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Evaluation of Preparatory Class Mathematics Curriculum of Social Sciences High School

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Abstract

This study aims to evaluate mathematics curriculum used in social sciences high schools' preparatory classes based on Stufflebeam (CIPP) evaluation model in terms of context, input, process and product dimensions. With this aim, this study seeks to answer "How is preparatory class mathematics curriculum (PCMC) evaluated in terms of its context, input, process and products?" from the viewpoint of teachers and students. Case study method which is one of qualitative research methods is used in this study. The study is carried out in the first term of 2021-2022 academic year in a social sciences high school which uses National Ministry of Education's curriculum. Participants of the study are 65 students and four mathematics teachers. Mathematics achievement test and interview forms are used as data gathering tools. The results of the study revealed that both teachers and students have critical views of context, input, process and product dimensions of the curriculum; however, the criticisms intensify in process and product dimensions of the curriculum. Another finding of the study is that specific conditions of schools and characteristics of students and teachers have a major impact on commitment to curriculum, teaching-learning processes and learning outcomes. Some recommendations are made for implementers and researchers based on the findings of the study.

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Introduction

Studies for developing curriculum for secondary education have been carried out since the establishment of Turkish Republic. These studies for developing curriculum for secondary education initially were considered as preparing subject lists and aimed increasing students' general knowledge and also equipping them with necessary occupational skills in line with their interests and talents (Varış, 1996). The biggest impact on secondary school curricula was United States of America's starting educational reforms as a result of Soviet Union's sending first human made space rocket to the moon. United States of America's efforts to improve science programs soon took effect on Europe and European countries started similar programs. Educational programs were modernized and fundamental changes were made especially in the fields of science, mathematics, engineering and technology (Kazez, Durdu, & Göktaş, 2017).

In Türkiye secondary schools were considered as educational institutions only accessible to upper class families until mid-1950s. However, after this period they opened their gates to people from all socio-economic levels of society. Thereby secondary schools gained a higher diversity of talents, motivations, values and behavioral patterns. This situation resulted in upper class socio economic level children to turn onto Anatolian high schools and private schools for their secondary education. Although, nearly all students graduated from high schools could get into universities until 1950s and 1960s, the capacities of universities started to be insufficient for all high school graduates as a result of insufficient planning (Sakaoğlu, 2003).

The number of young population willing to get into universities increased with 1970s and universities started to be regarded as an opportunity to improve quality of life for individuals. 1960s and 1970s were the years of seeking for improvement and Türkiye was considerably affected from tendency to prioritize science and mathematics in secondary education which was prevalent notion worldwide. At the end of 1960s and 1970s major structural changes and modernizations were made in science and mathematics curricula of secondary schools especially in science high schools and Anatolian high schools (Ünal & Ünal, 2010). However, improving quality of social sciences education were neglected and as a result, content of social sciences lessons were not sufficient to equip individuals with abilities to connect with daily activities, adapt changing social conditions and find solutions to social problems they encounter (Demir & Demir, 2012).

A number of intellectuals, Sina Akşin, Murat Katoğlu, İlber Ortaylı and Mete Tunçay, expressed the idea that literature high schools should be established as a way to balance science high schools. This idea led up to the foundation for social sciences high schools. Although high schools which had been established before this period seemed to be convenient in terms of student selection and efficiency, the lack of a system related to social fields became obvious. It was clear that students gifted in social sciences field were placed in unrelated high schools as there weren't schools relevant to their abilities. Due to increasing importance of social sciences education in developed countries, emergence of career opportunities for individuals and widespread popularity of financial and political subjects made establishment of social sciences high schools an important agenda in Türkiye (Bilgili, 2001). Establishment of social sciences high schools were announced in 17 November 2003 in Government Gazette with issue number 25292 (Government Gazette, 2003).

The number of social sciences high schools, which were first established in 2003-2004 educational year with the name of Prof. Dr. Mümtaz Tarhan Social Sciences High Schools, were 32 until May 2014. However, with National Ministry of Education's decision to turn Anatolian Teacher High Schools into Social Sciences, Anatolian and Science High Schools formalized with enactment of "2014-2015 Educational Year Basic Regulations for Registrations into Secondary Schools", (Government Gazette, 2014) their number increased to 92. Selection and placement of students to social sciences high schools is carried out via central exam system (LGS) and most of the schools have boarding schools. Curricula in social sciences high schools mostly focus on social sciences and mathematics subjects. Graduates of social sciences high schools can opt for various fields such as law, political sciences, geography, literature, public administration and history as well as fields related to science and technology. One of the most important characteristics of social sciences high schools' is their 5 yearlong curricula in which the first year is preparatory class.

Preparatory classes were first introduced in Anatolian high schools with the aim of teaching some lessons in foreign languages (English, German, and French) as a way to improve students' foreign language knowledge and skills and prepare them to learn these lesson subjects in the targeted foreign languages in the upcoming years. Preparatory class weekly schedule in Anatolian high schools and social sciences high schools consists of 40 class hours in total. Distribution of lesson hours are 4 hours for Turkish Language and Literature, 4 hours for Physical Education, Art and Music, 3 hours for Mathematics, 20 hours for first foreign language, 4 hours for second foreign language, 4 hours for information technologies, 1 hour for counseling and guidance (MEB, 2018).

National Ministry of Education's decision published in Government Gazette with issue number 31232 (2020) regarding Regulatory Change in Administration of Secondary Education Institutions stated that "Secondary schools which admit students with central examination system can open preparatory classes for all or part of their students if Ministry approves their eligibility" (p. 1). This regulation removed Social Sciences High Schools' obligation to have preparatory classes and out of 92 Social Sciences High Schools 24 continued to have preparatory classes without making any change, 19 schools continued with a limited number of preparatory classes and 49 schools decided to continue their programs without preparatory classes (MEB, 2021).

Review of related literature didn't reveal any data showing that this decision was taken after evaluation of curriculum. However, results of curriculum evaluation provide necessary information for administrators to design, implement and reform curricula (Kridel, 2010). For this reason, carrying out evaluative research about efficiency of lessons taught in preparatory classes can remarkably benefit making educational policies. This study is expected to shed light on the topic of evaluating mathematics lesson curriculum in social sciences high schools' preparatory classes.

High School Preparatory Classes Mathematics Curriculum

Both global developments in scientific, social, financial, technological fields and exam results obtained from national and international tests made making changes in mathematics curriculum an unavoidable necessity and several changes have been made in 1927, 1931, 1934, 1949, 1952, 1956, 1970, 1976, 1987, 2005, 2011, 2013, 2018 throughout Turkish Republic's history (Keskin, 2019).

Middle School Mathematics (grade 5, grade 6, grade 7, grade 8) and High School Mathematics Lessons (grade 9, grade 10, grade 11, grade 12) curricula introduced in 2013-2014 educational year reformed mathematics programs. Secondary schools preparatory class mathematics curriculum was prepared in line with this program. This new curriculum was designed to improve mathematics skills attained in previous years and prepare students for 9th grade mathematics curriculum. The curriculum's objectives are enabling students understand mathematical concepts and expressions, express their opinions during stages of solving a mathematical problem, develop positive attitudes and self-esteem towards mathematics, efficiently use mathematical language, do mental arithmetic calculations, solve problems related to daily life, improve themselves intellectually, learn about historical development of mathematics and scientists who contributed to this development, and improve skills for doing research, creating and using knowledge (MEB, 2016).

Preparatory class's mathematics lesson is planned to be 3 class hours each week. 1 hour of the lesson is allocated to learning outcomes related to games and 2 hours of the lesson is allocated to other learning outcomes. Content of the curriculum includes two learning areas which are "Numbers and Algebra" and "Geometry". "Numbers and Algebra" learning area includes "Numbers" and "Algebraic Expressions" units while "Geometry" learning area includes "Angles" unit. The lesson consists of 26 learning outcomes and 108 class hours in total. The lesson aims to achieve meaningful understanding of mathematics instead of rote learning and memorization based education.

Curriculum and Curriculum Evaluation

According to Bobbitt, curriculum in its broadest sense includes all learning experiences and a part of these experiences take place under school educations' supervision. On the other hand, John Dewey, who has an experience, centered educational approach, states that school is life itself and defines curricula in much broader terms (Kridel, 2010). According to Hewitt (2018), curriculum is the source of taught information and it is a combination of all information and skills gained from official setting of school or informal setting of all social groups such as family and peer groups. Bilen (2014) defines curriculum as all regular learning experiences provided to students in order to achieve specific learning objectives. On the other hand, Ornstein and Hunkins (2009) state that there are various variables and viewpoints involved in definition of curriculum and for this reason it is not possible to make a simple definition. Although there have been alternative definitions and approaches of curriculum made by pedagogues, politicians and specialists since 1900s (Kridel, 2010), it is obvious that a well-designed curriculum can guide teachers and help students achieve their goals (Serçe, 2020). Curricula must have certain qualities such as flexibility, practicality, being scientific and serving specified aims. Also, they need to be open to changes in accordance with changing conditions of educational processes. Keskin (2019) states that educational systems can raise progressive individuals who are able to contribute their countries provided that they develop and implement educational curricula which are suitable to specified aims.

Analysis and evaluation of effects of changes made in educational curricula has a significant place in educational research. Planning this type of research in the related field, identifying deficiencies in implementation and receiving feedback from implementers can remarkably benefit curriculum development (Bayraktar, Güner, Akkurt Denizli, & Sezer, 2016). Curriculum evaluation includes processes such as systematically documenting curriculum outcomes and

adding a value in reaching a decision to related curriculum (Green & Stone, 1977). According to Piskurich (2000), any person other than curriculum developer can use curriculum evaluation to see effectiveness of related curriculum or an activity included in the curriculum. A variety of approaches are embraced in the process of curriculum evaluation. These models are Goal Based Evaluation, CIPP (Context, Input, Process, Product) Model, Discrepancy Evaluation Model, Congruence-Contingency Model, UCLA Evaluation Model, Educational Connoisseurship and Criticism Model, Saylor, Alexander and Lewis Model, Analytic Program Evaluation Model, Consumer Oriented Model, Goal Free Evaluation Model, Responsive Model and CODE Model (Demirel, 2021). Curriculum's capacity to deliver activities, which are created to achieve learning objectives, is analyzed during decision making stage of evaluation. Daniel Stufflebeam is the pioneer of decision oriented approach. Stufflebeam programs developed CIPP (Context, Input, Process, Product) model which focuses on decisions taken by related administrators instead of goals. Stufflebeam defines curriculum evaluation as a process of gathering, specifying, reporting and implementing some objects' merit and worth in order to support accountability, disseminate effective practices and guide decision making (Stufflebeam, 2003). According to Stufflebeam, evaluation offers opportunities to gathering a wide range of information related to curriculum and enables making healthy decisions. Curriculum needs to be evaluated in four different stages (Context, Input, Process, Product) in order to gathering information which can be used as a base for decisions. Also, decisions have to be made in the areas of "Planning", "Constructing", "Implementation" and "Reconstructing" during the process of curriculum evaluation (Uşun, 2016). CIPP model requires curriculum evaluators to make decisions in the following four areas:

a) *Context Evaluation* is the stage in which evaluators gathering data about what kind of needs are expected to be fulfilled by the curriculum. Deficiencies encountered during evaluation, unfulfilled needs and underlying reasons for these unfulfilled needs are focused during the process of collecting data related to targeted needs.

b) *Input Evaluation* is the stage which specifies required resources and how to use them. Specific strategies are determined and decisions about how and where to use these strategies are taken in this stage. A wide range of resources such as materials, methods and techniques to be used are reviewed during this stage.

c) *Process Evaluation* is the stage which evaluators check whether there is or isn't a consistency between planned and implemented activities. They try to find out if the curriculum is being implemented as it was planned.

d) *Product Evaluation* is the stage in which evaluators compare targeted goals and outcomes of the curriculum. Outcomes of the curriculum are interpreted, achievements and shortcomings are evaluated at this stage and whereby evaluators set a course for maintaining or abolishing the curriculum in case of success or failure.

Examination of studies carried out in Türkiye related to curriculum evaluation reveals that mathematics curricula have been evaluated in various aspects. Mathematics curricula have been evaluated in terms of learning domains (Devlez, 2011; Övez, 2012), assessment and evaluation aspects of curriculum (Tuncel, 2015), school type (Avcı, Erikçi & Ok, 2021; Biçer & Ada, 2020), Bloom Taxonomy (Çil, Kuzu, & Şimşek, 2019) as well as grade levels (Biçer, 2019; Demir, 2021; Eroğlu, 2019; Yalçınkaya, 2018). In addition to these studies, there are some studies which evaluated mathematics curricula using Stufflebeam's Context-Input-Process-

Product Model (Aközbek, 2008; Keskin, 2019, Önal, 2020). However, review of related literature showed that there isn't any study carried out on preparatory class's mathematics curriculum. This study, which evaluated preparatory class's mathematics curriculum, is believed to contribute curriculum evaluation research in this regard.

Within this context, this study aims to evaluate preparatory class curriculum in social sciences high schools in terms of context, input, process and product stages defined by Stufflebeam Evaluation Model. To this aim, this study inquires to answer the question "How is preparatory class mathematics curriculum evaluated from the point of students' and teachers' views in terms of its context, input, processes, products and effects?"

Method

Research Design

This study aims to evaluate preparatory class's mathematics curriculum (PCMC) using Stufflebeam (CIPP) model to make judgments about value and efficiency of the curriculum with a qualitative design. Case study method, which is one of qualitative research methods, is used in this study. Case study is in depth and descriptive analysis of a limited system (Merriam, 2018). Case study is an empirical research method analyzing a current phenomenon in its real life context especially when the boundary between context and phenomena is ambiguous (Yin, 2008). Both qualitative and quantitative data can be used in this design. Qualitative and quantitative data are gathered together but they are analyzed separately and findings are compared to see whether they confirm each other or not (Creswell, 2013). Achievement test results constitute qualitative data while semi-structured interviews and document analysis constitute qualitative data of this study.

Case

Preparatory classes became optional for schools with regulatory change published in Türkiye - Legal Gazette (Resmi Gazete) issue number 31232 (2020). The school this study was carried out decided to abolish preparatory classes at the beginning of 2021-2022 academic year. For this reason, there were 9th grade students who attended preparatory class in the previous year and also 9th grade students who started the school without preparatory class education at the beginning of 2021-2022 academic year. This situation provided an opportunity to evaluate PCMC.

Participants

The study was carried out in a state social sciences high school in 2021-2022 academic year two groups of participants are formed for the study. An achievement test consisting of 32 multiple choice questions was applied to 60 preparatory class students to obtain qualitative data. 4 mathematics teachers and 5 students, chosen from the 9th grade students who had completed the preparatory class, from among 60 preparatory class students, took part in a semi-structured interview to obtain qualitative data.

Data Collection Tools

Achievement Test

In the development of this achievement test, 8th grade achievements were also included in the PCMC. Twenty learning outcomes from 8th grade curriculum was selected and a total of 40 questions which include 2 items for each learning outcome were prepared by researchers in order to assess achievement levels of students. The achievement test was applied to 187 9th grade students to identify reliability of the test. The results obtained from the test was analyzed through SPSS25 program and KR20 (Büyüköztürk, 2002) value internal consistency coefficient was determined as 78. 8 items which had low item difficulty was excluded from the test and KR20 value was determined as 80. Content validity is an assessment tool's extent of representing desired behaviors (Baykul, 2000). The test includes at least one item from each learning outcome in order to gain content validity. The achievement test was applied to a total of 60 students from two classes. One of these classes had preparatory class education from the previous year and the other class didn't have preparatory class education.

Teacher and Student Interview Forms

Document analysis and interview forms are used as qualitative data collection tools in the study. Interview is a technique of collection data through verbal communication. Interviews are carried out mostly through face to face communication although they can also be carried out through phone calls and video calls (Karasar, 2020). Interviews in this study were carried out with 4 preparatory class mathematics teachers and 5 preparatory class students by using semi-structured interview forms. Open ended questions were prepared in line with context, input, process and product dimensions of CIPP model. Related literature was reviewed to ensure content validity of the items prepared and items were controlled by three specialists working on the fields of teaching mathematics and educational curriculum. Necessary changes were made with regard to specialists' views. Examples of teacher and student interview questions are shared below.

Sample teacher interview questions:

Do you think that PCMC efficiently prepares students to 9th grade curriculum?

What are your ideas about suitability of learning outcomes to students' readiness levels in PCMC?

What are your ideas about the course book?

Do you make changes during the process of implementing PCMC? Can you explain what kind of changes do you make?

What are your thoughts about activities and games included in PCMC and could you implement them as stated in curriculum? Can you explain it?

Does the program form a basis for 9th grade mathematics lessons? What are your thoughts about its ability to improve students' mathematical thinking?

Do you think there is any difference between academic achievements of students who attended preparatory class and students who didn't attend preparatory class?

What is your general idea about PCMC? What do you think are strengths and weaknesses of the curriculum?

Student interview questions:

Is PCMC suitable to your learning level? Can you explain it?

Do you think that weekly class hours (3 hours) of mathematics course enough to cover all topics and activities?

What are your thoughts about activities included in PCMC?

Do topics and activities appeal to your interest? Can you explain it?

What are your ideas about techniques your teacher used during mathematics lesson?"

Document Analysis

PCMC was analyzed for document analysis. Document analysis aims to specify an existing or formerly existing situation as it is. The case, object or individual that is the subject of analysis is examined on its merits without any effort to change them (Karasar, 2020).

Data Analysis

Descriptive analysis (Büyüköztürk, 2002) and t test was used to analyze quantitative data gathered from achievement tests applied to 60 students. Analysis of quantitative data was carried out through descriptive analysis of semi-structured interview forms. "In descriptive analysis, initially the data is openly described and then these descriptions are explained and interpreted. Cause-effect relations are scrutinized and some conclusions are drawn" (Yıldırım & Şimşek, 2016). In direct quotations, teachers are coded as T1….T4 and students as ST1...ST5.

Results

Findings of the study include qualitative findings of interviews carried out with teachers and students and quantitative findings obtained from achievement tests.

Context Evaluation

PCMC is analyzed in terms of class hour sufficiency and suitability to student needs and qualifications. To this aim, teachers were asked "Do you think that PCMC efficiently prepares students to 9th grade curriculum? Do you find this curriculum sufficient?". Teachers expressed that the curriculum was sufficient and it prepared students for 9th grade. However, teachers also added that some parts of curriculum were too congested for the allocated time. Some quotations from teachers' opinions about curriculum are as follows:

> T4: *"Yes, I think curriculum prepares preparatory class students to the 9th grade. Because the curriculum is beneficial to cover any missing areas from 8th grade and as students are coming from diverse middle schools with diverse levels of readiness it is important to form a base for 9th grade curriculum."*

> T1: *"The program aims to prepare students for 9th grade but there are too many topics and it is not possible for us to teach all of them. That's why I believe it is not sufficient."*

PCMC is a common curriculum for all Anatolian and social sciences high schools and there are differences between achievement levels of these schools. Implementing the same curriculum for all these schools can be thought as the main drawback.

In order to understand readiness level of students, the question "Is PCMC suitable to your learning level? Can you explain it?" was asked to students. Students expressed that they generally didn't have much difficulty in learning as PCMC is mostly a revision of 8th grade except from equations and algebraic expressions. Some quotations from students' opinions are as follows:

> ST1: *"I didn't have any difficulty in the first term but in the second term I had difficulty in algebraic expressions. This may be because of my own mistake.*"
>
> ST4: *"*Actually *I didn't have difficulty in most of the topics but algebraic expressions and equations were a little bit compelling."*

Achievement test results showed that most of the students had difficulty in algebraic expressions and equations topics. Students' average from a total of 4 items related to these topics was $\bar{x}$:2,3.

Another question posed to students and teachers was about the amount of weekly class hours of mathematics. Teachers were asked "What are your thoughts about weekly class hours of PCMC (3 hours in a week) and is it enough to adequately cover activities?"

Weekly class hours of PCMC consist of 2 hours of teaching and 1 hour of practice. General view of teachers is that the class hours are sufficient and they expressed that they can cover topics and activities adequately (f:3). Only one teacher expressed that class hours aren't sufficient. Some quotations from teachers' views are as follows:

> T4: *"We have three class hours in total. We spend two hours for teaching and one hour for games which are a part of curriculum. This is how our curriculum is prepared and we follow it by allocating to hours to teaching and one hour for activities. I think it is quite sufficient."*
> T1 who finds class hours insufficient expressed that *"There are no restrictions for topics here. The lesson book is also prepared without time planning. We do all activities but cannot cover all topics in depth."*

Students were asked "Do you think that weekly class hours (3 hours) of mathematics course enough to cover all topics and activities?" Majority of students expressed that class hours allocated for the lesson were enough to cover topics and activities. 2 students stated that activity time, which is one hour a week, should be increased. For instance, ST4 stated that

> ST4: *"We generally had enough time. We had two hours for learning topics and one hour for* activities *and games. I think it would have been better if we had one more hour for games and activities."*

Input Evaluation

Input provided by PCMC was analyzed in this stage of the study. Teachers were asked "What are your ideas about suitability of learning outcomes to students' readiness levels in PCMC?" Common view of teachers related to this question was that learning outcomes for preparatory classes should be a revision of middle school which aims to overcome any missing learning areas. Additionally, some learning outcomes were stated to be above students' readiness levels. Some quotations from teachers' views are as follows:

T3: *"Some parts of the curriculum are not suitable to students' levels. I mean there are some topics above students' levels and there are questions related to these topics. I believe that these questions should be revised and edited to match students' levels."*

T4: *"I think preparatory class curriculum shouldn't include any new learning outcomes. I believe that it should be a revision of 8th grade or all middle school. Second degree two unknowns equations is not an emphasized topic in 8th grade but we have this learning outcome in preparatory class. There are even equations with elimination model and graphic drawings. I think these topics and learning outcomes are not necessary for 9th grade. However, the other topics especially first degree equations are suitable for students' levels."*

Another question related to PCMC was "What are your thoughts about topics appeal to students' interests?" Teachers expressed that topics were above students' levels and some topics should be excluded from curriculum. On the other hand, teachers expressed that game activities were appealing to students' interests. Some quotations from teachers' views are as follows:

T1: *"Some topics appeal to students' interests and some don't. I believe that some topics should be excluded because they shouldn't be taught at this stage."* similarly T2 stated that *"They were not much interested in mathematics parts of the lesson but they were quite interested in games. We added some other games to make the lesson more fun and we also used smart board which students liked very much."*

Students were also asked a similar question "What are your thoughts about activities included in PCMC?" Students expressed that they found game activities quite fun and interesting. They found topics easy as they were a revision of 8th grade. One student expressed that activities were not useful. Some quotations from students' views are as follows:

ST4: *"Especially game activities increased our participation in the lessons and this positively affected our achievement."*

ST2: *"Some topics were bad. I mean they didn't contribute to our learning but the games were good and helped us a lot."*

Another factor of input evaluation was course book. Interviews with teachers and students provided insight related to their ideas about course book. The first question posed to teachers about the course book was "What are your ideas about the course book?" Common view of teachers was that the course book was above students' levels. They expressed that students had difficulty in doing activities. One of the teachers expressed that topics were not sequenced while another teacher stated that the number of examples need to be increased. Some quotations from teachers' views are as follow:

T3: *"I think the course book is not a good one. Let's put it this way, difficulty level of topics, random sequencing and some topics that belong to 9th grade. All these things make me think that a better book could be prepared by just revising middle school subject."*

T1: *"The course book is prepared as if it is a university entrance exam preparation book. Questions and question forms are way too exaggerated not suitable to students' levels at all. The only positive thing in the course book is games. Other than that, topics are way above required level."*

Students were asked "Do topics and activities appeal to your interest? Can you explain it?" in order to take their opinions about course book. Common views of students were that they found the activities in course book generally easy and similar to activities they had in previous year. Also they expressed that they skipped some activities. Some quotations from students' views about course book are as follows:

ST1: *"Activities in the course book were nearly the same as the ones we did in the 8th grade. Some of them were a little bit difficult and there were some activities teacher said that they were not useful. I remember that we skipped these activities as teacher said they were not useful for us."*

ST4*: "Activities that we played games were interesting. We made these activities by playing games and they were very nice."*

Process Evaluation

Teachers' and students' views related to implementation of curriculum, techniques and methods were used in the process evaluation stage of PCMC. To this aim, the first question asked to teachers was "Do you make changes during the process of implementing PCMC? Can you explain what kind of changes do you make?" Common view of teachers was that activities in course book were above students' levels and they used supplementary resources for this reason. Also, they skipped some topics which they thought were above students' readiness levels. Some quotations from teachers' views are as follows:

T3: *"Personally I made some changes. For example, there were those questions not suitable for my students. I prepared questions myself to make topics more comprehensible for students. There were questions in exponents and some other topics which I prepared questions to make them easier for students"*

T2: *"We were only making changes in the usage of course books. We used some extra resources and that way we dealt with problems."*

Another question posed to teachers related to process evaluation stage was "What are your thoughts about activities and games included in PCMC and could you implement them as stated in curriculum? Can you explain it?" General view of teachers is that games were interesting for students. They expressed that games were suitable to students' levels but some activities were difficult for them to understand. Some quotations from teachers' views are as follows:

T1: *"I think the games were fine but activities were above students' levels. Students weren't ready for high school level yet but some questions were at 12th grade level. That's why we had to find questions from other resources and use them in the classroom."*

T2: "*The games were nice. We found and added some games so we had quite a large number of games. The numbers of examples were too few."*

Students were asked "What are your ideas about techniques your teacher used during mathematics courses?" in the process evaluation stage. Students stated that their teachers used extra resources during classes and they solved many questions. Some quotations from students' views are as follows:

ST1: *"Generally our teacher used extra resources in addition to course book. Our teacher usually taught the subject and gave assignments at the end of classes. Assignments were helpful for the exams."*

ST5: *"We usually solved questions as a learning technique. First, our teacher taught the subject then we solved questions. The games were entertaining activities."*

Product-Effect Evaluation

Product-effect evaluation stage of PCMC includes daily life usability of program, practicality of information, effects of attending preparatory class on academic achievement in mathematics, strengths and weaknesses. Finally, teachers' suggestions for improvement were compiled.

The first question posed to teachers about daily usability of information students learn in PCMC was "Do you think that students can use the skills they learn in PCMC in their daily lives?" Common view of teachers was that students use these skills and problem solving abilities in daily activities such as shopping, measuring time and counting. Also, students improve their arithmetic skills. Some quotations from teachers' views are as follows:

T2: *"I think they must have used these skills. They must have improved their practicality and quick thinking. The course included simple problems related to real life. Their arithmetic abilities must also have improved. I think this is useful."*

T4: *"They are definitely used in daily life as mathematical skills. The course benefits them in many ways such as cognitive development, strategic thinking. The course does not only just improve their simple arithmetic operations, but also their cognitive abilities."*

A similar question was asked to a student which was "Can you explain whether you use or do not use what you have learned in mathematics lessons in daily life?" 3 students expressed that they use mathematics in their daily life activities such as shopping, dates, figuring time and dates and managing money. However, 2 students couldn't relate mathematics they learned in the class with their daily usages. As such, there were differences between teachers' and students' ideas. Some quotations from students' views are as follows:

ST2: *"I use it in my daily life the way it can be used. Usually things about money or time, nothing else."*

ST4: *"I didn't use it in my daily life"*

Another question posed to teachers in the product-effect evaluation stage of CPMC was Does the program form a basis for 9th grade mathematics lessons? What are your thoughts about its ability to improve students' mathematical thinking? Teachers expressed that the curriculum was beneficial in covering missing areas from 8^{th} grade and forming a basis for 9th grade. One of the teachers expressed that geometry of triangles shouldn't be in curriculum. Some quotations from teachers' views are as follows:

T4: *"Yes, I believe that it forms a basis for 9th grade and this is the main aim of this curriculum. This curriculum serves as a revision for middle school and preparation for high school. It forms a basis for next year by covering all missing points from previous years."*

T1: *"Sure, there are many topics which prepare students to the next year. There are some unnecessary topics like geometry of triangles but I think the other topics were beneficial for 9th grade."*

Students were asked "Do you use the information you learned in preparatory class mathematics lesson in mathematics lessons or any other lessons?" Students answered that they use the information they learned in mathematics lessons or other lessons. Some quotations from students' views are as follows:

ST5: *"I used it in mathematics and other lessons."*

ST4: *"The things we learned in this class were useful in mathematics lessons and other related lessons."*

Teachers were asked "Do you think there is any difference between academic achievements of students who attended preparatory class and students who didn't attend preparatory class?" In order to understand effects of PCMC on students' achievement levels in product-effect evaluation stage of PCMC. Two teachers stated that they have lessons for both classes whereas two teachers stated that they have lessons with only classes which attended preparatory classes. All 4 teachers expressed that students who attended preparatory classes had higher level of academic achievement. However, they couldn't present a specific reason for this difference. They expressed that the situation may be a result of higher cognitive development or covering missing subjects during preparatory class. Some quotations from teachers' views are as follows:

T3: *"I personally believe that they have an advantage. Because some of the topics in 9th grade had already been taught in preparatory class. For example, equations, operations on whole numbers and basic problems. I think they have advantages in these topics."*

T4: *"There is difference between academic achievements. I can clearly see that because I have lessons for both classes. But I am not exactly sure about why there is such a difference. It may be because they had preparatory class but they are definitely better. They are one year older than other 9th grades and they may be cognitively more improved because of that. Maybe last years' program formed a good basis for them."*

At this stage, students were asked "What are your thoughts about advantages and disadvantages of having mathematics lessons in preparatory class?" Students expressed that it was beneficial for them as they had a chance to revise topics from middle school which helped them to make up for their missing points and form basis for 9th grade. Some quotations from students' views are as follows:

ST2: *"I think it was a great advantage because we revised previous years and I believe it will affect next year very positively. I wasn't only beneficial for remembering previous topics but also beneficial for making future topics easier for us."*

ST3: *"Topics were better structured. For example, we have square roots topic this year and we can understand it easily because we learned it last year."*

Additionally, a 32 item mathematics achievement test was applied to compare achievement levels of students who have attended preparatory class and students who didn't attend preparatory class. Results of the test are presented in Table 1.

Table 1

T-test Results for Students Who Attended Preparatory Class and Students Who Didn't Attend Preparatory Class.

Test	*N*	$\bar{X}$	*SS*	*Sd*	*t*	*p*
Students who attended preparatory class	30	21,13	3,82	58	1,429	.158*
Students who didn't attend preparatory class	30	19,67	4,12			

*p< 0.05

Table 1 shows that average score of students who attended preparatory class ($\bar{X}$= 21.13) is higher than average score of students who didn't attend preparatory class ($\bar{X}$= 19.67). However, there isn't a statistically significant difference between achievement scores of these two classes (*t= 1.429; p< .05*).

Teachers were asked "What is your general idea about PCMC? What do you think are strengths and weaknesses of the curriculum?" in order to get teachers' general views of PCMC in product-effect evaluation stage of the study. Teachers expressed that the main strength of the curriculum was game activities and historical development of mathematics. They believed that these topics and activities appealed students' interests and helped them develop positive attitudes towards mathematics. In regard to weakness of the program, the factors stated were those some topics were above students' levels, some topics and activities were too difficult and some topics were not suitable for preparing to 9th class. Some quotations from teachers' views are as follows:

> T4: *"The curriculum is actually a nice one and different from other curricula. It has a lot of topics related to historical development of mathematics. This appeals to students' interests. Also there are games and no other curriculum has so much time allocated to games. It is nice to show students other aspects of mathematics. I mean many learning outcomes are presented this way. Weakness of the program is that it lacks learning outcomes which consolidates middle school topics, they could have been better than giving new topics."*

> T3: "*It has some weaknesses. Topic selection and presentation should be more like a revision and preparation for 9th grade. There are some too difficult questions which are not suitable to students' level. This curriculum can be changed to match students. This is my general idea."*

The last question asked to teachers in product-effect stage of the study was "What are your ideas for improving PCMC?." Teachers expressed that PCMC should be revised to match basic topics and its content needs to be decreased. Some quotations from teachers' views are as follows:

> T1: *"I think there are too many topics and they should be decreased and simplified. There can be some 9th grade topics but their content should be limited."*

> T3: *"I can say that the course book and its content needs to be revised. Instead of randomly giving topics they need to be sequenced like numbers, exponential numbers, root*

numbers, absolute value, and problem types. Also they have to be appropriate to students' levels. There are discrepancies in the book. Some topics are too easy while some others are too difficult and they are not sequenced logically. For this reason, we had to use some extra resources."

Discussion, Conclusion and Implications

Teachers' and students' views related to curriculum were analyzed to evaluate PCMC in terms of context, input, process and product. Additionally, mathematics achievement test was applied to both students who attended preparatory class and students who didn't attend to preparatory class in order to assess curriculum's efficiency.

Evaluation of context showed that most of the teachers believed that PCMC prepared students to next grade and covered missing learning areas. Also, teachers expressed that 3 hours of course time would normally be sufficient but some topics such as algebraic expressions and equations were too intensive which created problems related to allocated time. Except for this problem, the curriculum was found sufficient taking into consideration that preparatory class is a transition period for 9th grade and a revision of 8th grade. Similar to teachers' views, students' views related to context of the curriculum show that students had difficulty in algebraic expressions and equations. Review of literature shows that there are no studies carried out to evaluate PCMC. However, comperative studies carried out by Önal (2019), Abat (2016) and Aközbek (2008) to evaluate context, input process and product dimensions of 9th grade mathematics curriculum reveal similar findings to this study. These studies also showed that the curriculum was sufficient in terms of context and allocated enough time for activities and learning outcomes. Consequently, efficiency of the curriculum can be increased with some alterations in line with teachers' and students' views.

The second part of the findings is the input evaluation. PCMC course book was evaluated in the input stage of the study. Teachers expressed that learning outcomes of the curriculum should aim to revise middle school topics and cover missing areas. Additionally, some learning outcomes such as algebraic expressions and equations were found above students' academic levels. Preparatory classes are a transition period for students and these learning outcomes above students' levels necessitated teachers to utilize some other resources. Review of literature showed that Singer (2018) and Önal (2019) found learning outcomes were suitable to students' levels.

However, the study carried out by Çiftçi, Akgün and Deniz (2013) showed that 9th grade mathematics learning outcomes were not suitable to all students' levels and they differed among different school types. Anatolian High School and Social Sciences High Schools in Türkiye accept students with varying academic achievement levels. However, the same curriculum is used in all schools which can in turn affect curriculum fidelity. Bümen, Çakar and Yıldız, (2014) stated that one of the most important factors effecting curriculum fidelity in Türkiye is learning differences among students. On the other hand, students and teachers interviewed in the study expressed that activities and games included in PCMC were appealing to students' interests.

One of the findings of this study is that the course book used in preparatory classes was not suitable to all school types and it consisted of activities above students' levels. Demir (2018)

found that 9th grade mathematics course book was found insufficient by teachers. Also, the study carried out by Önal (2020) revealed that teachers were not content with course book and they thought topics were difficult to understand. There is only one preparatory class mathematics course book prepared by National Ministry of Education Board of Education and Discipline. This course book is prepared for all Anatolian High Schools and Social Sciences High Schools in Türkiye and this situation can explain why this book is not suitable for the specific school this study is carried out. Students interviewed in the study expressed that most of the topics were suitable to their levels as they had already learned them in middle schools but some topics were above their levels.

The third part of the findings is the process evaluation. Data from process stage of curriculum evaluation shows that teachers utilized extra resources and activities during lessons. Game activities included in the curriculum were found to be appealing o students' interests. Teachers expressed that they were obliged to utilize extra resources and activities as some activities in the course book were above students' levels.

Teachers' and students' views related to techniques and methods in PCMC were used in the process evaluation stage of the study. Teachers stated that activities in the course book, which is the main resource for the lesson, were above students' levels. For this reason, they utilized extra resources for some activities and they skipped some topics. Also, teachers expressed that game activities included in the curriculum were more appealing to students' interests.

The fourth part of the findings is the product-effect evaluation. Product-effect evaluation stage of PCMC includes daily life practicality of knowledge given by curriculum, effects of attending or not attending preparatory class on mathematics academic achievement, and weaknesses and strengths of the curriculum. Lastly, teachers' suggestions for improvement of the curriculum are presented.

According to teachers' views, product evaluation shows that students can reflect their mathematical operations and thinking skills into real life. Common view of teachers is that students use these skills for solving problems, shopping, managing time and counting. Also, students' abilities for arithmetic operations increase. Aközbek (2008), Önal (2020) also state that curriculum increases students' mathematical skills and contributes problem solving process. Findings of these studies are in line with findings of this study. PCMC is also focused on forming a basis for 9th grade and covering missing areas from previous years. 3 students interviewed for the study expressed that they use the information they learned in mathematics in various areas of daily life such as managing money and time. However, two students expressed that had difficulty in relating their mathematical knowledge with daily life activities. Çil, Kuzu and Şimşek, (2019) state that preparing mathematics curricula with a process based approach and integrating activities with projects enables reflecting mathematical knowledge in daily life activities efficiently and provides opportunities for meaningful learning.

Another finding of the study is related to PCMC's efficiency in preparing students to next grade. Teachers expressed that the curriculum covered missing areas form previous years and formed a basis for 9th grade topics. Additionally, students expressed that they were able to use mathematical knowledge they learned in preparatory class in various other lessons. However, one of the teachers stated that the topic geometry of triangles shouldn't be in the curriculum. Common view of the teachers was that the number of topics should be reduced and that topics needed to be reorganized from easy to more difficult. Furthermore, they

believed that the topics formed a basis for next grade but topics related to geometry shouldn't be in preparatory class curriculum. The study carried out by Çiftçi, Akgün and Deniz (2013) also concluded that geometry topics were not mastered sufficiently as 9th grade mathematics curriculum was congested.

Another finding of the study is related to difference between academic achievement levels of students who attended preparatory class and students who didn't attend preparatory class. All teachers expressed that students who attended preparatory class had higher academic achievement. Similarly, students who attended preparatory classes expressed that they had advantages over other students. However, it is unclear whether they are more successful because they had opportunity to revise middle school subjects and cover missing areas in preparatory class or they have developed more cognitively because they had an extra year. The study carried out by Arslan and Babadoğan (2004) states that age can be an important factor which has positive effect on concrete and abstract thinking.

Teachers' opinions about strengths and weaknesses of PCMC and suggestions for further improvement make up the final stage of product-effect evaluation. Strengths of the curriculum were identified as game activities and topics related to historical development of mathematics. Teachers expressed that these activities and topics aroused students' interests and developed positive attitudes towards the lesson. Weaknesses of the curriculum were concluded as some of the topics not being suitable to students' levels and including too difficult questions. Teachers suggested that PCMC should be revised by excluding some topics and putting more emphasis on basic subjects. Additionally, allocation of topics should be more focused on preparing students to 9th grade. One of the teachers added that preparatory class should be made optional for students.

To sum up, findings of this study showed similar results to various studies carried out on mathematics curricula (Aközbek, 2008; Keskin, 2019; Önal, 2019). These studies show that context and input elements of curricula are generally viewed positively whereas process and product elements are criticized more prominently. It is evident that curriculum development processes are carried out with most ideal methods but teacher and student characteristics have significant effects on curriculum fidelity, teaching-learning processes and learning outcomes (Bümen, Çakar & Yıldız, 2014). Based on the findings of this study, following suggestions are proposed for researchers and implementers.

- Course books can be revised to match their content to students' levels.
- A variety of course books can be prepared to meet needs of different schools.
- Preparatory class curriculum can be reformed to include only 8th grade learning outcomes.
- This study was carried out with teachers and students of preparatory classes in a Social Sciences High School. Different types of schools which have preparatory classes can be researched to extend scope of the research; hence mathematics curriculum of preparatory classes in different types of schools can be further evaluated.
- This study is the first study to evaluate mathematics curriculum in preparatory classes. For this reason, findings of this study can be a resource for other studies.

Author Contributions

Literature review and Research Design: Derya Göğebakan Yıldız, Seçil Bilgin.

Acquisition, Analysis and Interpretation of Research Data: Seçil Bilgin, Sayime Arıkız, Reyhan Tarhan.
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Critical Revision of the Manuscript: Derya Göğebakan Yıldız, Seçil Bilgin.

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TÜRKÇE GENİŞ ÖZET

Hazırlık Sınıfı Matematik Öğretim Programının Değerlendirilmesi: Sosyal Bilimler Lisesi Örneği

Giriş

Öğretim programlarında yapılan yeniliklerin ve değişimlerin etkilerinin incelenmesi ve değerlendirilmesi eğitim araştırmalarında önemli yer tutmaktadır. Piskurich (2000)'e göre programı hazırlayanın dışında başka biri, ilgili programın ya da programın içindeki bir etkinliğin verimlilik bakımından sonuçlarını görmek amacıyla program değerlendirmeden yararlanabilir. Yapılan alanyazın taramalarında hazırlık sınıfı matematik dersi öğretim programı değerlendirme verilerine ulaşılamamıştır. Yapılan bu çalışmanın program değerlendirme çalışmalarına katkı sağlayacağı düşünülmektedir. Bu bağlamda çalışmanın amacı, Sosyal Bilimler Lisesi hazırlık sınıflarında yer alan Hazırlık Sınıfı Matematik Öğretim Programı'nı (HMÖP), Stufflebeam (CIPP) değerlendirme modelinin bağlam, girdi, süreç ve ürün boyutları açısından değerlendirmektir. Bu amaç doğrultusunda çalışmada "HMÖP'ün a) bağlamı, b) girdileri, c) süreci, d) ürünleri ve etkileri öğretmen ve öğrenci görüşleri açısından nasıl değerlendirilmektedir?" sorusuna cevap aranmıştır.

Yöntem

Bu çalışma HMÖP'ü Stufflebeam (CIPP) modeline göre değerlendirmeyi amaçlayan nitel bir çalışmadır. Araştırmada sınırlı bir sistemin derinlemesine betimlenmesi ve incelenmesine dayalı nitel araştırma desenlerinden durum çalışması kullanılmıştır (Merriam, 2018). Çalışma 2021-2022 eğitim öğretim yılı I. döneminde MEB'e bağlı bir Sosyal Bilimler Lisesinde yürütülmüştür. Çalışmaya 65 öğrenci, 4 matematik öğretmeni katılmıştır. Veri toplamak amacıyla matematik başarı testi, öğretmen ve öğrenci görüşme formları kullanılmıştır.

Bulgular

Çalışmanın bulgular bölümünde öğretmenlerle ve öğrencilerle yapılan bireysel görüşmelerden elde edilen nitel bulgulara ve matematik başarı testinden elde edilen nicel bulgulara yer verilmiştir. Bağlam değerlendirmesinde HMÖP'ün ders saati ve yeterliği öğrenci özellik ve ihtiyaçları açısından incelenmiştir. Öğretmenler programın yeterli olduğunu, öğrencileri üst sınıfa hazırladığını ve öğrencilerin eksik bilgilerini giderdiğini ifade etmişlerdir. Ancak öğretmenler programın içeriğinin bazı bölümlerinin yoğun olması nedeniyle yeterli bir biçimde uygulanamadığını belirtmişlerdir. Ayrıca öğretmenler ve öğrenciler haftada 2 saat ders

ve 1 saat uygulama şeklindeki planlamanın uygun olduğunu ancak bazı konuların içeriklerinin azaltılmasının program uygulamalarını rahatlatacağını ifade etmişlerdir.

Çalışmada HMÖP ve ders kitabı girdi olarak ele alınmıştır. İlk olarak öğretmenlerden programın kazanımlarının öğrencilerin düzeyine uygunluğu açısından görüş alınmıştır. Ortak görüş, kazanımların ortaokulun tekrarı şeklinde olması gerektiği ve programın öğrencilerin eksik bilgilerini tamamlamayı hedeflemesi gerektiği yönündedir. Ayrıca programda bazı kazanımların ve konu içeriklerinin öğrenci seviyesinin üzerinde olduğu ifade edilmiştir. Ancak, oyun etkinliklerinin öğrencinin ilgisini çektiğini belirtmişlerdir. Bir başka girdi olarak kabul edilen ders kitabı hakkındaki ortak görüş, ders kitabının öğrenci seviyesinin üzerinde hazırlanmış olmasıdır. Bir öğretmen konularda ardışıklık olmadığını dile getirirken bir öğretmen örnek sayısının artırılması gerektiğini belirtmiştir. Öğrenciler ders kitabındaki konu ve etkinlikleri genel olarak yapılabilir bulduklarını, etkinliklerin ortaokulda öğrenim gördükleri kitap ile aynı olduğunu ve bazı etkinlikleri hiç yapmadıklarını söylemiştir.

HMÖP'ün süreç boyutunun değerlendirmesinde program uygulamaları ve kullanılan öğretim yöntem ve tekniklerine ilişkin öğretmen ve öğrenci görüşlerine başvurulmuştur. Öğretmenlere programdaki uygulamaları nasıl buldukları, programı uygularkenherhangi bir değişiklik yapıp yapmadıkları sorulmuştur Öğretmenler ders kitabında bulunan etkinliklerin öğrenci seviyesinin üzerinde olduğunu düşünmektedirler. Bu nedenle ek kaynak kullanma gereği duymuşlardır. Aynı zamanda öğrenciler için zor olduğunu düşündükleri konuları işlemediklerini belirtmişlerdir. Öğrenciler ise öğretmenlerin ders kitabına ek olarak yardımcı kitap kullandıklarını ve çoğunlukla soru çözümü yaptıklarını ifade etmişlerdir.

HMÖP'ün ürün-etki değerlendirmesi boyutunda programın günlük yaşama aktarılabilirliği, bilgilerin kullanışlılığı, hazırlık sınıfı okuyup okumamanın matematik akademik başarısına olan etkisi, güçlü ve zayıf yönleri açısından ele alınmıştır. Öğretmenlerin ortak görüşü öğrenciler problem çözme becerilerini alışveriş yapma, zaman ölçme, sayma gibi günlük hayat durumlarında kullanmaktadırlar. Ancak öğrencilerle yapılan görüşmelerde bazı öğrencilerin dersle günlük hayattaki kullanım arasında bağ kurmada zorlandıkları anlaşılmıştır. Tüm öğretmenler hazırlık okuyanların daha başarılı olduğunu ifade etmiştir. Ama başarının neden kaynaklandığını net bir şekilde söylememişlerdir. Zihinsel gelişimin etkisinin olabileceği ve hazırlık sınıfında eksik bilgilerin giderilerek bir üst sınıfa geçilmesinin başarı farkını oluşturabileceği ifade edilmiştir. Öğrenciler programın avantajları olduğunu ifade etmişlerdir. Ortaokulun tekrarı olduğunu ve eksiklerini kapatıp iyi bir temel attıklarını dile getirmişlerdir. Diğer taraftan hazırlık sınıfı okuyan öğrencilerin matematik testinden aldıkları puanların ortalaması ($\bar{x}$:21.13) hazırlık okumayan öğrencilerin ortalamasından daha yüksektir. Ancak hazırlık sınıfı okuyan ve okumayan öğrencilerin matematik başarıları arasındaki bu farkın istatistiksel açıdan anlamlı olmadığı sonucuna ulaşılmıştır.

Son olarak, öğretmenler, programın güçlü yönü olarak oyun ve matematiğin tarihsel gelişimi etkinliklerini dile getirmişlerdir. Bunların öğrencilerin ilgisini çektiğini ve derse ilişkin olumlu tutum sergilemelerine katkı getirdiğini ifade etmişlerdir. Programın zayıf yönü olarak ise konuların öğrenci seviyesine uygun olmaması ve zor olarak adlandırılan etkinliklerin ve soruların olmasını belirtmişler, bunun yanında konu dağılımının 9. sınıfa hazırlık şeklinde olması gerektiğini söylemişlerdir.

Tartışma, Sonuç ve Öneriler

Araştırmanın bulgusu matematik öğretim programı değerlendirmesi yapan birçok çalışma ile benzerlik göstermektedir (Aközbek, 2008; Keskin, 2019; Önal, 2019). Birçok çalışmada programların bağlam ve girdi boyutları genel olarak olumlu algılanırken özellikle süreç ve ürün boyutlarında öğretmen ve öğrencilerden gelen eleştirilerin daha fazla ön plana çıktığı görülmektedir. Program geliştirme süreçlerinde ideal olan yaklaşımların göz önünde tutulduğu ancak okullar arası farklılıkların, öğrenci ve öğretmen özelliklerinin (Bümen, Çakar, Yıldız, 2014) programa bağlılığa, öğrenme-öğretme süreçlerine ve öğrenme ürünlerine çok fazla etki ettiği anlaşılmaktadır. Araştırma sonuçlarından hareketle aşağıda uygulayıcılara ve araştırmacılara önerilerde bulunulmuştur:

- Öğretmenler ders sırasında öğrenciyi merkeze alan öğretim yöntem ve tekniklerini kullanarak geleneksel eğitim anlayışı dışına çıkabilirler.
- Ders kitapları içerikleri bakımından tekrar gözden geçirilerek konular ve içerisindeki örnek sorular öğrenci seviyesi dikkate alınarak yeniden düzenlenebilir.
- Hazırlık sınıfı matematik ders kitabı çeşitliliği artırılabilir.
- Hazırlık sınıfı programı sadece 8. sınıf kazanımlarını kapsayacak şekilde düzenlenebilir.
- Bu araştırmada, bir sosyal bilimler lisesinin hazırlık sınıfı matematik öğretmenleri ve bu derse giren öğrencilerle çalışılmıştır. Araştırmanın kapsamının genişletilmesi adına farklı türde liselerin hazırlık sınıfı matematik öğretmenleri ve öğrencileri seçilebilir. Böylelikle farklı türdeki liselerin hazırlık sınıfı matematik öğretim programları daha kapsamlı değerlendirilebilir.
- Bu araştırma HMÖP değerlendirmesi konusunda yapılmış ilk çalışmadır. Bu bakımdan diğer araştırmacılar için elde edilen bulgular kaynak teşkil edebilir.