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DETERMINATION OF ACQUISITIONS RELATED TO "TIME AND CHRONOLOGY" IN BASIC EDUCATION COMPULSORY COURSES*

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ABSTRACT

It is a known fact that in order for students to acquire time and chronology skills in social studies education, it is necessary for them to complete certain mental development and preliminary learning. In this process, many courses contribute to the development of time and chronology. The aim of the study is to determine the extent to which learning outcomes that could be effective in the development of time and chronology skills are included in Curriculum. "Document analysis method" was used in the study. The data obtained were analyzed by "content analysis". In this context, the relevant teaching programmes were examined in 2021. As a result of the research, the following findings were obtained: "Life science, science, Turkish, mathematics, visual arts, social studies, Turkish language and arts curricula contain many learning outcomes related to "time and chronology", while no concrete data was found in other curricula. It is thought that these learning outcomes may directly or indirectly contribute to the development of "time and chronology skills".

Keywords: Social Studies, curriculum, time and chronology, course outcomes.

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INTRODUCTION

Humans have tried to determine which of the events that take place in a continuous flow is earlier and which is later, which is in the past and which is at a later date (Elias, 2000). This desire for determination has led to the necessity of positioning events and situations in a certain order in the temporal process, and this order has formed the basis of "chronology".

Chronology is the science of calculating and adjusting time or time intervals and recording and organizing events according to time (Tanaka, 2019). Time is "an abstract concept that provides the formation of day and night, weeks, months, seasons and years" (Çağatay, 1978). The measurement of time is determined according to the rotation period of the Earth in relation to celestial bodies (Hope, 1997).

The skill of perceiving time and chronology includes the sub-skills of "acquiring calendar information, distinguishing time (past-present-future time), using time expressions correctly, making chronological order, interpreting the data in the timeline and creating a timeline" (MoNE, 2018). This skill is realized in certain stages. At the age of 4, children can order their daily routine chronologically. At the age of 5, they know the days of the week, the names of the months, that the day is 24 hours long and can use concepts such as yesterday, today, tomorrow, morning and afternoon. They can also order events in the past as before and after. By the age of 6-7, they have a firm grasp of the calendar and clock time. At age 7, they can list the days, months and seasons and can tell which month it is. At age 9, a sense of historical time emerges. Can make chronological order. At the age of 10, they comprehend succession and continuity. At the age of 11, historical time perception develops. At the age of 13-14, their temporal cognition reaches the level of adults. At 14, can use time terms such as century. At age 15, can distinguish the differences between parts of a century. At the age of 16, they can use time concepts in a meaningful way and historical thinking begins (Hodkinson, 2004).

“Perceiving time and chronology" is one of the basic skills in the social studies curriculum. In the social studies learning areas, it is stated that "the ability to perceive time and chronology" should be acquired by students. In the learning areas of "Individual and Society" and "Culture and Heritage" in grades 4 and 6, and in the learning areas of "Science, Technology” and “Society and Production, Distribution and Consumption" in grade 7, this skill is emphasized in the realization of the learning outcomes. It was emphasized that "time, past, present-future connection", which is one of the basic principles of social studies, should also be taken into consideration while achieving the course outcomes.

In the light of the studies conducted, the factors related to the development of time and chronology perception are grouped and explained as follows:

Time measurement and calendar: Day, week, month, year formation (daily and annual movement of the Earth), calendar information, clock information.

Language development: time concepts, question-answer (discussion), chronology of events (Cooper. 2012)

Mathematical operations knowledge and skills: Number skills (understanding and counting numbers, knowing and using number facts, calculating, measuring, manipulating data, problem solving) (Hoodless, 2008 and Cooper, 2012).

In this context; "Time measurement, calendar, life sciences, science and mathematics; language development, Turkish language, mathematical operation knowledge and skills can be associated with mathematics curricula because the relevant outcomes are included in these curricula.

Time measurement and the calendar: The measurement of time and the preparation of calendars are the result of the observation of celestial bodies. The Earth completes its orbit around the Sun in a year of 365 days, 5 hours and 48 minutes. The cyclic period of 28 days and 12 hours in which the Moon completes one full revolution around the Earth is defined as a month, and the period between the two main phases of the Moon is defined as a week. The 24-hour period during which the Earth completes one complete revolution around its own circumference constitutes the day. During this cyclical movement, the sun sets and rises in some regions, creating "day and night". In order to learn these time concepts, it may be necessary to have a general knowledge of celestial bodies and a prediction of the Earth's rotation around the Sun and its orbit.

Language development: Language is one of the factors necessary for children to learn the concepts of time and chronology and to express these concepts after learning them. The development of language positively affects the development of knowledge and skills related to time and chronology, and the majority of studies agree that language development is central to the acquisition of an understanding of time (Sole, 2019). In this context, children should be taught time concepts such as duration, period, age, decade, century, millennium; because they need to have knowledge of what these concepts are in order to be able to perform and develop certain operations related to time (Cooper, 2012).

When children talk about what they remember or know, they reveal a lot about their awareness of time and chronology (Hoodless, 2008). In this direction, their knowledge can be revealed through the answers obtained from the questions asked to the students.

The time of events and the chronological order of events are very important in social studies education. Literary products such as stories, biographies, fairy tales, jokes and epics are among the methods that can be effective in helping students learn the time and chronological order of events and then internalize and use this knowledge. Students can be made to retell these products they have read or listened to in chronological order (Demircioğlu, 2015) or learn chronological order by asking questions such as "what did he do next, why did he do these actions in this order, what would have happened if he had not done this?" (Galan, 2016). Proficiency in language enables these activities to be carried out.

Knowledge and skills in mathematical operations: It is a well-known fact that mathematical knowledge and skills are important for time and chronology. In this context, the following assessments can be made.

Number Skills: Having number skills is very important in chronological operations. Children need to be able to read, write and order numbers, perform operations on a timeline, add and subtract numbers, and understand and use the concepts of B.C .and A.D. (Cooper, 2012).

Hoodless (2008) evaluated the relationship between mathematics and chronology under the following headings:

Understanding and counting numbers: Number skills, which develop with age, are necessary for children to understand and manipulate timelines and calendars. These skills are used in a variety of history-related activities. Number skills are closely related to the ability to understand and use dates and traditional timelines. Children's understanding of positive and negative numbers and where they appear on a number chart is also linked to an understanding of the division of BC and AD in historical chronology.

Knowing and using number facts: In order to work with timelines and calculate time intervals, children need to know how addition, subtraction and number facts are divided into decades.

Calculation Calculation skill is required to analyze certain statistical values. This skill is used in many processes related to time and chronology.

Measurement The measurement of time is one of the areas of mathematics with the closest connection to history. A sense of time is one of the goals that should be developed in the early years. In this direction, children are first expected to learn everyday language about time, to order events and objects chronologically, and to measure short periods of time. In the next stage, there are activities related to estimating time intervals and time, creating tables and graphs, and reading. All of these skills are used in work with timelines.

Problem solving Mathematical skills are needed to solve a historical problem related to chronology and reach a logical conclusion.

Data processing: Since historical science is a field that deals with vast amounts of data, it relies heavily on data processing methods. Mathematical skills are used to organize the collected data to create graphs, to read and interpret the graphs, and to make numerical calculations between the data.

Studies have revealed that "time measurement, calendar knowledge, language development and mathematical processing skills" help in teaching time and chronology. The following results were reached in the studies on the subject:

Şimşek (2006) confirmed that achievements in the concept of historical time and related chronology skills are related to their achievements in mathematics and language (Turkish). Accordingly, he found that achievements in chronology skills such as placement, sequencing, positioning, dating, distancing, and synchronicity were highly related to mathematics achievement and achievements in making sense of historical time terms were highly related to language (Turkish) achievement. Safran and Şimşek (2009) found that time perception does not

emerge spontaneously in children, but is shaped by age-related mental development and experience. Aktın and Dilek (2016) questioned early childhood chronological thinking skills and how children put these skills to work. Altun and Kaymakcı (2016) explained the place of time and chronology in history teaching by classifying the types of timelines. Demircioğlu (2005) stated that more than half of the eighth grade primary school students did not develop an understanding of the concept of century and could not know concepts such as chronology, calendar, Hijri Calendar, Gregorian Calendar correctly. Dawson (2007) stated that chronological development is closely linked to language and mathematical development, Harnett (2011) stated that with the development of mathematical understanding, children are able to perceive larger numbers related to time and perform operations, Wood (1995) stated that the development of the concept of time is closely linked to the development of language, Cooper (2012) concluded that number and calculation skills and language are essential for developing chronological understanding, Hoodless (2008) concluded that there are links between mathematical skills and chronology, Sole (2019) concluded that visuals are important for temporal development.

The aim of the study is to determine the extent to which learning outcomes that could be effective in the development of time and chronology skills are included in Curriculum.

1. What are the learning outcomes related to time and chronology in primary and secondary school curricula?
2. How can the contribution of the related objectives in the curriculum to the acquisition of "time and chronology" skills be evaluated?

METHOD

Methodology of the Research

Qualitative research document analysis method was used in the study. It was decided to apply this method because it was thought that document analysis was the best method that could serve the purpose of the research and there were appropriate documents for the research topic. Qualitative research can be defined as "research in which qualitative data collection techniques such as observation, interview and document analysis are used and a qualitative process is followed to reveal perceptions and events in a realistic and holistic way in a natural environment" (Yıldırım and Şimşek, 2013). Document analysis is a method used to systematically analyze written documents (Wach and Ward 2013). Document analysis is carried out in line with certain stages. These studies and researchers are tabulated below. Forster (1994) describes this process as accessing documents, checking originality, coding and categorising, data analysis and data utilisation; Fraenkel and Wallen (2006) describe it as determining the purpose of content analysis, determining coding categories, defining concepts, determining analysis units, determining the location of data, and establishing a logical structure. developing a sampling plan and analysis; and Altheide (1996) has evaluated it under the headings of determining criteria, data collection, determining areas of analysis, coding, verification, and analysis. In qualitative research, the concept of credibility is used for the internal validity of the data.

Population and Sample

The universe and sample of the research consist of the current primary and secondary school curricula (life science, science, Turkish, mathematics, visual arts, social studies, Turkish language and arts) that came into force in 2018.

Data Collection

By accessing the current primary and secondary school curriculum that came into effect in 2018, course outcomes related to time and chronology were determined. The universe and sample of the research consist of the current primary and secondary school curricula that came into force in 2018.

The stages of the "document analysis" method to be used in the research:

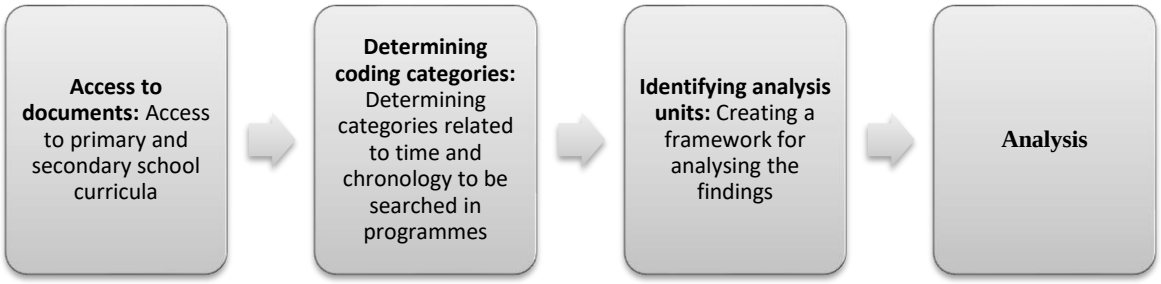

Figure 1: Document Analysis

Reliability and Validity

In order to increase credibility, the data should be presented in a clear and consistent manner and expert opinion should be taken. In this context, the collected data should be compared with each other, these data should be critically questioned, evaluated and compared with the data obtained with different data collection tools (Cansız Aktaş, 2019). Detailed description and expert review were utilised to ensure the reliability and validity of the research. In this regard, the aim was to provide sufficient information about the content and to convey the results faithfully to the nature of the data and without interpretation. To contribute to the reliability and credibility of the study, it was reviewed by an expert in the field to correct any errors and omissions (Yıldırım and Şimşek 2013).

Materials and Data Analysis

In the study, the criteria to be sought for time and chronology in 2018 primary and secondary school curricula were tabulated. Since the examined programs were handled in line with social studies, the grade preference was focused between 1 and 7. According to the table, the acquisitions related to time and chronology in the programs were determined. In this direction, only in the curricula of "life science, science, Turkish, mathematics, and visual arts" courses, achievements related to time and chronology were reached. No concrete data was found in other

programs. Then, the learning outcomes for developing time and chronology in the related curricula were tabulated. The data obtained were analyzed by content analysis. The purpose of content analysis is to reach the concepts and relationships used to explain the collected data (Yıldırım & Şimşek, 2013). In this context, firstly, a framework for data analysis was created based on the research questions. Then, based on the framework, the data were read, organized and defined. Finally, the findings obtained were explained and interpreted in a cause and effect relationship.

FINDINGS

Findings related to "time and chronology" in the life science curriculum:

One of the skills included in the life science curriculum is the skill of "perceiving time and space". In this direction, various achievements were included in the program.

Table 1. Outcomes Related to "Time and Chronology" in The Life Science Curriculum

Classroom	Unit	Course Outcomes
1	Life at Home	"Plans what they can do during the day. The time allocated for activities such as playing games, studying, resting, sleeping, eating, spending quality time with family and friends and using mass media is emphasized."
	Life in Nature	"They observe garden plants, wild plants and trees in their immediate surroundings, and how plants change over time (growth, defoliation and flowering, etc.). These issues are emphasized by making use of their observations."
		"Observes the Sun, Moon, Earth and stars. Topics such as the shape and size of the Sun, Moon, Earth and stars are emphasized"
		"Understands the changes that occur in nature according to the seasons."
2	Life at Home	"Implements the tasks planned during the day. The time allocated for tasks such as playing games, studying, reading, resting, sleeping, eating, spending quality time with family and friends and using mass media is emphasized."
	Life in Nature	"Investigates the effects of the Earth's shape and movements on human life. The formation process of the day, month, year and seasons is handled in a simple way. While explaining the formation of the day and year, the phenomena of the Earth's rotation around itself (rotation) and its orbiting around the Sun (orbiting) are utilized."

MoNE (2018) Life Science Curriculum

Time cognition in children develops gradually. First, this development starts with terms such as before, after and now. The perception of time, which begins to form starting from the preschool period, continues its development with the acquisitions in the primary school curricula. In this direction, it was found that certain learning outcomes in the "life science curriculum" examined and listed in Table 1 have connections with time and chronology. When Table 1 was analyzed, the following results were reached:

In the 1st and 2nd grades, there are gains related to time management in the nature of "perceiving the duration of time spent on certain activities and planning this time". These outcomes are considered to be important for the beginning of time awareness.

Social Studies Education Program Grade 5 *"While planning personal time, the importance of taking into account the situations of playing games, studying, reading, sleeping, spending quality time with family and friends and using mass media is emphasized.* "The learning outcome is similar to these outcomes.

In Grade 1, with the outcome "plants are observed and their change over time is recognized.", the foundation is laid for the linear progression of time and the perception of temporal change that occurs in this process. In addition, the change in seasons during the passing of time also supports this awareness.

The social studies curriculum also includes acquisitions related to the change of time. For example, comparing traditional children's games with the present day in 4th grade, comparing the past and present use of technological products, the change of cultural elements in 5th grade, the change of social roles over time in 6th grade, the importance of soil in the past and present in 7th grade can be given as examples of these acquisitions. Acquisitions related to the change of time can be included in the "life science course curriculum" beforehand and can form a prediction for later.

Factors that make up time such as the Sun, Moon, Earth and stars are included in the 1st grade life science lesson outcome. In Grade 2, the shape of the Earth, its rotation around itself and the Sun, and the resulting concepts of "day, month, year" are important elements for time perception. In the "science, technology, society" unit of the social studies education program, topics related to the shape of the Earth and time calculations are included in line with the relevant acquisitions.

When Table 1 is evaluated, it is concluded that the relevant learning outcomes in the life science curriculum have qualities that have basic features in the formation of "time and chronology" perception. It is thought that these outcomes can contribute to the development of time and chronology skills in "social studies education".

Findings related to "time and chronology" in the science curriculum:

Table 2. Outcomes Related to "Time and Chronology" in The Science Curriculum

Classroom	Unit	Course Outcomes
4	The Earth's Crust and the Movements of the Earth	"Explains the difference between the Earth's rotational and circular motions." " Explains the events that occur as a result of the Earth's movements. (The rotational motion of the Earth is mentioned.) The circular motion of the Earth is mentioned. The change in the position of the Sun during the day due to the rotation of the Earth is mentioned. The formation of day and night is mentioned. The concepts of day, year, time are given.)"
5	Sun, Earth and Moon	" Explains the rotation and circulation movements of the Moon. (The concept of the moon as a time period is mentioned. Explains the relationship between the phases of the Moon and the movement of the Moon around the Earth. It is stated that the time between the two main phases of the Moon is one week.)" " Prepares a model representing the movements of the Sun, the Earth and the Moon relative to each other. (The direction of the Moon's orbit around the Earth is indicated. The direction of the Earth's orbit around the Sun is indicated.)"
6	Solar System and Eclipses	"Predicts how a solar eclipse occurs. (It is mentioned that there is not a solar eclipse every month.)" "Predicts how a lunar eclipse occurs. (It is mentioned that there is not a lunar eclipse every month.)"
7	Solar System and Beyond	Recognize the star formation process.

MoNE (2018) Science Curriculum

For the development of time and chronology skills, students need to know the annual and daily motion of the Earth and the concepts of day, week, month and year formation. These outcomes are directly included in the science education program.

When Table 2 is examined, it is seen that the concepts of rotation and circulation of the Earth and the concepts of night-day, day, day and year formation are mentioned in the 4th grade science education program.

In the 5th grade, the concept of the moon as a term of time, the rotation and circulation of the moon, the phases of the moon, and that the time between two phases of the moon is one week were mentioned.

In 6th and 7th grade, the solar system is mentioned. In 8th grade. The formation of seasons and climate in relation to the relationship between the Earth's axis of rotation and the plane of orbit around the Sun.

These topics in the science curriculum are also indirectly included in the "science, technology, society" unit in social studies education. In this context, it is thought that the related acquisitions help the development of time and chronology.

Findings related to "time and chronology" in the turkish curriculum: "Time and space" is one of the themes in the Turkish course. In this direction, there are many acquisitions related to time and chronology in the program.

Acquisitions Related to Time and Chronology in The Turkish Curriculum:

Table 3. Acquisitions Related to Time and Chronology in The Turkish Curriculum

Classroom	Skill Area	Course Outcomes
1	Listening/watching	"Makes predictions about the development of events in what he/she listens to/watches." "Narrates the text he/she listens to/watches. He/she is encouraged to tell the events according to the order of occurrence."
2	Listening/Watching Reading (comprehension) Writing	"Makes predictions about the development and outcome of the events in what he/she listens/watches. " " Narrates the text he/she listens/watches. It is ensured that the events are told according to the order of occurrence." "Explains the main points of what they read. Attention is paid to the order of events." "They write short texts. They are made to write the events in order of occurrence."
3.	Listening/Watching Reading (vocabulary) Writing	"Makes predictions about the development and outcome of events in what he/she listens/watches." "Explains the main points of what he/she reads. It is ensured that the events are told according to the order of occurrence." "They write short texts. They are made to write the events in the order of their occurrence." "Writes a narrative text. It is emphasized that the events should be written according to the order of occurrence."
4.	Listening/Watching Reading (comprehension) Writing	"Makes predictions about the development and outcome of events in what he/she listens/watches." "Explains the main points of what they read. Attention is paid to the order of events." "Writes a narrative text. a) The necessity of writing the events in the order of their occurrence is reminded."

		" Writes numbers correctly. The writing of numbers with letters, the writing of numbers consisting of more than one word, the writing of Roman numerals are emphasized."
5	Listening/Watching	"Makes predictions about the development and outcome of events in what he/she listens/watches."
	Reading (comprehension)	"Determines the story elements in the text. Plot, space, time, place, time, person and being cast, narrator, etc. story elements such as story elements are emphasized."
	Writing	" Writes numbers correctly. Emphasis is placed on the writing of fractional numbers, ordinal and multiplication numbers, and numbers with four or more digits."
6	Listening/Watching	"Makes predictions about the development and outcome of events in what he/she listens/watches."
	Reading (comprehension)	"Determines the story elements in the text. The plot, space, time, time, person and being cast, narrator are emphasized."
	Writing	"Writes a narrative text. It is ensured that students determine the elements of time, place, person and event, and create a draft of what they will tell in the exposition, node and solution sections of the story."
7	Listening/Watching	"Makes predictions about the development and outcome of the events in what he/she listens/watches.
	Reading (comprehension)	"Determines the story elements in the text. The plot, space, time, time, person and being cast, narrator are emphasized."
	Writing	"Compares the written texts with the media presentations. It is ensured that they are compared in terms of heroes, place, time and event."
		"Writes a narrative text. Students determine the elements of time, place, person and event and create a draft of the story's exposition, node and solution sections."

MoNE (2019) Turkish Curriculum

Language is necessary for children to learn concepts related to time and chronology and to express their knowledge on this subject. In this direction, the following inferences can be made from the achievements in the areas of "listening, watching, reading (comprehension) and writing skills" in the Turkish curriculum.

Listening, watching: The outcome "*Makes predictions about the development and outcome of the events in what he/she listens/watches*." was included in every grade level from Grade 1 to Grade 7 and continued developmentally. This outcome improves students' perceptions about the chronological developmental course of events and helps them gain skills. In order for historical literary or audio-visual activities in social studies and history education to be perceived chronologically, children need to have acquired this skill. For example, when making inferences about the cause and consequence of a war or making connections between events, the necessary mental preparation is supported by the Turkish lesson outcomes.

In 1 and 2 classes, the outcome "Encouraged to tell the events in the order of their occurrence." is thought to directly help the development of chronology skills.

Reading (comprehension): In grades 1, 2, 3, 4, "describes the main points of what he/she reads. Attention is paid to telling the events in the order of their occurrence." The acquisition supports the positioning of historical texts in a chronological order.

As the past is different from the present and the future, it is also different from each other among its periods. In this context, it is necessary to perceive time in order to perceive how the period is compared to time and the

change and continuity in the process. In the Turkish "5th, 6th, 7th, 8th grade program, "Determines the story elements in the text. ...time, person, etc." supports the development of time perception.

Writing: In grades 1.2.3.4, the learning outcome "writes events in the order of their occurrence" can help to make chronological order in historical writing activities. Knowledge of time and chronology also includes numerical terms. Hours, days, months, years, centuries... are expressed numerically. Children need to be able to perceive these terms if they want to learn about history and the chronological order of these dates. In grades 4 and 5, the learning outcome of "writing numbers correctly" supports this skill. Especially the 4th grade outcome "writing Roman numerals" is considered to be important because this outcome is not included in the social studies curriculum, but it is widely used in books. If the student does not learn Roman numerals in Grade 4, he/she is likely to have problems in future lessons. In the outcome 6.7.8, "writes narrative texts", the element of time was again emphasized.

Studies have emphasized the importance of language development in the acquisition of time perception and chronology skills (Cooper. 2012). In this direction, it is thought that the learning outcomes in the Turkish curriculum support the teaching of time and chronology in social studies education. For example, in the 4th grade social studies curriculum "The student is enabled to chronologically order the events that he/she considers important in his/her own life (birth, first speech, starting school, etc.)." A connection can be established between the learning outcomes in the Turkish curriculum of "telling and writing events in the order of occurrence". The element of "time" in the texts is frequently emphasized in the subjects in line with the achievements of the "culture and heritage" unit in the social studies curriculum. In addition, certain time concepts (such as Roman numerals) in the social studies curriculum are taught with the outcomes of the Turkish curriculum.

Findings related to time and chronology in the mathematics curriculum:

Table 4. Acquisitions Related to Time and Chronology in The Mathematics Curriculum:

Classroom	Unit	Course Outcomes
1	Measurement	"Reads full and half hours." "It shows the times of certain activities during the day. For example, breakfast, lunch, dinner, bedtime, start and end of the school day, etc. It is worked over 12 hours."
	Data processing	"Indicates the day, week and month on a calendar." "Makes sequences with reference to specific events and situations. Sequences events chronologically using the words before-after, first-end, today-today-tomorrow, morning-afternoon-evening, night-day." " Reads simple tables with at most two groups of data. Students are made to read tables that they frequently encounter or use at school, such as daily nutrition tables and calendars."
2	Measurement	Reads and displays whole, half and quarter hours. Examples of time use over 24 hours are given. The words exact time, before noon, afternoon, morning, noon, evening and midnight are used. Analog and digital clocks are used together. Adjustment work is done on the clock.
	Data processing	"Explains the relationship between units of time measurement. It is limited to minute-hour, hour-day, day-week, day-week-month, month-season, season-year relationships. " "Solves problems related to units of time measurement. Remains within the class number limitations."

		Collects and categorizes data by asking questions about a problem or a topic, organizes them in the form of a tree diagram, tally or frequency table; creates object and figure graphs.
3	Measurement	" Tells, reads and writes time in minutes and hours. " "Explains the relationship between time measurement units. " Explains the relationship between year-week, year-day, minute-second. "Compares the duration of events." "Measurement and comparison of the time between the beginning and the end of tasks, a specific work or action." "Examples where different time measurement tools such as hourglasses are used are also included."
	Data processing	"Solves problems using units of time measurement." "Explains the information shown in a figure and object graph, transforms and interprets the graph into a tally and frequency table." "Solves problems that require addition and subtraction operations by using the information given in the graphs or by creating graphs." "Reads and interprets simple tables of at most three groups of data and organizes the data obtained from the table."
4.	Measurement	" Explains the relationship between units of time measurement." "Conversions between hours-minutes, minutes-seconds are made." "Conversions between year-month-week, month-week-day are made." "When converting, the leap year is also addressed." "Solves problems using units of time measurement. " "The importance of time management in problems is emphasized."
	Data processing	"Examines the bar graph, makes comments and predictions on the graph." "Constructs a bar graph." "Uses different representations to present the data obtained." "Solves problems related to daily life using information shown in bar charts, tables and other graphs."
5	Measurement	"Recognizes and converts units of time measurement and solves related problems." "Seconds, minutes, hours, days, weeks, months and years are considered." "Problems related to time management are addressed."
	Data Processing	"Formulate research questions that require data collection." "Collects data related to research questions and shows them in frequency tables and column graphs." "Solves problems related to the interpretation of data represented by a frequency table or column graph."
6	Data Processing	"Formulate research questions that require comparing two sets of data and obtain appropriate data. How many hospitals were in service in the five major cities in 1990 and 2010?" "Shows the data of two groups with a binary frequency table and a column graph." "Data Analysis Terms or concepts: minimum value, maximum value, span, arithmetic mean" "Calculates and interprets the openness of a data set." "Calculates and interprets the arithmetic mean of a group of data." "Uses arithmetic mean and range in comparing and interpreting the data of two groups."
7	Data Processing	"Creates and interprets line graphs related to data" "Finds and interprets the mean, median and peak value of a data group." "Constructs and interprets a circle graph for a group of data." "Shows data in column, circle or line graphs and makes appropriate transformations between these representations."

MoNE (2018). Mathematics Curriculum

In the development of time perception and the acquisition of time and chronology skills, skills such as counting, addition, subtraction, calculation, measurement and problem solving should be developed in addition to knowledge of the clock and calendar. For example, in order to be able to perceive when a historical event occurred, how long before, how long after or at the same time with other events, and to be able to sort events

according to their dates of occurrence, measurement, calculation and problem solving skills must be developed. Acquisitions to develop these skills are included in the mathematics curriculum.

When the learning outcomes related to time and chronology in the mathematics course were evaluated, the following findings were obtained:

Most of the operations such as counting, addition and subtraction, which are related to time and chronology skills, are acquired in mathematics lessons. These operations are included in all learning outcomes at certain rates. In addition, "measuring and collecting data, organizing, reading and interpreting data" also help the development of time and chronology skills.

Measurement: When Table 4 is analyzed, it is seen that from Grade 1 to Grade 5, there are acquisitions that improve measurement skills. In Grade 1, it is aimed to "use the calendar, to use the calendar by indicating the day and month, to realize that there are 7 days in a week, to read full and half hours". At this level, the student begins to learn how to read a clock and use a calendar, and becomes able to perform simple tasks related to the chronological ordering of events.

In Grade 2, while the development of time measurement continues with the goal of "reading whole, half and quarter hours", at the same time "minute-hour, hour-day, day-week, day-week-month, month-week-month, month-season, season-year relationships are started to be comprehended. The first steps are taken towards solving time problems in line with the class level.

In Grade 3, it was aimed for students to be able to read the time in minutes and hours and to explain the relationship between year-week, year-day, minute-second, and the program included achievements in this direction. In the 4th grade, it is aimed to "make the conversion between year-month-week, month-week-day. In the 5th grade, it is envisaged that they will be able to solve problems related to conversion operations.

When the achievements in the mathematics curriculum are evaluated, it is seen that at the end of the 5th grade, it is aimed that students will have mastered the basic concepts of time, gained the ability to measure and calculate time, and be able to solve problems related to time. In the social studies curriculum, time and chronology are emphasized at certain rates in all unit areas and numerical calculations are needed from time to time. In this context, it is thought that the achievements in the mathematics curriculum help to make these calculations.

The skills of "collecting, organizing (creating tables and graphs), reading, calculating and interpreting data" are necessary to determine the change in any event or situation over the years or to read and interpret a graph. These skills develop with numerical processing skills. In particular, it is used to chronologically order the amount of change in a situation over the years or to interpret a given graph and to make calculations between data. These operations are also needed, for example, when preparing a timeline based on data collected on various topics.

When Table 4 is examined, it is seen that the acquisition of "data collection and evaluation" in the "data processing" unit continues developmentally from the 1st grade to the 8th grade. In 8th grade, the student becomes able to analyze the data.

Data collection and evaluation are used in chronological processes. For example, when sorting the literacy rate between years x and y chronologically by year, the data on how many people can read and write in which years is first collected and the collected data is organized by year. Or, when reading such a pre-prepared graph and making calculations between years, mathematical operations are again used.

In the social studies curriculum*, "Observes the weather events occurring around him/her and transfers his/her findings to pictorial graphics. While transferring weather events, the skills of reading and creating graphics are emphasized*, and the 7th grade outcome "*Interprets the data about the demographic characteristics of our country by using tables and graphs. "*can be linked to *the "data processing"* outcomes in the mathematics curriculum.

Findings related to time and chronology in the visual arts curriculum:

Table 5. Findings Related to Time and Chronology in the Visual Arts Curriculum

Classroom	Unit	Course Outcomes
3	Culture and Heritage	Explain how works of art and traditional arts reflect different cultures and periods.
4	Culture and Heritage	Tell the common features of the artworks of different cultures in the museum.
5	Culture and Heritage Art Criticism and Aesthetics	Tells the differences between the works of art made in the past and today. Analyzes a work of art according to the period and conditions in which it was made.
6	Culture and Heritage	Examines the artifacts of Anatolian civilizations through museums.
7	Culture and Heritage	Examines the impact of historical events on works of art.

MoNE (2018). Visual Arts Course Curriculum

It is a known fact that visuals are an effective method in teaching time and chronology. Abstract historical periods, which are difficult to perceive in the past, can be concretized through visuals and in this direction, it helps the development of time perception. Studies have revealed that visuals are an effective method in teaching time and chronology.

It is thought that the acquisitions in table 5 in the visual arts curriculum support the perception of time positively. Acquisitions such as "Traditional arts reflecting different cultures and periods in 3rd grade, common features of works of art belonging to different cultures in 4th grade, common features of past and present works of art in 5th grade, examining the works of Anatolian civilizations in 6th grade, examining the work of art according to the period in which it was made in the 5th grade art criticism and aesthetics unit" in the culture and heritage unit are thought to be effective in the formation of historical time perception. Since these acquisitions concretize the perception of abstract historical time by supporting it with visuals, they can be used to gain time and chronology skills in social studies education.

Findings related to time and chronology included in the social studies curriculum:

Table 6. Findings Related to Time and Chronology İncluded ın The Social Studies Curriculum

Classroom	Unit	Course Outcomes
4	Individual and Society	Puts major events in their life in chronological order.
	Culture and Heritage	Compares traditional children's games with current games in terms of change and continuity. Understands the importance of the National Struggle based on the lives of its heroes.
	Science, Technology, and Society	Compares the past and present uses of technological products. Researches the inventors of the technological products they use and the development of these products over time.
5	Culture and Heritage	Recognizes the significant contributions of Anatolian and Mesopotamian civilizations to human history based on their tangible remains. Evaluates the historical development of cultural elements in daily life.
6	Individual and Society	Examines the change in social roles over time.
	Culture and Heritage	Interprets the emergence of Islam and the changes it brought about. Recognizes the changes that occurred in the political, social, and cultural spheres with the Turks' acceptance of Islam. Analyzes the process of the Turks settling in Anatolia within the scope of the 11th and 13th centuries. Proposes ideas about the effects of scientific and technological developments on future life.
	Science, Technology, and Society	Proposes ideas about the effects of scientific and technological developments on future life.
7	Individual and Society	Discusses the role of media in social change and interaction.
	Culture and Heritage	Explains the process of the Ottoman Empire's emergence as a political power and the factors that influenced this process. Understands the processes that forced the Ottoman Empire to change in connection with developments in Europe. Draws conclusions about social and economic change based on the institutions that emerged as a result of the reform movements in the Ottoman Empire.
	People, Places, and Environments	Draws conclusions about the factors affecting settlement from the past to the present through case studies.
	Science, Technology, and Society	Examines change and continuity in the preservation, dissemination, and transfer of knowledge. Analyzes the impact of developments in Europe between the 15th and 20th centuries on the formation of today's scientific knowledge.
	Production, Distribution, and Consumption	Explains the importance of land in production and management with examples from the past and present. Identifies the institutions that have played a role in vocational training and instilling professional ethics among Turks throughout history. Analyzes the changes brought about by digital technologies in the production, distribution, and consumption network.

MoNE (2018). Social Studies Curriculum

The inclusion of learning outcomes related to time and chronology in each unit of Social Studies education demonstrates that the programme views fostering historical awareness in students as one of its fundamental objectives. These learning outcomes are structured in a sequential and progressive manner, helping students to understand the processes from the past to the present in stages. Thus, students not only learn the historical sequence of events, but also gain the opportunity to develop a deeper historical perspective by understanding the continuity, change and interactions between these events. This structure moves chronological thinking

beyond being merely a means of conveying information, contributing to students' ability to relate different time periods and make critical interpretations.

CONCLUSION and DISCUSSION

One of the achievements that should be gained in social studies education is the development of time and chronology perception. Time and chronology are included in all learning areas of social studies education at certain rates and it is aimed to develop this skill. The course outcomes that aim to develop this skill are directly or indirectly included in the curricula of "life science, science, Turkish, mathematics, visual arts". When the programs were examined in this direction, the following results were reached:

Children's cognition of time develops gradually, so simple learning activities are needed at first to build their perceptions. Harnett (2011) explained this situation with example sentences as follows. "I did this before I started school, I learned to read after I started school, then I went to the library, we watered the seeds after we planted them". The days of the week, the months of the year, the names of the seasons provide support for this development. In the following stages, they have a greater awareness of time periods. In this direction, it is thought that the life science course outcomes in the 1st and 2nd grade curriculum are related to the development of time and chronology perception.

Day, month and year are formed as a result of the Earth's rotation around the Sun and itself. While teaching these concepts to children, general information about celestial bodies and the annual and daily movements of the Earth should be taught. Acquisitions related to this subject such as "Solar system, rotation and circulation of the Earth and the formation of day, night, day, day and year, rotation and circulation of the Moon, phases of the Moon, formation of week and month" are included in the science curriculum. Therefore, basic information about what concepts such as "day, week, month, year" related to time and chronology are included in the science curriculum.

Language development is very important in gaining an understanding of time. Şimşek (2006) concluded in his study that there is a high level of correlation between language (Turkish) achievement and making sense of historical time terms. "Properly used tense language can simplify the past and events" (Thornton & Vukelich, 1988). In this direction, the Turkish lesson curriculum includes many course outcomes related to time and chronology.

While historical texts are made sense of by the student, the order of time and events, i.e. chronology, is taken into account. In the Turkish lesson curriculum, the acquisition of "narrates and writes the events he/she listens to and reads according to the order of occurrence" is repeated developmentally. This outcome is indirectly related to the development of time and chronology skills.

The achievements in the Turkish lesson curriculum emphasize the element of "time" in the texts. Stories are one of the effective methods used to create "historical time perception" in social studies education. Stories contain

many clues about the time-related structure of the period. However, in order for students to benefit from these texts, they need to reach the competence to analyze a story. It is thought that these achievements in the Turkish curriculum can help students make these analyzes and gain historical time perception.

Many numerical terms are used in social studies textbooks. Students need to be able to read these terms correctly in order to internalize the information correctly; however, the learning outcomes related to reading these terms were included in the Turkish curriculum. For this reason, it is thought that the Turkish curriculum has an important mission in terms of teaching time-related numerical terms.

The mathematics curriculum includes learning outcomes related to "counting, adding, subtracting, calculating, measuring, solving problems, collecting data, and performing operations on the collected data" as well as "clock and calendar knowledge" which are directly or indirectly related to time and chronology. Students learn to read clocks, use calendars, measure and calculate time in mathematics lessons. Şimşek (2006) found that there is a high level of correlation between chronology skills and mathematics achievement. Accordingly, it is thought that mathematics knowledge contributes to the development of time and chronology knowledge and skills.

Utilizing visuals in teaching history is another effective method used in teaching time and chronology. Activities related to the characteristics of the historical period described by the visuals and the comparison of that period with the present also contribute to the formation of historical time perception. In this direction, it is thought that the related acquisitions in the "visual arts" course are important for the development of time and chronology.

When the primary and secondary school curricula were evaluated in general, it was found that the learning outcomes related to time and chronology are not only in social studies but also in life science, science, Turkish and mathematics curricula. It is thought that these learning outcomes in different disciplines are related to time and chronology in a complementary way and can be associated with the learning outcomes in the social studies curriculum.

SUGGESTIONS

"Time and its chronology" is formed gradually and in a certain process. There are various acquisitions related to time and chronology in different curricula. In this direction;

1. It should be taken into account that the acquisitions related to time and chronology in different disciplines are prerequisites and complementary to each other.
2. The gradual development of the programme's intended outcomes in a manner appropriate to different age groups will contribute to ensuring continuity in students' perception of time.

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