The comparison of the science and technology curriculum with the physics, chemistry and biology curriculums

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Abstract

The purpose of this study is to examine whether the curriculums for primary and secondary education support each other in different aspects and to make some suggestions towards the study’s records for more effective applications. The study is in survey method. In this study the comparison of the science and technology curriculums for primary education (for 4-8th class) and the physics, chemistry and biology curriculums of secondary education (for 9-11th class) was made in point of the curriculums’ philosophy, vision and mission, structure (information and skill acquisitions), content of subjects, explanations, subdisciplines and the association of different lessons. At the end of the comparison of the curriculums it is found that they support each other.

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Keywords: Science and technology; physic; chemistry; biology; curriculum; primary and secondary education; college education.

1. Introduction

The renewal process of Turkey in the education system has started with the renewal of the programs of instruction / the curriculums in 2003. The contemporary education approaches, which are analyzed in accordance with the demands of the individual and the society, have become the source of the new education programs prepared in our country. Education is a whole. In other words the education studies continuing throughout the training process of the student have to be complementary.

Ünal et. al., (2004), indicates that in our country the curriculums in the field of science have not been prepared towards an adequate planning indicates since 1923 whereas in 1997 detailed science curriculums were developed by EARGED with a different comprehension

On the grounds of the opinions of the teachers, Bayrak and Erden (2007), remark that there were some deficiencies in the science (6th - 8th class) curriculums which were newly put into effect in 2001 – 2002 academic year. However Demirbaş (2006) has put forward that the 6th class the science and the technology curriculum and the science curriculum have succeeded what is intended in terms of the success level of their purposes, the evaluation of their contents, the evaluation of the learning - teaching processes, the levels of the use of different instruction

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methods, the role and the evaluation of the teacher. In a similar sense, Gömlesiz and Bulut (2006) have come up with the conclusion that the renewed science and the technology curriculums are effective at the level of “very much” in the application process of the acquisitions, the concept, the education level and the evaluation anticipated in the program. Kurt and Yıldırım (2009) have cited that in respect to the curriculum of the 9th class chemistry lesson, the teachers have some thoughts such as; the timetable is not enough for the activities specified in the program, there are mistakes in the sequence of the topics, the experiments are not applicable for research and examine etc. The studies for improving the science curriculums of the secondary education have started in 2006 and 9th class curriculum has been completed in 2007 and put into practice in 2008 – 2009 academic year. In 2009 – 2010 academic year, the curriculums belonging to the 10th class are being applied. Taking into consideration that the renewed curriculums are prepared according to the evolution principle, the curriculums of the elementary education and the curriculums of the secondary education should support each other. For this reason, in this research, a comparison has been made between the new programs developed in the field of science at the level of elementary and secondary education. With this purpose an answer is sought for the question of “Do the curriculums of the elementary education, science and technology lessons (4th - 5th class and 6th - 8th class) and the curriculums of the secondary education, physics, chemistry and biology lessons support each other?”

1. Method

1.1. The model

The research has a survey model. In the study the curriculums of the elementary education, 4th - 8th class, science and technology lessons and the curriculums of the secondary education, 9th - 12th class, physics, chemistry and biology lessons are compared in terms of the philosophy, the vision, the skills, the content, the inter disciplines, the interaction with other lessons and the number of acquisitions.

1.2. The data collection tools

As the data collection tools, the curriculums of the elementary education, 4th - 5th and 6th - 8th class, science and technology lessons and the curriculums of the secondary education, 9th - 12th class, physics, chemistry and biology lessons taking place in the website of the board of Education and Discipline (TTKB) are used.

1.3. The data analysis

In the analysis of the data, the philosophy, the vision, the skills, the content, the inter disciplines, the interaction with other lessons and the number of acquisitions of the curriculums of 4th - 8th class, science and technology lessons and the curriculums of 9th - 12th class, physics, chemistry and biology lessons are scanned; the acquired data is interpreted qualitatively.

2. Results

The comparison between the curriculums of the elementary education, 4th - 5th, science and technology lessons, the curriculums of the elementary education, 6th - 8th, science and technology lessons and the curriculums of the secondary education, 9th - 12th class, physics lessons is given in Table 1.

| 4th class | 5th class | 6th class | 7th class | 8th class | 9th class | 10th class | 11th class | 12th class |
|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|
| Philosophy | It forms the philosophy of the constructivist approach programs based on the student centered learning |
| Vision | Educating all students as science and technology literates no matter what their individual differences are. |
| | Raising individual/s who internalized that the physics is none other than life, who can solve the problems to be faced with scientific methods, who can analyse the interactions between Physics – Technology – Society and Environment, who can |
develop positive attitudes and behaviours for him/herself and his/her environment, who has skills for the information literacy that the information society requires, who can express his/her opinions objectively in the most effective way, who is peace with him/herself and his/her environment and who is productive.

| PSS Acquisitions | - | 22 acquisitions (Problem Solving Skills) |
|------------------|---|----------------------------------------|
| SPTSE Acquisitions | 36 acquisitions | 38 acquisitions | 40 acquisitions |
| SPS Acquisitions | 24 acquisitions | 32 acquisitions | 22 acquisitions |
| AV Acquisitions | 26 acquisitions | 28 acquisitions |

### The Contents of the Topics

- Force and movement, light and sound, electricity in our lives
- Force and Movement, Electricity in our Lives, Sound
- Force and Movement Sound, Electricity in our Lives
- The Nature of Physics, Energy, Matter and Properties Of Matter, Force and Movement, Electricity and Magnetism, Waves
- Matter and Properties of Matter, Force and Movement, Electricity, Modern Physics, Waves
- Matter and Properties of Matter, Force and Movement Magnetism, Modern Physics, Waves, From Stars to Quasars
- Matter and Properties of Matter, Force and Movement Electronics, Waves, Modern Physics, The Nature of Physics From Atoms to Quarks

### Interdisciplines

- Human rights and citizenship (2), special education (1), psychological counseling and guidance (2), Health culture (1), Health culture acquisition (2), Developin career consciousness (2)
- Disaster prevention (1)

### Association with Other Lessons

| Turkish, Social Sciences, Music | Turkish, Social Sciences, Music | Turkish, Social Sciences, Music | Science and Technology | Science and Technology | Science and Technology, Chemistry | Science and Technology, Chemistry, Physics |
|---|---|---|---|---|---|---|
| 76 | 76 | 70 | 92 | 61 | 71 | 47 | 81 | 105 |

When the curriculums of the elementary education, science and technology lessons and the curriculums of the secondary education, physics lessons are analyzed, it has been seen that of the constructivist approach based on the student centered learning constitutes the main philosophy of all programs. Moreover having the acquisitions of SPTSE (Science / Physics - Technology – Society - Environment), SPS (Scientific Process Skills) and AV (Attitude and Value) is a common trait for the programs. When the contents related to these programs are looked over, it has been seen that the examined acquisitions of both the elementary education and the secondary education are complementary. On the other hand, the acquisitions of PSS (Problem Solving Skills) take place only in the curriculums of the secondary education, physics lessons but not in the curriculums of the elementary education, science and technology lessons. When the contents are inspected, it has also been seen that the programs complement each other with a volute structure, either. In other words, the topics are given in a complementary way
from the simple to the complex. The interdisciplines take place in the elementary education but not in the secondary education.

Besides the interaction with other lessons take place in all of the examined programs. This situation shows that the interdisciplinary interaction is one of the overemphasized subjects in the renewed curriculums. When the number of the acquisitions directed to the contents of the topics is analyzed, not any very remarkable difference can be seen; where the least acquisition is in 10th class and the most acquisition is in 12th class.

The comparison between the curriculums of the elementary education, 4th - 5th, science and technology lessons, the curriculums of the elementary education, 6th - 8th, science and technology lessons and the curriculums of the secondary education, 9th - 12th class, chemistry lessons is given in Table.2.

Table 2. The comparison between the curriculum of the elementary school science and technology lessons and the curriculum of the secondary school chemistry lessons

| Contents of the Topics | 4th class | 5th class | 6th class | 7th class | 8th class | 9th class | 10th class | 11th class | 12th class |
|------------------------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|
| Philosophy              | It forms the philosophy of the constructivist approach programs based on the student centered learning |
| Vision                  | Educating all students as science and technology literates no matter what their individual differences are. |
| SPTSE / CTSE Acquisitions | 36 acquisitions | 38 acquisitions | 10 acquisitions |
| SFS Acquisitions        | 24 acquisitions | 32 acquisitions | 11 acquisitions |
| AV / CAV Acquisitions   | 26 acquisitions | 7 Communication, Attitude and Value Skills (CAVS) acquisition |
| The Interdisciplines    | Developing career consciousness, Entrepreneurship (2) Human rights and citizenship (1) |
| Association with Other Lessons | Turkish, Social Sciences, Mathematics, Painting, Mathematics, Turkish |
| The number of Acquisition | 46 | 46 | 44 | 46 | 58 | 90 | 123 | 106 | 151 |
When the units related to the chemistry in the curriculums of the elementary education, science and technology lessons and chemistry lesson in the curriculums of the secondary education are analyzed, it has been seen that the constructivist learning approach is adopted in the philosophies of both program. It has been ascertained that in the vision of the curriculums of science and technology raising science literate individuals is aimed whereas in the curriculums of the chemistry, raising individual/s that is conscious of his/her individual and social responsibilities and aware of the chemical concepts and principles influencing his/her life are aimed. It has been determined that, in terms of comprising of the scientific process skills, the curriculums of science and technology gives way to more skills than the curriculums of the chemistry. In a similar sense, it has been ascertained that the acquisitions of science - technology – society – environment in the curriculums of science and technology are more emphasized than the acquisitions of science - technology – society – environment in the curriculums of chemistry lesson. The acquisitions of attitude and value in the curriculums of science and technology have been named as communication, attitude and value skills in the curriculums of the secondary education chemistry lesson. When analyzed in respect to the contents, it has been determined that the topics beginning with the matter and properties of the matter in the science and technology lesson in 4th class; proceeds with an extending scope and content in the oncoming classes until 12th class, in a way to support the introductory information. Although the acquisitions of inter disciplines have been allowed in 4th and 8th class, it is striking that these acquisitions taking place in a limited number in the related field of learning, in the curriculums of science and technology, are not allowed in the curriculums of the secondary education chemistry. It has been detected that, in terms of the association with other lessons, both the curriculums of science and technology and the curriculums of the chemistry, the associations with the activities to be realized in the related lessons are allowed. It is also striking that not any instruction is given in the units related with the subject of association with other lessons in the curriculums of the science and technology lessons in 6th - 8th classes, in the elementary education. When the programs are analyzed, it has been confirmed that, in the instructions parts, both programs are given in detail in terms of the limitations, the misconceptions and the warnings of in. It has been observed that the number of acquisitions increases in respect to the contents of the topics in the oncoming classes.

The comparison between the curriculums of the elementary education, 4th - 5th, science and technology lessons, the curriculums of the elementary education, 6th - 8th, science and technology lessons and the curriculums of the secondary education, 9th - 12th class, biology lessons is given in Table.3.

| Philosophy | It forms the philosophy of the constructivist approach programs based on the student centered learning |
| Vision | Educating all students as science and technology literate no matter what their individual differences are. | Supposing that everybody can be fond of biology, everybody can learn biology tastefully and everybody can be successful at biology vision of the Curriculum of the Biology Lesson is to raise up biology literate individuals. |
| SPTSE Acquisitions | 36 acquisitions | 38 acquisitions | 40 acquisitions |
| SPS Acquisitions | 24 acquisitions | 32 acquisitions | 22 acquisitions |
| AV / CAV Acquisitions | 26 acquisitions | 20 (CAV) acquisitions |

| The Contents of the Topics | Let us Solve the Puzzle of our Body; Let us Visit and Know the World of Living Beings | Reproduction, Growth and Development in Living Beings; Systems in our Body | Systems in our Body; Human and Environments |
| | Cell, Organism and Metabolism; Classification of Living Beings and Biological Diversity; Consciousness | Transformatio of Energy in living beings; Nuclear division and reproduction; Ecology of the eco system. | Plant biology; Genetics, Genetic engineering; Biotechnology; Ecology of the community |
| | The beginning of Human life and evolution, The protection and the | | |
When the units related to the biology in the curriculums of the elementary education, science and technology lessons and biology lesson in the curriculums of the secondary education are compared, it has been seen that the constructivist learning approach is used as a common philosophy in both programs; the vision in the programs are focused on literacy; the acquisitions of SPSTE, SPS and AV in the curriculums of the elementary education are handled with similar but different names in the curriculums of the secondary education; the volute structure taking place in the contents of topics in the curriculums of the elementary education; science and technology lessons continues in the curriculums of the secondary education biology lessons; the inter disciplinary association taking place in the curriculums of the elementary education do not take place in the curriculums of the secondary education; the association with other lessons take more place in the curriculums of the elementary education but they are used only twice in the curriculums of the biology lessons and the number of acquisitions used are similar.

3. Discussion

In consequence of the research, when the findings acquired are analyzed, it is visible that the curriculums of the elementary education, science and technology lessons and the curriculums of the secondary education, physics, chemistry and biology lessons are parallel. In all levels, the programs have been prepared on the basis of the constructivist approach and a student centered structure has been set forth. The common vision of the programs is to ensure raising the students as productive individuals who can apply the things he / she learned to his / her daily living, who can solve the problems to be faced with scientific methods, who can analyze the relations between
science – technology – society and environment and who can make the right decision by thinking critical and creative. The contents of the topics of the curriculums have been organized towards the evolution principle and the progressive levels of the students have been taken into consideration. The number of acquisitions is parallel in the elementary education and in the secondary education. However it is striking that in some classes the numbers of acquisitions are very few or too much.

It has been observed that the acquisitions of SPSTE, SPS and AV taking place in the curriculums of the elementary education also continue in the curriculums of the secondary education. In respect of the structure of the secondary education, some changes have been made in the names of these acquisitions. For example, the acquisitions of AV are given as CAV in the curriculums of the secondary education with the addition of communication skills. When developing the acquisitions of SPSTE and SPS and AV in the curriculums of the 4th - 5th and 6th - 8th classes, in the elementary education, is a matter of fact, the same acquisitions are preserved in curriculums of the secondary education. Furthermore, only in the curriculums of the physics lessons, the problem solving skills are handled under the name of PSS.

While the interdisciplinary associations take place in the curriculums of the elementary education, these associations are not allowed in the curriculums of the secondary education. The association between the classes are used more frequently in the elementary education than the secondary education.

It is very positive that the curriculums improved in the levels of the elementary education and the secondary education in science are parallel. All curriculums of science and technology lessons in the elementary education, which were started to be improved before, have been put into practice and their efficiencies in application process have been shown in the researchs. (Gömleksiz & Bulut, 2006; Bayrak & Erden, 2007; Demirbaş, 2008). Improving process of the curriculums of science and technology in the secondary education have just been completed and 11th class will be put into practice in 2010 – 2011 and 12th class will be put into practice in 2011 – 2012. For this reason, the researches in relation to the curriculums of secondary education, science are in very few numbers. The advertising activities regarding these curriculums are still going on. However there is a need for the of presentation of these curriculums the teachers and the in-service training activities for the application of these in an efficient way. Kurt & Yıldırım (2009) have drawn attention to this deficiency in their research.

4. Conclusion and Recommendation

The fact that the curriculums of the elementary education and the secondary education have a similar structure in terms of philosophy, vision, contents of the topics, acquisitions and associations; will effect the education process in a positive way. It will be useful that the arrangements to be made according to the level of the student and the student to have the similar operation of the lessons in the secondary school due to the experience that the he/ she obtained in the elementary education. As a consequence the structural similarity of the curriculums of the elementary education and the secondary education is very important. The complementary structure of the curriculums of the elementary education, science and technology lessons and the curriculums of the secondary education, physics, chemistry and biology lessons will ensure the education to be realized in harmony. For this reason it will assure that the text books, which are prepared in accordance with the curriculums of the elementary education science and technology lessons, to be inspected carefully by the authors and the prepared book sets to be in harmony. The book sets prepared on the grounds of the structuring approach in the elementary education, will serve as a model for the secondary education books. In this way, the students educated by complying with the student centered learning in the elementary education, will be able to implement this comprehension in a more successful way when they get by the secondary education. Moreover, the authors preparing the book sets of the science and technology lessons in the elementary education, have to examine the curriculums of the physics, chemistry and biology lessons in the secondary education and knowing what kind of subjects in which levels will the students met in the following years, they have to arrange the scopes and the limitations accordingly.
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