Evaluation of 10th Grade Mathematics Curriculum of General Secondary Education Institutions

Genel Ortaöğretim Kurumlarının 10. Sınıf Matematik Programının Değerlendirilmesi

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Abstract

The purpose of this study was to evaluate the 10th grade mathematics curriculum of General Secondary Education Institutions through the perceptions of mathematics teachers, students, and classroom observations. In this study, mixed method design and Malcolm Provus' Discrepancy Evaluation Model was utilized. Data were collected through questionnaire, semi-structured interview schedule and observation form. Participants of this study were 136 students and 8 mathematics teachers chosen through convenient sampling strategy. The quantitative data were analyzed by using SPSS 22.0 and qualitative data were analyzed through content analysis. The results indicated that although the existing program was planned as learner centered, the implementation process revealed that teachers maintained their traditional roles and teacher-centered methods. There was a discrepancy between the curriculum and implementation process. In order to improve the implementation stage of the curriculum, it can be suggested that in-service training programs about different teaching learning and assessment strategies can be provided, the cooperation between teachers, parents and schools can be strengthened, and finally, teachers can be provided with necessary teaching materials.

Key Words: Curriculum evaluation, Provus' Discrepancy Evaluation Model

Özet

Bu çalışmanın amacı Genel Ortaöğretim Kurumlarının 10. sınıf matematik programını öğretmen-öğrenci görüşlerine ve sınıf gözlemlerine dayalı olarak değerlendirmektir. Çalışmada, Malcolm Provus'un Farklar Yaklaşımı ile Program Değerlendirme Modeli kullanılmıştır. Veriler anket, yarı yapılandırılmış görüşme ve gözlem formları ile toplanmıştır. Çalışmaya dahil edilen 136 öğrenci ve 8 matematik öğretmeni uygun örnekleme yöntemi ile seçilmiştir. Nicel veriler SPSS 22.0 programı kullanılarak analiz edilirken nitel veriler içerik analizi yoluyla incelenmiştir. Araştırma sonuçlarına göre, matematik programının öğrenen merkezli olarak planlanmasına rağmen uygulama sürecinde öğretmenlerin geleneksel rollerini sürdürdükleri ve öğretmen merkezli yöntemler kullanmaya devam ettikleri belirlenmiştir. Sonuç olarak, planlanan programla uygulamadaki program arasında

farklar olduğu ortaya çıkmıştır. Programın daha etkili uygulanabilmesi için öğretmenlere farklı öğretim ve değerlendirme yöntemleri ile ilgili hizmet- içi eğitim verilmesi; öğretmen, veli ve okul işbirliğinin sağlanması ve son olarak da gerekli araç- gereç ve materyal sağlanması önerilmektedir.

Anahtar Sözcük: Program Değerlendirme, Provus'un Farklar Yaklaşımıyla Program Değerlendirme Modeli

Introduction

Mathematics education and mathematics achievement have always been on the agenda of the Turkish national education system. Mathematics is perceived as one of the key components of secondary education because it is a required subject in the national and international exams. The results of some international studies such as PISA (Programme for International Student Assessment) (OECD, 2004) indicated that Turkey is one of the least successful countries at mathematics. It performed 31 out of 38 countries in mathematics. In terms of PISA 2012, students in Turkey scored 448 points in mathematics, lower than the OECD (The Organisation for Economic Co-operation and Development) average of 494 (OECD, 2013).

All these factors resulted in some educational changes. Firstly, the new elementary mathematics curriculum was prepared in 2004, after piloting at selected schools during 2004-2005 academic years, started to be implemented in grades 1-5 of all elementary schools during 2005-2006 academic year. The 6th grade curriculum was implemented beginning from 2006-2007 academic years and continued with 7th and 8th grades. After, the implementation of elementary curriculum, a new secondary education curriculum based on constructivist approach was prepared and implemented in 2009.

Characteristics of the 10th Grade Mathematics Curriculum

The Mathematics Curriculum of General Secondary Education Institutions was theoretically based on constructivist approach (MONE, 2013). According to constructivist approach, learners are expected to be active constructors of knowledge rather than passive receivers and they are also supposed to construct their own knowledge by doing, searching, reasoning and making connections to the previous knowledge. In constructivist curriculum, teachers are

expected to facilitate students' learning and foster learners' skills like critical thinking, problem solving skills, creative thinking and research skills (MONE, 2011). In addition to this, teachers are expected to direct instruction according to students' prerequisite learning, perceptions, motivation and by taking into account individual differences. Students are involved in group discussions and cooperative group activities which allow them learn by interacting with their classmates (MONE, 2013).

Basing on the "Numbers and Algebra", "Geometry" and "Data Counting and Probability" subdomains, 10th grade mathematics curriculum expects students' develop problem-solving skills, mathematical thinking skills, to be able to use Mathematics' own language and terminology accurately and effectively, value mathematics, have self-confidence, positive attitude toward mathematics, to be willing to learn mathematics; take pleasure of doing mathematics and finally develop psycho-motor skills and use information and communication technologies like graphing calculators, spreadsheet software, dynamic mathematics / geometry software, website, animation, application etc. and effective use of the Internet for access to resources like mathematical videos, applications and so on is appreciated and supported (MONE, 2011).

The assessment part of 10th grade mathematics curriculum support student-centered curriculum. In the curriculum, besides traditional evaluation approaches like multiple-choice tests and true-false exams to measure complex skills like reasoning, comprehension, problem solving, research and investigation abilities, alternative evaluation approaches like portfolios, performance evaluation, project works, concept maps and drama techniques should be provided (Bulut, 2008; MONE, 2013).

Rationale of the Evaluation Study

Curriculum evaluation studies are very important in determining the success and effectiveness of curriculum implemented in schools (Ozdemir, 2009). Although reforms in Mathematics curriculum in 2009 and 2013, there are some factors hindering the effective implementation of the 10th grade mathematics curriculum since the results of university entrance examination and international exams indicated low mathematics scores.

There are different studies evaluating the effectiveness of mathematics curriculum (Aközbek, 2008; Artut and Aslan, (2014); Avcu and Yenilmez, 2011; Bal, 2008; Cet, 2000; Halat, 2007; İnan, 2006; İzci and Göktaş, 2014; Şahin, 2009; Uzel and Şimşeker, 2012 and Yıldırım, 2009) but there are not much comprehensive studies evaluating mathematics curriculum from the aspects of both teachers' and students' perspectives. Furthermore, there are some studies focused on evaluating only one dimension of the curriculum like alternative assessment techniques or reaching the objectives of curriculum with regard to student success and teachers' opinions (Bulut, 2006; Sırmacı, 2003).

Therefore, it is necessary to carry out a comprehensive evaluation study including all parts of the curriculum in order to provide the stakeholders with information about the implementation process of mathematics curriculum of General Secondary Education Institutions and to highlight the strengths and weaknesses of it to revise and modify the program for better implementations.

Aim and Research Questions

The purpose of this evaluation study was to evaluate the qualities of 10th grade mathematics curriculum of General Secondary Education Institutions. In other words, this study aimed to compare the discrepancies between the standards of the mathematics curriculum (what is planned) and what was implemented (what is really performed).

Focusing on goals and objectives, content, teaching and learning processes, teachers' roles, and assessment aspects of the curriculum, this evaluation study sought to find answers to the following research questions related to the existing 10th grade mathematics curriculum:

1. What were the students' perceptions about the goals and objectives, content, teaching and learning processes, teachers' roles and assessment components being implemented by teachers in General Secondary Education Institutions?

2. What were the teachers' perceptions about the goals and objectives, content, teaching and learning processes, teachers' roles and assessment components being implemented by themselves in General Secondary Education Institutions?

Method

In this part, curriculum evaluation model, design of the study, participants, data collection instruments, data collection procedure and data analysis were explained.

Curriculum Evaluation Model

In this study, Malcolm Provus' Discrepancy Model was used. Discrepancy evaluation compares intents with accomplishments (Geisert, 1973). This comparison procedure yields "discrepancies" between intents and outcomes, and these discrepancies are then utilized as data for decision making.

According to Provus, a program goes through four developmental stages to which he added a fifth optional stages. These five stages are: (a) definition/design (b) installation (c) process (interim products) (d) product and (e) cost-benefit analysis (Gredler, 1996).

During the definition/design stage, the focus is on defining goals, processes or activities, student entry behaviors, staff qualifications, training media and facilities, and delineating necessary resources and participants to carry out the activities and accomplish the goals (Fitzpatrick, Sanders and Worthen, 2004, p. 76). During the implementation stage, discrepancies between expected and actual implementation of the program is identified. In other words, the intent is to make certain that the program has been installed as it had been designed (Gredler, 1996). Process evaluation stage, focuses on the development of student behaviors and whether they are changing in predicted ways and learning activities are evaluated for their effectiveness. Lastly, during the product stage, program outcomes are evaluated. In other words, whether the terminal objectives are achieved in the implementation (Fitzpatrick, Sanders and Worthen, 2004; Gredler, 1996).

The Use of Provus' Discrepancy Model in This Study

The Provus' Discrepancy model was used in this study both depended on the perspectives of teachers and students. Investigating the extent they are performed in the classrooms, determination of the discrepancy between what is intended and what is performed was the aim.

According to Sampong (2007) and Steinmetz (2000), if Provus' Difference Model is being used in the evaluation of a curriculum now in place and implemented, then it should be evaluated by separating it into structural dimensions. Hence, in this study, Provus' Discrepancy Evaluation Model was not applied at the design stage, in other words, 10th grade mathematics curriculum was evaluated while the curriculum is now in place and implemented, there is no possibility of returning to earlier stages and edit the first stage in retrospect according to discrepancies in evaluation.

The literature review indicated that Provus' Discrepancy evaluation model was utilized to evaluate the programs such as a new science and technology curriculum, mathematics curriculum, a distance teacher education program as well as evaluating a modular system implemented in vocational and technical secondary schools (Şahin, 2008; Keleş, 2009; Şahin, 2009; Berk, 2012; Sampong, 2009).

Design of the Study

In order to achieve the aim of the study, both qualitative and quantitative research designs that is mixed method were used to reveal the perceptions of students and teachers about implementations. The goal of using mixed method design is to draw on the strengths and minimize the weaknesses of qualitative and quantitative research designs (Creswell, 2007). This study used triangulation design. According to Fraenkel and Wallen (2006) in this design, quantitative and qualitative methods are given equal priority and all data are collected simultaneously.

Participants

This study was conducted with 136 students and eight mathematics teachers, who were teaching at 10th grades of general high schools in the spring semester of 2013-2014 education year. The participants of the study were selected through convenient sampling strategy. The participants were from Ankara and Manisa. The number of students in each class for Manisa changed between 24-29 and for Ankara 28-33.

In this study eight teachers were involved. Four teachers were from Ankara and have been teaching over 15 years and except one, all of the others graduated from mathematics department and took pedagogical formation certificate. Moreover, the four teachers from

Manisa have been teaching between 2-5 years and two of them graduated from education faculties and two of them graduated from mathematics department and obtained certificate of pedagogical formation.

Data Collection

In this study, various data sources, questionnaire, semi-structured interview schedule and observation forms were used as data collection instruments.

Student Questionnaire based on Provus' Evaluation Model

In the development process of "Student Questionnaire based on Provus' Evaluation Model", a comprehensive study on the literature including journals (Aksu, 2008; Anılan and Sarıer, 2008; Bal, 2008; İzci and Göktaş, 2014; Şahin, 2008; Şahin, 2009; Taşpınar and Halat, 2009; Uşun and Karagöz, 2009; Yazçayır, Selvi and Demirel, 2013) and theses were examined (Acar, 2007; Aközbek, 2008; Keleş, 2009; Orbeyi, 2007; Yıldırım, 2009; Yılmaz, 2006; Yurday, 2006).

Hence, expected qualifications were listed in items with regards to goals and objectives, content teaching and learning processes, teachers' roles, and assessment components of the curriculum. These lists were transferred to a questionnaire with a four-point and three-point likert type to get the perceptions of students to the extent that they were achieved in classes as performance indicators. Hence, while the items in the questionnaire represent the expectations of the Board of Education set for the constructivist curriculum, the responses of students' represent how much they were implemented in classroom settings.

In the questionnaire, 15 items were written for the evaluation of goals and objectives, 16 items were written for the evaluation of content, 16 items were written for the evaluation of teachers' roles, 7 items were written for the evaluation of teaching and learning processes and 7 items were written for the evaluation of assessment components of the curriculum.

Interview Schedule

The first part of the interview schedule included demographic information part to obtain information about teachers' gender, working years, level of education. In the second part, there were open

ended questions in line with Provus Discrepancy Evaluation Model to find out the teachers' perceptions about goals and objectives, content, teaching and learning processes, teachers' roles, and assessment components of the curriculum. Interview schedule included initially 7 questions. The interview schedule was piloted before implementing it for the study. The questions of the interview schedule were piloted with 2 Mathematics teachers teaching at the 10^{th} graders so as to see whether the questions were understandable and clear. All interviews took almost 40 minutes. Interviews were conducted by the researcher and recorded.

Observation Form

A semi structured observation form was developed by the researchers. The framework of observation was specified beforehand. This framework included, instructional methods and techniques, instructional materials, feedback and assessment techniques and closure. Before conducting observations, necessary permissions were taken from teachers whose classes would be observed. 4 classes were observed, 2 of the classes were from Ankara and 2 of the classes were from Manisa, for a total of 7 hours. Although 3 classes were observed for 2 hours, 1 class was observed for 1 hours. The teachers were teaching the same unit, Trigonometry, but they were teaching different subjects of trigonometry.

Data Analyses

The Statistical Package for the Social Sciences, SPSS 22.0 program was employed to analyze the data collected through the questionnaire. Descriptive statistics and frequencies and percentages were utilized to interpret the results. The analysis of interviews was conducted through content analysis. The data were analyzed in relation to pre-determined themes. The answers of teachers were coded by the researcher and teachers were indicated as T1, T2, T3, etc. Then the codes which were meaningful and coherent were categorized under the related themes. As for the observation data, observation notes were analyzed in line with the pre-determined themes and findings were classified under these themes. The classrooms that were observed were indicated as C1, C2, C3, etc.

Validity and Reliability

In this study, in order to ensure the validity of the instruments, the questionnaire, observation form and interview schedule were reviewed by 2 curriculum development, measurement and evaluation, 1 mathematics education experts and 3 mathematics teachers of the General High School Institutions. Moreover, in order to ensure credibility, the researcher adequately engaged in data collection environment by allotting enough time for each interviews and observations. Finally, at all interviews the same questions were asked with the same wording in order to make the data comparable and enhanced reliability.

In order to increase the validity and reliability of results some precautions such as member checks, triangulation and prolonged and substantial engagement procedures were applied. Moreover, rich descriptions about the context within which the study occurred were included. Findings were submitted in a clear, coherent, and systematical way. In addition to these, an external audit to examine the collected data for the appropriateness of themes and whether the interpretations and conclusions supported by the data was included. Finally, both positive and negative results and rival explanations were included.

For this study, the reliability coefficient of goals and objectives part is 0.85; content part is 0.73; teaching and learning process part is 0.72; teachers' roles part is 0.89 and assessment part is 0.71.

Findings

In this part of the study, findings and interpretations related to evaluation of 10th grade General Secondary Education Mathematics Curriculum were included.

The Evaluation of Second Stage of the Provus' Discrepancy Evaluation Model: Findings Related to the Evaluation of Implementation Stage

The results of students' perceptions about the objectives of 10th grade General Secondary Education Institutions' Mathematics Curriculum's meeting the predetermined standards (determined by MONE) suggested in the curriculum are shown in Table 1.

Table 1. Descriptive Statistics According to Students' Perceptions about the Objectives of 10th Grade Mathematics Curriculum

The objectives of 10th Grade Mathematics Lesson	Strongly Disagree		Disagree		Agree		Strongly Agree		M	SD
	f	%	f	%	f	%	f	%		
1. Helpful in using mathematics in other courses and daily life.	35	25.7	61	44.9	30	22.1	10	7.4	2.14	.86
2. Improve mathematical skills and knowledge.	60	44.1	62	45.6	8	5.9	6	4.4	2.28	.75
3. Require the use of mental skills to guess and calculate effectively.	2	1.5	11	8.1	52	38.2	71	52.2	3.41	.70
4. Helpful in developing positive attitudes towards mathematics.	33	24.3	42	30.9	45	33.1	16	11.8	2.32	.97
5. Helpful in developing self-confidence towards mathematics.	30	22.1	51	37.5	39	28.7	16	11.8	2.30	.93
6. Helpful in developing skills to make research.	23	16.9	59	43.4	41	30.1	13	9.6	2.32	.87
7. Helpful in constructing knowledge by myself and using it.	26	19.1	55	40.4	38	27.5	17	12.5	2.34	.93
8. Aligned from simple to complex and from known to unknown.	7	5.1	37	27.2	46	33.8	46	33.8	2.96	.91
9. Related to stu-	12	8.8	34	25	61	44.9	29	21.3	2.79	.88

dents' previous learning.										
10. Helpful in being aware of the real life problems and establish connections between mathematics lesson and real life problems.	34	25	63	46.3	31	22.8	8	5.9	2.04	.82
11. Helpful in developing problem solving skills and make use of them in different situations.	4	2.9	23	16.9	68	50.0	41	30.1	3.07	.77
12. Helpful in using mathematical terminology and language accurately.	24	17.6	46	33.8	51	37.5	15	11	2.42	.91
13. Helpful students in finding their own solutions and ways to solve problems rather than copying teachers' way of solution.	40	29.4	56	41.2	28	20.6	12	8.8	2.09	.92
14. Helpful in developing higher level thinking skills (creative thinking, critical thinking, problem solving etc.)	8	5.9	27	19.9	50	36.8	51	37.5	3.06	.90
15. Have the quality of preparing students for work.	20	17.4	23	16.9	60	44.1	33	24.3	2.78	.98

Table 1 shows the frequencies and percentages of students' perceptions about the objectives of 10th grade mathematics curriculum. According to students' perceptions, they mostly agreed with items 3, 11, and 14 and least agreed for the items 1, 10 and 13 about 10th grade Mathematics curriculum' meeting predetermined standards in terms of objectives.

According to perceptions of students, 10th grade mathematics curriculum was sufficient in requiring the use of mental skills to guess and calculate effectively instead of memorization or other kinds of activities (90.4 % of the students agreed or strongly agreed); in helping students develop problem solving skills and making use of them in different situations (almost 80 % of the students agree or strongly agree) and finally in developing higher level thinking skills (creative thinking, critical thinking, problem solving etc.) (74.3 % of the students agree or strongly agree).

On the other hand, most of the students stated that 10th grade Mathematics curriculum was insufficient about using mathematics in other courses and daily life (almost 70% of the students disagree or strongly disagree); about not meeting the standards for being aware of the real life problems and establishing connections between mathematics and real life problems (71.3 % of the students disagree or strongly disagree) and finally, about not directing students to find their own solutions and ways to solve problems rather than copying teachers' way of solution.

Teachers' Perceptions about the Goals and Objectives of the General Secondary Education Institutions

To learn the teachers' perceptions about the goals and objectives of the 10th grade mathematics curriculum of General Secondary Education Institutions, interviews were conducted. There were four items (1., 2., 3., and 7. items) in the interview form which aimed to reveal the teachers' perceptions about the goals and objectives.

Teachers stated their perceptions about the objectives about the 10th grade Mathematics curriculum that it did not direct students to use mathematics in other courses and daily life sufficiently (T1, T3), improve mathematical skills and knowledge (T1, T4), develop positive attitudes and self-confidence towards mathematics (T2, T3)

sufficiently. It develops problem solving skills but does not help to use them in different situations (T1, T2, T3, T4, T5, T6) and develop higher level thinking skills (T1, T2, T3)

T1 stated:

"10th grade mathematics curriculum focuses on constructing relations with mathematics and daily life however, since the national exams do not ask daily life problems, we mainly focus on exam type questions….The program is well designed in terms of objectives, there will not be problem if we can implement them while teaching without concerning national exams".

Because of the weak relationship between mathematics and daily life students did not understand the importance of many subjects and want to learn it.

T3 stated that:

"it is hard to make connection between mathematics and daily life of students while teaching trigonometry…students often say that we do not need to learn trigonometry…ones who want to be engineer should learn it…"

Most of the teachers (T2, T3, T4, T5, T7, T8) stated that practicing the objectives of curriculum in real classroom environment was not possible. T4 stated that the objectives of 10th grade Mathematics curriculum were not appropriate to the development level of students. In order to be successful at 10th grade mathematics course students should have learned pre-requisite knowledge for example while learning trigonometry, they should knew functions, equations and geometry (mainly properties of triangles and circle). However, according to teachers, there were many students in each class who did not know even addition and subtraction with negative numbers hence teachers did not expect them to be good at trigonometry.

To answer the first research question about the students' perceptions about the content of 10th grade Mathematics curriculum of General Secondary Education Institutions, student questionnaire which included 7 items with four alternative responses was used as data collection instrument. The mean scores of items ranged from 2.29 to 2.99.

Table 2. Descriptive Statistics of the Students' Perceptions about the Content of 10th Grade Mathematics Curriculum

The content of 10th Grade Mathematics Lesson	Strongly Disagree		Disagree		Agree		Strongly Agree		M	SD
	f	%	f	%	f	%	f	%		
1. Content is appropriate to students' needs.	22	16.2	46	33.8	42	30.9	26	19.1	2.53	.98
2. Content is appropriate to students' skills.	13	9.6	49	36.0	50	36.8	24	17.6	2.63	.89
3. Content is related to the students' daily life.	29	21.3	54	39.7	38	27.9	15	11	2.29	.93
4. Content is interesting for students.	20	14.7	31	22.8	46	33.8	31	22.8	2.65	.99
5. Content is arranged to enhance curiosity, desire to search and eagerness to learn.	24	17.6	58	42.6	37	27.2	17	12.5	2.35	.91
6. Content is arranged from simple to complex.	11	8.1	29	21.3	47	34.6	49	36	2.99	.95
7. Content contains repetitions in order to enhance learning.	7	5.1	30	22.1	56	41.2	43	31.6	2.99	.87

The frequencies and percentages of students' perceptions about the content of the curriculum are shown in Table 2. Students mostly agreed with items 6 and 7 and least agreed with the items 3 and 5 about 10th grade Mathematics curriculum's meeting predetermined standards in terms of content. Although, students stated that the content of the curriculum was arranged from simple to complex and contains repetitions in order to enhance learning, the relation of curriculum to the daily life and its arrangement to enhance curiosity, desire to search and eagerness to learn is week.

Teachers' Perceptions about the Content of the General Secondary Education Institutions

According to interview results, teachers stated that content was not sequenced parallel with other disciplines, basically with Geometry (T2, T4, T6, T7, T8).

T4 stated that:

"we teach unit circle in mathematics lesson before the students are taught this subject in 11th grade Geometry lesson….. The content is not parallel with Geometry lesson so while teaching some units I have problems…".

Moreover, T8 stated that "*while making proof about sine and cosine theorems a comprehensive knowledge of triangles is required however students do not learn necessary information at 10th grade*."

(T2, T3, T7) stated that the content was overloaded with Trigonometry, some of the units of trigonometry were not appealing to the interests of students (T2, T3).

As a result of the interviews, it can be said that because of the content not being more appealing to students' age level and interests (T1, T4), not making relations with daily needs of students (T2, T3), not involving more concrete information (T2, T3, T6) and not involving more activities (T7). Hence, according to perceptions of teachers the content was not sufficient to meet the standards of 10^{th} grade Mathematics curriculum.

The Evaluation of Third Stage of the Provus' Discrepancy Evaluation Model: Findings Related To the Evaluation of Process Stage

The results of students' perceptions about teachers' roles in meeting the predetermined standards of 10^{th} grade Mathematics Curriculum are shown in Table 3. The mean scores of items ranged from 2.52 to 3.21. Students mostly agreed with items 1, 8 and 10 and least agreed for the items 2, 4 and 5.

Table 3. Descriptive Statistics of Students' Perceptions about Teachers' Roles as Suggested in the 10th Grade Mathematics Curriculum

What are the students' perceptions about teachers' roles as suggested in the curriculum?	***Strongly Disagree***		***Disagree***		***Agree***		***Strongly Agree***		**M**	**SD**
	f	**%**	**f**	**%**	**f**	**%**	**f**	**%**		
1. Teacher direct students to reach the sources of information.	5	3.7	17	12.5	59	43.4	55	40.4	3.21	.80
2. Teacher cooperates with parents.	23	16.9	44	32.4	44	32.4	25	18.4	2.52	.98
3. Teacher direct students' workings and learning.	9	6.6	26	19.1	60	44.1	41	30.1	2.98	.87
4. Teacher considers individual differences of students.	25	18.4	31	22.8	49	36	31	22.8	2.63	1.31
5. Teacher uses a variety of tools and mathematical models.	21	15.4	29	21.3	50	36.8	36	26.5	2.74	1.18
6. Teacher change activities and methods when needed.	18	13.2	34	25	43	31.6	41	30.1	2.79	1.02
7. Teacher value communication with students.	9	6.6	31	22.8	52	38.2	44	32.4	2.96	.91
8. Teacher respect to different opinions.	10	7.4	24	17.6	49	36	53	39	3.07	.93

9. Teacher creates a supportive environment.	7	5.1	28	20.6	59	43.4	42	30.9	3.00	.85
10. Teacher provides medium for students to learn by doing.	5	3.7	27	19.9	53	39	51	37.5	3.10	.85

According to results, students indicated that their teachers directed students to reach the sources of information, respected to different opinions finally, they provided medium for students to learn by doing. On the other hand, most of the students found their teachers insufficient in terms of cooperation with parents, considering individual differences of students and finally, in using a variety of tools and mathematical models.

Teachers' Perceptions about the Roles of Teachers of the General Secondary Education Institutions

According to interview results, almost all of the teachers stated that their main role was being presenter, source of knowledge and directors of questions to students.

T3 stated:

"*The role of teachers is transmitting the knowledge or presenting the subject because of the exams and parents' expectation for students to be successful is very important. Hence, we as teachers are trying to find all types of questions that can be asked at national exams and teach their way of solution. Students were accustomed to this type of teaching."*

According to the classroom observations (in classrooms C1, C2, C3, C4) concerning the teacher's roles, it was seen that most of the teachers kept their traditional roles as being the transmitter of knowledge, which made students as the receivers of knowledge and restricted students' making research (C1, C2, C3, C4).

To learn the students' perceptions about the teaching and learning processes suggested in the curriculum, student questionnaire was used as data collection instrument and the following data were gathered. Students were informed about different methods and

techniques like brainstorming, drama, role-playing, etc. before answering the questionnaire.

Table 4. Descriptive Statistics of Students' Perceptions about Teaching and Learning Situations as Suggested in the 10th Grade Mathematics Curriculum

What are the students' perceptions about the extent the teaching and learning situations being implemented by the teachers suggested in the curriculum?	**Never**		**Seldom**		**Always**		**M**	**SD**
	f	**%**	**F**	**%**	**f**	**%**		
1. Teacher uses lecturing method.	4	2.9	31	22.8	101	74.3	2.71	.52
2. Teacher uses discussion method.	35	25.7	78	57.4	23	16.9	1.91	.65
3. Teacher uses demonstration technique.	8	5.9	52	38.2	76	55.9	2.50	.61
4. Teacher uses role-playing techniques.	87	64	37	27.2	12	8.8	1.45	.65
5. Teacher uses project method.	63	46.3	60	44.1	13	9.6	1.63	.65
6. Teacher uses brainstorming technique.	55	40.4	57	41.9	24	17.6	1.77	.73
7. Teacher uses question and answers techniques.	11	8.1	56	41.2	69	50.7	2.43	.64
8. Teacher uses drama method.	107	78.7	23	16.9	6	4.4	1.26	.53
9. Teacher uses simulation technique.	56	41.2	56	41.2	24	17.6	1.76	.73
10. Teacher uses group-work.	98	72.1	29	21.3	9	6.6	1.35	.60
11. Teacher takes advantage of computer-assisted instruction.	46	33.8	53	39	37	27.2	1.93	.78

According to Table 4, the mean scores of items ranged from 1.26 to 2.71. Students were mostly agree with items 1, 7 and 11 and least agreed with the items 4, 5, 8 and 10 about the 10th grade Mathematics curriculum meeting predetermined standards in terms of the teaching and learning processes.

According to results, while teachers used lecturing method, applied question and answers techniques, took advantage of computer-assisted instruction, according to most of the students their teachers never used role-playing techniques, project, drama method and finally group studies.

Teachers' Perceptions about the Teaching and Learning Situations of the General Secondary Education Institutions

Teachers were asked about their perceptions regarding the instructional methods and techniques that they implemented during their lessons. All of the teachers stated that they used lecturing method while teaching a new subject which supported the answers of students and none of the teachers stated their use of role playing, drama, simulations and brain storming. All of the teachers stated that they did not use the group work technique because of class size and being much noise in the class during group work.

According to interview results teachers indicated that they did not use group work (T2, T3, T7) during teaching-learning processes.

T7 stated that:

"*When we asked the students to work in groups, there was much noise and chaos in the classes... When I tried to conduct discovery method, after sometime, if students do not find the necessary answers or ways, then their attention is easily distracted from the subject... they are not patient in discovering… they just want to get a number without thinking much...*"

The classrooms were also observed to investigate the teaching and learning processes closely and similar results with interviews were obtained. Teachers frequently used the question and answer technique as a way of directing students to solve problems, give feedback and correct errors. It was observed that teachers did not use role playing, drama, simulations and brain storming as an instructional

technique. Practice of group work technique was observed none of the classes.

As for the assessment procedures, the frequencies and percentages of students' perceptions about the 10th Grade Mathematics curriculum are shown in Table 5.

Table 5. Descriptive Statistics of Students' Perceptions about the Assessment Procedures as Suggested in the 10th Grade Mathematics Curriculum

What are the students' perceptions about the extent the assessment procedures being implemented by the teachers suggested in the curriculum?	**Never**		**Seldom**		**Always**		**M**	**SD**
	f	*%*	*f*	*%*	*f*	*%*		
1. Essay type exams	3	2.2	18	13.2	115	84.6	2.82	.44
2. Oral exams	52	38.2	65	47.8	19	14	1.76	.68
3. Multiple-choice tests	28	20.6	71	52.2	37	27.2	2.07	.69
4. True-false tests	87	64	36	26.5	13	9.6	1.46	.67
5. Short-answer tests	76	55.9	42	30.9	18	13.2	1.57	.72
6. Matching tests	86	63.2	35	25.7	15	11.0	1.48	.69
7. Projects	27	19.9	64	47.1	45	33.1	2.13	.72
8. Performance works	14	10.3	51	37.5	71	52.2	2.42	.67
9. Portfolios	90	66.2	29	21.3	17	12.5	1.46	.71
10. Concept maps	83	61	42	30.9	11	8.1	1.47	.64
11. Posters	105	77.2	23	16.9	8	5.9	1.29	.57

For the assessment and evaluation procedures, the mean scores of items ranged from 1.29 to 2.82 over the mean three. Results revealed that teachers mostly applied essay type exams, multiple-choice tests and performance works. On the other hand, according to

students' perception (% 66.2), teachers never used portfolios, posters (% 77.2) and concept maps (% 61). Although according to % 80 of the students' perception, teachers seldom or always used projects, the meaning of project was quite different from the project homework that their teachers assigned one in a year.

Teachers' Perceptions about the Assessment Procedures of the General Secondary Education Institutions

The perceptions of teachers was also revealed through interview and all of the teachers (T1, T2, T3, T4, T5, T6 T7, T8) stated that they did not implement portfolios, concept maps, posters and projects as alternative assessment techniques. The reasons for not using this assessment technique was revealed by teachers (T4, T6, T7) as lack of students' motivation, insufficient time and heavy content coverage. As for the performance assessment, all mathematics teachers answered interview questions stated that they assigned students problems to solve from any kinds of text book they want.

T1 stated that:

"I want students' to take a test book from any publisher and solve the problems related to the subject we have learned in the class…then I sign them after checking they are solved by student. By this method, at the end of the semester, students who take performance work expected to solve almost all kinds of question types..."

All teachers agreed with the methods of T8 and found it effective because if teachers had given a different kind of performance work, students received too much support from their parents. Moreover, all teachers perceived project works as being not beneficial for students' learning.

T4 stated:

"*I do not believe that these project works are done appropriately…the students take project when they receive low grades from Mathematics exams. Their purpose is not to learn Mathematics or solve problems but to make their grades higher. Project works do not contribute to students' learning but contribute to their grades…".*

None of the teachers stated performance works are effective and make students study systematically.

T3 stated that

"*Students have to make performance work from all the courses she or he takes which direct students prepare something immediately by copying and pasting from internet…This type of performance work do not improve students' creativity and higher mental abilities*."

The Evaluation of Fourth Stage of the Provus' Discrepancy Evaluation Model: Findings Related to the Evaluation of Product Stage

In order to evaluate the product stage of 10th grade mathematics curriculum interviews were conducted with teachers. There are different outputs related to the 10th grade mathematics curriculum. The outputs expected from students are not just related to students' getting higher grades but also there are some affective and psychomotor features that are expected to be gained. There were three items (3, 5 and 7) in the interview form which aimed to reveal the perceptions of teachers about the products related to the 10th grade mathematics curriculum.

Teachers stated that 10th grade mathematics curriculum was not so effective in improving students' mathematical skills and knowledge (T1, T4), was not sufficient in developing positive attitudes and self-confidence towards mathematics because especially students from Turkish and Mathematics Department found some subjects like complex numers and trigonometry very difficult to learn hence at the end of the year they gave up because they thought that they could not memorize all these formulas and solve the problems.

T3 stated that:

"students often say that we do not need to learn trigonometry…ones who want to be engineer should learn it…"

Moreover, according to teachers the curriculum did not support students' psychomotor skills such as using calculator or some kinds of computer software related to mathematics. Moreover, although it is stated in the curriculum that students' learning to read trigonometry table which includes the values of trigonometric functions (sine, cosine, tan and cot) is required, the values of these functions are given at the course books by rounding the number after the questions in brackets. Hence, students do not need to apply trigonometry table or use calculator for rounded and readily given trigonometric values.

Conclusion and Discussion

The purpose of this study was to evaluate the qualities of 10th grade General Secondary Education Institutions' mathematics curriculum by comparing the discrepancies between the standards of the mathematics curriculum (what is planned) and what is implemented (what is really performed) in terms of goals and objectives, content, teachers' roles, teaching and learning processes and assessment aspects through the perceptions of mathematics teachers, students, and classroom observations. It was found that the findings related to these dimensions supported each other to a great extent.

The findings revealed that 10th grade General Secondary Education Institutions' mathematics curriculum was not sufficient completely in meeting the standards stated by the MONE. Similar to the student questionnaire results, teachers suggested that the curriculum should involve more applicable objectives related to daily life issues. Aksu (2008) and Orbeyi, (2007) stated that teachers found the relationship between objectives and real life weak. Althogh, many teachers believed that the program was well designed in terms of objectives; however, they stated that there were problems in the implementation of it mostly because of national exams as also stated similarly in the studies of Anılan and Sarıer (2008) and Kutluca and Aydın (2010). Since relationship between mathematics and daily life is weak, students do not understand the importance of many subjects and do not want to learn them. Hence, it is suggested that teachers plan teaching and learning process in a way that involve real-life problems to direct students make connections with real life.

Moreover, according to results, teachers stated that the objectives of the 10th grade General Secondary Education Institutions' mathematics curriculum were not appropriate to the developmental level of students. In many studies a similar result was obtained (Güneş and Baki, 2011; İzci and Göker, 2014; Konur and Atlıhan, 2012). One of the reasons for this case may be stated as students' lack of background knowledge as also indicated by the teachers included in this research study. Some students do not know how to solve equations and apply geometric properties while learning trigonometry. Hence, as suggested by Popham (1993) and Üçüncü and Tertemiz

(2012), background knowledge of students should be checked by teachers before teaching a new subject.

As for the content of the 10th grade mathematics curriculum, students stated insufficiency of the content in responding to the needs and skills of students. Most of the students and teachers stated that the content of the curriculum was not related to the students' daily life and was not arranged to enhance curiosity and eagerness to learn as also stated by Cet (2000). Since students have difficulty in learning some abstract subjects like inverse trigonometric functions, sum and difference which may be left to university level as also stated by Kutluca and Baki, (2009).

As for the teachers' roles, it was determined that teachers continued their traditional roles such as being the transmitter of knowledge which makes students as the receivers of knowledge supported by observations, questionnaires and interview results. A similar result obtained by Acar (2007) and Yurday (2006). Similarly, Keleş (2009) stated that not only teachers adopted the ideas that the new curriculum brought, but they also reported their performing a combination of new curriculum practices and previous applications.

As for the teaching and learning processes of the curriculum, students stated that teachers mostly used lecturing method, discussion method and question and answers techniques and to some extent they used computer-assisted instruction. On the other hand, although stated in the curriculum, the use of role-playing techniques, project method, brainstorming technique, drama method, simulation technique and group work studies was insufficient in practice which could be mentioned as a similar result of the studies conducted by Avcu and Yenilmez (2011), Anılan and Sarıer (2008), Yıldırım (2009) and Yılmaz (2006).

Finally, as for the assessment processes of the curriculum, students stated that teachers mostly applied essay type exams, multiple-choice tests, and performance works. However, especially the use of portfolios, concept maps, math diaries, posters and projects although suggested in the curriculum was insufficient as also stated at the study of of Aksu (2008) and Aslan (2011). Similar to the results of this study, Arseven, Kontaş and Arseven (2014) stated that teachers did not implement adequately portfolios, concept maps, posters and

projects as alternative assessment technique. This case may stem from teachers' not knowing how to implement many types of alternative assessment techniques as also stated by Duru and Korkmaz, (2010), Halat (2007), Güneş and Baki (2011) and Merter and San (2012).

Based on these findings, it can be suggested that the implementation stage of the curriculum needs to be improved by taking some precautions like in-service training programs about different teaching learning strategies, assessment strategies and computer technologies involving the use of GeoGebra, Cabri etc. In addition to these, decreasing the number of students to create appropriate classroom environment for different teaching methods like cooperative learning to improve the implementation process of the mathematics curriculum can also be suggested. Finally, the overloaded content of the curriculum may be lightened for effective and permanent learning.

All in all, it was seen that although the existing program was planned to be more learner-centered and process oriented, the implementation process revealed that teachers maintained their traditional roles and teacher-centered methods in teaching mathematics. There is a contradiction between the curriculum and the implementation process of it. Hence, it can be said that, according to results of the study, the classroom practices of the teachers were different from what was expected in the curriculum which led to a gap or discrepancy between the intended curriculum and the implemented one.

For further research, besides teachers and students, evaluation data may be collected from other stakeholders such as curriculum experts, school managers and the authorities of MONE. Moreover, the sample of the study was limited in the number of students and teachers. A further study with a large sample could add more to the generalization of the results. Instead of restricting the study to only to Manisa and Ankara cities, further studies may include different schools from seven regions.

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Genişletilmiş Özet

Giriş

Matematik dersi ulusal ve uluslararası sınavlardaki önemi nedeniyle ortaöğretimin temel bileşenlerinden biri olarak algılanmaktadır. 10. sınıf matematik programında öğrencilerin problem çözme ve matematiksel düşünme becerileri geliştirmeleri, matematiğin kendi dil ve terminolojisini kullanmaları, matematiğe karşı olumlu tutum sahibi olmaları, psikomotor beceriler geliştirmeleri, hesap makinesi; dinamik matematik / geometri yazılımları ve animasyon uygulamaları gibi bilgi ve iletişim teknolojilerini kullanmaları beklenmektedir (MEB, 2011).

Alan yazında matematik programının etkililiğini değerlendiren farklı çalışmalar (Acar, 2007; Aksu, 2008; Aközbek, 2008; Anılan and Sarıer, 2008; Bal, 2008; İzci and Göktaş, 2014; Orbeyi, 2007; Şahin, 2008; Şahin, 2009; Uşun and Karagöz, 2009; Yazçayır, Selvi and Demirel, 2013; Yılmaz, 2006; Yurday, 2006) bulunmaktadır. Bazı çalışmalarda ise programın hedef ya da değerlendirme boyutu gibi sadece bir yönü öğrenci başarısı ya da öğretmen görüşlerine göre değerlendirilmektedir (Artut ve Aslan, 2014; Bulut, 2006; Sırmacı, 2003; Taspınar & Halat, 2009 ve Yıldırım, 2009). Bu nedenle, Genel Ortaöğretim Kurumları matematik programlarının uygulanmasındaki güçlü ve zayıf yönler hakkında

paydaşların bilgilendirilmesini sağlamak amacıyla programın tüm bileşenlerini değerlendiren kapsamlı bir çalışmanın gerekli olduğu düşünülmektedir.

Amaç ve Araştırma Soruları

Bu çalışmanın amacı, Genel Ortaöğretim Kurumlarının 10. sınıf matematik programını değerlendirmektir. Başka bir ifadeyle, matematik programının standartlarıyla (ne planlandı?) uygulanan program (gerçekten yapılan ne?) arasındaki farklılıkların belirlenmesi amaçlanmaktadır. Bu bağlamda çalışmanın araştırma soruları şu şekilde ifade edilmiştir:

1. 10. sınıf matematik programının hedef, içerik, öğretme ve öğrenme süreçleri, öğretmen rolleri ve değerlendirme süreci öğrencilerin algılarına göre nasıldır?

2. 10. sınıf matematik programının hedefleri, içeriği, öğretme ve öğrenme süreçleri, öğretmen rolleri ve değerlendirme süreci uygulama açısından öğretmenlerin algılarına göre nasıldır?

Yöntem

Bu çalışmada karma yöntem kullanılmıştır. Karma yöntem nitel ve nicel araştırma tasarımlarının olumlu yönlerini ortaya çıkarırken, zayıf yönlerini ise en aza indirmektedir (Creswell, 2007). Bu çalışmada nicel ve nitel yöntemlere eşit önem verilen ve tüm verilerin aynı anda toplandığı zenginleştirilmiş desen (triangulation) kullanılmıştır (Fraenkel ve Wallen, 2006).

Program Değerlendirme Modeli

Bu çalışmada, Malcolm Provus'un 'Farklar Yaklaşımı ile Program Değerlendirme Modeli' kullanılmıştır. Provus'a göre, bir program tanım / tasarım, uygulama, süreç ve ürünler olmak üzere dört gelişimsel aşamadan geçmektedir (Gredler, 1996).

Katılımcılar

Bu çalışma 2013-2014 öğretim yılı bahar döneminde 10. sınıflarda öğrenim gören 136 öğrenci ve sekiz matematik öğretmeni ile gerçekleştirilmiştir. Katılımcılar uygun örnekleme yöntemi ile Ankara ve Manisa illerinden seçilmiştir.

Veri Toplama Araçları

Çalışmada nicel veri toplamak için araştırmacı tarafından Provus'un Farklar Yaklaşımı ile Değerlendirme Modeline dayalı olarak bir öğrenci anketi geliştirilmiştir. Bu bağlamda, alan yazındaki pek çok çalışma (Acar, 2007; Aközbek, 2008; Anılan ve Sarıer, 2008; Bal, 2008; İzci ve Göktaş, 2014; Keleş, 2009; Orbeyi 2007; Şahin, 2008; Şahin, 2009; Taşpınar ve Halat, 2009; Uşun ve Karagöz, 2009; Yazçayır, Selvi ve Demirel, 2013; Yıldırım, 2009; Yılmaz, 2006; Yurday, 2006) incelenmiştir. Matematik programında öğrencilerin sahip olması beklenen nitelikler, maddeler halinde listelenerek bu maddeler dörtlü ve üçlü likert tipi bir ankete aktarılmıştır. Anketteki maddeler Talim ve Terbiye Kurulu Başkanlığı tarafından

belirlenen standartları temsil ederken, öğrencilerin yanıtları, planlananların sınıf ortamında ne kadar uygulandığını temsil etmektedir.

Ankette, 15 madde program hedefleri; 16 madde içerik; 16 madde öğretmen rolleri ve 7 madde öğretme ve öğrenme süreçlerini değerlendirmek için geri kalan 7 madde de değerlendirme sürecine ilişkin öğrencilerin görüşlerini öğrenmek için yazılmıştır. Cronbach Alpha güvenirlik katsayısı hedefler için 0.85; içerik için 0.73; öğretme ve öğrenme süreçleri için 0.72; öğretmen rolleri için 0.89 ve değerlendirme bölümü için 0.71 olarak hesaplanmıştır.

Görüşmelerde öğretmenlere açık uçlu yedi soru sorulurken araştırmacı tarafından geliştirilen yarı yapılandırılmış gözlem formunda gözlem çerçevesi, öğretimde kullanılan yöntem ve teknikler, öğretim materyalleri, geri bildirim ve değerlendirme tekniklerini içerecek şekilde önceden belirlenmiştir.

Hazırlanan öğrenci anketi, gözlem ve görüşme formları matematik eğitimi, ölçme ve değerlendirme ve eğitim programları ve öğretim alanlarında görev yapan öğretim üyeleri ile üç matematik öğretmeninin görüşlerini almak üzere sunulmuştur. Uzman görüşleri doğrultusunda düzeltme ve değişikliklerin tamamlanmasının ardından gerçek uygulamaya dâhil edilmeyen iki öğrenci ile uygulama süresi ve soruların anlaşılırlığını kontrol etmek için pilot uygulama yapılmıştır. Pilot uygulamalardan elde edilen izlenimler sonucunda, sorularının bazılarında düzeltmeler yapılarak daha iyi anlaşılmalarının sağlanması için kısa açıklamalara yer verilmiştir.

Veri Analizi

Çalışmanın nicel verileri SPSS 22.0 programı kullanılarak analiz edilmiştir. Betimsel istatistikler, yüzde ve frekans değerleri çalışma sonuçlarını yorumlamak için kullanılmıştır. Çalışmadaki nitel veriler içerik analizi yoluyla incelenmiştir. Öğretmenlerin cevapları araştırmacı tarafından kodlanmıştır. Çalışmada elde edilen verilerin ve kodlamaların doğrulanması için bazı ek yöntemler (çeşitleme, katılımcı teyidi, meslektaş teyidi, vb.) kullanılmıştır. Ayrıca çalışmada doğrudan alıntılara yer verilerek sonuçları açıklamak geçerliği artırıcı bir önem olarak yapılan araştırmada dikkate alınmıştır. Çalışmanın güvenirliğinin sağlanması için araştırma sorusularına uygun veri toplama yöntemi kullanılmıştır. Ayrıca, görüşme sırasında izin alınarak görüşme ses kayıt cihazı ile kaydedilip saklanmıştır. Böylece benzer çalışma yapan diğer araştırmacılar için çalışmanın tekrar edilebilirliğinin dolayısıyla güvenirliğinin artırılabileceği düşünülmektedir.

Bulgular

Elde edilen sonuçlara göre, 10. sınıf matematik programı, öğrencilerin algılarına göre matematiği diğer dersler ve günlük hayatta kullanma, matematik dersi ile gerçek hayat problemleri arasındaki bağlantılar kurmada ve kendi çözüm yollarını bulmaya yönlendirme konusunda yetersiz bulunmuştur.

Matematik öğretmenleri, 10. sınıf matematik programının, matematiksel bilgi ve becerileri geliştirmede, matematiğe yönelik olumlu tutum ve öğrencilerin

matematiğe yönelik özgüvenini geliştirmede yetersiz olduğunu, hesap makinesi veya matematik ile ilgili birtakım bilgisayar yazılımlarını kullanmak gibi öğrencilerin psikomotor becerilerini desteklemediğini belirtmişlerdir. Ayrıca, programın öğrencilerin problem çözme becerilerini geliştirse de farklı durumlar ve derslerde bunları kullanma ve üst düzey düşünme becerilerini geliştirme konusunda yardımcı olmadığı belirtilmiştir.

Öğretmenlerin sunuş yoluyla öğretim stratejisi, soru-cevap tekniği, bilgisayar destekli öğretim uygulamalarından yararlandığı fakat rol oynama, proje, drama yöntemi ve grup çalışmalarına fazla yer vermedikleri tespit edilmiştir. Bu durum için grup çalışmasında sınıfların yeterince büyük olmaması, çok gürültü olması gibi farklı nedenler belirtmişlerdir.

Araştırmanın sonuçlarına göre öğretmenlerin değerlendirme yöntemi olarak çoğunlukla yazılı yoklama, çoktan seçmeli testler ve performans çalışmalarına başvurdukları ancak portfolyo, poster ve kavram haritaları gibi alternatif değerlendirme yaklaşımlarını programda yer almasına rağmen fazla kullanılmadıkları tespit edilmiştir.

Tartışma ve Öneriler

Bu bulgulara dayanarak, programın uygulanması aşamasının iyileştirilmesi gerektiği söylenebilir. Bunun için öğretmenlere farklı öğretme öğrenme stratejileri ve değerlendirme stratejilerini içeren hizmet içi eğitim programları düzenlenebilir. Duru ve Korkmaz (2010), Güneş ve Baki (2011), Halat (2007), Merter & San (2012), ve tarafından yapılan araştırmalara göre de öğretmenlerin alternatif değerlendirme uygulamaları konusunda yeterli bilgi ve tecrübeye sahip olmadıkları belirlenmiştir. Ayrıca, işbirlikli öğrenme yöntemi gibi farklı öğretim strateji ve yöntemlerinin uygulanabilmesi için öğrenci sayılarının azaltılması ve etkili bir öğrenme için matematik öğretim programının konu yoğunluğunun sadeleştirilmesi önerilmektedir.

10. sınıf matematik programında Aksu (2008) ve Orbeyi (2007) tarafından da belirtildiği gibi, matematik dersi ve günlük hayat arasında sağlam bir ilişki kurulamaması nedeniyle, öğrenciler matematiğin hayatlarındaki önemini fark edememekte ve bu nedenle matematik öğrenmeyi reddetmektedirler. Öğretmenlerin konuların öğretim sürecinde kendilerinin de belirttiği gibi sadece üniversite giriş sınavında sorulan ve belli bir yanıt gerektiren sorular yanında, öğrencileri gerçek yaşam ile bağlantı kurmaya yönlendirecek şekilde planlamalar yapmaları önerilmektedir.

Son olarak, öğretmenler 10. sınıf matematik programının içeriğinin özellikle geometri dersi ile paralel olmadığını belirtmişlerdir. Örneğin, sinüs ve kosinüs teoremi ile ilgili ispat yapabilmek için öğrencilerin kapsamlı olarak üçgenlerle ilgili bilgi teoremleri öğrenmiş olmaları gerektiği ya da birim çember kavramını öğrenmeden önce çember ve dairenin özelliklerini bilmeleri gerektiğini belirtilmişlerdir. Bu nedenle, matematik programının içeriğinin geometri ile paralel bir şekilde tasarlanması uygun olabilir.

Çalışmanın sonuçlarına göre, matematik programının öğrenen merkezli olarak planlanmasına rağmen uygulama sürecinde öğretmenlerin geleneksel rollerini sürdürdükleri ve öğretmen merkezli yöntemler kullanmaya devam ettikleri belirlenmiştir. Sonuç olarak, planlanan programla uygulamadaki program arasında farklar olduğu ortaya çıkarılmıştır. Programın daha etkili uygulanabilmesi için öğretmenlerin hizmet- içi eğitime ihtiyaçlarının karşılanması, öğretmen, veli ve okul işbirliğini sağlaması ve son olarakta yeterli araç- gereç ve material sağlanması önerilmektedir. Ayrıca, programda yer alan hedeflerin öğrencilerin hazır bulunuşluk düzeyine uygun olacak şekilde kazandırılmaları sağlanmalıdır. Bu konuda öğretmenlerin görüşleri alınarak programın tekrar gözden geçirilmesi önerilmektedir.

Gelecekte yapılacak araştırmalarda, değerlendirme verileri öğretmenler ve öğrencilerin yanı sıra, program uzmanları, okul yöneticileri ve MEB yetkilileri gibi diğer paydaşlardan da toplanmalıdır. Ayrıca, araştırmada yer alan öğrenci ve öğretmen sayısı sınırlı kalmıştır. Büyük bir örneklem ile yapılacak başka bir çalışma sonuçların genellenebilirliğine katkıda bulunabilir. Son olarak, çalışmayı, sadece Manisa ve Ankara illeri ile sınırlandırmak yerine yedi bölgedeki farklı illerden de veri toplanıp kapsamlı bir değerlendirme çalışması yapılması önerilmektedir.