

Investigating the Propriety of a Science and Technology Curriculum in Turkiye

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The purpose of this paper is analyzing the new Science and Technology curriculum, which was declared as the new primary school curriculum in August 2004 by Turkish Minister of Education (MoE), based on Posner's (2004) curriculum analysis framework. The written curriculum was examined and the findings were supported with a variety of resources including online newspaper articles regarding with the scope and implementation of the new curriculum in Turkiye, critiques of some educational organizations and forum discussions of teachers. After stating the strengths and weaknesses of the curriculum, some suggestions that are important for the curriculum to be implemented effectively were recommended.

The new Science and Technology curriculum, which was declared as the new primary school curriculum in August 2004 by Turkish Minister of Education (MoE), was tested in 120 schools representing the population of Turkiye in 2004-2005 academic year (Özpolat, 2005; Türkiye Bilimler Akademisi [TUBA-Turkish Science Academy], 2004). Then, it has been implemented throughout the country since 2005-2006 academic year on account of the successful results which have never been reported officially.

According to Posner (2004), curriculum analysis is critical in determining whether a curriculum is appropriate to be used in a particular classroom, school, or school district. This examination requires understanding the underlying assumptions of the curriculum and determining the extent to which they are valid for the particular situation. Posner (2004)'s framework for curriculum analysis consists of four sets including curriculum documentation and origins, curriculum proper, curriculum in use, and curriculum critique. The questions are organized into these sets so that the analysis can be organized in a manageable fashion. Since a complete and detailed curriculum analysis addressing all five sets of questions is not practical, the second set (curriculum proper) is selected for the purpose of this paper. Specifically, the following questions were asked in order to analyze the propriety of the new Science and Technology curriculum:

1. What are the purposes and content of the curriculum?
2. What assumptions underlie the curriculum's approach to purpose or content?
3. How is the curriculum organized?
4. What psychological assumptions underlie the curriculum's organization?

Methods

The analyzed curriculum documents were including the problem, to which the curriculum was responding, only the names of the curriculum developers, the foundations of the curriculum, lists of learning areas and goals, detailed explanations of unit organizations. The research articles about the implementation of constructivist curriculum, online newspaper articles regarding with the scope and implementation of the new curriculum, critiques of some educational organizations, and forum discussions of teachers were used in order to support the findings.

Any information about curriculum developers (institutions, roles), teacher attitudes, administrative structure, school facilities, and financial constraints, little information about how to consider different learner characteristics and lack of unity in the document explaining the organization of the units were limitations in documentation.

Findings

What are the purposes and content of the curriculum?

The vision of Science and Technology curriculum is expressed as "...making all the students science and technology literate people no matter what the individual differences they have" (Öğretmenler Portalı-Teachers' Portal, 2006). It is supposed that the reasons of economic and social problems in Türkiye stem from the educational system so that being a developed country is only possible with the citizens having necessary qualities to produce and use scientific and technological knowledge and education is seen as a means of this growing process. These assumptions reflect technocratic thought which holds the idea of creating Science and Technology experts in charge of the society and key to the economic development. The analysis with regard to the purposes and content of the curriculum are elaborated in the following three topics namely educational goals and aims, learning goals, and multicultural view in content.

Educational goals and aims

The educational goals of the curriculum can be grouped into three areas: (a) ability to understand the nature of science and technology and the mutual interactions among the science, technology, society, and environment, (b) proficiency in using science and technology during problem solving, decision making and constructing new knowledge, (c) awareness of career options regarding with science and technology and using relevant knowledge and skills to improve economic productivity.

Although the educational aims in the curriculum are stated as "personal and social development of the students, learning basic skills, developing higher level thinking and economic productivity in their future worklife", the standards-based education system in Türkiye narrows the aims of education and gives emphasis on educational excellence and results of standardized testing rather than preparing the students to the life.

Learning goals

There are four groups of learning goals regarding with knowledge, science-technology-society-environment, scientific thinking skills, and attitude and values. In the curriculum, not only knowledge but also skills, values and attitudes are included when writing the learning objectives and their relationships are stated in the document explaining the organization of each unit.

Multicultural view in content

Multicultural view advocates the diversity of student population and student action. Taking into account of learner differences, it can be said that there is little information about learner differences in the curriculum documents. Each title such as “The Girls and Science”, “Advanced Learners in Science”, “Students Having Learning Disabilities and Science” includes only one paragraph with general information thus, may not help teachers understand or find the ways of adapting the learning process based on different student characteristics.

Cobern (1996) states that the role of culture in science learning requires greater attention among ethnic minority cultures or in developing countries. Similarly, the students of different ethnic or cultural origin in East and Southeast Türkiye value the school goals differently and have diverse expectations, which indicate that the goals of national education and expectations for schools set for the system are not highly responsive to cultural differences. Such conditions are likely to cause failure of non-dominant students. For example, the activities including asking the students to “prepare a sandwich for balanced nutrition” and “bring a toy car to measure the speed” can be given as examples of the ignorance of different socio-economical conditions of students.

Besides, it is apparent that most of the activities require materials and it is not clear whether the materials will be provided by the schools, teachers or students. But some newspaper articles stress that the materials used in the project activities are generally supplied by the parents and many parents could not afford these materials because of their economical conditions (Eğitim Sen, 2005). So, the curriculum is developed based on the assumption that all the schools in Türkiye have similar conditions or all the parents have enough power to supply the materials.

What assumptions underlie the curriculum’s approach to purpose or content?

The new Turkish Curriculum in Science can be partly considered a constructivist curriculum. Constructivism implies that the student is always an active agent in the process of meaningful learning (Matthews, 2000). The new Turkish Curriculum in Science stresses student involvement in hands-on science activities that engage scientific thinking and reasoning. On the other hand, while the importance of problem solving and inquiry-based learning strategies in Science education are stated in the documents, it is clear that problem-formation and problem-solving are not emphasized adequately.

Furthermore, the situations in which students should have prerequisite information are taken into consideration. To this end, the concept map of each unit is given in a systematic way so as to present the concepts of learning areas and units. Although the alternative assessment strategies such as student portfolios are emphasized to evaluate the student learning, the multiple choice, true-false and fill in the blanks questions proposed in some units reflect a behaviorist approach to evaluation. Moreover, the success and future of students in Turkiye are determined by nation-wide standardized tests and there is no clue about how this curriculum can help to solve the ineffectiveness of the one-dimensional standardized tests focusing on rote learning and memorizing.

Finally, the roles of the teachers are identified as; “creating a supportive learning environment that helps students construct their own knowledge through inquiry, real-world exploration, and collaboration, taking into consideration of the individual differences of students, using the students' experiences, guiding the classroom activities to facilitate student learning, identifying and nurturing the scientific talent and interests of all students...” all of which imply a constructivist view of teacher role. However, no clear information or way to do this is provided in the curriculum documentation.

How is the curriculum organized?

The program labels the chief learning areas as “Living Things and Life, Matter and Change, Physical Events, The Earth and The Universe”. It seems that the curriculum is covered at increasingly higher levels of difficulty in grade six through grade eight. How the learning goals to be acquired at the end of each unit are related with the science concepts and skills in other class levels.

The interdisciplinary connection is mostly with Turkish courses. On the other hand, there is little or no connection with social sciences and mathematics. However, mathematics forms the basic methods of science, thus providing the connections among science, technology, and mathematics is an essential component for improved science literacy (TUBA, 2004).

What psychological assumptions underlie the curriculum's organization?

The curriculum expresses both top-down and project approaches. Top-down approach advocates that curriculum should be organized around fundamental concepts, themes, or principles (Posner, 2004) all of which are seen in the organization of Science and Technology curriculum. Moreover, “the student as scientist” metaphor is stressed in the curriculum materials which is a dominant psychological claim in top-down approach.

However, based on project approach the curriculum is organized around student activities, which the teacher and students plan together (Posner, 2004). Because the Science and Technology curriculum is activity-based, offers learning activities in which students with different interests and abilities work together and stresses cognitive skills, it reflects project approach in curriculum organization. On the other hand, the lack of interdisciplinary projects and insufficient link between the community and the school estrange the curriculum from project approach.

Conclusions

Based on the results, it can be mentioned that stressing student involvement in hands-on science activities that engage them with scientific thinking and reasoning, offering learning activities in which students with different interests and abilities work together, describing teachers' role as facilitators are the strengths of the curriculum.

On the other hand, it is clear that the economic productivity has a relative priority among the educational goals and is stressed both in the rationale and main purposes of the curriculum. Curriculum is oriented to improve the students' judgement capacities with regard to information and ignores the improvement of their aesthetic judgment.

Curriculum materials seem to devote inordinate amount of space to activities with the lack of interdisciplinary projects. While the importance of problem solving and inquiry-based learning strategies in science education are stated in the documents, it is clear that problem-formation and problem-solving are not emphasized adequately. Moreover, the characteristics of target audience receive little attention and teacher training and attitudes, administrative structure, school facilities, and financial constraints are totally ignored. Additionally, the role of the teachers is ambiguous and difficult to understand especially for the teachers who are not familiar with the ideas of constructivism.

Recommendations

In conclusion, we should always be cautious about the underlying assumptions of curriculum, try to analyze its principles, goals, and ideologies in order to determine whether the curriculum is appropriate for use in a particular educational setting. Based on the analysis, the possible things that needs to be done in order for the Science and Technology curriculum to be implemented effectively are suggested as follows:

- curriculum should be oriented not only to improve students' knowledge but also their aesthetic judgement.
- more examples about how to design a basic experiment in order to solve a problem should be provided.
- the wide range of social and cultural differences in the country should be considered.
- the nation-wide exams and the education in schools should be in accord in order for the students to gain the learning goals stressed in the curriculum.
- inservice training opportunities to teach teachers how to implement constructivist teaching approaches should be provided (Walker, 2004)

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