



Analyses of Secondary School Science Curricula According to Quantum Paradigm

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Abstract

There's a close relationship between a country's persistence and the scientific and technological level it has. This requires an effective and efficient science education. Effective science education is possible with qualified and functional science curricula, because the real factors that make students qualified in the instruction process are the teachers and the curricula.

Secondary school science curricula have been reorganized in the context of the major educational reform applied in 2004 in Turkey. This reform named "radical" by academicians was named by the Ministry of Education as "a change in paradigms". With the reform stated, science curricula which were philosophically based on essentialism and on a Newtonist approach in aspects of scientific understanding, were stated to be reorganized based on the Quantum paradigm and Reconstructivist approach.

The aim of this study emerging from the doubts stated is to analyze the secondary school science curricula reorganized in the context of the 2004 reform and changed in some aspects according to the quantum paradigm. The data of the study held in qualitative model and documentary analyses model are the secondary school science curricula that are reorganized by the Ministry of Education and that are in application and scientific researches, news and reports. These data are analyzed using the content analysis method and grouped in certain titles. These analyses are commented by making a synthesis of the literature and some results are reached.

The results of the study can be summarized as follows: In Turkey, the secondary school science curricula reorganized in the context of the 2004 reform are based on the philosophy of progressivism and designed according to the reconstructivist approach, student centered and active curriculum approach. In these curricula which put forward learning rather than education, some contemporary theories and understandings such as cooperative learning and multiple intelligence theory are given. But however the Ministry of Education states that these curricula are based on the quantum paradigm, important traces of the Newton understanding are found in the analyses of these curricula. This determination not only shades the reform held by the Ministry of Education in 2004 and named as "a change in paradigms" but also shows that secondary school students in Turkey are not equipped with contemporary science knowledge, because the quantum paradigm is accepted to be the scientific understanding of the day. If this is true, it is compulsory for Turkey to re-analyze secondary school science curricula in order not to fall behind in science education.

1. Introduction

In Turkey science education has always been in school curricula in history. Up to the 2000s the science education renewed many times. The point in general the education in part science education, educational reform was made in Turkey in 2004. The science education curricula were reconstructed by this reform made by MEB, the only authority of education in Turkey. The fact that these years were the years of educational reforms around the world and the unacceptable results of the PISA exams triggered this reform. It was commented that the science education curricula was based on a Newtonist approach with a modern-positivist character, was ineffective and inefficient, prevented thinking, aimed to tame the individual rather than developing him [1], and weakened personality [2]. MEB made some revisions in science education first in 2004 later in 2013 with the effect of these reasons.



Primary school science education curricula, name of which changed to “science and technology with the reform made in 2004 was based on progressivist philosophy and constructivist approach [2], [3], [4].

Another new aspect of these curricula was the use of Quantum paradigm changing from Newtonist approach in the former curriculum. MEB authorities stated that the change in curricula was a transition from a positivist thinking to a non-positivist and Radical constructivism was adopted with the facilities present. According to this, the direction of the change was from Newtonist and behaviorist thinking came with positivism to a postmodernist, constructivist, chaotic, holistic, and quantumist thinking [5].

The change made in 2013 didn't include much change in philosophy, approach and contents and aimed to adapt the new primary and secondary education system. The primary school education was changed to 8 year continuous education to two levels of 4 year primary and 4 year secondary. Science education is given in the last two years of primary and in all years of secondary schools. The have of the courses were changed to science course in 2013 and put into effect in 2013-2014 educational year. The aim of this study is to analyze SCTC in all aspects according to quantum paradigm and determine the scientific and epistemological nature of it.

2. Method

This study is in scanning model and documentary analyses model. The data of the research was obtained from documents of MEB about SCTC and scientific studies made about this issue. These documents are analyzed according to quantum paradigm. The analyses are model with some keywords as “constructivism” postmodernism and subjective knowledge that qualify the general qualities and dimensions and the quantum paradigm. Then those analyses are commented and some conclusions are made.

3. Analyses of Secondary School Science Course Teaching Curriculum

3.1 - The Structure of Secondary School 5th Grade SCTC

The structure school 5th grade SCTC which was put into effect in 2013 is an integrated course including science, chemistry, and biology. The curriculum is formed of 7 units, 12 main aims and 44 acquisitions.

Some knowledge, skills, and affections and four learning domains are determined in the curriculums that are science, technology, society and environment [6]. In this study the unit's substance and change are analyzed of the units in the curriculum.

The vision of MEB is determined as Growing all students scientifically literate. The statement that the individual is aware that While operating the know ledge in cognitive processes the social structure, values and beliefs of the culture he lives in are effective can be accepted as a reflection of constructivist approach in epistemological sense. Because constructivist learning happens when the student applies his experiences, knowledge, beliefs, and skills to learning process using his cognitive schemes. [7] Also with these statements, an epistemological parallel can be formed between Piaget and Vygotsky ideas and postmodernism that includes constructivism. All these comments support that MEB's SCTC IS based on constructivism.

3.2. Main Aims and Acquisitions of secondary school SCTC

Main aims of SCTC are determined analyzing main Aims of Turkish National Education, and Basic Principles of Turkish National Education, The first unit of SCTC included in the study, which is substance and change, has six acquisitions and the second unit, which is the world and the universe, has ten.



Mostly cognitive development focused these traditional [8] acquisitions associate with behaviorist approach which is close to Newtonist paradigm, intellectualism, and positivist philosophy of the enlightenment. This contradicts with constructivism, because constructivism (radical constructivism) is not intellectualist but practicist [9]. Another problem with these acquisitions is being about only cognitive development of the individual. Furthermore, most of these acquisitions are related to the application step and a few to the analysis step of Blooms cognitive taxonomy [10] However it must be discussed if these cognitive levels are appropriate for 5th grade students or not.

Upon taking the acquisitions of the two units in SCTC epistemologically and scientifically, is seen that these are mostly efforts of reaching the known and explaining the known it can be said that SCTC considers knowledge objectively in a Newtonist view from the beginning, whereas, constructivism, especially radical constructivism, which is epistemologically close to quantum paradigm considers knowledge subjectively. In literature, cognitive constructivism considers objective approach. [7] Upon taking this into consider ration, SCTC is closer to cognitive constructivism at the acquisitions dimensions.

3.3. The Roles of Teachers and Students in secondary school SCTC

The differences between Newton and quantum paradigms in issues of knowledge, reality and the universe reflect to the roles of teachers and students in teaching process. [11] The individual is seen as an object to be made some operations according to the certain targets determined. Before, in o curriculum adopting Newtonist approach, focusing on results (products). Because in Newtonist classical physics, the initial conditions of a known object is thought to be enough for estimating its future location. [12] Targets being certainly determined [7], Which can be commented a stance against the nature of learning can cause neglections of other elements in curriculum [13], As a reflection of modernism and Newtonist approach, the teacher is the authority of in class, and he transfers the absolute information to the cognitively passive students in classroom as the role of the teacher in this process may be a notary as the confirmatory, or an operator as the distributor of the information.

Where as in process focused curricula, which quotes quantum paradigm this is a collection of probable conditions [12]. The goals cannot be determined initially, because the teacher as a probability engineer organizes the learning environment and guides the construction of the knowledge by the students as the active subjects of learning process. In this approach, the teacher is supposed to change to someone who learns while teaching. From someone who transfers information [14],

3.4. Strategies and Methods Adopted in secondary school 5th grade SCTC

Like many other curriculum approaches, SCTC suggests some strategies and methods. The importance of these suggestions can be understood better. When remembering that strategies and methods are main reasons of school where students will be active and teachers will be guides and directors, and cooperation are suggested. These strategies and methods that are student centered [15], and reflect diversity, can be accepted appropriate to postmodernism, which questions objects [16], [17], progressivist philosophy, learner centered education, and constructivist approach. However, students re-constructing knowledge with these strategies and methods on teachers using these strategies and methods according to their nature or not.

3.5. Assessment and Evaluation Approach of Secondary school 5th grade SCTC

Assessment and evaluation is usually the last element of curricula. This element focuses on products in conventional curricula and on process in contemporary curricula [11]. In this context in Newtonist, positivist curriculum approach which is accepted to be conventional, facts are objectified by separating and isolating them from environments and processes that surround them and then reduced to observable and assessable qualities. [18], According to this approach, assessment and evaluation focuses on the result of teaching process and has a mission of selection and elimination This classical



evaluation approach, is commented [19], give enough information about the student. In this curriculum which is epistemologically close to quantum paradigm and based on constructivism, assessment and evaluation focuses on processes and aims to redirect.

SCTC uses an assessment and evaluation approach that includes both the processes and the results of teaching. It can be commented that statements as quantitative data are not alone significant associates with quantum paradigm rather than the Newtonist approach based on quantitative measurability. Again the statement that Knowing that quantitative data out of conventional assessment tools are not significant alone, it is suggested to be closer to constructivist approach that focuses on holistic development rather than the positivist approach that aims to develop students only in cognitive aspects. According to this it can be said that SCTC is closer to quantum paradigm and parallel to constructivism in the aspect of assessment and evaluation.

4. Conclusion

Secondary school 5th grade SCTC held in this study is a continuation of the 2004 science and Technology course Teaching curriculum from the aspects of the theories and pedagogical approaches it depends on. In the analyses it is concluded that SCTC is closer to constructivism and quantum paradigm in the aspects of its structure and vision. However it reflects positivism and Newtonist approach in scientific positioning and the consideration of objective knowledge of the curriculum focus on cognitive development, Newtonist and positivist characterized and close to behaviorist approach. 5th grade SCTC is close to constructivism in aspects of teacher and student roles and carries traces of quantum paradigm. When the curriculum is taken into consideration in aspect of activities, it can be considered that the strategies and methods suggested in the curriculum are appropriate to postmodernism that reflects student centered and diversity, progressivism, learner-centered education, and constructivist approach. 5th grade SCTC adopts a holistic. Assessment and evaluation approach that includes both the process and the results of teaching process and associates with quantum paradigm in the aspect of assessment and evaluation elements.

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