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A Comparison of the Middle School Science Programmes in Turkey, Singapore and Kazakhstan

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Abstract

Comparative education is important for recognising the education systems of different countries for bringing new practices into the education system and for ensuring educational equality among different societies. This study discusses the education systems of Turkey, Singapore and Kazakhstan. The science programmes of the three countries are compared in terms of their general objectives, processes and skills, content, measurement and evaluation approaches and learning outcomes. This is a comparative education research with a horizontal approach. The middle school science curriculum of the three countries was used as a data collection tool. As a method of analysis, document analysis was carried out. According to the results of the research, the programmes of all three countries are similar in terms of their general aims, processes and skills, but in contrast they have differences in measurement and evaluation approaches and learning approaches

Keywords: Comparative Study, Science Curriculum, Turkey, Singapore, Kazakhstan

Introduction

A country's education system cannot be described as being in a coincidental relationship with its own society. All education systems adopt the characteristics of the society in which they exist and reflect that society's values (Baskan, 2006). Education allows societies to transfer their cultural heritage to future generations and to adapt to developments happening at the time. Individuals living in the community are always looking for ways to determine what they have achieved from their past experiences and how they will meet the needs of their age. One of the purposes of education is to guide individuals in these ways. This can only be achieved by increasing the quality of teaching programmes. In this context, a teaching program consists of four steps: content, goal, learning-teaching process, evaluation (Demirel, 2013; Incikabi, 2011). The four elements of the new programmes that are delivered in terms of developing technology and certain other conditions must be reorganised and constantly updated (Özdemir, 2009). In this process of updating, the various programmes are compared with each other to establish any missing parts, and the models are designed with the strengths of the programmes in mind in order to shape the programmes under development. Already, this process tends to start from the ideal when developing the programme. The development, improvement and adaptation of each of the lessons is a matter of relevance for the educators and the rulers of the state (AAAS, 1990). It is important to increase the quality of the teaching programme in order to increase the efficiency of teaching (Ayas, Çepni & Özbay, 1994; Uysal & İncikabı, 2017, 2018).

The relationship between the components of the programmes is dynamic. Every change can affect other elements (Demirel, 2013). Every curriculum needs careful design before being put into practice. For this reason, the curriculum should be tested. The curriculum fosters students' conceptual learning, together with their fluency in operations and communications by testing their knowledge, all the while stressing the development of their problem-solving skills (Ciltas, 2013). Although some judgements are made about the draft curriculum based on previous information, it is possible to make a more precise judgement after the draft is put into practice and the effects on learning are determined. The most powerful factor that makes evaluation necessary in terms of programme improvement is the fact that any programme is initially based on a hypothetical structure (Yılmaz, 2006). On the basis of programme development activities, the programme must be designed, tested, tweaked or corrected and finally implemented (Demirel, 2013).

The aim of science education is to enable individuals to use science process skills; in other words, to be able to define the problems around them, to observe, to analyse, to hypothesise, to experiment, to conclude, to generalise and to apply the information they have using the necessary skills. Students can gain these science process skills through certain science education activities (Khayotha & Sitti, 2015). The science curriculum, in its dynamic structure, is continuously renewed. Changes in the programmes are inevitable due to the conditions and technology that are developed together with the basic concepts and skills that have been inherited from past programmes (Demirci, 1994). It would be more useful to study and investigate the education systems of different countries and to shape education practices according to the results of these surveys. This would avoid the need to conduct research that would not go far beyond the facts that have already been identified in scientific studies in other countries (Demirel, 2013). 'Comparative Education' is the name of the field in which such studies are conducted.

As part of this research, the aim is to compare middle school science programmes in secondary schools in Turkey, Singapore and Kazakhstan. According to the 2015 TIMSS results,

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the top four rankings in science are in Singapore, Japan, China-Taiwan and the Republic of Korea. In this research, the science curriculum in Turkey is compared with the Singapore curriculum, which came second in the 2011 TIMSS and first in 2015, and with Kazakshtan which is one of the most developing countries according to the 2011 and 2015 reports from TIMSS. The similarities and differences between the programmes of these countries have been determined and this study attempts to define the extent to which the practices within the programmes can respond to the needs of the respective countries by taking their specific conditions into consideration.

In recent years, the ineffectiveness of science education has become one of the most important problems in the Turkish Education System (Eş & Sarıkaya, 2010) such as lack of scientific process, misdistribution of learning areas. For this reason, it is always necessary to review the 'Science Teaching Programmes' and to make the necessary updates based on the changes happening in other countries.

Yılmaz and Çavuş (2016) compared issues in secondary school physics in Kosovo and Turkey according to grade level, objectives and units studied in terms of number of hours and outcomes. According to the study, the purpose of the teaching programmes in Turkey was identified as being clearer. In addition, it was understood that the subjects are linear in Kosovo but in a spiral structure in Turkey. However, it was determined that the outcomes related to physics are higher and there are more hours of lesson time than in Kosovo.

Güneş and Aksan (2015) compared Turkey and South Korea's biology curriculum. In making this comparison, the basic approaches, aims, areas of learning and structure of the programmes were taken into account. According to the results of the research, there are differences in the naming of the subjects in each country's programmes. On the other hand, it was determined that there are similarities in the general objectives and basic approaches of the programme. Yavuz-Topaloğlu and Balkan-Kıyıcı (2015) compared Turkey's and Australia's Science Programmes in their studies in terms of their content and purpose. According to the survey results, it was found that in the Turkish programmes, the environment, technology and other content are given more emphasis. It was also seen that the learning outcomes of the Australian programmes are lower. Özata-Yücel and Özkan (2014) compared Turkey, the UK, Ireland, Finland, Canada, New Zealand and the United States (New Jersey and Massachusetts) and found that the ecosystem, biodiversity and environmental problems are located in the curriculum. According to the results of the research, it can be seen that the related issues are handled differently in different countries. We have reached the conclusion that Turkey's education programmes give more importance to technology. Eş and Sarıkaya (2010) addressed the Irish curriculum in their study and compared the curriculum of the two countries in terms of content and purpose. According to the survey results, there is no content related to information and communication technologies in the Turkish curriculum. At the same time, compared to Ireland's curriculum, it was also found that in Turkey, there are more outcomes related to concepts.

Similarly, Eş, Sarikaya, Ekici and Ekici (2010) compared Canada's Ontario curriculum with Turkey's science education programme for general purposes, and they compared these programmes in terms of the underlying approaches and teaching-learning processes. According to the results of the research, it was found that both programmes have similar learning areas, addressing a student-centred approach. However, in terms of the overall objectives, Turkey's programme was identified as having more clear explanations. Tasar and Karaçam (2008) compared the Science and Technology/Engineering programmes of Turkey and Massachusetts. This comparison was made by taking the aims, contents and principles of the programmes into account. According to the results, the MBTM curriculum is followed in order to teach individuals the consciousness of American society. In Turkey, however, society and nation are not mentioned in the curriculum. Science literacy has always been considered important and plays a significant role in driving Singapore's technological and economic developments. In the Singapore education system, Science is introduced formally at grade 3 and it remains a core subject area throughout a child's ten years of compulsory education from elementary to high school levels (Koh & Lee, 2007).

Aslan (2005) studied the Singapore curriculum and compared the programmes of the two countries in terms of student achievements, teaching-learning experiences and test situations. According to the results of the research, it was stated that the main purpose in Turkey is to provide topic coverage in the Science Teaching Programme. In the Singapore Science Teaching Programme, it is understood that the main purpose is to explore themes and the subjects are the vehicles to achieve this. Turkey's general exams only consist of multiple-choice questions but in Singapore, the exams consist of multiple-choice and open-ended questions. Turkey's evaluation activities aim to determine the degree of achievement of the outcomes contained in the unit. Studies in classroom assessments in Singapore are clearly presented to teachers.

The significance of this research is that it enables us to compare the programmes of the countries which are the subject of the research, to determine the good and the incomplete aspects of the programmes, to make a synthesis in terms of the programmes and to make possible suggestions and shed light on the work to be done thereafter. Due to the newness of the programme, there have not been enough comparative studies in the field of science education, especially in the countries that have realised innovations in recent years (Eş & Sarıkaya, 2010). For the purpose of the research, the problem to be investigated is 'what are the similarities and differences between middle school science teaching programmes in Turkey, Singapore and Kazakhstan?'

As a result of this problem, the following sub-problems will be investigated:

1. What are the similarities and differences in terms of overall objectives in the middle school science teaching programmes in Turkey, Singapore and Kazakhstan?

2. What are the similarities and differences of the middle school science teaching programmes of Turkey, Singapore and Kazakhstan in terms of the skills and processes they include?

3. What are the similarities and differences in the middle school science teaching programmes in Turkey, Singapore and Kazakhstan in terms of learning areas?

4. What are the similarities and differences in the middle school science teaching programmes in Turkey, Singapore and Kazakhstan in terms of measurement and evaluation?

5. What are the similarities and differences in the middle school science teaching programmes (at the eighth grade level) in Turkey, Singapore and Kazakhstan in terms of outcomes?

Method

Research Model

In the study, an analytic method which is called the 'Bereday Model' is used. This approach of Bereday (1964 as cited in Bray, Adamson & Mason, 2014) is examined in two ways—comparative and field study—while two or more countries are examined. This model is in four stages: defining, interpreting, combining and comparing.

- Identification: At this stage, sources for the comparative elements are identified and discussed.
- Interpretation: When interpreting, the elements to be compared are evaluated from different directions (philosophical, geographical, social etc.).
- Combination: The elements of the different countries are paired together for comparison. Thus, the differences and similarities between them are determined.
- Comparison: The comparison is concluded in an objective and consistent manner by setting out the data obtained from pairing at the comparison stage.

The educational systems of the three countries that are examined during the identification phase are presented for informational purposes without any comments. The information defined in the interpretation phase is expressed. At the time of assembly, matched data were presented together and tables were arranged. The comparative stage of the research is expressed in the results section.

Data Collection Tools

As a data source in this research, the secondary school science programmes of Turkey, Singapore and Kazakhstan were used. Since the Singapore curriculum was written in English, it was directly examined by the researcher. However, the curriculum of Kazakhstan was translated into Turkish from an official language of the country through an interpreter. All three countries have access to the curriculum from official Internet sites.

Data Analysis

In the analysis of the data obtained in this study, the document analysis method was preferred. The document analysis method is an approach that includes systematically reviewing each element in order to objectively reveal the patterns obtained from the scope (Böke, 2002). At the beginning of the study, in order to create the coding list, the related literature was examined. Two experts working independently were involved in the coding process of the data. Both experts have numerous studies regarding program analysis and development. As a result of the first coding, the agreement rate (reliability coefficient) between coders was calculated as 83.5% according to the Miles and Huberman (1994) formula. The coders came together and discussed the items causing the dispute and reached an agreement on each item.

Findings

In this section, the science courses of Turkey, Singapore and Kazakhstan are provided by a comparison of the programmes according to the research problems.

Table 1. *Comparison of general objectives*

Objective	Turkey	Singapore	Kazakhstan
Gain Basic Knowledge	To give basic information about Biology, Physics, Chemistry, Earth, Sky and Environmental Sciences, Health and Natural Disasters	To help students develop the field knowledge needed to conduct science research	Continuity in the development of knowledge, skills and abilities acquired in primary school
Gain Environmental Consciousness	In the process of discovering nature and understanding the relationship between man and the environment, adopting scientific process skills and a scientific research approach and finding solutions to the problems encountered	This goal aims to develop students' curiosity, interest and tendencies in science and technology related issues and their interest and attention to the environment	Education and research activities, rational nature management and environmental protection skills, necessary skills to ensure the safety of human and social life
Science-Society-Technology Interaction	To raise awareness of how science affects society and technology	To develop students' curiosity, interest and tendencies in science and technology related issues	Creating the interaction of nature, society and the economy
Career Consciousness	To develop science-related career consciousness	Aims to increase awareness that scientific research and applied areas involve cooperation and accumulation activities	
Solving Daily Problems	To take responsibility for everyday life problems and to use knowledge of science, scientific process skills and other life skills to solve these problems	Attracting students to science-related issues that concern their lives, society and the environment	To develop mental and creative skills to solve life problems
The Formation of Scientific Knowledge	Helping understand how scientists create scientific knowledge, the processes it goes through and how this new knowledge is used in new research		
The formation of Scientific Knowledge as a Result of Common culture	To contribute to the understanding that science is the result of the common endeavour of scientists from all cultures and to develop a sense of appreciation of scientific studies		Development of an integrated information, value and attitude system corresponding to a multinational assembly
Security Consciousness	To recognise the importance of safety in scientific studies and to contribute to its implementation		

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The comparison of the programmes in terms of general objectives

The findings of the coding obtained from the expressions containing the general objectives of all three programmes are given in Table 1.

According to Table 1, all three programmes have similar common objectives. It was understood that although 2 objectives are uniquely listed in Turkey's curriculum, for the 4 objectives out of listed 8 ones, all of three countries have common statements.

As regards the aims in the programmes, it is observed that the four objectives of the curriculum are to provide basic information, to gain environmental awareness, to provide science-society-technology interaction and to solve daily life problems. Taking into account the outstanding objectives of these common themes, it is seen that all three countries are aiming to provide the students with basic knowledge.

In particular, it was stated that Kazakhstan's science curriculum is primarily aimed at the development of knowledge gained in previous years. The science curriculum in Singapore also outlines the necessity of providing basic knowledge to conduct science research. Within the environmental awareness theme, all three programmes aim to create interest in environmental problems that students are experiencing and aim to develop a scientific approach in order to solve these problems.

Besides, some themes only appear in the list for one country. For example, 'patriotism consciousness' is emphasised only in the Kazakhstan science education programme. In Turkey, the basis of the Law as regards the National Education curriculum is stated. In this respect, the students are educated as citizens who depend on Atatürk Nationalism, Atatürk's Reforms and Principles and the Constitutional expression and as citizens who are embracing, protecting and developing the national, moral, spiritual and cultural values of the Turkish people. They are expected to love and attempt to glorify human rights and the constitution; they are expected to be democratic and know their duties and responsibilities towards the Republic of Turkey.

In fact, this goal also demonstrates the need for students to have patriotism consciousness. Similarly, 'security awareness in scientific research' was openly expressed only in the Turkish science curriculum. As regards the aims in the programmes, it can be seen that all three programmes have general objectives. While the objectives in the Turkish Science Education Programme and the Singapore Science Education Programme include the entire programme, the specific objectives of each course are included in the Kazakhstan Science Education Programme. Numerically, there are 12 goals in the Turkish Science Education Programme and three objectives in the Singapore Science Education Programme, whereas in the Kazakhstan Science Education Programme, there is one general objective and 35 objectives in the total of all the courses.

When the content is compared, it can be seen that all three programmes aim to encourage students in the habit of doing scientific research, to make them learn basic information about the subjects and to increase their knowledge of science subjects.

As a matter of fact, it has been determined that each lesson in the Kazakhstan Science Education Programme aims to give its students specific qualifications.

The comparison of the programmes in terms of process and skills

The findings of the coding obtained from the expressions containing the processes and skills of all three programmes are given in Table 2.

In all three programmes, it can be seen that the skills to be taught to the students are included and the processes that are required to acquire these skills are included. While these skills and processes are handled in detail in the Singapore Science Education Programme, details are not given in the Turkish Science Education Programme and the Kazakhstan Science Education Programme. When the themes created are examined, it can be seen that the themes of 'creative thinking', 'scientific process skills' and 'scientific literacy' take place in all three countries.

It has been determined that in the Singapore Science Education Programme and the Turkish Science Education Programme, the skills of 'joint research and questioning' and 'problem solving and effective communication' are provided to the students. In addition, competencies that have been abbreviated as scientific process skills in the Turkish Science Education Programme have been found to take place in detail in the Singapore Science Education Programme as follows: hypothesis formation, problem

Table 2. *Comparison of processes and skills*

Process-Skill	Turkey	Singapore	Kazakhstan
Research-Question	X	X	
Solving Problems	X	X	
Cooperation	X		
Self Confidence	X		
Effective Decision Making	X		
Effective Communication	X	X	
Sustainable Development Consciousness	X		
Life time Learning	X		
Technology-Society-Environment	X		
Attitude	X		X
Perception	X		
Value	X		
Creative Thinking	X	X	X
Scientific Process Skills	X	X	X
Scientific Literacy	X	X	X

identification, prediction, observation, comparison and analysis.

Comparing programmes in terms of learning areas

The findings of the coding obtained from the expressions containing the learning fields of all three programmes are given in Table 3.

Table 3. *Comparison of content domains*

Learning Areas		
Turkey	Singapore	Kazakhstan
Knowledge	Variety	
Skill	Models	
Hearing	Systems	
Science-Technology-Society-Environment	Interactions	

When all three programmes are compared in terms of learning areas, it can be seen that learning areas are not included in the Kazakhstan Science Education Programme at first. There are four learning areas in the Turkish Science Education Programme and the Singapore Science Education Programme but these learning areas are named differently. While dividing the Turkish Science Education Programme learning areas into sub-learning areas, they identified the Singapore Science Education Programme learning areas as themes and associated them with topics. There are sub-learning areas in the Turkish Science Education Programme. Their explanation is also given in the programme.

It can be said that when comparing the Singapore Programme with the Turkish Programme, the sub-learning areas in the Turkish Programme are explained under the heading of skills and process in the Singapore Programme. The Turkish Science Education Programme can be considered as the most detailed programme in terms of learning areas.

Comparison of programmes in terms of measurement and evaluation approach.

The findings of the coding obtained from the expressions containing the measurement and evaluation approach of all three programmes are given in Table 4.

When all three programmes are compared in terms of measurement and evaluation approaches, it can be seen that the measurement and evaluation approach within the Kazakhstan Science Education Programme takes the form of 'main results', 'personal results' and 'system activity results'. Of these, 'fundamental' and 'system activity results' are explained as a demonstration of the adoption of the complementary evaluation approach.

Personal outcomes are said to be appropriate for the process evaluation approach because it is said that the students are made to learn about their learning levels through that approach. As a result of the comparison of the Turkish and the Singapore programmes in terms of the measurement and evaluation approach, it can be seen that both programmes have a similar approach. Both programmes seem to suggest a complementary and formative assessment and evaluation approach. In particular, the collection effect of performance-based evaluations within the Singapore Science Education Programme is also given as a percentage.

In addition, performance-based evaluation tools recommended in the programme of Singapore are listed.

Table 4. *Comparison of measurement and evaluation approach*

Approach	Turkey	Singapore	Kazakhstan
Process Assessment	A measurement-evaluation approach has been adopted in order to ensure that pupils are monitored and guided in the process, learning difficulties are identified and remedied and continuous feedback is provided to support meaningful and lasting learning	Collected studies provide a continuous record of the students' development and progress in information acquisition, understanding of scientific concepts, application of process skills and development of attitudes	The level of education of students is assessed from three perspectives: main results, personal results, system effectiveness results
Complement	For this reason, it is recommended to assess the performance of the student at the end of the process with the learning product presented by the student	Assessment measures the extent to which the desired knowledge, skills and attitudes are attained by students. While completing the teaching and learning process, it gives formative and summary information to teachers, students, schools and families	
Feedback	Self and peer assessment approaches have been adopted, with the use of complementary measurement tools and techniques, with an emphasis on a process-oriented assessment approach, where the student has the opportunity to assess himself and his peers	The assessment provides feedback to the students and helps them understand their strengths and weaknesses	
Use of Technology	Technology is also used to monitor and evaluate students' learning process and performance at the end of this process		

However, it has been stated that such an evaluation is recommended to be used in the programme of Turkey. However, the reasons and necessity of the evaluation approach within the Singapore Science Education Programme are explained in detail.

Comparison of the programmes in terms of outcomes

The findings of the coding obtained from the expressions containing the outcomes of all three programmes are given in Table 5.

Table 5. *Comparison of number of learning outcomes*

Number of Learning Outcomes		
Turkey	Singapore	Kazakhstan
252	89	113

A sample outcome from Turkey:

> ** Associates the occurrence of seasons with the inclination of the earth's rotation axis and the orbit around the Sun.*

A sample outcome from Singapore:

> ** Substances may be classified as elements, compounds and mixtures.*

A sample outcome from Kazakhstan:

> ** Cognitive methods of chemical experimental bases and chemical substances.*

When comparing the achievements of all three programmes, it can be seen that the achievements are not expressed as sentences in KSEP. Instead, concepts are included in the subject headings. As a result of comparing the TSEP and the SSEP in terms of achievements, it can be seen that the two programmes have a similar approach. The behaviours that both programmes should try to develop in students are expressed in short and clear sentences.

However, there are more numerical gains in the Turkish Science Education Programme. It can be considered that this is due to the fact that the Turkish Science Education Programme contains more detailed sub-learning areas. At the same time, there is no such division in the Singapore Programme as the achievements within the Turkish Science Education Programme are disaggregated on a class basis

Results and Discussion

The results that were obtained according to the research findings show similarities in terms of the general objectives of the Science Curriculum of Turkey, Singapore and Kazakhstan. The current framework of the Singapore Science Curriculum is centred on Science as an Inquiry. It focuses on the acquisition of general inquiry processes and science process skills which scientists use to make sense of the natural environment (Koh & Lee, 2007). The Turkish curriculum is the most detailed in terms of general objectives. This situation has also been observed in the studies of Yılmazlar and Çavuş (2016) and Eş, Sarıkaya, Ekici and Ekici (2010). In these studies, the teaching programmes implemented in Turkey were found to be more detailed than the ones in Kosovo and in the province of Ontario. However, in addition to the above, the 'Kazakhstan Natural Sciences Curriculum' consists of the descriptions of each course. This detail cannot be seen in Turkey and Singapore.

In terms of the scope of the general objectives, Turkey and Singapore are similar. Both programmes aim to provide students with the habit of conducting scientific research, to provide students with basic information about the subject and to increase students' awareness of science subjects. This situation was seen in the study of Güneş and Aksan (2015) which was about the comparison of the programmes of Turkey and South Korea. In this study, it was found that the objectives of both programmes were to teach students that their goals in life are to acquire and use research skills, inquiry and scientific process skills and to use scientific methods to solve problems that may be encountered in daily life.

Another aim of the study is to compare the programmes of Turkey, Singapore and Kazakhstan in terms of processes and skills. Therefore, all three programmes aim to increase curiosity as regards scientific literacy, analytical thinking and introspection. These results have appeared in the studies of Güneş and Aksan (2015) which compared the biology programmes of South Korea and Turkey. In the present study, it was found that the most advanced curriculum in terms of skills and processes is the 'Singapore Science Teaching Programme'. Another objective of the study is to compare Turkey, Singapore and Kazakhstan in terms of learning areas of the programme. According to the findings of the research in Turkey, learning areas are divided into sub-learning areas but in Singapore learning areas are defined as themes and these are related to the topics. In Kazakhstan, learning areas are not mentioned.

In Turkey's 'Science and Technology Course' the following learning areas take place: 'Live and Life', 'Matter and Change', 'Physical Phenomena' and 'Earth and Universe' with the subject areas 'Skills', 'Hearing', 'Science and Technology- Society-Environment'. There are four themes in the Singapore Science Curriculum named 'Diversity', 'Modeller', 'Systems' and 'Interactions'. This result is similar to the results of Aslan (2005) in the comparative study. According to this study, it is understood that the main purpose is to provide topics in the Science Teaching Programme in Turkey. In the Singapore Science Teaching Programme, it is understood that the main purpose is to provide the theme, and that the subjects are the tools. With the major recent programme revisions such as infusing thinking skills and the Science Practical Assessment, Singaporean science teachers are strongly encouraged to use the inquiry-based instruction and performance-based assessments in their science classrooms. This will ensure that curriculum goals can be met through these authentic learning experiences as students construct meaningful, broadly applicable, well-structured, information-rich knowledge, skills and affective domain attributes (Koh & Lee, 2007).

In Kazakhstan, the main objectives of the education system are: creating necessary conditions for quality education aimed at the formation, development and professional growth of personality based on national and universal human values and achievements of science and practice; development of creative, spiritual and physical skills of a person, formation of the solid ethical principles and a healthy lifestyle, intellectual enrichment by creating conditions for personality development; civic consciousness and patriotic education and cultivating love of the homeland of the Republic of Kazakhstan (Nabi, Zhaxylykova, Kenbaeve, Tolbayev & Bekbaeva, 2016).

Turkey, Singapore and Kazakhstan education programmes were compared in terms of measurement and evaluation approaches. As a result, it was found that measurement and evaluation approaches were not included in the Kazakhstan programme in the first place. Turkey and Singapore programmes were seen as having a more similar approach. Both programmes seem to suggest a complementary and formative assessment and evaluation approach. Particularly in Singapore, the effect of performance-based evaluations as regards the total number is also given as a percentage. These results were also found by Kaytan (2007) in the study that compared the results of Turkey's, Singapore's and Britain's mathematics programmes. In this study, the importance of process evaluation in all three programmes is given.

Suggestions

Depending on the results of the research, the following suggestions are presented:

•While programmes are being prepared, programmes in different countries should be compared.

•In particular, the programmes of countries that have succeeded in international exams comparing achievements of students such as TIMSS and PISA should be examined. However, while doing this, the education systems of the countries should be considered.

•As a research topic, programmes and education systems in different countries at different levels of education can be compared.

•In addition to the aims of this work, the topics and aims of the sciences (such as Physics, Chemistry, Biology) covered in the 'Science Curriculum' may be a new research topic.

•The systems of training the teachers who are practitioners of teaching programmes should also be investigated.

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