

Program Development Models and Reform in Turkish Primary School Mathematics Curriculum

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ABSTRACT: The purpose of this paper is to discuss the current reform in the Turkish Mathematics Education at the elementary level by summarizing the types of program development models and changes involved in the current reform. There are three models of program development; subject centred, learner centred, and problem centred. In terms of content, the Turkish elementary mathematics curricula seem to adopt more of a subject centred curricula although the claim was a learner centred one. In terms of methods, however, learning is more emphasized than teaching. Conceptual understanding is given more importance rather than rote memorization of facts and rules. Besides knowledge, skills and attitudes are also embedded in the content. In sum, more constructivist pedagogies are adopted.

Key Words: Curriculum reform, mathematics education, elementary education

Since January 2004, the Turkish Ministry of National Education has been in the process of a massive curricular change in school curricula especially at the elementary level. The reform has been initiated by a grant from the European Union. Elementary school curricula in 5 different subject areas, including mathematics, have been completely redeveloped and started to be implemented in 2005-06 school year after piloting them in 100 elementary schools in 6 different provinces for an academic year. The intend was to shift from a behaviourist approach to more of a constructivist one. The purpose of this paper is to discuss the current reform in the Turkish Mathematics Education at the primary level by summarizing the processes of program development models and changes involved in the current reform.

The Reform Movements in Turkiye

Major international studies such as TIMSS (1999), PISA (2003) have shown that the Turkish Educational System did not work well in producing a quality mathematics and science education at the elementary level. Turkish students fall well below the international average in both of these studies. Such international indicators as TIMSS, PISA, and other internal indicators such as some national exams forced the educational system to undergo a major curricular change at both elementary and secondary level.

In fact, some efforts have been made in the last ten years to make changes in the curricula. Many of these changes did not go beyond a surface revision except the preschool curriculum for 36-72 month olds developed in 2002. This program places the child in the centre of the curriculum. Activities are planned in a constructivist fashion while considering the individual differences in learning, and leaving room for localization of the activities. Similarly, major changes in 5 different subject areas at the elementary level are in place now. As mentioned above, the basic

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idea behind these curricular reforms was to change the curriculum from a subject centred to a learner centred one and change the pedagogies from a behaviourist to a constructivist one.

Curriculum Development Models

There are mainly three kinds of curriculum development models in the literature. These are subject centred models, learner centred models, and problem centred models. Any curriculum development process might adhere either one of these models or adopt a blend of the three models. In the subsequent sections, we will briefly summarize these three models and try to locate the new Turkish curricular reform in these models.

Subject centred models

This model dates back to ancient Greek times and Roman period. It is still in effect with some modifications and is still most commonly used model. In this model, the curriculum consists of subject areas and the subject areas consist of subjects to be taught. In short, priority is given to subjects. This model fits in idealism and classical realism as its philosophical background and essentialism for its educational philosophy.

Efforts starting from the year 2000 shifted curriculum development processes from a subject centred curriculum to a process development models in Türkiye. Now, the mostly repeated claim is that the learner is more important than subjects. Therefore, the learner centred models have been becoming more popular now.

Learner centred models

This model places the learner in the centre of program development. Subjects to be taught and other events are arranged according to the needs of the learner. Learners are free to choose whatever they want to learn. It could be claimed that the philosophical basis of this model is pragmatism. The educational philosophy behind this model is progressivism and constructivism.

Again, we can talk about four kinds of this model; individual oriented models, experience centred models, romantic or radical models, and humanistic models. There are some differences among these models in terms of priorities. If implemented well, these kinds of models can easily lead to problem centred models.

Problem centred models

These models are interested in social problems, needs, interests, and abilities of the learners. Proponents of these models claim that, through education, it is possible to raise individuals who have the ability to solve major social problems so that it is possible to create a healthy society. Problem based curriculum models take their philosophical backgrounds from social constructionism as an educational philosophy.

In practice, while developing a curriculum all these three models can be mixed or used at the same time since social problems, individual needs and interests, and core subjects are all important considerations that cannot be ceased from. Therefore, it is very usual to use some aspects of each model to make a less objectable curriculum.

Basic characteristics of the three curriculum development models mentioned above can be summarized as in Figure 1.

Program	emphasis	content	methods	teacher	environment
Subject centred	subjects	Different disciplines	Direct instruction, question-answer	Subject specialists	classroom, books
Learner centred	Learner's abilities and interests	Activities based on abilities and interests	Learning by doing, problem solving, projects	teacher, guide, psychologist	Flexible volumes, different materials
Problem centred	Social problems	Different social problems	Problem solving, cooperative learning	Socially conscious individual, rich general culture, subject specialist	Flexible volumes, different materials

Figure 1. Basic characteristics of program development models

The New Mathematics Curriculum

The changes from the old to the new mathematics curriculum are summarized in Figure 2 (MEB, 2004). These changes are related to the content, delivery, and assessment aspects of the new curriculum. It seems that the newly developed Turkish primary mathematics curriculum adopted a mixed model while emphasizing the subject centred model in the content development and learner centred models in the pedagogies and assessment techniques. In this respect, this can be considered a deep change in terms of both content and pedagogies but not in the way the content is developed. The content seems to be developed based on a subject centred approach.

OLD	NEW
Elementary school mathematics curriculum for grades 1 through 5 contains 1249 behavioural objectives. Textbooks written based on these objectives were very uniform and dull. Both the textbook writers and the teachers are restricted to make very limited decisions.	There are 368 learning outcomes that summarize the knowledge and skills for students to develop. These outcomes can be obtained through different learning activities. So, the textbook writers and teachers are relatively freer to produce or choose activities.
The content for 4th and 7th grade is too dense to follow for students considering their development.	The content is distributed evenly from grade 1 through grade 8.
Teaching methods, techniques and strategies are not student centred.	Teaching-learning activities prepared parallel to learning outcomes require student centred methods, techniques, and strategies.
Content is organized based on how to teach.	Content is organized based on how students learn.
There are few sample activities that require the use of manipulatives.	Almost all of the sample activities show how to use manipulatives for students' construction of knowledge.
There are overlapping content in other subject areas	There are connections to other subject domains.
There are few examples of realistic mathematics.	Daily use of mathematical knowledge is emphasized.
There are limited number of alternative assessment techniques, extra curricular activities, research, and projects.	Alternative assessment techniques, extra curricular activities, research, and projects are included.
All students are expected to exhibit the same performance, with no local flexibility or individual differences. There is little room for students to choose from the alternatives.	Respect for individual differences, different learning and thinking styles is suggested. There is more room for students to choose from the alternatives.
There is little mention about developing positive attitude in students.	There is more emphasis on how to develop positive attitude towards mathematics and on student motivation.

Figure 2. Comparing the old and the new curriculum

The process of program development in Türkiye is summarized in Figure 3. As seen in the figure, it starts and ends with assessing the needs of the individual and/or society. This approach may produce more responsive curriculum.

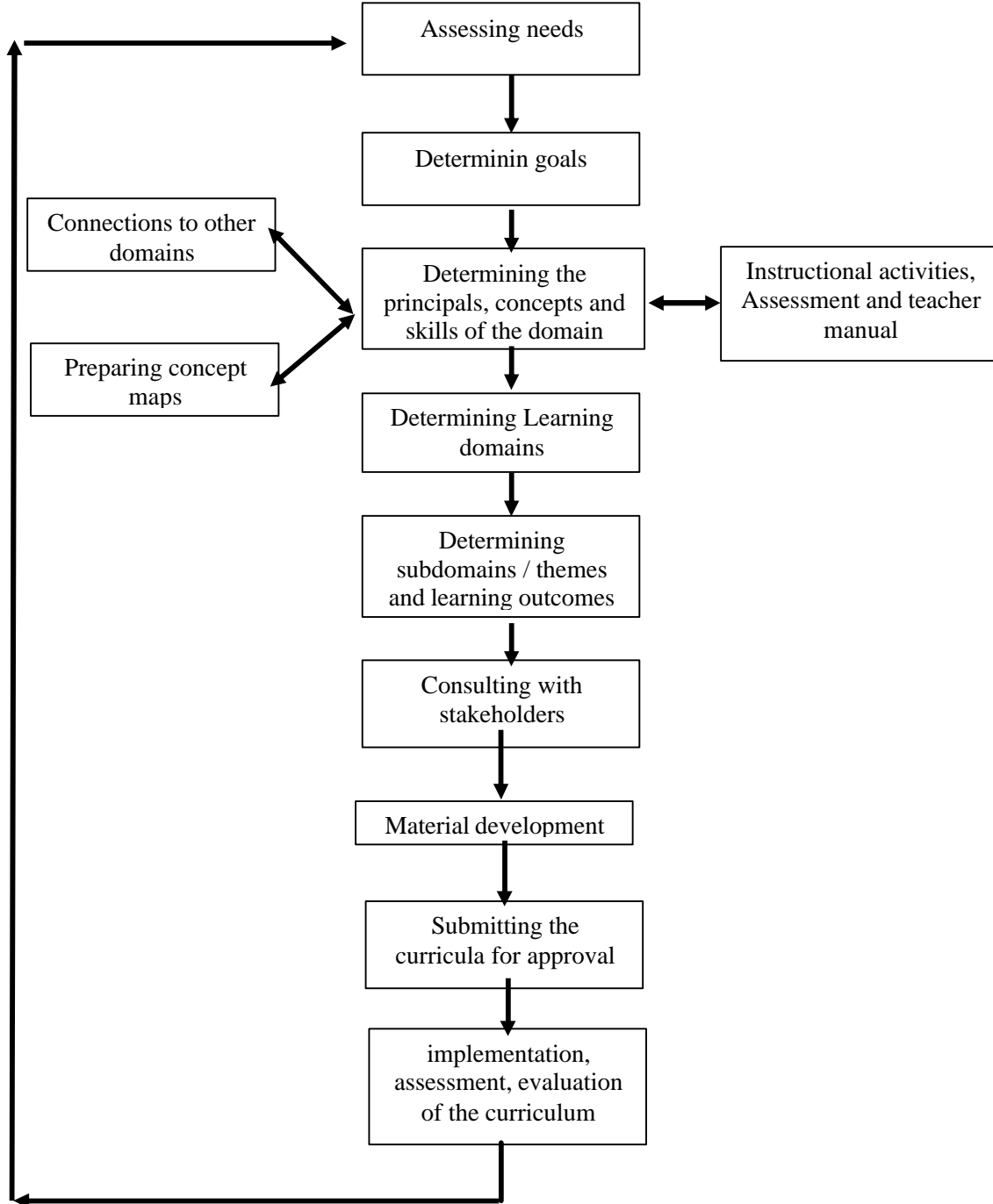


Figure 3. The program development model of the new curriculum

There are many changes in the content included in the elementary mathematics curriculum. For example, while the sets are taken out from the curriculum until the sixth grade, some new contents such as patterns, tessellations, symmetry, data management, three dimensional buildings, and spatial visualization are included in the new curriculum. These changes are in line with curricula in other countries such as the US, UK, Singapore, Ireland, Holland.

The content is presented with more emphasis on conceptual knowledge rather than procedural knowledge. Students are expected to count manipulatives, for example, before learning how to write numerals. Similarly, besides teaching how to add or subtract natural numbers, students are introduced with different meanings of operations and mathematical modelling of word problems. Again, more emphasis is given to different meanings of fractions and multiple representations of mathematical knowledge.

Besides content, there are also changes in skills emphasized in the curriculum. For example, there are increasing emphasis on such macro skills as problem solving, reasoning, communications, connections, and information technologies as well as such micro skills as computation, mental calculation and estimation. These skills were not systematically handled in the old curriculum. As if, they were just accidentally scattered around.

Another domain of change in the new curriculum is the approach taken towards the assessment of learning. More emphasis is given to process evaluation rather than product evaluation. Also, instead of using just tests and exams, such tools as portfolios, projects, group works are used in assessment of student's learning. These changes are all in line with constructivist approach to learning.

The most prominent change seems to be the way the content is delivered. Such constructivist pedagogies as active learning, use of manipulatives, cooperative learning, and the use of realistic and authentic tasks are emphasized in the new curriculum. Through active learning students construct their own knowledge and add an intellectual value on it (Ward & Tiessen, 1997). Students are eager to learn. Knowledge learnt is long lasting, more transferable to other domains, and meaningful. Passive students on the other hand, are limited to what is presented to them (Carr at al., 1998). In such a class it becomes very hard to keep the students motivated to learn. In order for learning to occur, students should explain the new phenomena with already existing knowledge (Clements 1997). Therefore, students should not only be physically but also mentally active in the learning process. Such an approach require the teacher take new roles such as questioning, arranging, organizing while reducing the other roles such as telling, instructing, dictating.

It is not easy for teachers to adapt to the new roles easily. This change require extensive period of training on the part of teachers. However, there is little attention given to the teacher training in the whole process of reform. It is also the case for mathematics education. Many teachers may not have even used any concrete material in teaching mathematics, however, they are now required to use in their classrooms. In addition, it is not usual to find manipulative materials for teaching and learning mathematics in a typical classroom. In sum, it seems that, the shortage of manipulatives and lack of teacher training are the most important barriers in front of the new mathematics curriculum reform.

Conclusions

Since the establishment of Modern Turkish Republic in 1923, many curricular reforms have been implemented in schools. Similar to the current one, almost all of them have been initiated as a top-down reform process. After developed by a group of selected teachers, academicians, and curriculum experts, the new curriculum has been piloted to a number of schools. The curriculum has been revised according to a very limited feedback from pilot schools and other stakeholders. Curriculum reform in Turkey is not considered a long term improvement process but a relatively short term change process in which a static curriculum is produced. In short, it is a short term improvement, long term implementation type of reform.

There are considerable differences in terms of approach taken towards the content and the delivery of mathematics education at the elementary level. These curricular changes require two important changes which we think overlooked by the reformers, teacher training and teaching and learning materials especially math manipulatives. There is a strong need for teacher training and manipulative materials in the classroom however very little action has been taken towards overcoming these difficulties. Although we started to call the changes as reform, it is too early to treat them as such for we do not know if the curricular changes will produce the intended results.

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