DEVELOPING A THINKING CULTURE IN THE CLASSROOM: A PARTICIPATORY ACTION RESEARCH[1]

Abstract: In this study, cooperating with the classroom teacher, the researcher aimed to improve the thinking skills of students through teaching activities prepared based on the dimensions of thinking cultures. The research is designed using the qualitative paradigm in the participatory action research model. A total of six cycles were carried out during the thirty-three-week application process in line with the 'cultures of thinking dimensions' along the research process. The implementation process focusing on the cooperation of the teacher and researcher as a weekly cycle in the form of problem detection, literature review and seminar, preparation, implementation, monitoring and evaluation of the action plan. The action research reveals that developing a culture of thinking increases the diversity and frequency of utilization of the thinking skills by students. The results indicate, that although practices related to the culture of thinking approach contribute to the development of students' thinking skills, this development is slow and the teacher's motivation in this regard is an important variable.

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INTRODUCTION

Due to the emergence of '21st century skills', the transformation of education by the digital technology, the change of the nature of knowledge, and finally with the impact of the pandemic around the world resulting in educational activities to be executed via distance education has resulted in an increase in the need for teaching thinking processes and skills. Teaching thinking is an educational area emerging as a reaction against the assumption that intelligence is fixed in order to help students reach their full potential as a result of the interaction of many disciplines such as neurology, psychology, philosophy and sociology (Higgins, 2015). Many approaches and programs have been developed for this education from past to present. (Feuerstein, 1980; Lipman, 1981; De Bono, 1984; Shayer, 1999; Tishman, Perkins ve Jay, 1995; McGuinness, 2000; Dawes, Mercer ve Wegerif, 2000; Ritchhart, 2002; Topping, 2003). Current research about these approaches and programmes assure that a way to ensure the development of thinking processes and skills is based on the consideration of more social and affective domains (Perkins, Thishman, Ritchhart, Donis, and Andrade, 2000; Ritchart, 2002; Hurley and Nisbet, 2004; Ritchhart, 2007; Salmon, 2008). The social dimension in the way of developing thinking processes and skills is related to the fact that the development of these skills should not be considered independent of school and class culture, as well as based on the current culture and cultural characteristics. It emphasizes the need to include parents and peers in the process, although the teacher has the lead role in the teaching process (Topping and Bryce, 2004; Kim, 2002; Lebuda, Jankowska and Karwowski, 2020). The affective dimension, in the way of developing thinking processes and skills emphasizes motivation, dispositions attitudes, values and habits related to teaching thinking. In this context, a culture of thinking is one of the approaches that attracts attention because it includes both social and affective dimensions in teaching thinking (Tishman, Perkins and Jay, 1995; Fisher, 1999; Perkins, 2001; Ritchart, 2002; Costa, 2008).

A culture of thinking focuses on addressing teaching of thinking processes and skills in a socio-cognitive context. In learning, there is an approach based on the foundations of the theory of social constructivism (Ritchart, 2002; 2005). A culture of thinking is a metaphor associated with classroom/school culture in which thinking is 'valuable, visible, and active', revealing the mutual symbiotic relationship between the teacher, learner, and the act of learning (Ritchart, 2015). The dimensions including the types of thinking to be taught in the process of developing a culture of thinking are (Thishman et al., 1995):

(1) Language of thinking: It includes words in a language that points to mental processes and products, questions that describe and evoke thinking, class discussions, providing students with data instead of solutions, giving instructions and feedback.
(2) Thinking dispositions: It refers to affective characteristics such as motivation, tendency, attitude, and values related to the development of thinking processes and skills.
(3) Mental management: This concept is treated in the literature as metacognition and is about supporting an individual in managing his/her mind. Mental management is the activity of reflecting on and evaluating one's own thinking processes.
(4) Strategic spirit: This dimension is associated with producing and using thinking strategies that enable the learners progressing step-by-step and in a planned way in order to solve problems or make decisions.
(5) Higher order knowledge: it is associated with addressing information-generation processes such as problem solving level, inquiry level, and evidence level, beyond the facts in a discipline.
(6) Teaching for transfer: This is a dimension applying any knowledge, skills, strategies and others to another context.

These dimensions are of great importance in terms of understanding, making visible, and facilitating systematic progress in teaching a culture of thinking that is more implicitly present

in the classroom environment. Considering the explanations on the sub-dimensions of a culture of thinking aforementioned, the sub-dimensions are frequently researched individually in the context of teaching thinking and that there is a strong evidence for their impact. In other words, it has been determined that survey model or quasi-experimental design is mostly used in the studies on teaching thinking across Turkey. In these researches, it's clear that thinking processes such as critical thinking, creative thinking, metacognition, problem solving, decision making are examined in terms of the impacts of different variables (Akınoğlu, 2001; Emir, 2001; Çetingöz, 2002; Kürüm, 2002; Aksoy, 2005; Aybek, 2006; Karataş Öztürk, 2007; Özcan, 2007; Tok, 2008; İbrahimoğlu, 2010; Çoraklı, 2011; Ülger, 2011; Kurtuluş, 2012). Moreover, there have also been studies using thinking programs such as De Bono's CORT (Aybek, 2006), Feuerstein's instrumental enrichment (Özüberk, 2002) and Lipman's philosophy for children (Okur, 2008). There are also studies examining teacher competence, especially in teaching thinking skills (Dilekli, 2015). However, there aren't enough studies conducted about affective (studies conducted in affective field are mostly limited to critical thinking tendencies) and social aspects of teaching thinking while considering these local studies. At the same time, when we examine overseas literature, we also see that there are few studies carried out about the six dimensions of a culture of thinking separately investigated(Perkins, Tishman, Ritchhart, Donis, and Andrade, 2000; Perkins and Salamon, 2001) as well as studies regarded as holistic (Ritchart, 2007; Salmon, 2010; Yusoff, Bunkers and Embong, 2017; Andersen, 2018), and these studies are in the form of case study or survey model.

In summary, this study is based on the affective and social domains of teaching thinking processes and skills in the context of a culture of thinking. Especially in teaching thinking, there is a need for further research based on affective and social domains (Baumfield, 2006), thus it is believed that this study will contribute to the literature. The most important component of this problem situation is the collaboration between teacher and researcher. The collaboration between researcher and teacher is extremely important for combining theoretical knowledge with the experience of teachers in practice. Depending on this rationale, this research has been based on the question of 'how can a culture of thinking affect the development of the students' thinking skills with the cooperation of a researcher and teacher in an elementary class (5th Grade)?'. In the research process, in the context of this question, answers will be sought for the following sub-questions:

(1) What thinking skills did students use before the action research process?
(2) How did students' thinking skills develop during action research aimed at developing sub-dimensions of the culture of thinking?
    a. What improvement was observed in the thinking skills of the students in the first cycle in which the thinking language was developed?
    b. What improvement was observed in the thinking skills of students in the second cycle in which their thinking disposition was developed?
    c. What improvement was observed in the thinking skills of students in the third cycle in which mental management was developed?
    d. What improvement was observed in the thinking skills of students in the fourth cycle in which the strategic attitude was developed?
    e. What improvement was observed in the thinking skills of students in the fifth cycle in which high-level knowledge was developed?
    f. What improvement was observed in the thinking skills of students in the sixth cycle when transfer for learning was developed?

METHOD

RESEARCH DESIGN

In this study, an action research with qualitative research design has been used. The action research has been applied in accordance with the participatory action research. Action research can be evaluated in the context of critical theory and used as both quantitative and qualitative research methodologies. Moreover, it provides recovery about the current problem status and also aims to connect theory to practice (Freankel and Wallen, 2006).

PARTICIPAINTS

The research environment was a public school located in Hatay province of Turkey. The school had 19 staff and 360 students. The participants of the study consisted of a total of 37 students, of whom were 18 girls and 19 boys and the classroom teacher at the 5th grade. The mothers of the vast majority of students were housewives, while their fathers were workers or tradesmen, and most of them were bilingual. The classroom teacher who voluntarily agreed to become a practitioner of the research, was 37 years old. This teacher, who had worked for sixteen years professionally, was a graduate of the department of primary education of the faculty of education.

The researcher was also among the participants and kept notes on the problems in order to shape the action plans, making sure not to affect the natural flow in the class. She also took on roles such as informing the teacher at the points needed to develop a culture of thinking, identifying problems related to a culture of thinking with the teacher, and providing the teacher with guided learning assistance in preparing action plans for solving these problems. Before the actual study the researcher conducted a three-month pilot study on the theme of 'aiming to develop a culture of thinking' with both of the 5th grade classroom teachers working at the same school. Thus, the researcher increased his experiences on this subject by developing and experimenting with lesson activities and materials.

Among the participants of the study there was also the Validity Committee, which followed the study from the presentation of the research proposal to the reporting process of the research in order to monitor every step of the research process. The validity committee, consisting of three academic members offered guided learning assistance to the researcher at each stage from the beginning to the end of the research, and the meetings were recorded.

DATA COLLECTION

Action research is a mean of achieving recovery that includes identifying the need for change, planning, implementing, and evaluating change. In this context, the research process followed in the study is shown in Figure 1 (Stringer, 2008; Mills, 2003, Kemmis and McTaggart, 2007; McCarty, 2010; Coughlan and Coghlan, 2002).

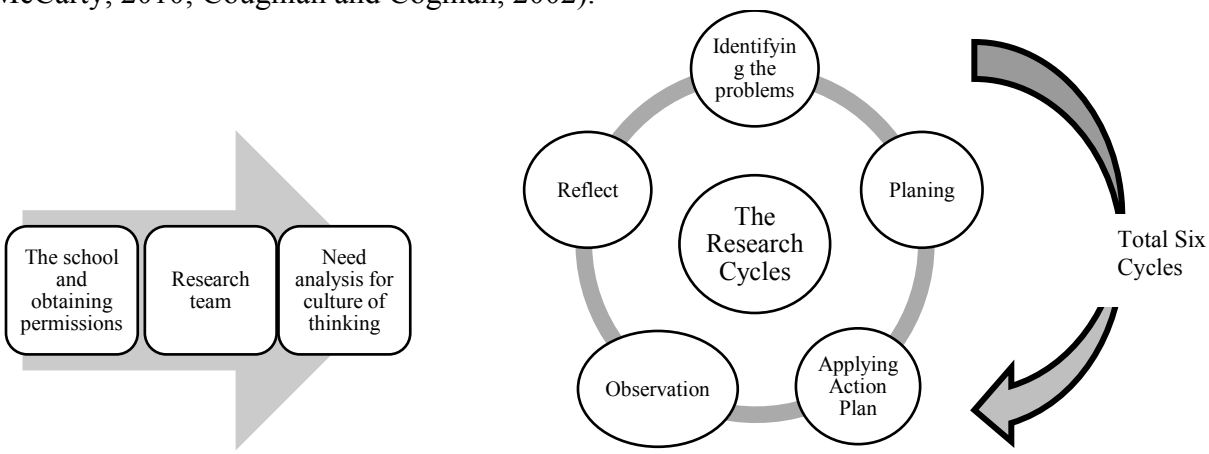

Figure 1. The Action Research Process

As seen in Figure 1, the action research process started with the school to be studied and the necessary permissions (permissions from the Ministry of National Education, school administration, teachers and parents). The study consists of a needs analysis and a total of 6 research cycles. The steps followed in these six cycles are summarized below:

(1) Identifying the problems: At this stage, in each cycle, there is a discussion of the problems identified in the class aimed at the development of the culture of thinking and the determination of the sub-dimensions of the culture of thinking to which these problems are related. In the first cycle, we focused on solving problems facing the dimension of the language of thinking, and in subsequent cycles, problems facing the culture of thinking were solved by adding other dimensions of the culture of thinking.

(2) Planning and seminar: At this stage, information about the issues needed by the teacher was exchanged before the preparation of the action plans and in accordance with the problems identified in the preparation process. In other words, information sharing between teacher and researcher continued throughout the cycle. At this stage, in addition to sharing information, action plans aimed at solving problems were prepared by the teacher and researcher. In preparing action plans, it has been cared not to disrupt the annual flow of plans. A general plan has been prepared in line with the problems encountered during the development of action plans in each cycle. In accordance with this general plan, activities aimed at the dimensions of the relevant culture of thinking have been prepared in accordance with the content of Turkish, Mathematics, Science, Social Sciences and traffic courses given by classroom teachers. Examples of the activities included in the plan prepared in each cycle in cooperation with the researcher-teacher are presented in Appendix B.

(3) Implementation, observation and reflection of the action plan: The action plans prepared at this stage have been implemented. The action plans implemented were revised and reorganized at the end of each week in line with the exchange of ideas with the teacher. During the implementation of the action plans, the researcher took notes in the field on the development of the culture of thinking and the obstacles to this development, and shared these notes with the teacher, supported by video recordings taken in the classroom in reflection interviews. These shares were used to shape the overall Action Plan prepared. The teacher is responsible for implementing action plans. There was no interference with the teacher during the practice. However, during recess and reflection interviews, ideas were exchanged by interacting with the teacher about the implementation of the plan.

DATA ANALYSIS

Analysis in action research shows continuity (Stinger, 2008; Mills, 2003). Each course observation was analyzed at the macro level to determine whether the problem was solved during the research process and whether new problems would be encountered. Hence, a total of 252 courses were macro-analyzed with the help of two field experts at the end of the six cycles before they were reported, 102 recordings were micro-analyzed. During micro-analyzing, the content analysis technique was used.

In the analysis of the observations, all of the video recordings selected as a sample of the observations were first transcribed into a word file. Raw information from classroom observations in this process consists of a total of 7 booklets and 1481 pages, including the pre-study process. At a later stage, the observation records were first encoded by a line-by-line reading technique. The developed taxonomy of cognitive processes developed by Marzano and Kendall (2007) was used as the theoretical framework for coding. The categories and definitions used are as follows (Marzano and Kendall, 2007, 62-63):

(1) Retrieval: It requires students to recognize information.

(2) Comprehension: It requires translating knowledge into a form.

(3) Analyzing: It requires five mental processes such as matching, classifying, analyzing errors, generalizing, and specifying.
(4) Knowledge utilization: It involves the application of knowledge in specific situations.
(5) Metacognition: It involves monitoring, evaluating, and regulating the functioning of all other types of thought.
(6) The self-system: It is related to arrangement of attitudes, beliefs, and emotions.

For the validity and reliability of the observations, the researcher coded a total of 123 pages of data twice, 30 days apart. Accordingly, it was found that there was 87.5% compatibility among the codes that the researcher made at different times (Miles and Huberman, 1994, 64). The reliability among inter-coders was calculated and the consistency between the expert and the researcher about class observations was 85.39% (Miles and Huberman, 1994, 64). Codes that weren't agreed on have been reviewed in the context of the theoretical framework with the expert.During the research process, 102 semi-structured interviews were conducted with the teacher, the first of which was on August 15, in the context of current problem identification, informing, the development, implementation, monitoring and evaluation of action plans. The interviews were audio-recorded. The shortest interview lasted for 40 minutes and the longest interview lasted for 116 minutes. Since the school environment was not suitable, the interview environment has been determined before each interview by the joint decision of the teacher and researcher. Analysis of the reflection interviews was used in the context of supporting the observation findings, and the transcription of the interviews took a total of 1243 pages.

VALIDITY AND RELIABILITY

For the validity and reliability of this research, the following measures have been taken:

(1) In order to reduce data loss, observations and interviews conducted has been recorded directly.
(2) The obtained results were shared with the teacher and were confirmed by the participant
(3) Data collection, data analysis process and findings have been reported in detail.
(4) The validity committee has shared its opinions about the research process, analyzing the data and presentation of the findings.
(5) The codes that the researcher created at different times and the consistency of the second inter-coder have been considered.

RESULTS

In this study, it has been aimed to develop thinking skills in the context of a culture of thinking with the cooperation of the researcher and teacher. Decisions made during the research process were realized by the teacher and the researcher and they have been applied by getting the opinion of the validity committee. All findings on thinking skills in the action research process are presented in Chart 1, created in accordance with Table 1 presented in the annexes. The findings presented in Table 1 and Chart 1 will be discussed under separate headings according to cycles.

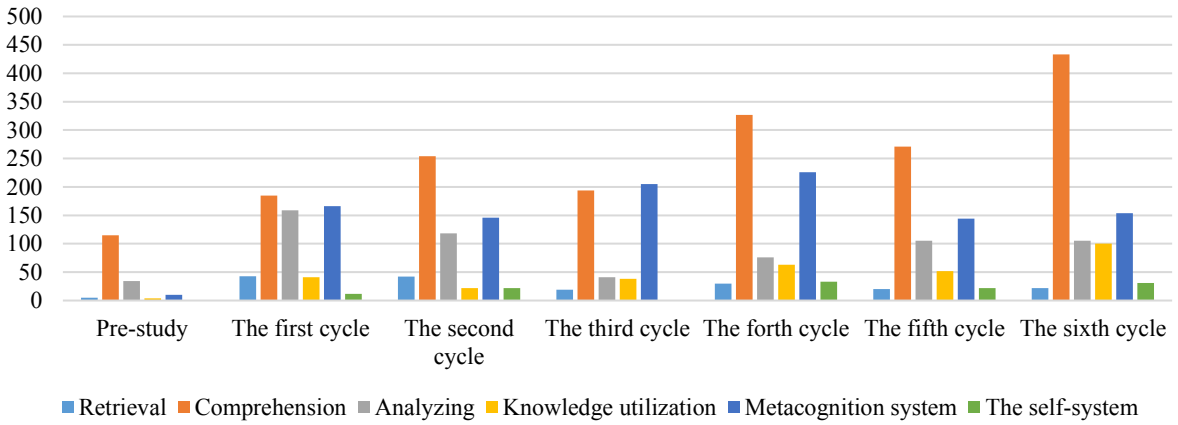

Figure 1. Findings regarding observations of the development of thinking skills

In the first step of the study, the current situation has been described in order to define the research context and establish the baseline for the first cycle.

NEEDS ANALYSIS

In order to describe the current culture of thinking and the thinking skills used, a total of 38 lesson hours were observed for four weeks. Detailed (micro-level) analyses of this current condition were carried out via video-recordings containing 9 course hours. As a result of the analysis of student discourses, it was revealed that the thinking skills used in understanding information and the cognitive awareness categories were more frequent. It was observed that the students used thinking skills in the categories of retrieval, analyzing, using and incorporating information into the self-system much less frequently for four weeks. The most remarkable finding, which has the power to influence the current culture of thinking prior to the study, is that students tend to ask questions very rarely (see Table 1). Another situation that is noteworthy in this cycle is that deficiencies were identified in the thinking skills that students used. For example, in a Turkish lesson, it was observed that students' estimates were similar and they had difficulty in making predictions after the teacher asked students to guess the end of the text.

Teacher: What could the child have said to the balloon seller when he came down, children?
Student1: I Won. I thought you were gonna give me a balloon.
Teacher: Maybe he said y ou were going to give it to me. Yes
Student2: I have removed the balloons, can you give me my balloons?
Teacher: Can you give me my balloon?Yes
Student3: I pulled out your balloons, so give me a balloon
Teacher: Come on, give me a balloon.Yes
Student2: I pulled out your balloons,now give me a balloon
Teacher: Give me a balloon. Yes?
Student4: I saved your balloons. Give me a balloon.
Teacher: Give me a balloon. Yes?
Student5: I got all the balloons, only one left.
Teacher: He may have said that there is only one left. Yes?
Student6: I climbed a tree and took your balloons now give me the balloon (October 13, pages: 110-111)

When considering the teacher's verbal statements about this situation, it was seen that he only repeated what the students said instead of giving feedback and encouraging them to think more.

THE FIRST CYCLE: A LANGUAGE OF THINKING

As a result of interviews with the teacher and observations made in the classroom environment, the need for the development of the ability to ask questions and the low effectiveness and frequency of the use of basic thinking skills by students reinforced the need to develop a language of thinking as the first dimension. The first cycle continued for 12 weeks and a total of 20 interviews were conducted with the teacher during the cycle. The classroom teacher and researcher, who agree on the need to develop the language of thinking in the classroom, have focused on solving the problems mentioned below in this cycle:

- Prevalence of closed-end questions in the classroom
- Students use superficial and closed-ended expressions when expressing opinions
- Giving students enough time to think
- Lack of usage of thinking language words and expressions in verbal expressions used in the classroom

At the stage of developing action plans, a general plan was prepared for the problems encountered, primarily for the development of the language of thinking. In accordance with this general plan, action plans were prepared and 10 activities were conducted in the first cycle. During the first cycle, 65 lessons were recorded and problems were solved by analyzing these records at the macro level. Detailed (micro-level) analyses of the observations were carried out over 20 course hours. According to the findings obtained from student observations, there was a significant increase in thinking skills used in retrieval, the process of comprehension, using, analyzing data, metacognition and self-system categories compared to baseline stage. It has been observed that students often review their own learning, make statements, monitor their friends' learning, and exchange ideas. Another remarkable point in this cycle is that students start asking for time to think and are willing to ask questions. According to the current situation in the first cycle, students used 16 new thinking skills, and 'exchange of ideas, inference, and error analysis' skills were the most commonly used skills among these newly used skills. A significant increase in the frequency of asking questions was also observed. For example, in the science and technology lesson, a student expressed his or her desire to ask a question and asked the question to the class:

Student1: I have a question. Is there more water evaporation when there is a flow or when the water is dead?

Teacher: Now there may be more evaporation while at rest. But I don't know, let's just think about it anyway. Yes, let's strain your mind. Let's not answer that right away, let's think about which one will be more. Is it in current or still?

Student2: While still

Student3: Teacher, I think when there is current

Teacher: So on what basis are you saying that? What evidence can you show about this?

Student3: Teacher, I always see it in such waterfalls, the waters always flow down like this (December 22, pages:157)

In reflection interviews conducted during the first cycle, the classroom teacher noted that the language of thinking enabled the students to distinguish words of a language of thinking, listen to lessons more carefully, increase participation in some lessons, start to say their thoughts without hesitation and generate ideas. The classroom teacher's perception of this change is supported by the observation findings obtained as a result of micro-analysis and presented in Table 1. However, the development of thinking skills such as willingness to show evidence, demanding thinking time, wondering were not observed at the desired frequency. These skills are more associated with thinking dispositions, defined as the source of motivation of thinking skills.

SECOND CYCLE: THINKING DISPOSITIONS

At the end of the first cycle in which the language of thinking was aimed to be developed, the findings obtained through both interviews and observations revealed the need to continue to solve problems related to the language of thinking as well as the need to develop thinking dispositions. The second cycle continued up to four weeks. In this process, a total of 10 interviews were conducted with the teacher. In the first of these interviews, the researcher and the classroom teacher exchanged information about the first cycle and decided to prepare the second general action plan for solving the following problems:

- Inability to fully understand the language of thinking and inappropriate use of some words of the language of thinking
- Teacher has trouble producing questions
- Need to be given time to think
- Students have negative affective characteristics such as hasty, disorganized thinking and giving up
- Need to develop a questioning learning environment in the classroom

In line with the mentioned problems, the second cycle aims to develop the tendency of students to wonder and question, to develop alternative perspectives, to ask for time to think and to make efforts to think. Action plans were carried out each week in the form of adapting the determined activities to the dimensions of the language of thinking and thinking dispositions. These action plans included10 activities. In the course of monitoring the second cycle, a total of 10 interviews were conducted with the teacher. There were many changes during the implementation period in accordance with the collected data. As a result of the observations made by the researcher in the classroom, a total of 40 hours of video were recorded and 13 of these records were analyzed in detail. As a result of this analysis, although an increase in the frequency of skills that students use to understand data was observed, it was found that there was a decrease in the frequency of skills included in the categories of analyzing information, using information, and metacognition. In the category of self-systems, no changes were observed. In this cycle, it was determined that there was a significant increase in question-asking skills, more open-ended questions were asked, and that cognitive levels of questions increased.

According to the first cycle, the frequency of students expressing alternative views increased in the category of analyzing knowledge. It has been observed that they have begun to use a new skill about conducting research that is aimed at using it. However, no significant changes were observed in the use of skills included in the categories of metacognition. In the self- system Category, new skills were observed to ask for time to wonder and think. For example, the following excerpt shows how one of the students asks for time to think in a math class:

Teacher: I want you to write a problem in your notebook using the data. For this, I give you five minutes to write a problem and three minutes to solve the problem.

Student7: two minutes for us to think...it was 10 minutes. (February 17, pages:126)

In this cycle, there was a significant increase in question-asking skills in different categories, more open-ended questions were asked, and cognitive levels of questions increased. For example, in the science lesson, two students asked questions required analysis:

Student2: What difficulties would we face in our lives without electricity?

Teacher: yes, that's a good question....

Student6: What are the benefits and harms of electricity? (February 22, pages: 186)

It has been indicated that the students used expressions about ‘monitoring their own learning’, ‘monitoring the learning of their friends’ and ‘error analysis’ related to this dimension without exchanging data with the teacher about the mental management. It has also been noticed that this development in student observations is an improvement in the ‘monitoring’ dimension of mental management, and the need to provide development towards the ‘evaluation’ levels. For this reason, the researcher and the classroom teacher decided to switch to the third cycle to

solve problems related to mental management in accordance with the results obtained in the first and second cycle.

THIRD CYCLE: MENTAL MANAGEMENT

Concerning the findings obtained in the first and second cycles, the third cycle took two weeks to solve the problems related to mental management. A total of 11 interviews were conducted with the teacher during the cycle. The overall action plan developed by the researcher and classroom teacher was formed within the framework of the following problems:

- Increasing the quantity and quality of the words used in the thinking language
- Attention to thinking time
- Students continue to ask low-level and closed-ended questions
- The need to develop students ' research, inquiry and curiosity tendencies
- Giving quick and irrelevant answers to questions without thinking
- Improving the quality of students' thinking and monitoring their learning (checking whether they understand more in the teaching process)

In the third cycle, it is aimed to evaluate the thinking process before, during and after the thinking task in accordance with the identified problems and to reflect on the thinking process that it has. Action plans also were realized in the form of adapting the determined 18 activities to the dimensions of the language of thinking, thinking dispositions and mental management. During the third cycle, a total of 18 course hours of observations were made and a detailed (micro) analysis of 13 courses was made from these observations. According to the findings obtained as a result of this analysis, an increase has been seen in the frequency of thinking skills included only in metacognition category. In particular, there has been a significant increase in students ' ability to monitor their own learning, monitor course processing, present strategies and ask questions. For example, the following excerpt shows that in Traffic Class, A student watches his/her learning by asking questions about the activity and providing information about his/her cognitive status:

Student3: My Teacher how can you understand that Ahmet Bey acted like this?
Teacher: didn't you read the texts?
Student3: I read my teacher
Teacher: Yes
Student3: I couldn't relate. (March 3, pages:77)

In this cycle, where it is primarily aimed to improve mental management, it is a positive development for students in terms of processing information to start to 'present strategy' and 'observe'. In this cycle, students gave information more frequently about their cognitive performance. Besides, it is noteworthy that students begin to use verbal expressions aimed at 'strategy generation' without exchanging detailed information with the teacher about the strategic attitude dimension. This finding, obtained as a result of student observations, and the similarities between mental management and the strategic dimension have provided a basis for the development of strategic spirit, the fourth dimension of a culture of thinking.

THE FOURTH CYCLE: STRATEGIC SPIRIT

In line with the findings obtained in the third cycle, the researcher and the classroom teacher decided to prepare the fourth Action Plan with the approval of the validity committee to solve the problems related to strategic spirit. The fourth cycle lasted two weeks, with a total of 11 interviews with the teacher in the process. The overall action plan developed by the researcher and classroom teacher was formed within the framework of the following problems:

- need to increase interaction in the classroom
- Need to be given time to think

- need for students to improve their tendencies towards asking questions, researching and curiosity
- Students offer solutions directly instead of helping their friends
- Students cannot explain how the problem is solved correctly
- Students don't follow a strategy while researching
- Students have problems with ways they should follow while studying for the exams
- Students do not follow strategy while writing an essay in the course

In this cycle, where strategic spirit is developed, it is aimed to focus on teaching strategies. Action plans have also been applied each week in the form of adapting 15 activities determıned by focusing on solving the problems into the dimensions of strategic spirit primarily, thinking dispositions and mental management. A total of 30 course hours of observation were made during the fourth cycle, and a detailed (micro) analysis of 18 courses was made from these observations. As a result of this analysis, it has been determined that students often used the thinking skills included in the categories of understanding the data and metacognition. In this cycle, where strategic spirit is primarily intended to be developed, students' starting to present strategy and expressing what is said differently can be considered a different development than other cycles. For example, the following excerpt shows that in science class one of the students expresses the question his friend asked differently:

Student4: The world is round, or I think it's water where it looks blue, Why doesn't it spill?
Teacher: Where will it spill?
Student9: what Student4 means is that when we really look at the world from space, why doesn't the water on Earth spill out?(March 23, pages:54)

Consistent with these findings, in reflection interviews, the teacher noted that students began to present evidence, draw conclusions, ask questions, look at them from different aspects, and indicate the strategy. However, despite the increasing frequency of students presenting strategies and showing evidence, there has been a need to develop dimension of high order knowledge.

THE FIFTH CYCLE: HIGH ORDER KNOWLEDGE

At the end of the fourth cycle, the need to develop a high-level knowledge dimension related to how problem solving, research, and evidence were done became evident. The fifth cycle lasted three weeks and a total of 11 interviews were conducted with the teacher. The overall action plan developed by the researcher and classroom teacher was formed within the framework of the following problems:

- Experiments are applied in the form of presentation in a science lesson and students know the results of the experiments from the beginning
- Students think in a hasty way
- Students' sense of curiosity does not reach at the desired level
- The teacher unwittingly blocks the student to student interaction
- Students do not know how to research
- Teacher explains the solution rather than teaching how to solve the problem to students in mathematics course
- The teacher does not give students enough time to strategize
- Teacher does not provide much opportunity for students to present evidence in class

In the fifth cycle, it is aimed to develop ways of questioning, using evidence and solving problems in a discipline with a high-level knowledge dimension that is primarily tried to be developed. Action plans have also been realized in the form of adapting activities determined by focusing on solving the problems into the dimensions of high order knowledge primarily, language of thinking, thinking dispositions, mental management and strategic spirit. 31 activities were designed and applied in this cycle. A total of 26 course hours of observations

were made during the fifth cycle, and a detailed (micro) analysis of 13 courses was made from these observations As a result of this analysis, it has been stated that according to the fourth cycle, the frequency of use of thinking skills in the categories of analyzing and using information of students increased. In particular, it can be said that it is an important development for students to show evidence and provide information about their research. For example, in the following excerpt, the student who asked the question he was wondering in a social studies class stated that he did not know the answer and that he should think and investigate it until tomorrow:

Teacher: Well, think about it. Could be why? Let's think, your friend says My teacher says Student8 your friend says that when I look at sources, it's always first last name and then name, why is that?
Student8: I don't know, I need to think
Teacher: Think a little
Student8: I gonna investigate until tomorrow
Teacher: yes. It can be very nice (April 15, Pages:167)

In parallel with these findings, in the reflection interview conducted in the fifth cycle, the teacher stated that students present evidence, make inferences, improve their ability to ask questions, and start looking at them from different aspects. The quotes indicating this trend are presented below:

Teacher: I mean, let me say this. At least the skills of asking questions, preparing questions are a little improved than before. In other words, at least now, instead of preparing simple open-ended questions, instead of questions whose answers are clear and obvious, they have gained more skills in preparing questions based on thought, interpretation. A few students, at least that's all. ...
Teacher: when we got the answers to the questions, we found that their thinking developed a little more than before, so after thinking, they made some conclusions, and then they could look at things differently.
Teacher: now they can generate different questions by thinking. They can bring different interpretations.
Teacher: so when we asked students to identify the ways they should follow when showing evidence, they also made good determinations there. (April 6, Pages:36-37)

In the fifth cycle, increasing the transfer frequency of students and improving the transfer size could contribute positively to solving the problems that have appeared in the fifth cycle process.

THE SIXTH CYCLE: TEACHING FOR TRANSFER

Because of the significant increase in the frequency of transfer in the fifth cycle, the final dimension of a culture of thinking, the dimension of transfer was developed. The sixth cycle lasted six weeks and 11 interviews were conducted with the teacher. The researcher and the classroom teacher exchanged information about the current situation and sought solutions to the following problems identified below:

- Many questions are asked in a row in the lesson, but students are not given the opportunity to answer
- Students do not know how to research
- Failing to conclude the discussion
- Disorganized and hasty thinking of some students
- Students tell their friends about the solution instead of directing them to solve the problem
- Strategic deficiencies in solving mathematical problems
- Students cannot associate the concepts taught with everyday life

- No relationships with different disciplines

In the context of the sixth cycle, it has been aimed that students relate learned knowledge to their daily lives more. Action plans have been carried out in the form of adapting 31 activities determined by focusing on solving problems each week into the dimensions of transfer primarily, the language of thinking, thinking dispositions, mental management, strategic attitude and high order knowledge. A total of 35 course hours of observations were made during the sixth cycle, and a detailed (micro) analysis of 16 courses was made from these observations. As a result of this analysis, it has been stated that the students used the thinking skills related to the process of comprehension and metacognition as presented in Table 1 more frequently. In particular, there is an increase in the ability to summarize and in the frequency of specifying a result sentence compared to other cycles. In this cycle, when the questions asked by the students were examined, it was observed that they most often asked Why/How questions. In this cycle, in which transfer is intended to be improved, it has been observed that students relate the subjects taught most to their daily lives. For example, he expressed his opinion on the subject discussed in the social studies course by associating it with his daily life:

Student2: My teacher manager should be rich and patient, sensitive
Teacher: you say that the person who isn't rich can't manage.
Student8: my teacher, I will express my opinion. My teacher, now that the neighborhood headman is not rich, he's poor, but he runs the neighborhood. (May 5, Pages: 187-188)

In the interviews of reflection applied in the sixth cycle, it has been stated that students started to generalize, use a language of thinking, give answers after thinking a while, research, give feedbacks about their thinking in a hasty way, interact with each other despite the noisy environment, ask Why-How questions more than before, create a discussion environment for the first time, disprove the opposing views and to ask the points they wonder. Moreover, in this cycle it has been noted that a student presents a book as evidence, the other student states that he or she is experimenting to present evidence in a science lesson and another student uses the word of transfer. The most remarkable discourse of the teacher about the change he noticed in students is that there was a real discussion environment for the first time in the classroom. The quotes containing this opinion are presented below:

Teacher: I already mentioned this in my diary, so today, in fact, for the first time in the classroom, there was a full discussion in accordance with the rules of serious discussion.
Researcher: OK, there was noise or something, but the children participated with what they gave themselves.
Teacher: maybe yes, but for the first time there was a serious discussion, so what happened, what was happening in the discussion, that is, things before, when there was a counter-argument, when there was one, the others were usually loaded on it. Isn't that right? And they were intimidating him, but that's not what happened today. I mean, what happened today. Here were those who were on the side of the snake being a vertebrate, there were those who were on the side of the invertebrate. (May 4, Pages: 121).

DISCUSSION

This study includes some important findings about how the instructional scaffolding applied by using 'a culture of thinking' approach, can develop students' thinking skills. A culture of thinking approach can be a model that encourages the development of students' thinking skills that address the process of comprehension and metacognition. In this study designed as an action research, some important information has been obtained on some of the challenges encountered in the process of learning and teaching thinking. Although the lack of knowledge of teaching of thinking before the process plays a challenging and restrictive role, it has been determined that a certain level of diversity and frequency of use of thinking skills used by the

students increases compared to the beginning level. Despite this situation, in the process of the design of activity and material based on a culture of thinking it is undeniable that there is a gap between the knowledge the teacher knows and the application of this knowledge (Row, Subramaniam and Sathasivam, 2018).

During the use of the language of thinking, the first cycle, an increase in the variety of thinking skills used in all categories (retrieval, analyzing, knowledge utilization, cognitive metacognition, and self-system categories) was observed compared to other cycles. In particular, the presence of findings on metacognition without informing the teacher is thought to be associated with the use of the language of thinking being effective in increasing the variety and frequency of use of thinking skills. Astington and Olson (1990) also found that knowing the language of thinking and using it in the right places is associated with students ' ability to think critically. In this context, it should not be ignored that language is very important in activating thinking and processing information, rather than just the transmission of content (Ritchhart, 2002; Perkins and Richhart, 2004). A similar study in which thinking skills were tried to be improved concluded that students significantly developed their ability to use language of thinking, practice thinking skills, and skills of metacognition (Burke and Williams, 2008).

Considering the findings of the thinking skills used during the sixth cycle (as a result of the ratio of the frequency of thinking skills obtained in each practice to the week of practice), it has been observed that the variety of thinking skills used by the end of the fourth cycle increased, while the variety of thinking skills used in the fifth cycle decreased by 28% compared to the fourth cycle, and also the 38% in the sixth cycle. This proves that teaching thinking skills is long-term and requires constant effort (Wolberg and Goff, 2012; Dajani, 2016; Gholam, 2019; Viña Leonardi, 2019). Failure to achieve the expected development from the fourth cycle in which strategic spirit is developed may be associated with a motivational problem related to the development of the teacher's thinking skills, as well as with the development of resistance to change (Garmston, 2001). In the process of developing thinking skills, the teacher's knowledge, skills and motivation are important variables in this regard (Costa, 2001; Fisher, 1999; Hurley and Nisbet, 2004; Dilekli, 2015; Ritchart, 2015). Although the effects of thinking skills programs are encouraging, the probability that they usually fail to make a lasting impact may be associated with a lack of teacher competence, professional development, and colleague solidarity in this regard (Leat, 1999). In other words, developing a culture of thinking in all or at least two classes of the school could increase the motivation of the teacher. Another reason for the decrease in teacher's motivation can be related to the fact that he expressed his worry about the inability to complete the curriculum while creating action plans during the fourth and the fifth cycles. In the case studies conducted by Yusoff, Semon and Embong (2017), it has been stated that the students needed much more time to be trained in terms of higher-order thinking skills and the teachers worried about that they couldn't complete the curriculum if they spent too much time in waiting the students to finish the tasks given. A decrease in the diversity of learners' thinking skills after the fourth cycle may also be associated with a decrease in the number of questions they ask. While there was a significant increase in the number of questions asked by students until the fourth cycle, it has been observed that there was 44% decrease in the number of questions in the 5th cycle and 76% decrease in the 6th cycle compared to the 4th cycle. In this context, it proves the possibility of a close relationship between the number of questions students ask and the thinking skills they use. Most of questions were asked about thinking dispositions and it could be due to the decrease in students' motivation to think and the inability of the teacher to motivate the students sufficiently in this regard (Perkins, Tishman, Ritchhart, Donis and Andrade, 2000). As a result of the development of thinking dispositions, the increase in the frequency of asking questions can be explained by the positive effects of studies aimed at developing direct interest and questioning tendencies in this cycle. It can be

said that the use of the culture of thinking approach increases the frequency of asking questions at a higher order, as well as the frequency of asking questions. In the literature, the existence of important findings showing asking questions as the most powerful teaching tool in the development of higher-order thinking skills supports this result (Dos, Bay, Aslansoy, Tiryaki, Cetin and Duman, 2016; Nappi, 2017; Cumhur, 2018). Another important point that should be emphasized in the context of this study is that although progress has been made according to the initial level, it cannot be said that the use of these skills in the research process has turned into a series of strategies. In other words, the limited use of thinking skills aimed at knowledge utilization could not go beyond an experience structured by the teacher and researcher. However, the decrease in frequency of a skill often used in one cycle during the development of a culture of thinking in the later cycle was disappointing for the researcher in terms of understanding how quickly any development can disappear again. This situation is an indication that the approaches of the culture of thinking support the development of available thinking routines (thinking skills existing in the categories of comprehension of knowledge and metacognition prior to the study) rather than creating new ones in the context of analyzing the knowledge, its utilization and inclusion into the self-system. However, developing a culture of thinking that needs making thinking visible in the classroom is a process requiring time , practice, labor, interest, and investment from the teacher's point of view (Wolberg and Goff, 2012; Dajani, 2016; Yusoff, Seman, and Embong, 2017; Viña Leonardi, 2019). It can also be said that it is an extremely difficult process for the teacher, as it involves changing all the routines that the teacher uses in the classroom and transforming the classroom culture.

CONCLUSION

Compared to the baseline, the sixth cycle, in terms of a culture of thinking, students often talk less, the classroom environment is dominated by a non-discussion environment; towards the final dimension, a change has been observed towards an environment where more questions are asked, the information presented is questioned, the discussion environment is created, evidence is shown. Qualitative and quantitative progress has been made in thinking skills, which are used as a reflection of the development of dimensions of culture of thinking in the classroom. In particular, it was concluded that there was a significant increase in thinking skills based on comprehension of knowledge, analyzing knowledge and metacognition categories. The development of a culture of thinking model described in this study has been understood to be a multi-layered (dimensions and cultural forces involving types of thinking), gradual and long-term process. It can also be said that the culture of thinking model contributes to transforming the teacher-centered atmosphere in the classroom into a more learner-centered atmosphere, making learners more motivated to think. Although there is no very strong evidence that they progress at the desired level in all dimensions of culture of thinking, this model includes different types of thinking (metacognition, problem solving, decision-making, creative thinking, critical thinking, etc.), it can be said that it makes the act of thinking visible and creates an atmosphere that contributes to the development of thinking skills, especially towards the categories of comprehension of knowledge and metacognition. Although a culture of thinking is an abstract concept, it is very difficult to interpret which dimension is more effective in the development of thinking skills due to the cumulative progression of its dimensions. For this reason, it can be determined which dimension contributes more to the development of thinking skills by focusing on the dimensions of future studies one by one. Because the culture of thinking is a phenomenon directly related to the multidimensional and social environment, it is important to take the necessary measures to spread it over a long process and conduct it in the form of teamwork. In this study, which was carried out to develop a culture of thinking, it was concluded that the expected transformation did not fully occur,

especially in the last three dimensions (strategic spirit, high-order knowledge and transfer). Therefore, when developing a culture of thinking, the need to consider dimensions as a whole rather than developing them respectively and not degrade them to a model should not be ignored (Perkins and Ritchhart, 2004; Dilekli, 2015). Because it subdivides thinking and makes it difficult for the teacher to analyze, use and include knowledge into the self-system, it may have prevented the desired results from being achieved. In the application process, it should also be taken into account that the language of thinking can be effective in developing any dimension, such as a cultural force, rather than a culture of thinking dimension. It can also be said that the use of the culture of thinking model in terms of thinking skills can be effective in terms of developing awareness in students and creating new thinking routines in the classroom.

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Appendix A

Table1: Student thinking skills observed in the process of a culture of thinking approach.

Category	Codes	Pre-study 4 Weeks	First cycle 12 Weeks	Second cycle 4 Weeks	Third cycle 2 Weeks	Fourth cycle 2 Weeks	Fifth cycle 3 Weeks	Sixth cycle 6 Weeks
Retrieval	To choose / sort out	1	3	7	11	11	4	7
	Asking questions	4	24	35	8	19	16	15
	TOTAL	5	54	42	19	30	20	22
Comprehension	Express opinion	60	10	96	65	120	78	103
	Give examples	27	13	13	2	11	25	60
	Making a statement	22	67	85	41	107	116	122
	Simulation	9	3	1	2	3	-	10
	Compare	3	39	11	33	29	7	33
	Summarize	2	-	-	-	1	-	21
	Stating why	2	41	39	39	23	31	50
	Express result	-	5	1	-	-	-	28
	Translate differently	-	2	4	8	33	12	-
	Asking questions	-	-	29	4	32	30	23
	TOTAL	125	180	279	194	359	299	450
Analyzing	Guess	34	35	9	13	9	24	13
	Make inferences	-	44	21	2	12	24	22
	Error analysis	-	27	11	7	9	7	10
	Suggesting Alternative Views	-	5	15	4	2	4	12
	Generalization	-	2	-	1	-	-	-
	Classify	-	-	-	-	-	-	3
	Asking Questions	-	-	6	-	-	1	-
	TOTAL	34	113	62	27	32	60	60
Knowledge utilization	Transfer to learn	4	37	16	16	14	26	45
	To observe		1		10		5	3
	Research			6	2	4	2	6
	TOTAL	4	38	22	28	18	33	54
The *metacognitive system*	Reviewing your own learning	47	72	78	130	139	85	95
	Watching the lesson in progress	4	24		20	9	2	
	Watching Your Friends Learn	2	54	39	26	58	15	18
	Seeking meaning / asking for explanation	-	9	6	-	1	-	-
	Presenting strategy	-	3		10	45	19	46
	Evaluate	-	-	5	3		10	14
	Naming the cognitive process	-	-	-	-	3	18	14
	Trying to refute the evidence presented	-	-	-	-	-	-	1
	Time management	-	-	1	2	-	2	-
	Asking Questions	-	17	7	24	12	4	7
	TOTAL	53	179	136	215	267	155	194
The self-system	Willingness to exchange ideas	-	50	29	14	12	17	28
	Willingness to show evidence	-	7	8	-	13	16	21
	Be curious	-	3	13	-	18	-	8
	Questioning the reliability of information	-	2	1	-	-	1	1
	Demanding time to think	-	4	11	-	4	5	4
	Asking Questions	-	-	-	-	-	1	-
	TOTAL	-	66	62	14	47	40	62

Appendix B

Table 3. Examples of planned activities in the action research process.

First cycle	Second cycle	Third cycle	Fourth cycle	Fifth cycle	Sixth cycle
Thinking language poster and word of the day Creating high-level questions for students The study of poetry acrostic is done.	Thinking alarm activity Question generation efficiency Hourglass activity The board I'm curious about Preparing slogans about thinking tendencies	Imagining and imagining the subject in the mind Story presentation about a scientist for Mental Management Making a poster to remind you of Mental Management Four thinking activities	Paired problem solving effectiveness Strategy development for essay writing Developing a research strategy Developing a strategy for solving problems	Using experiments for high-level knowledge How to classify living things in science Research on the first person to go to the moon Research on the author of the text	Ask non-governmental organizations to research and associate their functions with daily life Associating the environment, which is the subject of mathematics, with daily life