mathematics teacher).

"Entrepreneurship skill in mathematics education is similar to a pencil, I think; we should

put what we have in mind into action, that is, we have to concretize; entrepreneurial skill is like that, [it is] the state of action…" (2nd year pre-service mathematics teacher).

"Entrepreneurship skill in mathematics education is like a factory. Actually, there is continuity. Think about it like this, in mathematics it must be continuous and dynamic, and entrepreneurial skill must be continuous... If you maintain continuity, you add entrepreneurship skills to the process in mathematics education..." (3rd year pre-service mathematics teacher).

"I think entrepreneurship skill in mathematics education is like a clock that doesn't run out of battery. Think about it like this, does mathematics ever end? No, of course not, and entrepreneurial skill does not end, it constantly produces … as you add this skill to mathematics, there will be continuity, movement will come, I think…" (4th year pre-service mathematics teacher).

When the images and examples in Table 7 and Table 8 are examined, connections are seen again to the previous question of "What are entrepreneurship and entrepreneurship skills?" and to the participants' answers to that question. It is clear again in Tables 7 and 8 that while the entrepreneurship process is a more abstract process that remains in thought, entrepreneurship skill is considered as a more concrete form of ideas put into practice and transformed into production.

4. Discussion and Conclusion

In this study, it was aimed to examine the knowledge and images of pre-service elementary mathematics teachers regarding entrepreneurship and entrepreneurship skills. According to the findings of the research, it is concluded that the concepts of entrepreneurship and entrepreneurship skills are not sufficiently heard of or recognized among pre-service elementary mathematics teachers. While only 4 pre-service teachers who were studying in the 1st year of the program stated that they had heard of the concept of entrepreneurship and could make comments, this rate increased as years of education increased (4 in the 2nd year, 8 in the 3rd year, and 11 in the 4th year). A similar situation was seen for the concept of entrepreneurship skills. However, 3 pre-service teachers from the 1st year and 1 pre-service teacher from the 3rd year who had stated that they had knowledge about entrepreneurship could not define this concept, stating that they did not have knowledge about entrepreneurship skills. Thus, only 1 pre-service teacher from the 1st year reported hearing about entrepreneurship skill before and could interpret it. Once again, the rate of hearing of the concept and being able to define it increased as the years of education increased, although the overall rates remained low (4 pre-service teachers in the 2nd year, 7 pre-service teachers in the 3rd year, and 11 pre-service teachers in the 4th year). In Turkey, entrepreneurship is not widely known in the context of courses at the undergraduate level (Bozkurt, 2011). As a result of this situation,

it was stated that pre-service elementary mathematics teachers may have difficulties in explaining what the concept of entrepreneurship means when they enter professional life, and especially what entrepreneurship means in education and in practice (Deveci, 2016a). Similarly, Bacanak (2013) pointed out in his study that science teachers do not have sufficient knowledge about the concept of entrepreneurship. These results are consistent with the results obtained in the present study.

Interestingly, in response to the question of whether entrepreneurship and entrepreneurship skills are different from each other, all participating pre-service elementary mathematics teachers answered the question. Although 15 pre-service teachers said they were not different, they had also stated that they had not heard of these concepts before, and so they did not offer a definition. The remaining 33 pre-service teachers stated that entrepreneurship and entrepreneurship skills are different from each other. Similarly, among these pre-service elementary mathematics teachers, those who had stated that they had not heard of these concepts before could not explain the reasons for the difference or offer a definition. From the remaining participants, three main differences between the two concepts were determined according to the answers given. These differences suggest that entrepreneurship is a more abstract, passive, and theoretical idea. On the other hand, entrepreneurship skills are described as being more concrete, active, and practical. Entrepreneurship was described as a preparatory stage before taking action, with thinking and planning processes, in the definitions offered by these pre-service elementary mathematics teachers. On the other hand, entrepreneurship skills were described as putting those processes into action or as the implementation stage of the plan. Baysal et al. (2009) researched entrepreneurship in 5 Turkish and 5 social studies textbooks, and it was observed that only the 5th grade social studies textbook included the word "entrepreneurship" and an example of entrepreneurship. There was no example of entrepreneurship skill. With these results, it can be said that the similarities between entrepreneurship and entrepreneurship skills and supportive elements are not understood by students since these two concepts are not sufficiently included in their lessons.

Interestingly, in the question investigating the importance of entrepreneurship and entrepreneurship skills for pre-service elementary mathematics teachers, all participants, including those who had stated that they had not heard of these concepts before, replied that these concepts are important. However, among the explanations of this importance, all of the pre-service elementary mathematics teachers in the 1st and 2nd years of study, including those who had not heard of these concepts before, gave meaningless explanations such as "it is important because you asked about it." Five participants from the 3rd and 4th years who had stated that they had not heard of these concepts before did not answer this question. The other 3rd and 4th year pre-service teachers who answered the question explained the importance with reasonable answers. According to these answers, three categories of importance were established, and entrepreneurship and entrepreneurship skills are considered to be important as they support success, innovation-making differences, perseverance, work and discipline, and

talent. Among these categories, "innovation-making differences" was expressed the most. This category highlighted the fact that entrepreneurship and entrepreneurship skills require taking risks.

Following this category, the category focusing on talent with perseverance, work, and discipline was the second most frequent. Based on these findings, the participants thought that individuals with entrepreneurship and entrepreneurship skills have the characteristics of taking risks, being different from other individuals, having determination and discipline, and achieving success. In the study conducted by Chen and Lai (2010), it was observed that the entrepreneurship knowledge provided by entrepreneurship education encourages technical college students and university students in Taiwan to determine their entrepreneurial tendencies and entrepreneurial personality traits in a more reasonable way and understand the importance of these concepts. This result is consistent with the fact that pre-service elementary mathematics teachers who had more knowledge about entrepreneurship and entrepreneurship skills in this study gave more logical examples of why these concepts are important.

Twenty-seven pre-service elementary mathematics teachers stated that they attach importance to initiatives made in four areas of daily life. These areas were specified as the business sector, education, scientific developments, and the military field. Participants gave the most examples for the business sector and opening a business. Scientific developments followed the business sector. It was seen that they gave examples mostly according to things that they encountered in their families or their own lives. In the studies conducted by Gençay (2017) and Çelik, İnce, and Bozyiğit (2014), it was concluded that there was a significant difference between the presence or absence of a successful entrepreneur in the family and having entrepreneurial intentions. Although those works were not aimed at revealing the entrepreneurial intentions of pre-service mathematics teachers, the entrepreneurship steps they encountered in the family or close environment reflect on the examples of the pre-service elementary mathematics teachers in the present study. Although the research data were collected before the coronavirus pandemic, participants still gave examples of new vaccine studies, out-of-hospital treatment practices, and artificial intelligence in the category of scientific developments. It can be assumed that if these data had been collected after the start of the pandemic, more of these examples would have been provided by the participants.

In the image categories of entrepreneurship and entrepreneurship skills, 4 image categories with accompanying subcategories were determined for entrepreneurship. These involved being usable in all areas of life, perseverance, courage, acting first, innovation, and establishing multifaceted relationships (see Table 8). The features of the concept of entrepreneurship emphasized most in the relevant literature are, in descending order, risk-taking, being innovative, being creative, seeing opportunities, adapting to change, and self-confidence (Deveci, 2016b). In this study, the feature of being usable in all areas of life was stated by the participants and this feature was associated with numbers in mathematics. Only participants in the 3rd and 4th years of their education associated entrepreneurial images with innovation and multifaceted

relationships. In this category, the 1st and 2nd year pre-service elementary mathematics teachers did not give any examples. This may reflect that as the educational program progresses and the knowledge about entrepreneurship grows, images of these concepts in the minds of individuals also change. For entrepreneurship skills, 3 image categories with accompanying subcategories were determined. Bacanak, Ülküdür, and Öner (2012) stated in their study that the concept of entrepreneurship skill is affected by the personal and individual characteristics of teachers. It is likewise seen that the image categories and examples that emerged in this study reflected the individual characteristics of the pre-service teachers. The resulting image categories were related to determination, putting effort into action, innate talent, skill and continuity, innovation, and production (see Table 9). Participants mostly compared entrepreneurship skill to innate talent and skill, such as a student gifted in mathematics or a teacher with the ability to teach. Following this image, participants most often offered the image of continuity, innovation, and production in numbers. From these examples, it was concluded that skill requires continuity. In addition, linkages were seen here to the answers to the question of "What are entrepreneurship and entrepreneurship skills?" In both cases it was seen that while the entrepreneurship process is understood as a more abstract process that remains in thought, entrepreneurship skill is considered a more concrete form of ideas that have been put into practice and transformed into production.

5. Recommendations

In order to increase the knowledge of pre-service teachers about entrepreneurship and entrepreneurship skills, entrepreneurship training can be given via entrepreneurship courses or in teaching courses in faculties of education. In these courses, not only theoretical knowledge about entrepreneurship skills, which are among the skills that should be acquired by individuals within the scope of lifelong learning, but also studies involving applications can be undertaken with pre-service teachers. In order for pre-service teachers to meet more entrepreneurial individuals and to observe these concepts in practice, educated people working in various lines of business known for their entrepreneurship can be invited to classes. There is no prior study in the literature that reveals the knowledge and images of pre-service elementary mathematics teachers regarding the concepts of entrepreneurship and entrepreneurship skills. Therefore, other studies that support the results of this study should be developed in the future. This study was conducted with a certain number of pre-service elementary mathematics teachers studying in one education faculty. Similar studies can be carried out in different faculties with more pre-service elementary mathematics teachers. In addition, the interview questions asked in this study can be applied to new mathematics teachers and the results can be compared with those of the present work.

Conflict of Interest Statement

The author declares no conflict of interest regarding the article entitled "Knowledge and Images of Pre-Service Elementary Mathematics Teachers about Entrepreneurship and Entrepreneurship Skills".

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References

Açıkgöz K, 2003. Etkili öğrenme ve öğretme, Kanyılmaz Matbaası, İzmir

Ay S. T, Acar Ş, 2016. Views of classroom teachers about the acquisition of entrepreneurial skills. Electronic Journal of Social Science, 58: 960-976.doi: 10.17755/esosder.03138

Aytaç Ö, İlhan S, 2007. Girişimcilik ve girişimci kültür: sosyolojik bir perspektif. Selçuk Üniversitesi Sosyal Bilimler Dergisi, 18: 101-121

Bacanak A, 2013. Teachers' views about science and technology lesson effects on the development of students' entrepreneurship skills. Educational Sciences: Theory & Practice, 13(1): 622-629

Bacanak A, Ülküder M. A, Öner F 2012. Fen Ve Teknoloji Dersi Öğretmenlerinin Girişimcilik Becerisi ve Etkisi İle İlgili Görüşleri: Nitel Bir Araştırma.

Baysal H, Ozkul A, 2009. Türkiye'de girişimcilik eğitiminde ilkoğretimin rolü: ders

Kitapları üzerine bir içerik analizi. I. Uluslararası Davraz Kongresi, Isparta,Turkey, 24-27 September 2009

Bilge H, Bal V, 2012. Girişimcilik eğilimi: Celal Bayar Üniversitesi öğrencileri üzerine bir araştırma. Süleyman Demirel Üniversitesi Sosyal Bilimler Enstitüsü Dergisi, 2 (16): 131-148

Bird B. J, 1989. Entrepreneurial Behavior, Foresman and Company, Illinois

Bozkurt Ö, 2007. Girişimcilik Eğiliminde Kişilik Özelliklerinin Önemi, Çanakkale Onsekiz Mart Üniversitesi Girişimcilik ve Kalkınma Dergisi, 2: 93–111, http://acikerisim.lib.comu.edu.tr:8080/xmlui/handle/COMU/982

Bozkurt Ö, 2011. Dünyada ve Türkiye'de Girişimcilik Eğitimi: Başarılı Girişimciler ve Öğretim Üyelerinden Öneriler, Detay Yayıncılık, Ankara

Chen Y, Lai M. C, 2010. Factors Influencing the Entrepreneurial Attitude of Taiwanese Tertiary-Level, Business Students, Social Behavior and Personality, 38: 1-12. https://doi.org/10.2224/sbp.2010.38.1.1

Commission of the European Communities, 2006. Adult Learning: It Is Never Too Late to Learn. Brussels. http://europa.eu/legislation, Accessed: 10/02/2018

Çelik A, İnce M, Bozyiğit, S, 2014. A Study to Determine Family Elements Affecting Entrepreneurship Intention of College Students. Ömer Halisdemir Üniversitesi İktisadi ve İdari Bilimler Fakültesi Dergisi, 7 (3): 113-124

Deveci İ, Seikkula-Leino J. 2016. Finnish Science Teacher Educators' opinions about the implementation process related to entrepreneurship education. Electronic Journal of Science Education, 20(4): 1-20

Deveci İ, Çepni S, 2014. Fen bilimleri öğretmen eğitiminde girişimcilik. Journal of Turkish Science Education, 11(2): 161-188

Deveci İ, 2016a. Perceptions and competence of Turkish Pre-Service Science Teachers with regard to entrepreneurship. Australian Journal of Teacher Education, 41(5): 153-170, http://dx.doi.org/10.14221/ajte.2016v41n5.10

Deveci İ, 2016b. Fen bilimleri öğretim programıyla (5-8) bütünleştirilmiş girişimcilik eğitimi modüllerinin geliştirilmesi, uygulanması ve değerlendirilmesi, PhD Thesis, University of Uludağ, Bursa

Figel J, 2007. Key competences for lifelong learning, Office for Official Publications of the European Communities, Luxembourg

Gençay E, 2017. Kişilik özelliklerinin girişimcilik niyetine etkisi: bir araştırma, master thesis, University of Gaziosmanpaşa, Tokat

Hood J. N, Young J. E, 1993. Entrepreneurship's Requisite Areas of Development: A Survey of Top Executives in Successful Entrepreneurial Firms', JBV, 8(2): 15-135, https://doi.org/10.1016/0883-9026(93)90015-W

İşcan O, Kaygın E, 2011. Potansiyel girişimciler olarak üniversite öğrencilerinin Girişimcilik eğilimlerini belirlemeye yönelik bir araştırma. Organizasyon ve Yönetim Bilimleri Dergisi. 3(2):275-286

Korkmaz O, 2012. Üniversite öğrencilerinin girişimcilik eğilimlerini belirlemeye yönelik bir araştırma: Bülent Ecevit Üniversitesi örneği. Afyon Kocatepe Üniversitesi İktisadi ve İdari Bilimler Fakültesi Dergisi, 14 (2): 209-226

Lakoff G, Johnson M, 1980. Metaphors we live by, IL: University of Chicago Press, Chicago

Lee S. M, Peterson S, 2000. Culture, entrepreneurial orientation, and global competitiveness. Journal of World Business, 35: 401–416. https://doi.org/10.1016/S1090-9516(00)00045-6

Milli Eğitim Bakanlığı [Ministery of National Education-MoNE], 2013. Matematik Dersi Öğretim Programı (İlkokul ve Ortaokul1, 2, 3, 4, 5, 6, 7 ve 8. Sınıflar). T.C. Millî Eğitim Bakanlığı, Ankara, Turkey

Milli Eğitim Bakanlığı [Ministery of National Education-MoNE], 2018. Matematik Dersi Öğretim Programı (İlkokul ve Ortaokul1, 2, 3, 4, 5, 6, 7 ve 8. Sınıflar). T.C. Millî Eğitim Bakanlığı, Ankara, Turkey

Mueller S, Thomas A.S, 2001. Culture and Entrepreneurial Potential: A Nine Country Study of Locus of Control and Innovativeness, Florida International University,

Miami, National Academy of Management, Journal of Business Venturing, 16:51-75, https://doi.org/10.1016/S0883-9026(99)00039-7

Özdemir P, 2016. Girişimci üniversiteler ve Türkiye'de girişimcilik eğitimi, PhD Thesis, University of Maltepe, İstanbul

Pan V. L, Akay C, 2015. Eğitim fakültesi öğrencilerinin girişimcilik düzeylerinin çeşitli değişkenler açısından incelenmesi. Education Sciences, 9 (6):125-138

Senemoğlu N, 2007. Gelişim öğrenme ve öğretim: Kuramdan uygulamaya, Gönül Yayıncılık, Ankara

Şimşek H, Yıldırım A, 2006. Nitel araştırma yöntemleri. Seçkin Yayıncılık, Ankara

Tarhan M, 2019. Girişimcilik pedagojisine giriş [Introduction to entrepreneurship pedagogy]. Pegem Akademi Yayıncılık, Ankara

TDK, 2011. Türkçe Sözlük. TDK yayınları, Ankara

Tiernan P, 2016. Enterprise education in initial teacher education in Ireland. *Education + Training*, *58*(7/8): 849 – 860, https://doi.org/10.1108/ET-03-2016-0053

Türnüklü A, 2000. Eğitim bilim araştırmalarında etkin olarak kullanılabilecek nitel bir araştırma tekniği: Görüşme. Kuram ve Uygulamada Eğitim Yönetimi, 24: 543-559.

Uygun M, Mete S, Güner E, 2012. Genç Girişimci Adayların Girişimcilik Eğilimi ve Girişimcilik Özellikleri Arasındaki İlişkiler. Organizasyon ve Yönetim Bilimleri Dergisi, 2(4): 145-156

Wang C, Wong P, 2004. Entrepreneurial Interest in University Students in Singapore. Technovation 24(2): 163—72, https://doi.org/10.1016/S0166-4972(02)00016-0

Wulf A, Dudis P, 2005. Body partitioning in ASL metaphorical blends. Sign Language Studies, *5*(3): 317-332, https://www.jstor.org/stable/26189597. Accessed: 11.01.2021

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