Case study on the applicability of STEM education approach in Northern Cyprus education system according to the opinions of school administrators

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Abstract

The objective of this study is to determine the opinions of school administrators working in public secondary schools in Turkish Republic of Northern Cyprus as regards STEM model and reveal viewpoints on the applicability of STEM education model in TRNC. Embedded multiple case pattern, one of the qualitative research methods, was used in the study. The working group consisted of 2 principals and 5 assistant principals among the school administrators in the public secondary schools in Famagusta district of the Turkish Republic of Northern Cyprus. Research findings were reached by analyzing the data obtained from semi-structured interviews. Findings obtained as a result of the research have been discussed by comparing with the relevant literature. Finally, recommendations for practice and further research are presented.

Keywords: Stem, Northern Cyprus Stem, school administrators, case study.

1.INTRODUCTION

The success of nations in various fields is closely related to their adaptation to innovations. In other words, nations should closely follow the innovations in scientific and technological fields. Innovations in technology and science increase the demand for skilled manpower. In our age, there is a need for entrepreneurial individuals who can think creatively, give importance to details, have developed problem-solving skills, question, desire to research and learn, and make the right decisions (Thomas, 2014).

In our age, along with the technological development, the needs of the nations and the dynamics of the labor force needed to meet these needs have also changed. Especially the information processed in formal education institutions and converted into products or services cannot meet the labor supply of our age. For this reason, it is recommended that existing education programs be studied and focused on raising manpower suitable for the next century (Pekbay, 2017). Today, there is a tough competition between nations in terms of technology. As a result of this competition, developed countries have turned to

human resources who can work in science, technology and mathematics and started to make investments (Pekbay, 2017).

In the studies carried out, it is stated that STEM is derived from the initials of the concepts of science, technology, engineering and lastly mathematics and includes one of these concepts in the educational institutions of our age. STEM, or with its name in our language, FeTEMM, is the acquisition of knowledge and skills required in both mathematics and science lessons in the focus of education in the light of disciplines that come to the fore in the 21st century (Çorlu & Aydin, 2016).

With STEM education, it is extremely important to launch the education in question so that students become aware of their skills of questioning life, research, problem solving and finding solutions to the problems they encounter, as well as to train students who offer new products and introduce new discoveries.

Various researchers have stated that STEM education increasingly have come to the forefront in several countries, especially England, Canada and Australia (Jolly, 2014; Markham, 2011). Researchers pointed out that problems experienced in the mentioned branches of education are among the reasons for increasing popularization of STEM education (Venkataraman, Riordan and Olson, 2010). On the other hand, as in various innovative teaching approaches, educators have not yet reached a common consensus for the definition of

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STEM (Myer, Cooperrider and Gonzalez, 2015).

Morrison (2006) pointed out that one of the most striking goals of STEM education is to eliminate the interdisciplinary difference, to raise a generation that does research from the first link of education, pre-school, to university education, questions facts and events, and is eager to produce and innovate.

Despite not being a very new concept, STEM has begun to be very popular recently. STEM education, in the simplest terms, aims at raising qualified manpower that will adapt to the developing and changing era. In developed countries STEM is becoming more and more popular on a daily basis. However, the foundations of STEM education are just being laid in our country. Bringing talented individuals to society in STEM fields requires nations that want to make progress in technology and economy to review their education policies. In other words, integrating STEM into the courses offered in educational institutions is very important for the future of nations.

In this paper, it is aimed to determine the point of view of school administrators towards STEM education approach in public schools affiliated to the Turkish Republic of Northern Cyprus (TRNC) Ministry of National Education (MEB) and the current status of the education system. In this way, it is expected to contribute to the restructuring of the current education model and to the training of qualified manpower in our country. In this context, answer is sought to the problem sentence of the study, which is "What are your opinions on the application of the STEM education model in the TRNC education system?"

1.1. Objective of the Research

The objective of this study is to determine the views of school administrators working in public secondary schools in the Turkish Republic of Northern Cyprus on the STEM model and to reveal their perspectives on the applicability of the STEM education model in the TRNC. It is aimed to establish a relationship of views against the STEM education model. For this purpose, answers were sought for the following quantitative sub-problems related to the research.

1. How do school administrators evaluate the structure of education system?
2. According to school administrators, what are the deficiencies of the education system?
3. According to school administrators, does current education system meet the requirements of the information and technology age that we are living in?

4. What are the opinions of the school administrators on the renewal of current education system?
5. What are the viewpoints of school administrators regarding STEM education approach?
6. What do school administrators think about the combined use of Science, Technology, Engineering and Mathematics according to the STEM education approach?
7. What do school administrators think about the Contribution of the Usage of STEM Education to the Academic Achievement of Students?

2. METHOD
Research Model

In this study, a qualitative research approach was chosen in order to determine the views of school administrators about the STEM model and to reveal their perspectives on the applicability of the STEM education model in TRNC. In this study, embedded multiple case pattern, one of the qualitative research methods, was used. According to Yıldırım and Şimşek (2000), qualitative research is defined as a study in which qualitative data collection methods such as observation, interview and document analysis are used, and a process is followed to reveal perceptions and events in a realistic and holistic manner in the natural environment. Case research can reveal results by observing in real context, which is the determinant of cause and effect. Contexts are determinants of the interaction of situations, human relationships, and other factors (Cohen, Manion, & Morrison, 2007). In this paper, case study method was used with an embedded multiple case pattern. In this pattern, there is more than one case. However, each case considered and included in the study can be studied by dividing into various sub-units.

2.1 Study Group

The study group of the research consists of the school administrators at public secondary schools in Famagusta district of the Turkish Republic of Northern Cyprus. The schools were contacted and 2 principals and 5 deputy principals were determined. Thus, the number of school administrators interviewed was seven. While reporting the research, the names of the school administrators were not used, considering the ethical principles. For this reason, participating teachers were given code names.

Table 1 contains information on the code names, years of experience and positions of the school administrators participating in the study.

Table 1. **Professional Experience and Positions of School Administrators**

School administrators	Teaching experience	Position
OY 1	30-35	Principal
OY 2	30-35	Principal
OY 3	25-30	Deputy Principal
OY 4	20-25	Deputy Principal
OY 5	25-30	Deputy Principal
OY 6	30-35	Deputy Principal
OY 7	20-25	Deputy Principal

2.2 Data Collection Tool

In the study, an interview form prepared by the researchers was used in order to determine the school administrators' views on the STEM model and to reveal their perspectives on the applicability of the STEM education model in TRNC. In the interview form, besides the questions about demographic information prepared to obtain personal information of school administrators, 7 open-ended questions were included in order to determine their views on the STEM model and to reveal the perspectives on the applicability of the STEM education model in TRNC. The demographic questions in the interview form consisted of questions about their years of experience and positions.

Opinions were received from five experts from the field regarding the suitability to the purpose of the study, understandability and expressiveness of the questions in the interview form. Regarding the suitability to the purpose of the research (content), understandability and expressiveness of the questions in the form, opinions were received from a group of experts consisting of two experts from the education management field, two experts from the Turkish language field and one expert from the assessment and evaluation field. Experts were asked to evaluate the questions as 3 (appropriate), 2 (partially appropriate) and 1 (not appropriate) in terms of content, understandability and expressiveness, and to indicate their suggestions on the questions. The average of the evaluations of the experts was found to be 4. As a result of the expert opinions received, it was determined that the interview form was suitable for use in research. The questions were finalized by taking into account the suggestions of the experts.

2.3 Collection of Data

The data of the study were collected through interviews conducted by researchers in the 2018-2019 academic year by reaching out to school administrators. The interviews took place in November. The interviews were conducted with one-to-one interviews when both researchers and school administrators were available. One-to-one interviews with school administrators in classrooms on the specified dates were recorded with a tape recorder.

2.4 Analysis of the Data

While transcribing the interviews, each speech was transferred as it was heard, without any correction and in the interviewer-interviewee order. The answers obtained from the research were collected under themes by analyzing content. The analysis of the data was carried out by collecting the answers given by the teachers to the questions under themes and sub-themes and expressing the number of teachers who gave the answers for each theme.

FINDINGS

Table 2. **Findings Regarding the Evaluation of the Structure of the Education System by School Administrators**

Themes	F(n=7)	%
Rote learning and exams	3	42.87
TRNC education system	1	14.29
Student-oriented planning	2	28.58
Structure	1	14.29
Experimental	2	28.58
Learning by doing and living	1	14.29

As seen in Table 2, there are 6 sub-themes. The majority of school administrators stated that the general structure of the current education system offered children an educational environment based on rote learning and exams. School administrators participating in the study stated that there was a student-centered education in TRNC, that students did not conduct experimental studies, and that an education system structure was needed where students learned by doing and living.

When the table is examined, it can be seen that 14.29% of school administrators mentioned TRNC education system, 42.87% mentioned rote learning

and exams, 28.58% mentioned student-oriented planning, 14.29% mentioned structure, and 28.58% mentioned experimental learning by doing and living.

Some participants expressed their views about the general structure of the education system as follows:

"The current education system is based on rote learning and exams."

"Our country's education system is based on rote learning. It is a system that I do not like very much because the student memorizes during the exam period and then forgets what he/she learned shortly after the exam. The current system educates students who memorize and get a good grade but cannot implement it in practice." [G:(OY:1)]

"The current education system is based on rote learning with its current structure." [G:(OY:5)].

"TRNC education system covers all age groups."

"I think that with the spread of pre-school education in many regions in recent years, students begin as more ready for compulsory education." [G:(OY:2)]

"Although the current education system is student-oriented, it is far from being one."

"Although the current education system is planned as student- oriented, it is the most striking point that it is far from this system. However, even though the separation of the education structure into formal and non-formal education system seems to be the most fundamental point, it is a striking point that the dynamics within these structures are not strong." [G:(OY:3)].

''I think there are deficiencies and mistakes in the structure of the current education system.''

"There are many shortcomings and inaccuracies. I think the curriculum and the number of courses are structured incorrectly." [G:(OY:4)].

''I think that there are few practical or experimental courses in the general structure of the current education system."

"I believe that more experimental courses should be included in the curriculum." [G:(OY:4)].

''The general structure of our education system does not allow for learning by doing and living.''

"Education is confined to the classroom environment. Half-day training does not allow the application of a system based on doing and practice." [G:(OY:5)].

As seen in Table 3, most of the participants stated that one of the biggest deficiencies of the current education system was learning based on rote learning and that it should be replaced by a learning environment where children learned by doing, living and observing. They stated that the

rule of failing the class should be applied, the measurement and evaluation system was not fair, the infrastructure problems and the overcrowdedness in the classroom should be eliminated, and they were not satisfied with the current education system and the curriculum. In the light of these, the participants expressed their opinion that innovations and updates in the education system should be made as soon as possible.

Table 3. **Findings Regarding the Evaluation of the Deficiencies of the Current Education System by School Administrators**

Themes	F(n=7)	%
Rote-learning	4	57.16
Learning by doing, living and observing	4	57.16
Failing the class	1	14.29
Measurement and Evaluation	1	14.29
Number of students	1	14.29
Student-oriented	3	42.87
Special education students	1	14.29
Infrastructure	1	14.29
Administrative staff-student	1	14.29
Curriculum	1	14.29
Current education system	1	14.29
Innovations and updating	1	14.29

When the table is examined, it can be seen that 57.16% of participants mentioned rote learning, 57.16% mentioned learning by doing, living and observing, 14.29% mentioned failing the class, 14.29% mentioned measurement and evaluation, 14.29% mentioned number of students, 42.87% mentioned student-orientation, 14.29% mentioned special education students, 14.29% mentioned infrastructure, 14.29% mentioned administrative staff-student, 14.29% mentioned curriculum, 14.29% mentioned current education system, and 14.29% mentioned innovations and updating in their opinions.

Some participants expressed their views about the general structure of the education system as follows:

"The current education system is based on rote learning"

"It is based on rote learning, not giving students the opportunity to learn by doing or living" [G: (OY: 7)].

"Not offering students opportunities to learn by doing, living and observing"

"The biggest problem is that there is theoretical learning and students do not have the opportunity to learn by doing and living at the practical level" [G: (OY: 6)].

"I think that measurement and evaluation in the current education system is full of problems."

"In education, quantity is in the foreground rather than quality. Measurement and evaluation are full of troubles." [G: (OY: 1)].

"There are far too many students in the classrooms" [G: (OY: 1)].

"Not a student-oriented education system, but a teacher-oriented education system" [G: (OY: 3)].

"Not providing all opportunities and infrastructure for special education students to receive education in our schools"

"In order for special education students to receive education in our schools, all facilities and infrastructure must be provided. It is necessary to raise the awareness of all school staff, students and the general public. [G: (OY: 2)].

'' An infrastructure should be provided in schools where students can fulfill the conditions required by the courses and reinforce the knowledge they have learned by experiencing them. In schools, infrastructure should be provided that can meet the conditions required by the courses. "[G: (OY: 2)].

''Curriculum''

"I think that the curriculum content should be structured according to the course hours, the courses should be structured according to the age groups, and they should be evaluated in a way to take courses in different fields in a center." [G: (OY: 4)].

'' I can easily say that the current education system is not suitable for the century we live in. "

"I can say that there are many shortcomings compared to the 21ˢᵗ century we live in. First of all, infrastructure and technological infrastructure"[G: (OY: 7)].

"Teachers are not open to innovations and updating themselves" [G: (OY: 7)].

Table 4. **Findings Regarding the Evaluation of the Current Education System According to the Information and Technology Age**

Themes	F(n=7)	%
Not at the expected level	7	100
Technological infrastructure	4	57.16
Some schools	1	14.29
Technology	1	14.29
Science and language laboratories	2	28.56

As can be seen in Table 4, all school administrators stated that education system was not suitable for the information and technology age that we are living in, and a majority of them answered that their school did not have the technological infrastructure suitable for the century

we are living in and that they lacked laboratories for science and language classes.

When the table is examined, it can be seen that 100% of the participants said that it was not at the expected level, 57.16% mentioned technological infrastructure, 14.29% mentioned some schools, 14.29% mentioned technology, and 28.56% mentioned science and language laboratories.

Some participants expressed their views about the general structure of the education system as follows:

'' I think our education system is not at the required level."

"Unfortunately, the current education system is not at the required level." [G: (OY: 3)].

'' I think we do not have the technological infrastructure suitable for the age of information and technology in schools."

"There is one computer lab in the science high school, which accepts students with the simplest sample exam, and every child does not have a computer in the computer class" [G: (OY: 1)].

"I think our education system is not at the required level.

In this quarantine period we are in, we have understood this much better. First of all, there is no technology required in our schools"[G: (OY: 2)].

"It is a big problem that an information and technology environment cannot be created except for a few schools."

"Unfortunately, the current education system is not at the required level. The inability to create an information and technology environment, except for a few schools, and the inadequate or lacking technological infrastructure stands out as a serious problem." [G: (OY: 3)].

"There is no technology required in our schools." [G: (OY: 4)].

''There are no science and language laboratories in our schools." [G: (OY: 5)].

Table 5. **Findings Regarding the Evaluation of the Views of School Administrators for Changing the Education and Training System in Northern Cyprus**

Themes	F(n=7)	%
Change and renewal	7	100
Education based on rote learning	3	42.87
Student-oriented education model	2	28.58
Student-oriented education	3	42.87
Contemporary	1	14.29
Full-time education	2	28.58
Learning by living, doing and observing	1	14.29

As can be seen in Table 5, all school administrators stated that they thought that

education and teaching system should be changed or renewed, and a majority of them stated that education and teaching understanding based on rote learning should be abandoned at once, student-oriented education model and full-time education should be adopted, that students should be prepared for the future in an environment where they learned by living, doing and observing.

When the table is examined, it can be seen that 100% of participants mentioned change and renewal, 42.87% mentioned education based on rote learning, 28.58% mentioned student-oriented education model, 42.87% mentioned student-oriented education, 14.29% mentioned contemporary, 28.58% mentioned full-time education, and 14.29% mentioned learning by living, doing and observing.

Some participants expressed their views about the general structure of the education system as follows:

''The current education system needs to be replaced or renewed. ''

"I think we should abandon the education system based on rote learning."

"There is definitely a need for change. We must get rid of rote learning and misleading assessment and evaluation as soon as possible. We should switch to a student-centered education model and prepare students for life with a good direction in line with their interests, liking and abilities. [G: (OY: 1)].

"Must switch to student-centered education model, in line with the interests, liking and abilities of the students"

"We need to adopt a student-centered education model, and prepare students for life by guiding them towards the areas they are interested and talented in." [G: (OY: 6)].

"Student-centered education system should replace teacher-centered education system."

"First of all, the system should be student-centered, the competence and duty responsibility should be at a high level within the branches, the infrastructure required for afternoon education should be established in schools, and the infrastructure of vocational education should be further strengthened. [G: (OY: 3)].

''Our education system should be transformed into suitable for the age we live in"[G: (OY: 4)].

''Full time education should be adopted in schools.''

"First of all, the efficiency of the teachers should be increased. Course hour losses should be prevented. In addition, education should be extended to a full day and a system based on application and observation should be

implemented." [G:(OY:5)]

As seen in Table 6, some of the school administrators stated that they heard about STEM education approach, most of them did not, and they did not know about STEM education approach. However, the participants stated that they viewed the integration of the engineering field into the education system with a positive perspective.

Table 6. **Findings Regarding the Evaluation of School Administrators' Perspectives on STEM Education Approach**

Themes	F(n=7)	%
I heard	3	42.87
I did not hear	4	57.16
Education model	1	14.29
I do not have	4	57.16
Information and technology age	1	14.29
Engineering field	1	14.29

When the table is examined, 42.87% of participants answered that they heard, 14.29% answered as education model, 57.16% answered that they did not have, 14.29% answered as information and technology age, and 14.29% answered as engineering field.

Some participants expressed their views about the general structure of the education system as follows:

'' I've heard about STEM education approach before. ''

'' I know it is an educational model that reinforces the Science, Technology, Engineering and Mathematics lessons with common subjects. '' [G: (OY: 1)].

'' I have not heard of STEM education approach before. ''

"I've never heard of it. I do not know about this subject "[G: (OY: 5)].

'' I do not have detailed information about STEM education approach. ''

"I do not have very detailed information. I know there are applications as STEM or STEAM "[G: (OY: 2)].

'' Our age is now information and technology age. I think this system will encourage children to research more. ''

"I don't know much about this educational approach, but our age is now the age of information and technology. I think this system will encourage children to do more research. " [G: (OY: 6)].

'' I have a positive view of the inclusion of the engineering field in the education system.

"I think its inclusion in the engineering curriculum is interesting and can bring new

perspectives to children. Especially at the point of learning by doing, experiencing and observing "[G: (OY: 7)].

Table 7. **Findings Regarding the Evaluation of the Use of Science and Science, Technology, Engineering and Mathematics together in the TRNC by School Administrators**

Themes	F(n=7)	%
STEM education approach	5	71.45
Engineering field	1	14.29
Hands-on classes	1	14.29
Science and technology	1	14.29
Daily life	1	14.29
Research	1	14.29
Putting into practice	2	28.58
Infrastructure problems	1	14.29
Learning by doing and living	1	14.29

As can be seen in Table 7, majority of the participants stated that they thought that STEM education approach should be used in TRNC and that they were positive about the idea that an education system should be adopted that combines the fields of science, technology, engineering and mathematics, and that they believed that this should be applied in the education system at present.

When the table is examined, it can be seen that 71.45% of the participants mentioned STEM education approach, 14.29% mentioned engineering field, 14.29% mentioned hand-on classes, 14.29% mentioned science and technology, 14.29% mentioned daily life, 14.29% mentioned research, 28.58% mentioned putting into practice, 14.29% mentioned infrastructure problems, and 14.29% mentioned learning by doing and living.

Some participants expressed their views about the general structure of the education system as follows:

"I think that STEM education approach and TRNC education system should be integrated." [G: (OY: 1)]

"I think that the inclusion of the engineering field in the curriculum is interesting for children and can bring new features to children."

"I think that its inclusion in the curriculum in the field of engineering is interesting for children and can bring new perspectives to children. Especially at the point of learning by doing, living and observing." [G: (OY: 7)].

"STEM education system should be introduced in order for them to be prepared for life with practical lessons and to be successful in life."

"It would be very good to switch to the STEM education system so that students can prepare for

life with applied knowledge and be successful in life. Because it is important to adapt the education received to life for success."[G: (OY: 1)]

"I believe that science and technology should be transferred to all courses."

"I believe that science and technology should be transferred to all courses. I believe that technology should be used in all classes and in technology classes in schools." [G: (OY: 4)]

"It is important for our students to reflect the information they have learned into their daily lives."

"I think it should definitely be implemented."

"It is very important for our students to be able to use the information they have learned in their daily lives and to establish interdisciplinary relationships that they have learned at school."[G: (OY: 2)]

"It is very important to implement the STEM education approach." [G: (OY: 7)]

"I think that this system should be implemented, but infrastructure problems or deficiencies should also be eliminated."

"I think that this system should be implemented, but the infrastructure problems or deficiencies should also be eliminated, so that we will encourage children to research more through this approach." [G: (OY: 6)]

"Students should receive education in an environment where they make more use of learning methods by doing and experiencing."

"It is very important for students to receive education in an environment where they benefit more from learning by doing and experiencing methods." [G: (OY: 5)].

Table 8. **Findings Regarding the Evaluation of School Administrators' Views on the Contribution of STEM Education Usage to the Academic Achievement of Students**

Themes	F(n=7)	%
Positive	7	100
Believing	1	14.29
Analytical thinking	1	14.29
Student-oriented	1	14.29
Real life	1	14.29
New generation	1	14.29
Four fields	2	28.58
In an accurate way	1	14.29

As seen in Table 8, all of the school administrators stated that they viewed the STEM education approach in the TRNC positively and that they thought it would contribute to the academic success of the students.

Looking at the table, it can be seen that 100% of the participants mentioned positive, 14.29%

mentioned believing, 14.29% mentioned analytical thinking, 14.29% mentioned student-oriented, 14.29% mentioned real life, 14.29% mentioned new generation, 28.58% mentioned four fields, and 14.29% mentioned in an accurate way.

Some participants expressed their views about the general structure of the education system as follows:

''I think that it will contribute positively to the academic success of the students." [G: (OY: 4)].

''I believe that the STEM education approach will enable our young people to integrate better with the world."

"I believe that our young people will be better integrated into the world and this will help our country to take place in the modern world. In fact, I believe that great success will be achieved in education with an understanding that really puts the student at the center." [G: (OY: 1)]

"I believe that when this system is started to be used in a healthy way in the TRNC education system, a generation suitable for analytical thinking and solution structure will be raised." [G: (OY: 3)].

"Students' ability to apply what they learn in real life will motivate them and make learning meaningful."

"Students' ability to apply what they learn in real life will motivate them and make learning meaningful. In this way, education will also appeal to different learning styles, and it will also make sense for creative learners who are bored with classical education and training but have many different abilities "[G: (OY: 3)].

"Thus, in time, we will move away from this rote-learner and corner-cutter generation"

"Thus, in time, we will move away from this rote-learner and corner-cutter generation" [G: (OY: 3)].

"These four fields should definitely be used together."

"I believe that the use of these four different areas together will attract the attention of children and we can contribute to their success." [G: (OY: 4)].

"It will be useful if applied correctly."

"I think it will undoubtedly be useful if applied correctly." [G: (OY: 7)]

DISCUSSION AND CONCLUSION

Education activities under the Cyprus Turkish Education System are managed by the Ministry of Education with a central management approach. The Cyprus Turkish Education System has a structure that covers a period of fourteen years before higher education and consists of three main periods: Primary Education, Secondary Education and Higher Education (cited in Çağlar and Reis,

2007). TRNC national education system consists of two main parts, formal and non-formal.

According to the findings of this research, most of the school administrators participating in the study stated that there is a structure based on rote learning and exams in the education system in Northern Cyprus. In addition, they stated that although the TRNC education system was planned according to a student-centered structure, it was actually teacher-centered, and this situation had a negative effect on students' success. When the literature is examined, it is seen that other studies have obtained similar findings. According to the report of the Turkish Economic Policy Research Foundation (TEPAV) (2012), the use of memorization method in teaching is among the problems of the TRNC education system. In another study, Erden and Erden (2019) emphasized the following as important problems in the education system in the findings of the study they conducted in 2019: class passing and examination system, rote learning, class passing system, exam-based system, lack of assessment center, education, primary education not sending sufficient qualified to secondary education students, providing teaching rather than education, and teacher-centered practices.

School administrators participating in the study revealed the following views regarding the deficiencies of the current education system: the place of learning based on rote learning, the rule of failing the class, the measurement and evaluation system not being fair, infrastructure problems, and the dissatisfaction with the current education system and curriculum. In the light of these, they presented an opinion that innovations and updates in the education system should be made as soon as possible. Similar results have been presented in the literature on rote learning, according to the report of the Turkish Economic Policy Research Foundation (TEPAV) (2012). In addition, Erden and Erden (2019) stated in their study that the most important problems in the education system were problems related to the program and academic reasons, and problems with physical structure and equipment. The findings of this research and field studies are similar. Finally, in this research, school administrators provided an important opinion by mentioning the lack of a learning environment that students learn by doing, living and observing.

In this century, which is called the age of information and technology, more favorable conditions should be created in the education process in schools in order to increase and improve the efficiency of the education process (Seferoğlu &

Akbıyık, 2009). According to the findings of this study, all of the school administrators stated that the education system is not suitable for the information and technology age we live in, and the majority of them stated that the schools do not have the technological infrastructure suitable for the century we live in. They also emphasized the view that science and language teaching courses do not have laboratories. If we look at the researches in the literature, Çelebi (2008) stated that there are infrastructure and lack of equipment problems in all schools in Northern Cyprus. In another study, Erden and Erden (2019) stated that one of the important problems in the TRNC education system stems from the usage of technology. The authors emphasized the lack of new technologies, the technological deficiencies of the schools, the lack of technology, the lack of innovation, and social media. In another study, Sarpten (2020) stated that one of the decisions taken in the Council of the Ministry of National Education and Culture in 2005 on "the widespread use of educational technologies in schools and developing projects to eliminate the imbalance between schools" remained only on paper. This study and researches in the literature show similarities with the exception that in this study, school administrators stated the view that science and language teaching lessons did not have laboratories.

School administrators participating in this study stated the following: All participants think that the education and training system in Northern Cyprus should be changed or renewed. The majority of them stated that they should abandon the understanding of education and teaching based on rote learning as soon as possible, and that they should switch to a student-centered education model and full-time education, and that students should be prepared for the future in an environment where they learn by doing, living and observing. In the literature, Çağlar and Reis (2007) stated that while changing the education and training system in Northern Cyprus, a student-centered and constructive education system should be adopted. In another study, Çelebi (2008) determined that the TRNC education system needs a new model in the light of his analysis. Another researcher Sarpten (2020) stated that our country needs a quality education policy that has an understanding taking into account the needs of the age we live in and that is created with a shared vision. In addition, in the century we live in, students need an environment in which they actively participates in the learning processes and perform an independent, dynamic and continuous

learning in the school and classroom environment. Nowadays, students need to learn how to learn, think, generate ideas, research, and use knowledge. On the other hand, he stated that there is a need for an education system and qualified education policies where the teacher is a student in the classroom, learning with students and guiding the students.

Most of the school administrators who participated in the study stated that they did not hear about the STEM education approach and did not know about it. Only some of them stated that they heard it. STEM is becoming widespread day by day in developed countries, but this is not the case for Northern Cyprus yet. Through this research, it has been revealed that such an education is needed.

According to the findings of the study, almost all of the school administrators participating in the study stated that they thought that the STEM education approach should be used in the TRNC, and expressed their opinion that they viewed the idea of transition to an education system where science, technology, engineering and mathematics were used together. In the researches conducted in the literature, Altunel stated that there is an urgent need for interdisciplinary thinking in the Turkish Education System, which is among the first goals of STEM education.

All of the school administrators participating in this study stated that the implementation of the STEM education approach in the TRNC would contribute to the academic success of the students. When the literature is reviewed, it is possible to come across studies with similar results. Salman Parkalay (2017) stated in his study that STEM applications had a positive effect on the academic achievement of fifth grade students and their perception of inquiry learning skills about science. However, it was emphasized that there was no statistically significant difference in performance communication and participation sub-categories, while a positive increase was detected in favor of research and collaboration. Yıldırım and Selvi (2018) asked students for their opinions on the benefits of STEM applications. Students stated that it provided many benefits. These benefits are that it enables learning by doing and living, enables the subjects learned to be connected with daily life, facilitates the teaching of courses, increases academic success, and provides permanent learning. In addition, they stated that it contributed to the development of skills such as creativity, communication and cooperation. Gülhan and Şahin (2018) examined the effect of STEAM activities on

students' academic achievement and scientific creativity. They concluded that STEAM activities have a positive effect on students' academic achievement and scientific creativity. Finally, As a result of their research, Tofur and Gökkaya (2018) revealed that STEM education is very effective on students according to school administrators. This research and studies in the literature show similarities.

As a result, it has been found out that the following opinions of school administrators are similar to the findings of other studies in the literature:

- The education system in Northern Cyprus is based on rote learning and exams, and although it is planned according to a student-centered structure, it is teacher-centered and this situation has a negative effect on students' success,
- The place of rote learning as the deficiencies of the current education system in Northern Cyprus, the rule of failing class should be applied, the assessment and evaluation system is not fair, the infrastructure problems and the current education system and curriculum are not satisfied, and in the light of these, innovations and updates in the education system should be made as soon as possible,
- The education system in Northern Cyprus is not suitable for the age of information and technology we live in, and the schools do not have the technological infrastructure suitable for the century we live in,
- The education and training system in Northern Cyprus should be changed or renewed, they should get rid of the understanding of education and training based on rote learning, transition to full-time education with a student-centered education model is needed, students should be prepared for the future in an environment where they learn by doing, living and observing.

In addition, some points different from the literature were identified in the views of school administrators in Northern Cyprus: (i) the absence of a learning environment learned by doing, living and observing, (ii) the absence of science and language teaching laboratories, (ii) that they did not hear about the STEM education approach, (iv) they thought that STEM education approach should be used in TRNC, (v) science, technology, engineering and mathematics fields should be used together, and (vi) STEM education approach will contribute to the academic success of students in TRNC. It is believed that these findings will make significant contributions to both the literature and the

applications in the field. In addition, it is hoped that the research will be a pioneering study in terms of bringing findings from a different culture to the field, as it is the first study in this field in the Turkish Republic of Northern Cyprus.

RECOMMENDATIONS

In line with the findings of the research, the following recommendations are presented:
- Effort can be paid to make the education system in the TRNC student-centered.
- Effort can be paid to eliminate the deficiencies in the current education system in the TRNC.
- In-service trainings on learning by doing, living and observing can be organized for school administrators.
- In-service trainings on STEM approach can be organized for school administrators.
- A number of pilot studies can be conducted for the implementation of the STEM approach in cooperation with school administrators and the Ministry of National Education.

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