

Finnish Science Teacher Educators' Opinions about the Implementation Process Related to Entrepreneurship Education

İsa Deveci
Uludag University, Turkey

Jaana Seikkula-Leino
University of Turku, Finland

Abstract

The aim of this study was to examine the opinions of Finnish Science Teacher Educators (FSTEs) about the implementation process related to entrepreneurship education. The study used a phenomenological research design as one of the qualitative research approaches used to analyse the issue. Participants were purposely selected and included five FSTEs who work at a teacher training school in Finland. The study also used semi-structured interviews to determine participants' views regarding the subject matter. Findings show that FSTEs mostly benefit from the process of collaboration/teamwork in classroom activities. In addition, FSTEs refer to in-classroom activities include discussion groups and talks given by entrepreneurs. FSTEs use written tests/exams as measurement and evaluation techniques in their courses. It was seen that the best-emphasised entrepreneurial characteristics to nurture in students are risk taking, brainstorming, good planning, curiosity, self-confidence and creativity. For entrepreneurship education, FSTEs consider as suitable science subjects those that contain information about electrochemical cells or batteries, human biology, the natural environment, statistics and percentages, electricity production, recycling and metals.

Keywords: Science Education, Entrepreneurship Education, Teacher Education

Correspondence concerning this article should be addressed to:
İsa DEVECİ, Uludag University, Görükle Campus, 16059, Nilüfer-Bursa / Turkey,
deveciisa@gmail.com

Introduction

Entrepreneurship education has become a frequently mentioned subject within teacher education in recent years. The concept of entrepreneurship has been located in education curricula from primary education to higher education. In this sense, developing entrepreneurial characteristics of students from an early age has become one of the main topics of conversation. Thus, questions have been asked about whether the teachers who provide training for entrepreneurship education are themselves ready. Similarly, it has also been debated as to what extent pre-service teachers should be trained. This situation in teacher education institutions has brought to light entrepreneurship education.

It is useful to define the concepts of entrepreneurship education and the entrepreneur. For Lemechi and Anyakoha (2002), entrepreneurship education is defined as a carefully planned process giving rise to the acquisition of entrepreneurship skills for a more comfortable and qualified life. Ejilibe (2012) points out that the entrepreneur is broadly considered an integral player in the business culture of any nation and especially as an engine for creating jobs and economic growth. It has been said that entrepreneurship education is important for increasing

economic growth in Europe (Moberg et al., 2014). Moreover, it has been seen that entrepreneurship education plays an important role in both enhancing entrepreneurial characteristics and in shaping the mindsets of young people (Moberg et al., 2014; Nordic Innovation, 2012). Also, it has been stated that entrepreneurship education has a role in both improving the knowledge and success of students and to become active entrepreneurial characteristic of students (Aarchus Technical College, 2013).

Finland is among the countries most often mentioned in European Commission reports about teacher education and non-business studies (European Commission, 2004, 2008, 2011, 2013). Finland includes entrepreneurship education under different themes from primary education to higher education. For example, at a basic education level, entrepreneurship is taught under the theme of participatory citizenship and entrepreneurship (National Core Curriculum Basic Education, 2004) and for secondary education, it is taught under the theme of active citizenship and entrepreneurship (Finnish National Board of Education, 2003). The entrepreneurship education group is composed of the members of 13 teacher training schools that focus on providing support services for guided teaching practices and curricular work (Nordic Innovation, 2012). In this sense, it can be said that Finland has attached importance to entrepreneurship education.

There is a need for the development of entrepreneurial characteristics in science education in the twenty-first century (Achor & Wilfred-Bonse, 2013). Science education has a significant advantage in its ability to aid the implementation of entrepreneurship education (Deveci & Çepni, 2014). Chemistry education has an important role to play in order to help students find answers to various human and socioeconomic issues (Nwakaego & Kabiru, 2015). It has been stated that project tasks have an important role because they enhance the entrepreneurial characteristics of students in chemistry courses (Ttwoli, 2006). In addition, Ejilibe (2012) states that the biology curriculum should be made adaptable to meet the needs of students and society in terms of employment because most problems encountered in daily life are biological. Also, Agommuoh and Akanwa (2014) remark that physics is highly important for a nation's technological breakthrough and is the centre of technological activity and science. One of the most crucial goals of physics education is to ensure the preparation of the individual for the changing competitive environment of the world (Egbo, 2011). In this sense, Agommuoh and Akanwa (2014) indicate that physics education is the conveyor of science and technology in terms of the development of entrepreneurship. At the same time, Akpan (2010) notes that the Science Teachers Association of Nigeria, a country with developing research, is geared towards the promotion of entrepreneurship through relevant science, technology, engineering and mathematics education.

Santakallio's study (1998), which studied the Finnish context, introduced a description of the contents and goals of the project that focused on the development of education in technology and entrepreneurship at the beginning of 1998. Moreover, Mattila, Rytkölä and Ruskovaara (2009) investigated the opinions of teachers from different levels of education about entrepreneurship education, regardless of teaching field. Lepistö and Ronkko (2013) examined the perceptions of pre-service teachers regarding entrepreneurship education and how they understand entrepreneurship as part of their future pedagogical work; participants ranged from pre-service class teachers, pre-service craft teachers and postgraduates. Hannula, Ruskovaara, Seikkula-Leino and Tiikkala (2012) evaluated the opinions of Finnish teacher educators who work in all-round and professional/vocational teacher education in terms of four main areas, which contain I) teaching methods; II) development of students' entrepreneurial behaviour; III) planning and implementation of teaching and teacher training; and IV) enterprising operational

culture in organisations. Hannula (2011) studied how entrepreneurship education proposed in the strategies and curricula of Finnish vocational teacher education could be examined as document analysis. On the other hand, without considering teaching fields, Ruskovaara, Pihkala, Rytökölä and Seikkula-Leino (2010) presented the teaching methods and working approaches in entrepreneurship education used by Finnish teachers who work in basic and upper secondary education and basic vocational training and who take part in the measurement tools for entrepreneurship education project. In the comprehensive study conducted by Seikkula-Leino (2011), a two-part survey was undertaken in 43 municipalities by participants from different educational and socioeconomic backgrounds. The survey asked participants how entrepreneurship education has been implemented in Finnish comprehensive schools. The local curriculum reform in 2005 included a focus on the development of entrepreneurship education. On the one hand, in her study has been concentrated on the implementation of entrepreneurship education in 2006. In a study carried out by Seikkula-Leino, Ruskovaara, Hannula and Saarivirta (2012), they described the ways in which entrepreneurship education is integrated into Finnish teacher training curricula at the initial survey stage of the project which the Project (2010-14) was a national project for promoting entrepreneurship education especially in vocational and academic teacher education in Finland. The objective of the project is to improve the entrepreneurship education ability of the entire teacher training field. The study conducted by Hietanen (2013) applied the entrepreneurial activities performed by pre-service class teachers who are training to be class teachers, which means teaching pupils aged from seven to 12 years. The study interpreted the entrepreneurial activities during a music course taught at the higher education level as a learning method. In the study carried out by Seikkula-Leino, Ruskovaara, Ikavalko, Mattila and Rytkola (2010), they attempted to reveal that teachers have an important role in entrepreneurship education and the study focused on the learning and reflections of teachers from basic, upper secondary and vocational educational levels. In an experimental study, Gustafsson-Pesonen and Remes (2012) investigated the effects of entrepreneurial development coaching on secondary vocational school teachers' thinking and the ways in which the entrepreneurial development coaching programme changed participants' thinking and pedagogical actions in entrepreneurship education regardless of the teachers' teaching field. In a study conducted by Seikkula-Leino, Satu vuori, Ruskovaara and Hannula (2015), they investigated how Finnish teacher educators implement entrepreneurship education. The study's participants ranged from 100 teacher educators and training teachers for vocational studies and general education, to rectors and managers, without considering teaching fields. As shown above, studies on entrepreneurship education usually focus on general teacher education rather than on specific teaching fields. So, it can be said that there is a gap concerning science education research conducted on entrepreneurship education in Finland.

When analysing recent international literature on entrepreneurship education in science education, there are a number of different variables to consider. For example, most of the studies focused on how science education demonstrates a better understanding of the manner of application and the importance of entrepreneurship education (Deveci & Çepni, 2014; Achor & Wilfred-Bonse, 2013; Adeyemo, 2009; Buang, Halim, & Meerah, 2009; Ezeudu, Ofoegbu & Anyaegbunnam, 2013; Ejilibe, 2012; Nwakaego & Kabiru, 2015; Ugwu, La'ah, & Olotu, 2013). On the other hand, some of the studies examined the opinions of science teachers (Bacanak, 2013; Bolaji, 2012; Hsiao, 2010). Moreover, a study by Armstrong and Tomes (2000) concentrated on the opinions of scientist-entrepreneurs who were not exclusively scientists and who had acquired entrepreneurial characteristics. The study by Kleppe (2002) described a special course that was designed and taught to a group of high school mathematics and science teachers and this course covered subjects related to invention, innovation and entrepreneurship. The aim of Bikse and Riemere's (2013) study was to examine the

development of entrepreneurial competencies among Latvian student teachers in mathematics and science subjects. Similarly, the study carried out by Amos and Onifade (2013) investigated the opinions of both science student teachers and other student teachers about the necessity of entrepreneurship education in the teacher education programme. Nwoye (2012) conducted a study to determine the level of entrepreneurial skills acquired through physics education by secondary school students. A study carried out by Koehler (2013) examined two science teachers who created learning opportunities for students that went beyond the classroom and operated within low-income contexts. As the literature review demonstrates, no studies have been found that examine the opinions of science teacher educators in teacher education institutions. Thus, this research is expected to contribute to the literature in terms of filling this gap.

Bacanak (2013) states that middle school science teachers in Turkey do not have enough knowledge regarding the concept of entrepreneurship. Also, Bolaji (2012) specifies that science education is not developing entrepreneurial characteristics in Nigeria because the science teachers have a poor understanding of how to integrate entrepreneurship education into science education. From this point of view, it will be useful for both national and international literature to determine the current practices of entrepreneurship education with regards to science education in Finland where examples of good practice. The purpose of this study was to examine the opinions of FSTEs about the implementation process (teaching method, measurement and evaluation techniques, project development process, entrepreneurial characteristics, science topics, in and out classroom activities, faced challenges) related to entrepreneurship education.

Methods

A qualitative research approach was used to gain an in-depth understanding of individuals and events in their natural environment. A phenomenological research design was used within the qualitative research approach in order to examine the problem because the study focuses on clarifying and interpreting the experiences of people participating in the study (Ary, Jacobs, Sorensen, & Razavieh, 2010). Thus, the phenomenological research method was used to exhibit perceptions of science teacher educators about the implementation process related to entrepreneurship education in science education. In this sense, in a manner consistent with the nature of the phenomenological research method has been mostly focused on the knowledge and experiences of science teacher educators concerning entrepreneurship education is given in science education. Also, in the relevant literature it has been seen that most of the researches carried out in teacher training were used phenomenological research method (Bacanak, 2013; Hilario, 2015; Koçak, Polat, Çermik, Meral & Boztaş, 2015; Lepistö & Ronkko, 2013). This research approach provided the researcher with the ability to clarify the topic via formal and informal interviews and gain new insights into the issue from the themes that emerged (Denzin & Lincoln, 1994).

Participants

In this study, the selection of participants was used purposeful sampling. It has been expressed that purposeful sampling is aimed at the selection of information-rich cases that will set light to the phenomenon under examination (Patton, 2002). On the other hand, it has been seen that purposeful sampling intended to include people who were also experienced and knowledgeable about the phenomenon or people who are considered typical of the population related to research questions (Creswell, 2007). In this sense, it was taken into account participants having knowledge and experience about entrepreneurship in science education. So., the participants were purposely selected as FSTEs who worked at a teacher training school in

Finland because Finland is one of the most important countries to have displayed successful entrepreneurship education in the field of education (European Commission, 2011, 2012, 2013). While teacher training units provide academic teacher training in conjunction with universities, teacher training schools belonging to these units subsequently regulate and develop teaching practices and training through research-oriented training (Teacher Training School Strategy for 2020, 2011). The duties of teacher training schools are to provide teacher training for comprehensive and upper secondary school levels, supervision of teacher trainees, teaching experiments, research, in-service training and education. The participants of this study included five FSTEs: three females and two males. The age of the participants in this study ranged from 40- to 53-years-old. Participants had eighteen to twenty-five years of teaching experience. The areas of expertise of the five participants ranged from one in geography and biology, three in physics and chemistry and one in mathematics and technology.

Data Collection Tool

Data were collected in their natural setting to make the information richer and to gain a deeper insight into the phenomenon that was being studied. The researcher used semi-structured open-ended questions to explore participants' perceptions regarding the subject matter. Semi-structured interviews were conducted via an interview form with the participants. Firstly, the researcher created the interview form, which was composed of nine open-ended questions. Then, the researcher referred to four experts' opinions, each of whom has written for numerous scientific publications on the issue of entrepreneurship in teacher education both in Finland and Turkey. Secondly, the researcher removed one question based on the experts' opinions and three of the questions were revised because they were not understandable. Finally, the interview form contained eight open-ended questions about entrepreneurship education practices in science teacher education. The final version of the interview form is given below:

1. Which teaching methods are you currently using in your courses or other courses related to entrepreneurship education? Please explain why.
2. Which measurement and evaluation techniques are you currently using in your courses related to entrepreneurship education? Please explain why.
3. Which approach do you prefer to use in the project development process?
4. Which entrepreneurial characteristics of the students have you most emphasised in the process of entrepreneurship education? Please explain why.
5. Which science topics do you think that you can easily apply to entrepreneurship education? (The area of your expertise: physics, chemistry or biology).
6. What kind of in-classroom activities do you practise in your classrooms in terms of entrepreneurship education?
7. What kind of out-of-classroom activities do you practise in your classrooms in terms of entrepreneurship education?
8. Which challenges have you faced during the process of entrepreneurship education? Please explain and give reasons:
 - a) In terms of students;
 - b) In terms of yourself; and
 - c) In terms of educational environment.

Data Analysis

Interviews were recorded with a tape recorder. Firstly, data collected from the tape recorder were transferred to a word document in an electronic setting. Secondly, the researcher reduced the data in order to eliminate redundant data. Thirdly, the themes and codes were composed related to each question on the interview form. Within this process, themes are composed of codes, which have meaning obtained from data. An inductive analysis approach

was adopted. Inductive analysis ascertains the categories, themes and patterns of the data (Patton, 2002). Validity and reliability has been criticised too much in qualitative research, so measures were taken. For external validity, the quotations obtained from the interviews were cited without the researcher adding any comments or quotations. So as to provide internal reliability, the researcher checked whether the processes of data collection, codification and interpretation were in keeping with each other.

Results

STEs prefer teaching methods that include scientific methods, practical exercises/works, discussion, clay modelling, exercises on web pages and searching for information (Table 1). Two STEs stated that the teaching methods used are mostly in the form of scientific methods in accordance with the nature of science.

Table 1. Opinions of STEs about using teaching methods in entrepreneurship education.

Themes	Codes	Participants	f
Teaching methods	Scientific method	P3, P5	2
	Practical exercises/works	P4, P5	2
	Discussion	P1	1
	Clay modelling	P1	1
	Exercises on web pages	P2	1
	Searching information	P3	1

Sample expressions from the STE's views are below:

P3: *"Yeah...but I could use more but somehow there is so strong scientific nature in learning we have this so called scientific method that we teach and it goes ... so that you do that investigation then you observe things then you build up the theory around it and then you apply. So...so that's why perhaps I don't have that much link to this topic"*.

P5: *"we...and...and the main idea is to help the student to understand what the scientific method is when finding out that through the nature"*.

Another teaching method used by two STEs was practical exercises/works. The statements of the STEs on this subject were based on an active learning approach. The opinions of the two STEs are given below:

P4: *"We actually UE had this morning questions about entrepreneurship ...questions...umm...so pretty much what UE we go through those through exercises and examples so what we, for instance, had groups of three and...have a coffee shop...they were selling coffee and the buns and juice. And then how much of each were they selling for specific price when the total amount was 45 euros or something like that. And they need to solve those and for instance UE so quite funny that it happened today. And then UE another example that we went through was fix these expenses so there was a boy who opened a bookstore fixed expenses rent, electricity, salaries, how were those in total when it was with certain conditions and stuff like that. These what we have gone through"*.

P5: *“What I am teaching methods...we are using the practical work...so we try through the practical phenomenon so that we understand what is happening there.*

On the other hand, it was determined that STEs also use teaching methods that contain discussion, clay modelling, exercises on web pages and searching for information. The STE's comments are below:

P1: *“They're mainly discussion...we have that clay modelling, you know, what sort of enterprises are there in the cities and country side, they did the clay modelling...quite fun”.*

P2: *“We are on this...this computer class usually we work like...I give them a brief instruction what we are going to do on that lesson which is the main topic and usually I give the exercises in...in some kind of web pages. For example I...I have written a web page more about this topic perhaps added a video and they read the exercise and they do and after the lesson is done they return the exercise to me”.*

P3: *“For example searching information I could see this is related to entrepreneurship education because you have to be active, you have to find out yourself...Then, umm...sometimes the students have to explain the things to each other which is also I consider that you have to be”.*

Table 2. Measurement and evaluation techniques used by STEs in terms of entrepreneurship education

Themes	Codes	Participants	f
Measurement and evaluation techniques	Written tests/exams	P2, P3, P4, P5	4
	Practical work	P5	1
	Observation	P2	1
	Performance tasks	P3	1
	Question-answer technique	P1	1

Table 2 shows that most of the STEs stated that written tests/exams were used as measurement and evaluation techniques in their courses related to entrepreneurship education. Some of the STE's opinions are given below:

P2: *“We have a bigger test or two, more like an exam. Then I am using small...small tests...four or five during the course”.*

P3: *“I use many others than just to have that written exam although I have written exam. But then, we have, for example, oral presentation which is a part of this physics assessment.”*

The STEs expressed that they use measurement and evaluation techniques that incorporate practical work, observation, performance tasks and the question-answer technique. The STE's views on this subject are given below:

P5: *“...then we also have the practical work. And then we are assessing the practical work. Because they are writing the laboratory report. And then through the laboratory report we can find out what they have understood about their work. And then they also...how they have managed to do that”.*

P2: “And also, I am keeping track how active the students are in...in class. If they are participating in discussions or asking questions. And also I am keeping track of how much they do their homework”.

P3: “And they are not just presenting facts, they are presenting their opinion about something because it is so something difficult for young students to...to...present their opinion or have opinion about because they usually just answer “I don’t know...I don’t know.” So that’s why I want to teach them. That’s...then...then we have assessment tasks that students have to search information and build up a written presentation not an essay but a written presentation like...PowerPoint or that kind of things”.

P1: “Yes. I can have question. Like what we have had during the lesson. I can ask them what do you need to have your own (UE) for example. Then they give the answer. This is for the lower secondary school where the students are 13 to 16. But then in upper secondary we don’t have because I only have one course there I don’t have any questions or exams about the”.

Table 3. Opinions of STEs regarding the project development process related to entrepreneurship education

Themes	Codes	Participants	f
Project development process	Problem-based learning	P2, P3	2
	Act independently	P1	1
	Basic methods of science and inquiry	P5	1

Two STEs emphasised that they benefit from project development processes that include problem-based learning. Some examples of their answers are given below:

P2: “We use that...that way. Yes...So I...I give the...problem first and then we go there to the solution. Instead of me solving their way and that they are counting in getting the...so...so in mathematics sometimes we use this problem based and...”.

P3: “For example; they study the electrical phenomenon like electro-magnetic induction...Quite often yes. Not in this particular project, no, because this project was...their task was to formulate their opinion about what is the best way of producing electrical energy...yeah...so...so there is no such sort of problem but usually...usually in science is we have a research question there so basically a problem...So we have this research question. It starts with what sort of problems. And your task is to then find out by doing experiments...what’s the answer”.

Some STEs specified that they use the project development process based on students acting independently and basic methods of science and inquiry. For example:

P1: “I try to first figure out what do students know and what kind of experiences do they have and then I come and get involved when they need help but I pretty much in these kinds of processes give free hands to them. I kind of turn into a technical”.

P5: “Rarely but sometimes because we first have to help students to understand basic methods of science and the basic methods of inquiry. And then when they have learned them, then we can give them a project. So...yes...and the project means that they can do the whole thing from the beginning to the end so they decide...practice”.

Table 4. STE's highlighted entrepreneurial characteristics.

Themes	Codes	Participants	f
Entrepreneurial characteristics	Risk taking	P4, P5	2
	Brainstorming (developing new ideas or opinions)	P1	1
	Good planning	P2	1
	Curiosity	P3	1
	Self-confidence	P4	1
	Creativity	P5	1

When examining the STE's opinions, it can be noted that the most emphasised entrepreneurial characteristics for students to acquire were risk taking, brainstorming, good planning, curiosity, self-confidence and creativity. Two STE's opinions on risk taking are given below:

P4: *"We haven't gone through that...for instance risk taking ability...instead of having that, we could for instance think about...to make profit...how much more should we work or how much more we should UE sell or something like that..."*

P5: *"Then you also have to take a risk...to have the courage to try something without knowing what's going on there beforehand. UE reason you need the courage and then also...I am saying...they have to be kind of active in their old way...if they put themselves...I want to do this one"*

The STE's opinions on entrepreneurial characteristics included brainstorming, good planning, curiosity, self-confidence and creativity. From these answers, it can be understood that STEs are attempting to cultivate these characteristics in student teachers. Some of the STE's opinions are given below:

P1: *"So I kind of try to get pupils back to way of thinking that they are no boundaries but the brainstorming is important"*

P2: *"I think in IT we are most focused on good planning. Making a good plan what to do. And that is partially because we don't have so much time for each project. So you have to really plan what you are going to do. So I think good planning...good planning is the key there"*

P3: *"They have to be inquirers...They have to be find active information not just like it's going...coming to me...and...then they have to be...they have to have a...sort of like...a...awareness as citizens...they have to...in physics...they have to know about that...is this reasonable? Why is it not? Sort of like...be alert how to be a...how to...how to...survive in today's society"*

P4: *"Self-confidence...if it were to be incorrect it doesn't matter we move on further we have a look at our problem for instance how it was done, correct it and then move on further and learn from there. So for instance something like that. So the confidence...so if happen to make a mistake...so what?...correct it...move on"*

P5: *"I think that they are a kind of...hidden in our workings and our teachings but we don't stress students now we are practicing creativity...now we are creating the risk taking...what it's... it's...it's somehow inside the work that we do so we give them the task. Sometimes there is a place where they use their creativity for example; how to solve a certain problem UE...in the way"*

Table 5. Science topics that STEs can easily apply to entrepreneurship education.

Themes	Codes	Participants	f
Science subjects	Electrochemical cells or batteries	P3, P5	2
	Human biology	P1	1
	Natural environment	P1	1
	Statistics and percentages	P2	1
	Electricity production	P3	1
	Recycling	P4	1
	Metals	P5	1

From Table 5, it can be seen that two of the STEs consider suitable subjects for entrepreneurship education science topics that contain electrochemical cells or batteries. They explained their ideas about this topic as follows:

P3: *“OK. I would say that electricity production... Would be one of the examples. Umm...then...umm...in chemistry...the electrochemical cells or batteries”.*

P5: *“For example; the electro-chemistry...we are using batteries, electrolysis, so we know in future batteries would be one of the most important things we got all cell phones and things that are run by batteries...I am telling to them now if you understand this so in future you might find out the new batteries that run longer and there’s really a good...good chance for good business if you know”.*

Other STEs believed suitable subjects for entrepreneurship education could be science topics that contain human biology, the natural environment, statistics and percentages, electricity production, recycling and metals. Their opinions are given below:

P1: *“In biology, aaa...actually human biology because there comes the premedical aspects many times as well as healthcare aspects must be mentioned then of course we have these out of door topics aaa, and talking about how to take care of elderly people...at the moment in the school the pupils are so much city (UE) the a...the a...natural environment...the forests are kind of strange to them. So they are...due to the fact that I am teaching in this school I have so many immigrants here so it’s kind of...that makes it difficult...quite...”.*

P2: *“Statistics and percentages. So when we are counting the taxes for example that’s one very easy example”.*

P4: *“...we for instance start working recycling...why do we recycle for instance? And then from there on they...the money that we can save...how much...for instance effort we UE put into the recycling but the...what we get from recycling is so much more than actually putting the money into it. So...something like that...you could for instance...consider”.*

P5: *“For example; the rare metals...they used to be quite cheap...for example; lithium...it was ten years ago...it was a couple of tens of euros now it’s hundreds of euros...per a hundred gram...what UE UE UE...see that how their prices going up...and what’s the reason?...Because of the new technology...and they understand...now that this is a good idea...they have to understand the ways that most of the elements we have in the crown now have value but not probably today they might have a value after ten years. Because the technology is...is...is developing...and they are getting more”.*

Table 6. Out-of-classroom and in-classroom activities conducted in courses relevant to entrepreneurship education.

Themes	Codes	Participants	f
In-classroom activities	Collaboration/teamwork	P2, P3, P4	3
	Discussion groups	P1	1
	Inviting entrepreneurs to speak in the classroom	P3	1
Out-of-classroom activities	Visits	P1, P3, P5	3
	Exercises	P2, P4	2

As seen in Table 6, it can be noted that STEs prefer in-classroom activities that include collaboration/teamwork, discussion groups and the invitation of entrepreneurs to speak in the classroom. It can be determined that the teachers benefit more from collaboration/teamwork regarding student participation in classroom activities. Some of the STE's views are given below:

P2: *“If I think from the entrepreneurship point of view, I guess the collaboration and working together is one of those parts and finding the answer together and asking...asking others. I think...that's...that's the one thing”*.

P3: *“One of the things is that we always work in teams...so team work...we have the teams. And that's one of the skills that everyone should have because the team work seems to be all the thing...invite and other institutions' entrepreneurs”*.

In terms of in-classroom activities, it can be seen that STEs opt for activities to open up discussion for students and that events were organised, such as inviting entrepreneurs to speak in the classroom. The opinions of some STEs are given below:

P1: *“Ohh...discussion...discussion with me leading the discussion or them discussing together and then I don't...I am not sure of they achieved but I think it is useful for them. So pair discussions I use also a lot”*.

P3: *“Invite and other institutions' entrepreneurs...sometimes... but it's not done by me. I think it is quite often guidance counsellor that ask...ask people to tell about their...their work”*.

In terms of out-of-classroom activities, when looking at Table 6, it can be seen that STEs prefer out-of-classroom activities that contain visits and exercises. Some of the STE's opinions are given below:

P5: *“Then we visit companies... We call to the companies for example next week we are going to the company that is in...in...in this area...that electric company and we are going to see what type of things they are doing...what kind of jobs they can have...then we are visiting other places in the town...we try to show the students where it is applied...the knowledge they are learning”*.

P2: *“We have had these kinds of exercises that you have to find for example commercial which...which has some kind of discounts for example so they have to...have to search the papers or the internet and find a suitable commercial to use as a exercise in the lesson”*.

Table 7. Challenges faced in the process of entrepreneurship education.

Themes	Codes	Participants	f
In terms of student	They do not have an interest in the their future career	P1, P5	2
	They do not have a grasp of business terms	P2	1
	They are not keen	P4	1
In terms of educator	I have no more time	P2, P4, P5	3
	I do not have much experience	P1, P5	2
	I do not have more information	P3	1
In terms of educational environment	Material	P1, P4	2
	There is no problem	P2, P3	2
	Financial support	P1	1
	Place	P5	1

From Table 7, it can be seen that two of the STEs believe students are not interested in the their future career, which poses a problem in the process of entrepreneurship education. The views of some STEs are given below:

P1: *“Yes, it is too far in their minds...they are...they...at least...the first student or the pupils under 16...like...the future career...it is kind of so far...that they don't really...put enough effort in thinking of...of the future life. Then...they just have this certain profession in their minds but they...that's it. They...they don't usually think about being able to have their own companies or...or anything like that. So that is one problem for me. It is too far in their thinking”*.

P5: *“Students are not used to think that they could be a...a...entrepreneur...workers...or they could have a company of their own. And...the families are not...encouraging them...so they mainly thinking about”*.

Some of the STEs expressed a concern that students don't not have a grasp of business terms and students are not keen on it towards students have faces challenges. The opinions of some STEs are given below:

P2: *“For example some students have...they don't understand the what taxes mean. So they have difficulties with that...problem could be that the students don't know yet the terms, the correct words which we are talking about”*.

P4: *“...Well, it depends. Well...oh...yeah...well...some of the students aren't keen on coming to the board when we UE discuss for instance what is keeping you from that...why won't you want coming to the board? Why won't you UE present yourself to the others? So give the others an idea and then trying to UE discuss that what's keeping...keeping them from doing that...”*.

Table 7 shows that, in terms of the educator, STEs face challenges involving a lack of time, experience and information. Several comments made by STEs are as follows:

P2: *“That's one problem and ummm... could be also that...I am finding sometimes really hard to find it time for these because most of the time I'm focusing test on course and when we are going on and on sometimes I forget that I need to stop and think about other point of views like the entrepreneurship and the applications where this course can be used”*.

P5: *"It is not part of teacher education so we don't have so much experience of ourselves. It is different type of entrepreneurship. We might...most of the teachers their only place is the school"*.

P3: *"I could answer first to be UE...the greatest challenge is that I don't actually know that much about this entrepreneurship in general"*.

On the other hand, it was identified that there are challenges in terms of the educational environment, including material and financial support and the workplace. But two of the STEs stated that there was no problem with regards to the educational environment. Several opinions noted by the STEs are given below:

P4: *"I guess the material would be. Then I'd like there to be a bit more material and especially on courses on different topics...when we working with stuff like that ehm...entrepreneurship in there...a bit difficult so...if we could get a bit more material concerning different paths of topic...so how you would UE apply the idea in here and in here and in here..."*.

P5: *"It is not only that we show videos (laughs) I don't believe it is the way. UE UE some kind of practical works...exercises what we can do in the class. So then we come to the place what's the problem with the school educational system is...we don't have place"*.

P3: *"I don't see that is a challenge because I think everything can be done if there is a motivation to do that these are just if I would say that educational environment would be challenge I would say it would just sort of like excuse for not doing something"*.

Discussion and Conclusion

When examining the findings with regards to teaching methods, it was seen that some of the STEs participated in current research prefer a student-centred approach similar to scientific methods and practical exercises. The other research results demonstrate that teachers use problem-based active learning approaches in entrepreneurship education (Ruskovaara, Pihkala, Rytkölä, & Seikkula-Leino, 2010; Seikkula-Leino, 2011). This may be because entrepreneurship education contains more active learning, as well as the constructivist approach (Koopman, Hammer, & Hakkert, 2013). Moreover, methods just as discussion, clay modelling, exercises on web pages, searching information specified by other STEs supported these results in the context of current research. For example, Adeyemo (2009) states that in science education, students must be allowed to construct a conclusion for a case (or story) through discussion. Also, Adeyemo (2009) predicts that this strategy can develop entrepreneurial skills in science teachers and their students. On the other hand, Modi (2014) points out that clay modelling is one of the activities undertaken by students educated in commerce schools where students can learn by completing work in terms of entrepreneurship education. But, when examining other studies, for example, Seikkula-Leino (2007), notes that learning situations providing interactive learning, problem solving, creativity and reflection need to be considered in the implementation of entrepreneurship education. In another study, Pihkala, Ruskovaara, Seikkula-Leino and Rytkölä (2011) found that there are a fairly high number of teachers using the methods that utilise learning-by-doing, problem-based learning, co-operative learning, creative problem-solving techniques and learning by developing, etc. In this sense, it can be said that teaching methods used by STEs participated in current study are insufficient in terms of entrepreneurship education.

Looking at the findings with regards to measurement and evaluation techniques, it can be seen that some of the STEs use written tests/exams as measurement and evaluation techniques within entrepreneurship education. These findings show that the use of these traditional measurement and evaluation techniques is rather specific to entrepreneurship education. Thus, it has been stated that there is no single approach to the evaluation of educational outcomes for entrepreneurship education and a combination of qualitative and quantitative approaches may be used (OECD, 2009). Moreover, the opinions of other the STEs revealed that they understood that they benefit from practical work, observation, performance tasks and the question-answer technique. In fact, it can be said that the following techniques are needed to assess student performance in science education: multiple-choice items; observing students; questioning students (interviews); looking at students' work, which include open-ended questions; and performance tests/tasks, etc. (McColskey & O'Sullivan, 2000). In conclusion, it was determined that STEs participated in current study use measurement and evaluation techniques that are specific to science education for education processes concerning entrepreneurship education.

It was detected that some of the STEs prefer the approach of problem-based learning in project development processes related to entrepreneurship. Hamburg (2015) states that problem-based learning is suitable for entrepreneurship education. For science education, it has been argued that problem-based learning has an important role with regards to undergraduate elementary science education for pre-service teachers because it helps students and educators to define and analyse problems and create solutions (Etherington, 2011). Heilbrunn (2010) specifies that projects help students gain knowledge about entrepreneurship and this enables them to improve their entrepreneurial characteristics. Therefore, it can be said that two of the STEs had the right approach with regard to project development processes related to entrepreneurship. In addition, in this study it was seen that STEs participated in current study take advantage of acting independently, as well as basic methods of science and inquiry in project development processes.

Findings obtained from the some STE's opinions imply that they lay emphasis on entrepreneurial characteristics such as risk taking, brainstorming (developing new ideas or opinions), good planning, curiosity, self-confidence and creativity. It can be seen that all of the characteristics emphasised by STEs are consistent with several aims of entrepreneurship education. Akyürek and Şahin (2013) found that elementary teachers think students have enough self-confidence to take risks. In another study, Pihie and Bagheri (2011) found that students from technical and vocational secondary schools display medium self-efficacy. Based on these results, differences in students' characteristics can be attributed to variables such as learning environment, student demographics and the socioeconomic status of family, etc. Moreover, when the looking at the findings in terms of science education, it can be seen that entrepreneurship education provides an innovative learning domain for science lessons (Koehler, 2013). In this sense, Nwoye (2012) concluded that high-school physics students have low entrepreneurial characteristics and that the physics curriculum lacks the resources for the introduction of entrepreneurial characteristics. Similarly, in his study, Bacanak (2013) specified that middle-school science teachers think they do not have enough knowledge about entrepreneurship education. So, it can be said that the STE's participated in current study emphasis on entrepreneurial characteristics is the correct approach but these entrepreneurial characteristics have not yet been fully integrated into science subjects.

When examining the STE's opinions, it should be noted that they highlight important science subjects that can be utilised in entrepreneurship education. These science subjects are

composed of physics, chemistry and biology. In this sense, STEs have explained that will be utilized from science subjects just as electrochemical cells, batteries, human biology, the natural environment, statistics and percentages, electricity production, recycling and metals. These science subjects are propounded by the STEs in terms of entrepreneurship education, in the context of implementing entrepreneurship in science education has given significant clues. It has been emphasised that the importance of entrepreneurship is understood better when it is applied to chemistry lessons (Ezeudu et al., 2013). Moreover, Ezeudu et al. (2013) highlight that this can apply to entrepreneurship both in chemistry education and in biology education. For example, Ezeudu et al. (2013) state that the following items can be used during practicals: esters used in making perfume;, glucose used in making sweets and jams; acids for charging batteries; and insecticides, antiseptics and disinfectants. Similarly, Bikse and Riemere (2013) specify that there are several planned laboratory tasks for biology, chemistry and physics classes as elements in an entrepreneurship education framework that is a part of the process of the acquisition of science. Finally, when looking at science subjects from the entrepreneurship point of view, it can be seen that remarkable steps need to be taken in science education. In this study, the opinions obtained by the STEs included current study supported these developments.

The findings of this study indicate that some of the STEs benefit from the process of collaboration/teamwork use in classroom activities. In addition, STEs refer to in-classroom activities such as discussion groups and inviting entrepreneurs to speak in the class. Regarding this issue, Seikkula-Leino (2011) stated that teachers employ methods such as group work, discussion, individual work, field trips, peer work and the invitation of entrepreneurs to the school. From a science education point-of-view, Bacanak (2013) specified that science teachers think that these may be effective student-centred methods and techniques in entrepreneurship education. In the context of existing research, it can be said that STEs included current study prefer activities in which students are all together. On the other hand, the comments show that STEs participated in current study benefit from visits and exercises as out-of-classroom activities. Thus, it was reported that teachers mainly employ group work, storytelling, discussion, journal writing and out-of-school visits with regard to entrepreneurship education (Ruskovaara et al., 2010; Seikkula-Leino, 2011). In this sense, it can be said that visits play an important role in entrepreneurship education. These results are supported by the opinions of the STEs in current study.

When examining the opinions of the STEs regarding challenges faced by students, their main concerns are that students are not interested in their future career, students do not have a grasp of business terms and students are not keen on entrepreneurship. This may be because students do not feel close to entrepreneurship education because entrepreneurship is not a familiar concept to either students or teachers in the field of education. In the study conducted by Suonpää (2013), it was revealed that students face challenges that involve risk taking and uncertainty in entrepreneurship courses. On the other hand, according to the STE's views take part in current research concerning challenges faced in terms of their own issues, they believe they face time limits, inexperience and the problem of insufficient information on entrepreneurship. The results of the research included in the literature review supported these findings. For instance, it was stated that teachers spend extra time outside the school in the process of entrepreneurship education (Oplatka, 2014). In addition, the research results indicate that teachers do not know how to implement activities properly (Mattila et al., 2009) and that they do not give up their traditional roles (Kbathgate, Mostert, & Sandland, 2013). Moreover, Bacanak (2013) has determined that science teachers do not know exactly the nature of entrepreneurship characteristics. The source of this problem could be attributed to various factors, including educators' and teachers' lack of knowledge and experience about

entrepreneurship education. In the studies investigated opinions of STE in terms of educational environment, it can be seen that the STEs participated in current study encountered challenges concerning material and financial support and the workplace. Based on expert opinions, there are problems including a lack of sufficient human resources and financial support, as well as an ignorance of entrepreneurship education, etc. (Nordic Innovation, 2012). Also, it has been stated that principals limit themselves in terms of implementing entrepreneurial activities (Deakins, Glancey, Menter, & Wyper, 2005). Figueiredo-Nery and Figueiredo (2008) found that the physical condition of schools is not adequate for entrepreneurship education. Brown (2012) highlighted that public schools do not contain any practical elements or support for such teaching. All these results indicate that most public schools, from primary to high school, are inadequate in terms of learning environments and learning materials.

Finally, it has been seen that FSTEs participated in current study benefit from the process of collaboration/teamwork in classroom activities. In addition, FSTEs refer to in-classroom activities include discussion groups and talks given by entrepreneurs. FSTEs use written tests/exams as measurement and evaluation techniques in their courses also. Moreover, it was seen that the best-emphasised entrepreneurial characteristics to nurture in students are risk taking, brainstorming, good planning, curiosity, self-confidence and creativity. On the other hand, for entrepreneurship education, FSTEs consider as suitable science subjects those that contain information about electrochemical cells or batteries, human biology, the natural environment, statistics and percentages, electricity production, recycling and metals. Their main concerns regarding challenges faced by students are that students are not interested in their future career, students do not have a grasp of business terms and students are not keen on entrepreneurship. Based on these results, it can be said that;

- STEs should use more methods and techniques just as learning-by-doing, problem-based learning, co-operative learning, creative problem-solving techniques, learning diaries, project based learning often utilized in science education with regard to entrepreneurship education.
- STEs could also benefited from contemporary measurement and evaluation techniques just as portfolio, concept map, concept cartoons, know-Want-Learn (KWL) charts, conceptual change texts often utilized in science education.
- STEs should choice project based learning, and especially allow students to produce entrepreneurial project.
- Seminars and other informational meetings related to entrepreneurship can be arrangeable by entrepreneurs and experts for STEs in science teacher education. In this way, it could be provided STEs have a deeper understanding concerning entrepreneurship.

Acknowledgment

This study supported by Scientific and Technological Research Council of Turkey (TUBITAK). The authors also thanks to the science teachers educators who participate in this research.

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