Critical Thinking Skills in Early Childhood

Who For?

Parents

Preschool Teachers

School Counselors

Childhood Specialists

Child Psychologists

1. Thinking

Thinking is the most basic human characteristic. Fisher stated the importance of thinking by saying, "If we didn't think, we wouldn't exist". Thinking is a feature of human beings that starts with birth and can be developed directly or indirectly throughout life. Thinking is defined as "examining and comparing information in order to arrive at a conclusion and generating thoughts by making use of the interests, forming mental abilities and reasoning". Thinking can be explained as the whole of deliberate mental behaviors that are attempted to prevent/destroy events that disturb the individual in terms of internal or external factors and disrupt the physical and mental balance of the individual. Thinking is a complex phenomenon, so it is important to support this skill especially from the pre-school period.

Preschool children between the ages of 3-6 can make decisions by thinking about their own behaviors and can explain their own and others' behaviors using their knowledge and experience. For children, memorizing or memorizing information to remember is not exactly thinking. When children analyze and remember the ending situations, they perform the real act of thinking. Because thinking is the ability to use existing knowledge in new situations as a logical phenomenon.

1.1. Thinking Skills

Thinking skills are the basic skills that make the individual active, develop the sense of taking responsibility in the individual's learning, ensure that learning is permanent, and provide research methods.  Thinking skills have been classified in various ways. For example, thinking skill; We can consider three parts as problem solving skills, critical thinking skills and information processing skills, or we can consider thinking skills in stages as "basic operations, problem solving, decision making, critical thinking and creative thinking". The basic operations in this classification are to determine cause and effect relationships, to identify analogies, to identify relationships, to classify and to identify attributes.

Problem solving includes the skills of overcoming a defined difficulty/difficulty, combining the existing information about the difficulty, determining the data to be collected about the difficulty, producing solutions, testing the solutions produced, and trying to find simpler expressions of the problems. Decision-making includes the skills to combine available information on the subject, compare options, identify needed information, and determine the most appropriate one among the options. Critical thinking skills, on the other hand, can be explained as analyzing expressions,

recognizing unexpressed implicit thoughts, being aware of prejudices, and searching for different ways of expressing thoughts.

Creative thinking generally consists of the skills of creating an original and aesthetic product by using the logical and intuitive aspects of thinking. At the basic level of thinking, the information presented without an effort to produce something new must be placed in the mind, while in higher-order thinking skills, the information in the mind must be interpreted and structured.

2. Higher Order Thinking Skills

There is a significant difference between basic and higher-order thinking skills. Basic thinking requires routine or mechanical practices, such as listing and sorting pre-existing information. High-level thinking involves the child's interpretation, analysis, and manipulation of information by going beyond the routine problem. Higher-order thinking includes examining a problem, asking, proposing solutions, planning for research, and creative actions. In higher-order thinking, there is detailing the existing material/situation, making inferences beyond what is presented, constructing adequate representation, analyzing and constructing relationships. While using higher-order thinking skills, basic processes such as observation, measurement, inference, estimation, classification, data collection and recording are used.

The relative nature of higher-order thinking, the National Council of Teachers of Mathematics (NCTM) commission noted in its report, 'a real problem arises when one or more suitable solutions have not yet been developed for the individual or group concerned'. For example, a child who knows the formula for the area of a rectangle but does not know the formula for the area of a parallelogram will face a real problem when asked to find the area of a parallelogram. The child who knows the formula for the area of a parallelogram will encounter a problem if he asks the same question, but this is not a problem that requires high-level thinking. The need for an individual to use higher order thinking depends on the nature of the task and the person's intellectual history.

Higher-order thinking occurs when a person takes new information and existing knowledge and/or rearranges it and expands that knowledge to achieve a goal or to find possible answers in surprising situations. With this high-level thinking, the following objectives can be achieved; deciding what to believe; decide what to do; to create a new idea, new object or artistic expression; guessing and solving a non-routine problem. In order for children to understand what they read, they need to extract and use information that goes beyond what is written in the text. In addition to basic thinking processes, high-level thinking skills should be used.

2.1. Critical Thinking

In the past, problem solving and critical thinking skills have been used interchangeably. Thinking critically over time; It is seen that it is accepted as an evaluation of the value of reality, accuracy, knowledge, claims/evidence. Critical thinking is the type of logical, reflective thinking that focuses on deciding what to believe or do. It is a tendency towards reflective skepticism that allows for accurate assessment of situations.

We can explain critical thinking as "development and evaluation of claims/evidence". Critical thinking can be defined as an active process that includes discussions, not just evaluating them. Generating evidence includes the usual steps of problem solving: identifying background information, forming plausible hypotheses at the beginning, developing procedures for testing these hypotheses, voicing an argument from the results of these testing procedures, and evaluating and revising the arguments as necessary.

The history of critical thinking goes back to the famous Greek philosopher Socrates (470 BC - 399 BC). Socrates developed an inquiry technique, also called the Socrates method, which is still valid today. This technique is based on asking questions and aims to show that sometimes certain information may not make sense when questioned in depth. The views of the famous educational philosopher John Dewey have also shaped critical thinking. Dewey (1933) attributed the quality of one's thinking to his experience with his environment. One of the main points in his theory, known as the "learning by doing" approach, is that this experience is an inquiry process that encourages the student to think critically.

We can list the basic features of critical thinking as follows:

- Critical thinking is based on reasoning and reasoning. Inferences made in the critical thinking process should be based on appropriate, valid and solid evidence and should not be arbitrary.

- Critical thinking requires reflection: Developing a thought requires conscious consideration of other's and own thoughts.

- Critical thinking requires focus: It requires purposeful thinking. This goal is to make the best decision about what an individual does or believes.

When these features are examined, it is seen that there is a parallelism between critical thinking and problem solving, and that critical thinking has common points with creative thinking. Therefore, it is possible to say that thinking skills are intertwined with each other. Since each discipline and researcher focuses on their own field of interest in critical thinking, many different definitions of critical thinking have emerged and most of these definitions have been reductionist definitions. These definitions have made the mistake of seeing critical thinking as synonymous with logical thinking, methodical thinking, creative thinking, rational thinking, making judgments, and problem solving.

A Delphi Project (1988-1989) was carried out under the leadership of Peter Facione, an important researcher in critical thinking, to resolve the complexity of the definition of critical thinking. The Delphi technique is based on the principle that "Many opinions and thoughts on a particular subject are more meaningful than a single opinion". In the Delphi technique, the negative/positive effects of people on others are eliminated, as experts never see each other, as in face-to-face communications. The answers of the experts are checked, feedback is provided and statistical analysis of the answers is made. The Delphi technique for critical thinking is aimed at providing unity of concept.

In the conducted Delphi Project, it was clarified which skills critical thinking covers in line with the opinions of the experts. The project consisted of experts in philosophy (52%), education (22%), social sciences (20%), and physical sciences (6%). Experts stated that critical thinking includes cognitive skills of interpretation, analysis, evaluation, inference, explanation and self-regulation. All of these six skills are at the core of critical thinking.

In the Delphi Project, it was decided that critical thinking encompasses the following skills:

Interpretation: Understanding and expressing the meaning or importance of various experiences, situations, events, data, beliefs, traditions, judgments, rules, procedures or criteria.

Analysis: To reveal purposive and contemporary inferential relationships between statements, concepts, questions, descriptions, or other types of explanations intended to reveal judgments, beliefs, experiences, reasons, knowledge, or opinions.

Evaluation: Evaluating the reliability of statements , such as a description or explanation of a person's perception, experience, position, belief, judgment or opinion; assessing whether actual or planned inferential relationships between statements, descriptions, questions, or other types of statements make sense.

Making Inferences: Identifying and achieving what is required to reach logical conclusions; making assumptions and hypotheses; Reflection on relevant information and conclusions drawn from data, statements, evidence, judgments, beliefs, opinions, concepts, descriptions, questions, or other types of presentations.

Explanation: A person states the consequences of reasoning/judgment; a person's justification of judgment made in the conditions of clear, conceptual, methodological, criterion-reasonable and situational considerations based on results, and presenting one's reasoning with convincing evidence.

Self-regulation: The conscious examination of one's own cognitive activities, questioning, validating, confirming the factors used in these activities, or specifically applying the skills to analyze and evaluate one's own inferential judgments with a view to correcting one's reasoning or conclusions.

The disposition dimension, which is another dimension of critical thinking, has also become clear with the Delphi Project. About two-thirds of the experts participating in the project argued that critical thinking includes certain affective tendencies, while about one-third of the group argued that critical thinking includes cognitive skills and tendencies, not affective tendencies. This situation created the deepest division in the study. Most of the experts (61%) argued that affective tendencies constitute the meaning of critical thinking. A minority of experts (30%) insisted that critical thinking refers to a judicial process.

It is known that critical thinking depends on the ability and tendency to acquire, evaluate and use information effectively, and we can state that there are five basic dimensions of critical thinking and these are "consistency, unification, applicability, competence and ability to communicate". Consistency is related to the critical thinking individual's being aware of the contradictions in thought and being able to eliminate these contradictions. It is expressed that the combining dimension and the critical thinker can establish relationships between the dimensions of thought. According to the applicability dimension, the critical thinker should be able to apply his thoughts on a model.

The competence dimension indicates that the critical thinker can base his experiences and results on realistic foundations. On the other hand, in the dimension of communication, the critical thinker can share his thoughts in an effective and understandable way. We can also define critical thinking as "the art of thinking about thought". Different definitions are as follows: "Critical thinking is the mental processes, strategies and presentations that people use when generating solutions to problems". "Instead of coming to an absolute conclusion about the information read, found or said, it is also to consider that there may be alternative explanations".

Critical thinking is the mental activity of evaluating arguments or propositions and making decisions that can guide and act on the development of beliefs. Complete and genuine critical thinking consists of two parts. First, critical thinking requires asking questions. Accordingly, quality questions should be asked, questions that go to the core of the subject. Second, critical thinking involves trying to solve questions by grasping the logic. However, this is more than a thoughtless answer.

We can explain the skills that a critical thinker should have in eight items:

(1) being able to catch the difference between the proven facts and the claims put forward, (2) testing the reliability of the sources of the information obtained, (3) removing irrelevant information

from the evidence, (4) being aware of prejudice and scientific errors, (5) being aware of inconsistent judgments. (6) being able to ask effective questions, (7) using oral and written language effectively, and (8) metacognition, in which the individual becomes aware of his own thoughts.

There are three basic features of critical thinking: 1-Critical thinking is reflective. It refers to thinking about the thoughts that the individual has. Critical thinking occurs only when the individual reflects on his own thinking. "Why do I have these thoughts about ….., What evidence is it based on since the opinions are really my own conclusions?" Contains questions. 2-Includes the standards of critical thinking. It includes basing the thought on a criterion. In order for the thought to be critical, it is necessary to make judgments that comply with the criterion of rationality. 3-Critical thinking is realistic. Critical thinking is actually thinking about real problems. Because real problems are complex, have messy endings, and are not clear. Clarifying and refining them is part of thinking about them. These problems often do not have a single right answer, but they do have a wrong answer.

Critical thinking is synonymous with reasoning. In reasoning, there is an objective and rational examination of the individual and others. Judgments are not made quickly, decisions are based on solid evidence. It contains reality orientation and has no logic errors. Opposite to critical thinking are ways of thinking that favor and approve of what people believe. Critical thinking, on the other hand, has an important function that prevents the confusion of one's own wishes and needs with the realities of the world. Knowing and doing critical thinking are not the same thing. Field knowledge and experience are required for critical thinking.

A different researcher, on the other hand, stated three basic features of critical thinking skills as follows: 1. It is self-regulating thinking. 2. Thinking according to criteria. 3. It is sensitive to the environment.

• Critical thinking has a more complex structure formed by the combination of other types of thinking.

 • Critical thinking is an educational ideal.

 • Critical thinking is not a common skill.

• Critical thinking is affected by the context in which it is found.

 • It is important to have a critical thinking disposition for critical thinking skills.

• Having knowledge about the subject is a prerequisite for critical thinking.

 • When assessing critical thinking, one should look for clear indications in people's reasoning as they come to conclusions.

• Having a critical thinking spirit (disposition) is as important as critical thinking skills.

The characteristics of critical thinking people who can make logical and reflective decisions about what to believe or do are as follows:

 • Evaluates the reliability of the sources.

 • Identifies causes, consequences, and assumptions.

• Judge the quality of the argument, including the assumptions and evidence of the admissibility of reasons.

 • Develops and defends an issue's position.

• Asks appropriate and enlightening questions.

• He plans his experience and evaluates the design of his experience.

• Defines terms appropriate to the context.

• Has an open mind.

• Struggles to find the right information.

• It draws conclusions when prudently warranted.

The contributions of developing critical thinking skills of children in preschool and middle childhood can be listed as follows; develops the basic elements of communication for reading, writing, speaking and listening; helps to discover errors and prejudices; offers a path to freedom; offers the opportunity to change perspective; develops the ability to think differently; opens the way to discover new ideas; reveals the potential of the individual and the group; prevents blockages in thinking; It helps to see opportunities in problems that others cannot see. Third, critical thinking involves believing in the consequences of logic.

3. The Development of Critical Thinking

Critical thinking is built on a set of pioneering skills that develop from early childhood through adolescence and beyond. Pioneering skills such as experience, play, communication, social and emotional development, mental representations of the environment, and abstract thinking skills form the basis of critical thinking skills in children. In fact, critical thinking, which is a high-level way of thinking, is not a skill that can be limited to any age and time. Sometimes, while there are cases where the symptoms of this skill can be seen in a three-year-old child, it can be observed that it cannot be achieved by a trained adult.

Studies that have been done have based differences in thinking between age groups on a difference in diversity rather than a rating. Researchers stated that the difference in thought between children and adults is due to differences in knowledge and experience rather than qualitative changes. In other words, they stated that children's thinking is closely related to knowledge and experience. As an example, they showed that children can think more specialized and mature in subjects that many adults are novices (chess, goldfish, and dinosaur knowledge). Accordingly, not only are children more knowledgeable than they seem, but older children may be less competent than we think.

Children aged 3-6 are good at thinking about their own behavior, they are interested in observing the events around them. Children in this age group also have the ability to comprehend, develop their past and future mental images, and explain their own and others' behaviors by using their knowledge and experiences. We can say that children's reasoning skills begin to develop as early as the age of three, and they often question the wrong information conveyed by adults, and it is essential to emphasize the importance of social experiences in children's critical thinking. We can state that the theory of mind is the basis of children's critical thinking and that even very young children can think about thinking as a human activity of themselves and others.

We can list the levels of children in early childhood to have critical thinking skills according to their ages as follows:

2 and 3 years • Learning to be comfortable with various differences through repeated supportive experiences • Learning to express feelings when they want something or get hurt

4 years old • Begin to develop the basis for critical thinking by comparing images of right or wrong behavior • Making fun of and rejecting others because of their identity can be painful. • Engage in simple problem solving and conflict resolution to deal with teasing and rejection from others

5 years old • Begins to think critically about stereotypes. • Begins to think about unfair and hurtful behavior. • Finding solutions on how to handle some unfair behavior and comments • With the help of adults, can work with other children to counter the prejudices they face in daily life (Together they organize a petition requesting a wheelchair ramp for their friend).

6 years old • Begins to compare true and false beliefs about groups ("Some people say, 'Boys can't be teachers,' but it's Mr. Clement"). • He is respectful when asking questions about differences. • Problem solving conflicts involve prejudices.

7 and 8 years old • Thinking about how prejudices dominate their own opinions • Using newly formed reading skills to learn about stereotypes and prejudices about gender, race, ethnicity, disability and class • Participating in group actions to address discrimination in the school and community

As with many basic skills, critical thinking skills follow a developmental process from childhood to adulthood, but the use of this skill needs to be increased. While children's thoughts feed their experiences, the developmental process accompanies it. Therefore, it is necessary to consciously strengthen the opportunities offered by the environment in the development of children's thinking skills. The strongest, most natural, most practical and economical way that triggers children's thinking is to ask questions. The constructivist approach, which adopts a special form of communication with open-ended questions in the learning-teaching process in order to improve students' independent thinking and problem-solving abilities, allows the learner to construct, create, interpret and develop knowledge.

4.  Critical Thinking in Early Childhood

Thinking skills are associated with the 'frontal lobe', one of the four lobes of the brain. The prefrontal cortex is one of the most important parts of the frontal lobe. So much so that the prefrontal cortex is the place where stimuli from internal and external, conscious and unconscious, stored in memory and coming from all other sources are organized, combined and the behavior that will occur is decided. Probabilistic thinking, reasoning, interpretation, estimation, organizing information, producing and implementing strategies, regulating behavior, inferring require the development of the preforantal cortex. In order for these skills to develop in children, these parts of the brain need to develop, and this development takes place after the age of four.

For researchers who argue that critical thinking is seen in early childhood, the problems with Piaget's views (critical thinking cannot be seen in early childhood) stem from Piaget's idea that abstract thinking (formal reasoning) is the same as critical thinking. According to Piaget, abstract thinking involves manipulating concrete objects and independent symbols, while critical thinking is about what thinking is done with and with what it should be done. Accordingly, it is possible for a young child to think critically without thinking symbolically. From this point of view, even without abstract reasoning, a child can exhibit behaviors such as examining evidence, making decisions and predictions based on evidence, making reasoned judgments, and solving problems creatively in a dialectical way.

Critical thinking can be found in many settings, including a market setting. An incident in a kindergarten supports that critical thinking is a special type of thinking: Becky Reimer is a researcher

working in various kindergartens and collecting writing samples. "Heidi, can you write your name, is there anything else you can write?" he asked. Heidi said, "OK," and wrote her name: "I don't really care, I'll just copy, I know how to spell Y because I'm copying." she said. Heidi continued to copy the words she saw in class. Later, Becky told Heidi, "Okay Heidi, I'm going to write you a letter now. Maybe you want to write me a letter on this piece of paper: 'Dear Heidi, I like your red dress. I like your white coat.' From Miss Reimer". Heidi took the blank piece of paper and continued to write her message out loud: "Dear Miss Reimer, I like your pretty green outfit, it's from Heidi."

She edited her message in her own invented handwriting. Then she started to delete the invented writing from the top of the page and said, "Oh, who cares? If I could put it here," she said, copying the word brown she saw on the list on the table to represent the word "dear". She then copied the word red (red) for the word 'madam' and handed the letter she had invented in writing to Reimer: She continued to delete most of the scribbles and wrote "Jiaiw I" and then "Heidi G". She wrote "BOO" at the bottom of her letter. While reading the letter Heidi wrote to Becky, she pointed to yellow when she read the green and told the researcher that she wrote "BOO" for fun. Heidi originally spelled the name traditionally. While this scenario Becky has created is a less conventional answer than the list of words originally produced, it showed that Heidi understood that written signs might represent other things, namely the function of functions.

However, the review process Heidi started after reading her letter to Becky is interesting. It seemed as if Heidi had some doubts about how Becky's traditionally written letter and Heidi's invented script work in purposive contexts of written communication. Heidi paused and began erasing the writings she had invented and replacing them with colored words copied from a list on the table. Heidi's decision is not a random decision. Because it represents the last hypothesis about written communication, that is, not the invented script, but the choice of words that make it possible to communicate, not arbitrary, but tied to the semantic field of themes in particular.

Colors are the theme of both Becky's and Heidi's letters. Therefore, it is not surprising that Heidi adopted a strategy of using colorful words to convey her message. This may be a situation that shows that critical thinking is present during the copying of words. The interesting thing about this literacy thing is that Heidi takes the denotative function as an object of thought; This reflective action allowed him to reconsider his initial decision and to form a new hypothesis about the written language system, allowing them to take him home. This hypothesis allowed Becky to use colored words that invented writing, not random words, and to understand what might seem surprising.

As Heidi exhibited questioning and reflective skepticism during the writing process, it was determined that this situation was related to critical thinking. This example suggests that critical thinking is fundamentally a learning strategy. This example can be a way to go beyond borders for new areas of thought. Considering that knowledge is like walking in a swamp, Heidi developed new hypotheses in order not to sink in the current worldview.

Studies with preschool children show that children can make logical inferences as early as the age of five. While children think due to their slower processing speed compared to adults, they can't keep in mind as much as adults can. Children's memories work more limited. Therefore, the representations and mental models that assist them in reasoning are less developed than adults. For example, "If Peter is taller than Alan and John is taller than Peter, who is the tallest?"

Children under the age of five have trouble combining such pairs of propositions to make inferences. Because when listening to and coding such a proposition (John is taller than Peter), it is also necessary to keep in mind the first proposition (Peter is taller than Alan). If a child's speed of encoding and mentally combining information is so slow that they forget the first while listening to

the second statement, it means that children lack the necessary processing steps to make such inferences. Children over the age of five can process both propositions in parallel.

There are three conditions for the realization of critical thinking: These are; Metacognitive knowledge is metacognitive strategies and epistemological knowledge. While metacognitive knowledge means being aware of information, metacognitive strategies are expressing and verbalizing the person's knowledge about the use of cognitive or behavioral strategies that he or she applies in order to improve his/her performance or reach a goal. For metacognitive information, the statement 'I can count forward to ten, but not backward'; For metacognitive strategies, the statement 'It is better to start from the edges of the puzzle' can be presented as an example.

Epistemological knowledge, on the other hand, can be expressed as expanding one's understanding of knowledge and knowing. 'How does anyone know something?' and 'What do I know about my own knowledge?' can be given as examples of this concept. Metacognition, a construct that is increasingly recognized as having a central place in cognitive development research, is defined by expressions such as being aware of one's own thought and managing one's thought, or "thinking to think". In cognitive psychology, such cognitive functions are often studied under the heading of "executive control." Although their literatures are independent and separate from each other, metacognition and theory of mind serve the same purpose and include understanding mental events.

Metacognition reflects cognition about cognition. That is, thought about thought, knowledge about knowledge, etc. Cognition requires perception, understanding, and recall while metacognition requires one's own perception, understanding, recall, etc. Requires your thoughts on it. In general, metacognition develops with age, but it is stated that the effect of teaching on the acquisition of metacognitive skills is more than the effect of maturation. Vygotsky's influence on metacognitive theory emerged with his explanation of the transition from controlling others to self-control. According to Vygotsky, social interaction plays a major role in the basis of higher mental functions. This is the internalization of an important part of learning through experience in social environments.

Although Piaget contributed to the introduction of the concepts of readiness and developmental relevance to preschool education, he argued that children would not be successful in metacognitive skills because they had egocentric thinking. However, in recent years, studies examining children in natural play environments and evaluating verbal and non-verbal metacognitive skills at the same time reveal that Piaget's views on young children's metacognitive skills do not reflect the truth. Accordingly, studies show that metacognitive skills emerge in children much earlier than previously thought. It should be said that examining children's skills by using methods appropriate for their age will lead to more beneficial results for learning environments and lead to more accurate results.

In the report prepared by the American National Research Council on the education of pre-school children, it is stated that the concepts in all areas of pre-school education should be considered together with the acquisition of knowledge and ability, and that children should be able to "design, produce ideas, question, predict and produce results". It was stated that thinking to think skills (higher-order thinking skills) will also be supported when they are encouraged to "evaluate". Critical thinking is not a set of skills that can be deployed at any time, in any context. This is a skill that even 3-year-olds can come into play and even trained scientists can fail.

Children aged 3-6 are good at thinking about their own behavior, they are interested in observing the events around them. Children in this age group also have the ability to comprehend, develop their past and future mental images, and explain their own and others' behaviors by using their knowledge and experiences. Piaget argued that the difference in thinking between children and adults stems from logic and abstraction skills. Studies conducted in the last 30 years have stated that this

difference is not qualitative, unlike Piaget. Researchers stated that the difference in thought between children and adults is based on differences in knowledge and experience rather than qualitative changes. In other words, they stated that children's thinking is closely related to knowledge and experience.

When critical thinking skills are not used actively in childhood and in various areas of life, they atrophy and disappear. For this reason, teachers should organize experiences that will enable their students to gain these skills and encourage them to use them at all levels, in every lesson and in every field of life, and they should evaluate these skills with appropriate techniques and provide feedback. When different important mental functions in early childhood are examined in terms of thinking and speaking dimensions, it is stated that the development process of mental functions does not depend on independent changes in speech and thinking dimensions, but rather on the changes in the basic relationship between these dimensions.

One approach introduced by Vygotsky is to base the development of thinking and learning on activity. From an early age, children should be expected to ask questions, give reasons, rank, guess, and theorize. Self-awareness and understanding of others are also required for them to be open-minded and gain a balanced perspective.

5.   Supporting Critical Thinking Skills in Early Childhood

Since there are many different educational programs, policies and philosophies, it is not correct to think that a single approach will be effective in education of thought. As critical thinking is intertwined with many higher-order thinking such as decision making, creative thinking and problem solving, it can be supported and developed in different ways. Critical thinking occurs in reassuring environments where individuals can freely express their views. Exposing children to unusual problem situations supports the thinking process and forces children to think deeply and multidimensionally. Being able to see things from the perspective of others and talking about the feelings of others are also factors that enable children to approach events from a multi-faceted perspective.

Explanations made by adults to children are very important for the development of critical thinking. The adult should explain to the child the reason for the behavior that he/she does and that he/she expects from the child. The reason for the behavior expected from the children should not be explained with an approach such as "Because I want it like that", but with an expression such as "You shouldn't hold those scissors like that because the sharp side may cut your hand". The child should be prepared for the new situation before encountering new situations. Before starting a new activity, without visiting a new place, a short explanation of the purpose of the new situation will allow children to adapt to the new situation more easily, improve their self-regulation and support their critical thinking.

Methods of developing critical thinking skills are to find analogies, to enable students to research the necessity and appropriateness of the information given while solving problems, to ask for different solutions to problems, to increase communication and interaction between students, to ask open-ended questions to students, to give students enough time to answer questions, and to provide students with different skills. situations can be summarized as asking them to use it". Educators who want to improve the thinking skills of preschool children are faced with the egocentric and concrete ways of thinking of these children. The problem here is that children's thoughts are invisible to them. Here, the educator's task is to make the child's thinking visible to himself and others.

To make thought visible is to reveal it through questions, topics and problems. Educators can document and make their thoughts visible through the use of children's pictures, using thought maps

to support the development of children's thinking on thinking. In addition, children make their thoughts visible when they speak, write, draw, construct and dramatize. Therefore, documentation makes children aware of their own thinking processes. Various methods can be used to teach children to think critically. Most of these methods rely on metacognition at some point. All of the methods try to make children's thinking processes clearer and try to give children self-control over their own thinking.

While thinking about thinking may seem difficult for early childhood, it is not impossible when educators encourage it. As a way of doing this, the educator encourages children to think through questions. The educator offers children the opportunity to go beyond their memories and objects in making sense of the world or solving problems by asking what they think and asking open-ended questions. In order for children to develop their thinking skills, they need to make decisions, regulate their behavior, encounter tasks of different difficulty and take responsibility for their behavior. Planning is more than making choices.

Planning involves predicting what will happen, recognizing problems and generating solutions, predicting and applying results. Reflection is more than just remembering. Reflection is remembering through analysis. If children reflect when an event occurs or experience a situation, they become aware of what they have learned, what they are interested in, how they feel, and how they can expand their experience.

Strategies to develop children's planning skills are as follows: • Regular planning as part of the day • Making sure children are aware of learning centers and materials • Asking questions • Listening carefully to children • Supporting and accepting the child's plan and expanding the plan with alternatives • Encourage children to evaluate and expand • Record children's plans • Encourage children rather than praise. Many of these strategies improve children's reflective thinking skills as well as their planning skills. When children reflect on what they have done, they can provide information about what they can do when planning for the future.

Strategies for developing children's reflective thinking skills are as follows: • Reflecting throughout the day • Asking open-ended questions • Interpreting and expanding what children do and say • Accepting children's perspectives and comments • Identifying what children do during the planning process • Note down what children say • Supporting children to connect to reflect on their plans and activities • Supporting children to continue their activities the next day.

In the problem solving process at any time, critical thinking comes into play. The scope of critical thinking in the decision-making process for finding a solution is as follows: • Defining the problem, dilemma, problem • Defining the purpose • Generating different solutions • Thinking about the functionality of alternative solutions • Choosing a solution to try/implement • Evaluating the result, if the result does not work, try another solution . Critical thinking is based on all life skills and is one of the highest level of executive functions of the brain. These functions depend on brain processes such as working memory, cognitive flexibility, and projection.

The steps to be taken in the development of children's critical thinking skills are as follows: • The executive functions of the brain should be supported and developed. • Children should be encouraged to wonder. • Be a model for scientific thinking. • Children should be given opportunities to experience and create new things. • Critical thinking processes should be guided during problem solving. Open-ended questions are of great importance in teaching critical thinking. Especially in the early childhood period, it is necessary to ask questions such as "Why, Why, How" that will lead children to think about the event, behavior and process in critical thinking education. "Why did this

happen?", "What will happen next time?" Questions like these provide the opportunity for important thinking activities to encourage children to think.

Considering critical thinking skills as a separate course does not serve the purpose of teaching thinking. With the reduction of critical thinking to private lesson hours, the experiences gained from existing applications cannot be used sufficiently and it is not possible to spread what is learned to other areas of life sufficiently. For this reason, current trends are mostly directed towards the "Inclusion" model, which is more effective although it is relatively difficult to implement. In this model, critical thinking is not a specific teaching subject, but is applied as a continuous, integrated learning process that spans all course topics. The difficulty of the model is that the student is considered the founder of his own knowledge and the main actor of the learning scenario, and therefore his participation is binding in terms of achieving the goals.

There are many factors that affect the development of individuals' critical thinking skills. School, which is one of these factors, has a very important place among other factors in terms of having a planned program and saving the development of critical thinking skills from randomness. When the curricula are examined, it is stated that the expressions for the development of critical thinking in students are frequently used, and concepts and approaches that adopt critical thinking and student-centered learning theories are adopted.

Children are acquainted with the philosophy that develops critical thinking in the existing education system too late. Until this process, only the transfer of knowledge and the fact that the right knowledge was not questioned causes the philosophy courses to not have the desired effect on thinking. In order to support the thinking processes of children and increase their interest in philosophy, it is necessary to move away from traditional teaching methods, which are handled away from society and the problems of the world. Instead, up-to-date approaches such as making use of literary texts, analogy and drama techniques should be used in education that embody concepts, motivate learning, connect with life, have group interaction, and are far from memorizing. Teaching students to think critically probably lies in ensuring that the right thought is placed at the right time.

Although the time, environment and tools required for the development of critical thinking skills in children differ, the common point of the methods used in teaching critical thinking is to enable students to be active in the learning process, to look at an event or phenomenon from a different perspective, and to be a participant in group studies that support cooperation. Environments that allow critical thinking are far from hierarchical structure. For this, the classroom environment should be made suitable for participatory individuals who learn, discover, question, interpret, discuss, reason, form their own ideas. Classroom environments where students are in cooperation and teacher-student communication is strong will support the critical thinking process. The development of critical thinking requires a classroom environment that focuses on student and teacher interaction.

6. The Role of Teacher and Students in Supporting Critical Thinking Skills

In today's known as the information age, the importance given to the education of the individual has increased to a higher level since it is known that social development depends on the development of the individual. Since the knowledge produced in the last ten years is equivalent to the knowledge produced until the last ten years, the aims of education are also changing. To individuals who ask, question, research, listen, discuss, respect, open to communication and interaction, change and development, use information, dance with information, produce information from information, discover new information for a productive society that is not driven, directed or deceived for a democratic society. is needed. In order to raise such individuals, thinking skills need to be developed.

The role of the teacher and peer interaction is an important factor in the development of thought. For example, interaction; If the teacher's question is conducted as a student's answer, students think that they are in the context of a traditional authority and give their answers according to learned and memorized beliefs. On the other hand, when the interaction is left to the students, the cognitive and epistemological skills of the children are stimulated when the teacher encourages the interaction of the "critical dialogic" type between the students. Among the questions the teacher asks to encourage the exchange of critical dialogue among students are: Who wants to reformulate what has just been said? What do you want to say…? Who can give a counter-example? Which of the criteria you just stated seems to be the most reliable or appropriate? In this type of interaction, the role of the teacher is that of the "guide" (i.e., "information provider").

The teacher should encourage doubts or cognitive conflicts among students to guide them into an evaluation research process, avoid dogmatism, transcend relativism, and encourage the activation of attitudes about active listening and concern for others. The role of the teacher is therefore not easy, as the teacher becomes a co-researcher with the students, encouraging both reasoning and knowledge. There are two things necessary to learn to think critically: 1- Learning how to ask questions; when to ask the question, which question to ask, 2- Learning how to reason; when to use reasoning, what reasoning methods to use.

The teacher's role in teaching critical thinking is as follows: • Recognize the value and importance of each student as an individual. • Students should be confident in their abilities to solve their own problems. • Must believe in the soundness of jointly agreed decisions. • He should be patient in the face of the apparent slowness of the democratic process.

The classroom approach that a teacher with these characteristics should have is as follows: • Teachers should allow students to be broad stakeholders in determining classroom activities and even goals through discussion and choice. • It should allow and provide opportunities for students to shape their behavior in line with their own decisions, gradually increasing. • Instead of constantly telling the students the necessity of the way they behave, they should be shown or made to the students with examples, criticisms and explanations when the time comes, and opportunities should be provided for the students to reveal, develop and benefit from their talents. • Collaboratively work with students in a pleasant environment by encouraging student participation and personal initiative in activities inside and outside the classroom.

We can summarize the role of the student in teaching critical thinking as follows: • Students should start teaching with a positive attitude, as beliefs and tendencies about critical thinking directly affect teaching. • Especially in group work, each student should work actively and students should directly participate in teaching activities. • Students should be able to critically evaluate their own views. • All students should contribute to the democratic environment created in the classroom. • Students who are qualified as leaders in the classroom should not be an obstacle in the preparation of environments where other students can exhibit their views and works.

7. Inquiry Based Learning

The nature of inquiry-based learning is controversial, and even the term itself is not widely used in the educational literature. Many terms are used for inquiry-based learning, including "inquiry-based learning", "guided inquiry", "problem-based learning", "undergraduate research" and "inquiry-based teaching". Although inquiry has been a mainstay of academic endeavor for centuries, inquiry-based learning as a pedagogy has only recently come to the fore. The inquiry-based learning approach, which was at the forefront of experiences adopted by many teachers in the 1970s, also overlaps with the expression "learning by doing" suggested by the American educator John Dewey.

The term inquiry is also used to describe learning processes and strategies in any field, but can also include skills specific to a particular curriculum area. Children try to observe and explore their environment with a natural curiosity and questioning they innate, and in this process, they begin to ask questions in order to get to know their environment and to make sense of what is happening in the environment. Children construct knowledge by engaging in the processes of questioning, observing, predicting, and evaluating, and learn to coordinate evidence and theory, especially when guided and encouraged by adults.

In addition, inquiry-based learning has a cyclical structure. As children develop their knowledge, they seek new opportunities to apply emerging scientific thinking and reasoning skills. Inquiry-based learning activities are complex but have significant potential to build children's knowledge and improve many skills. Inquiry-based learning is a student-centered approach that can strengthen the links between teaching and research, is based on constructivist theory, and is effective in developing higher-order thinking skills. However, structured and directed forms of inquiry may be more useful to gradually develop certain inquiry skills.

During the inquiry process, children manage their own research activities, form hypotheses, design experiments to test hypotheses, and complete all stages of scientific research, such as gathering information and drawing conclusions. Therefore, learning by inquiry is an educational strategy in which children gather information about the world and follow the methods and practices used by professional scientists to construct knowledge. In inquiry-based learning, it is very important for the child to take the responsibility of discovering new information and to actively participate.

The basic components of the inquiry-based learning approach can be expressed in general terms as follows:

• Learning is guided by questions or problems

• Learning is based on the process of constructing knowledge and creating new understanding,

• Being an 'active' approach to learning that includes learning by doing,

• The role of the teacher is to guide , teaching being student-centered,

• Taking responsibility for students' own learning,

 • Transitioning to self-directed learning.

In early childhood education, one of the main goals is to improve the cognitive skills and socialization of children as successful adults of the future at schools. To achieve this goal, experts recommend that early childhood programs, like the inquiry-based approach, should be child-centered, meaningful interactions balanced under teacher guidance, and supportive of children's learning. Children who are exposed to a stimulating environment and education through inquiry-based activities can become active adults who take an interest in events or issues, take ownership of individuals' learning and solve problems or collaborate with others to answer questions.

As there are different definitions of inquiry-based learning, it has also been discussed by researchers at different levels. The questioning process was staged in terms of the teacher as follows:

1- Planning the initial situation, 2- Initial inquiries step, 3- Writing the problem, 4- First explanations and forming hypotheses, 5- Method suggestions stage, 6- Implementing the activities, 7- Concluding the hypothesis and the results. comparison, 8- Synthesis writing.

On the other hand, the inquiry process can be explained as follows: 1- Taking responsibility for learning 2- Identifying a topic and establishing basic information 3- Developing a question 4- Estimating possible answers and identifying relevant information 5- Identifying sources, gathering and evaluating information 6- Evaluating evidence 7- Synthesizing 8- Presenting developed new insights 9- Evaluating achievement 10- Self-reflection and Self-evaluation The learning outcomes of inquiry-based learning typically include the development of self-reflection, critical thinking, the ability to conduct independent research, responsibility for self-learning, and intellectual growth and maturity.

While questioning, children also have opportunities to explore, examine, rethink and reflect. With inquiry-based learning, children contribute to their learning and develop a sense of care in the subjects they discover. When using an inquiry-based approach, children not only learn about the subject but also get to know themselves and the environment by experimenting, exploring, discussing and collaborating with others.

### 7.1. Inquiry Based Activities in Preschool

Babies start questioning from the first moment they open their eyes to the world, use all their senses and try to interact with the environment. Thus, he begins to take one of his first steps towards making sense of the world by questioning. In this process, they have a lively curiosity and begin to ask many questions and seek logical answers to these questions. Children try to understand objects, events and situations by questioning, construct their answers by asking questions, retest them according to the situation, and communicate with others by sharing their ideas. Then they form their assumptions and use high-level skills such as logical and critical thinking.

Inquiry activity actually has a flexible structure that can be used in many activities such as science-nature, mathematics, philosophy, drama, language, art and games in the preschool period. Inquiry activities have long been recommended for children to learn better, especially in science and mathematics. By questioning, children can find answers to their questions and solve their problems more easily by displaying questioning attitudes towards the events and problems in their daily lives. Children in the inquiry process experience learning activities by doing and living, have the opportunity to create and research their own questions, and have the chance to conduct research under the guidance of the teacher by making observations. In addition, inquiry activities help children develop their personal and social understanding of the world using multiple perspectives and various forms of knowledge, such as mathematics, science, language, and the arts.

Research on inquiry-based teaching generally shows that inquiry-based teaching activities yield positive results. Such activities feed the natural curiosity of children, encourage scientific activity and reinforce the worldview that is the subject of research. In addition, the developments in instructional technology and the widespread use of computers in schools expand the scope of the subjects on which inquiry learning can be applied. Inquiry-based activities occur in various types depending on the roles between the teacher and the child, but are mostly expressed under the following headings:
• Open or full inquiry: Beginning with the child's question, followed by the child (or groups of children) designing and conducting an investigation or experiment and communicating the results.

• Guided inquiry: In guided inquiry, the teacher helps children develop inquiry investigations in the classroom. Usually the teacher chooses the question for research. The children can then assist the teacher in deciding how to proceed with the research.

• Structured inquiry: Structured inquiry, sometimes also referred to as directed inquiry, is mostly teacher-led guided inquiry. Typically this is implemented as children follow teacher instructions to find a particular endpoint or product.

Inquiry-based learning approach is a process that seeks answers to questions such as "what", "why" and "how" rather than a method. The process of implementing inquiry activities, which is at the heart of learning, should begin in the preschool period and continue with age-appropriate challenges at every grade level. When children solve a problem they are struggling with or make an effort, we should give them positive feedback. Thus, children realize that they have the ability to deal with more difficult problems.

The main features of inquiry applications are as follows:

• Children engage in scientifically oriented questions.

• Children prioritize evidence that allows them to develop and evaluate explanations that address scientifically oriented questions.

• Children formulate explanations from evidence to address scientifically oriented questions.

• Children evaluate their explanations especially in the light of alternative explanations reflecting scientific understanding.

• Children convey their proposed explanations and justifications.

7.2. The Relationship Between Inquiry Based Activities and Critical Thinking

Inquiry-based learning is the act of acquiring knowledge and skills. The activities prepared by considering this method are; discovery, observation, asking questions, examining sources, collecting data, analyzing, interpreting, synthesizing, answer-explanation and proposing predictions, communicating the findings through discussion and reflection; It enables to activate many skills together, such as applying the findings to the real situation and following new questions that may arise in the process. Inquiry-based learning emphasizes children's ability to critically view, question and explore various perspectives and concepts of the real world.

Inquiry-based learning develops children's critical thinking skills because this method is an important component of critical thinking in children; It develops mental activities such as interpretation, analysis, evaluation, explanation, inference and self-regulation. Many studies reveal that activities using inquiry-based learning are more effective than traditional methods in developing children's critical thinking skills. While remembering concepts is a prerequisite for more complex cognitive functions, critical and analytical thinking abilities are supported when children are often encouraged to interpret, analyze, evaluate, or synthesize.

Critical thinking skills are one of the skills that can be acquired by every child with appropriate activities and practices. Critical thinking is one of the basic skills that children should have in the 21st century. Although critical thinking skill is important for success in today's world, this skill has also had an important place in solving today's problems as it gives people life skills, creativity and innovation. Therefore, it is very important to teach this skill to children. Teaching critical thinking requires a holistic approach and should include a purposeful set of appropriate learning models that will enable the child to guide their cognitive skills. One of the most effective methods in gaining critical thinking skills is inquiry-based learning.

Good questions are those that guide thinking and encourage children to interpret, analyze, synthesize, criticize and reflect. Learning by inquiry is a dynamic learning approach that involves asking, making discoveries, and testing discoveries. This approach is closely related to philosophical activities. Philosophical thinking skills, which include critical, creative, attentive and collaborative thinking skills, are the main tools for asking and discussing philosophical questions and answers. Philosophical research is the search for answers to philosophical problems. Investigation is philosophical when it explores a common and debatable issue. Philosophy for children develops the collaboration and research skills children need to succeed in the twenty-first century. "Inquiry-based learning" is becoming a very important model in modern education circles as schools begin to move towards an approach to teaching and learning that engages children, arouses curiosity, and allows them to delve deeper into an area of interest.

Realizing that they need to think for themselves, children argue to answer the questions they ask. The role of teachers is to facilitate discussion and ask more probing questions so that children can clarify, justify and defend their answers or beliefs and draw solid conclusions. Children become more interested in learning when they try to create questions based on stimulating materials, clarify their questions and opinions, and justify their situations about their lives. In other words, questioning skills should be taught to children for effective questioning. Identifying what a question is, understanding the different types of questions, and then thinking about the different expected answers begins in the early years of life.

The key aspects of a philosophical inquiry are being able to open up the problems and the issues implied by the questions. To consolidate the benefits and value of the inquiry-based approach, it is important to use philosophy in these areas. There is no better way to develop children's reasoning skills than by involving them in collaborative inquiry-based learning. The main tools for asking and discussing philosophical questions and answers are philosophical thinking skills, which include critical, creative, attentive and collaborative thinking skills.

8.   Storyline

Many studies have been carried out on the constructivist approach in the world and different methods have been developed for the application of this approach. The "Storyline Method", which was developed in Scotland at the beginning of the eighties, is one of these methods founded on the foundations of constructivism. In this method, learning by doing and experiencing is based on in order to ensure that children learn better and their learning is permanent. This method requires storytelling and taking part in the story. It is based on the fact that the learning process is started with a story in general and strengthened with time, place and character connections, and then processed within a gradual body of topics.

The main elements of the storytelling method are: ⬜ The learning process is placed in a detailed time frame and sequence. ⬜ Characters are used in the process. ⬜ Various events are selected to work on. ⬜ Children are presented with real problems to solve. In storyline, the teacher can refer to the curriculum necessary to plan the teaching through the story sequence. Characters are chosen through a story format. For example, students can become astronauts, toy designers, grocery workers, or city planners and playground architects.

 The storyline begins with an interesting question over an interesting scenario. For example, for a toy factory story, the teacher asks the children, "What is a toy?" can ask the question. While this question reveals children's knowledge of the toy, it introduces children to storyline. This process can be followed by the following questions: "What do the toys in the factory look like?", "Who designs toys?", "Who can work in a toy factory?".

Many teachers want each student to create a character. Children can reveal the characters they have created as products. Teachers then confront children with more complex questions: "What does a toy designer need to know for his job?" Teachers asking children questions throughout the story section is similar to building. Each question guides the child to work on that area as planned by the teacher. Subsequent questions may be asked, such as: "What new toy designer can produce?" In this way, it enables children to design toys, to gain awareness about simple machines, physics, economy and environmental awareness. The teacher may also ask questions such as: "How do we pack the toys we produce?", "How can we ship them?", "How can the factory produce hundreds of these?" in order to teach children the principles of mathematics, design and economics.

Storyline is closely linked to socio-cultural theory. The socio-cultural theoretical tradition has four principles embodied in storyline: adult participation, the social nature of learning, challenge, and play. When planning the storytelling process, six dimensions are taken into account: story sections, key questions, student activities, classroom organization, resources, conclusion, and assessment opportunities. Storytelling–an approach to effective teaching and learning'.

The Storyline method has a number of key roles: • The story brings teachers and students closer together. • Students create a story and feel like a writer. • No one knows how the story will end, the whole story is a surprise. • The story gives support and challenge to anyone who needs it. Since the method of storytelling includes many methods and techniques, it is a method that can be used in children's literature, concept education, science education, teaching of social sciences, in short, wherever and whenever life is introduced. The method of storytelling, in terms of its structure and characteristics, aims to develop students' high-level thinking skills and to transfer these thinking skills to their daily lives.

The learning process is formed through chapters that form a series of stories. The process is guided by well-planned activities that focus on key questions and learning about experiences and outcomes. Key questions are open-ended questions to question what children know about the theme to be explored, and lead them to the next area of development. A story begins by establishing a visual environment in which everything will happen and the characters involved in the story, thus creating identity and ownership. In principle, a story gives teachers control of the learning process, doing their research, and making decisions at the same time as students are involved. Storytelling is much more than a method. It can also be said that it is an approach in which there is an active learning and teaching process.

In storyline, active learning scenarios are designed, a context is created, and potentially productive resources are provided. In this method, impromptu teaching is done while avoiding traditional content presentation formats (guide learning). With extensive content, students are not presented with information. Storyline facilitates students' search for information, preloading, and navigating preliminary ideas, and supports and refines the understanding of emerging content. The development of values and potential action are part of this process.

### 8.1. Storyline and Critical Thinking

• Real events are important in critical thinking. In the critical thinking process, there is no right one, but there are wrong answers/results. The narrative method, on the other hand, is based on the principle of "the truth is a variable". The process is based on real situations/problems. The child works on real problems for which he will produce his own solutions.

• Context is important in critical thinking, axioms (first argument) are used. In storytelling, it is accepted that children are not empty and that the construction of knowledge should be built on previous knowledge.

• Critical thinking is at the core of problem solving skills. The storyline method, on the other hand, presents real problems for children to solve.

• Asking questions has a key role in critical thinking. Questions activate the thinking process. In the storyline method, the process starts with key questions, and when the method is well planned, students' questions about the theme are formed.

• Language is the most important tool in critical thinking. Storytelling encourages the use of language in the discussion process.

• In critical thinking, conclusions are drawn based on what is known/evidence/arguments. Analysis, evaluation and inference are also formed by testing the accuracy of assumptions.

• As a result of critical thinking, the individual is expected to make a correct decision. In the storyline method, children take responsibility throughout the process and decide on their learning process together with the teacher.

• In storyline, the teacher asked, "What do you think you are most successful in this subject? Why do you think you're good at this? Can you show me a work in which you did not find yourself successful?" It tries to give children the ability to evaluate themselves by directing them to think about themselves with questions such as: The basic skill at the center of critical thinking is considered to be self-regulation. In self-regulation, the person reviews their own inferences using analysis and evaluation skills. It is about evaluating your own thinking process.