



Effect of Metacognitive Reading Strategies on Critical Thinking: A Mixed Methods Research *

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Abstract

This study aims at determining whether there were differences in the critical thinking skills of 6th-grade students with whom different metacognitive reading strategies were implemented in Turkish language courses. The Mixed research methodology was adopted that consists of quantitative and qualitative methods. Critical thinking applications in the control group of the study took place according to the Turkish language curriculum, whereas the applications in the experimental group were conducted through SQ4R (survey, question, read, recite, record, and review) and Interactive Read Aloud (IRA) strategies. In the quantitative part of the study, 95 students from 3 different classes attended the practice for 8 weeks, while in the qualitative part semi-structured interviews were held with 32 students in the experimental group. Quantitative data was analyzed on SPSS 22 software package, and MAXQDA 12 software program was employed for the analysis of qualitative data. It was concluded, upon a comparison of post-test scores of students who were taught the SQR4 strategy and the IRA strategy with the scores of those in the control group, that there was a significant difference in favor of the students who applied the IRA strategy in which the teacher acts as a model. No significant difference was observed between the teacher-guided experimental group applying the SQ4R strategy and the control group. Both quantitative and qualitative findings support this conclusion. All students from the IRA experimental group who participated in interviews stated that the strategy applied improved their critical thinking skills in different aspects, whereas most of the students in the SQ4R group stated that the strategy applied did not contribute to their skills.

Keywords

Metacognitive Awareness
Reading Strategies
Critical Thinking
SQ4R
Interactive Read Aloud
Mixed Method

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Introduction

In the 21st century, the goal of education is to make sure all students acquire the knowledge and skills for lifelong learning in the constantly changing and developing the world. Education media of the 21st century should be able to provide students such skills as “being open to innovation, creativity, communication, cooperation, science and design-oriented thinking, digital world citizenship, science and mathematics literacy, improving reading and language skills, and critical thinking” that will enable students to keep up with the changing world conditions. The foundations of these skills are laid at schools. The aim is to train students into democratic citizens who can solve the problems they encounter in their private and professional lives and are integrated into the society they live in (21st Century Learning, 2017). Brad (1984, as cited in Binatlı Büyükkurt, 1994) argues that students at secondary school level should be able to recognize valid statements, make inferences, recognize implicit assumptions, and establish cause and effect relationships.

Paul and Elder (2006) define critical thinking as “the art of analyzing and evaluating thinking with a view to improving it” (p. 4-5). Main components of thinking are setting goals, asking questions about the subject, collecting information, interpreting and making inferences, conceptualizing, making assumptions, implying, assigning importance, and developing a point of view.

Ennis (1993) defines critical thinking as “reasonable, reflective thinking focused on deciding what to believe or do” (p. 180). Nosich (2015) describes the marked features of critical thinking as follows: reflective, realistic, involves standards and requires being rational.

In the light of these descriptions, one can say that critical thinking means thinking rationally towards a certain goal or aim. Critical thinking consists of processes such as addressing the topic from different aspects, being open to proofs that show the inaccuracy of thoughts, making inferences, supporting arguments with concrete data, drawing conclusions and trying to understand them, taking probabilities into account, and solving problems (Willingham, 2007). In other words, critical thinking is making conscious use of metacognitive skills and strategies in order to get the desired result (Halpern, 1999). Paul and Elder (2006) also argue that critical thinking is self-directed, self-disciplined, self-monitored, and self-corrective thinking (p. 5).

In fact, critical thinking is a willing attitude or tendency to make the necessary mental effort in a situation that requires using critical thinking skills, rather than being a skill for scientific thinking or thinking in other subject areas (Halpern, 1999). Therefore, critical thinking on any subject cannot be acquired or applied outside the context. Metacognitive strategies do exist. Critical thinking is possible when metacognitive strategies are learned and applied. Ability to think critically (apply metacognitive strategies) depends on subject knowledge and implementation thereof. In that sense, teachers who want their students to be able to think critically should improve the students’ metacognitive skills (Willingham, 2007; Halpern, 1999).

Researchers argue that metacognitive awareness is developed not by teaching general strategies for a reading task, but through use of strategies that organize and interlink what needs to be done before, during and after the task (Carter, 2011; Hattie, Biggs, & Purdie, 1996). For this reason, many strategies have been developed whose names consist of the initials of the individual strategy steps to improve students’ learning and thinking skills.

The SQ4R reading strategy is an extended version of SQ3R strategy (Robinson, 1946), which is the most widely recommended strategy in the world. This strategy consists of “survey, question, read, recite, record, and review” stages (Pauk, 1984). Prior to reading, the text is analyzed by looking at such features as heading, sub-heading, visuals, font etc. Consequently, questions about the text are formulated, which is followed by the reading stage. During reading, students are asked to read up to a certain point in the text and afterward to repeat what they read in their own words. They are also asked to make a note of what they found important and underline/mark the words they did not know or understand. These stages are repeated until the reading task is completed. After reading, students are

expected to evaluate themselves by reviewing the text, checking whether they have understood the text, and answering the text-related questions.

Coon and Mitterer (2011) argue that the most crucial step of the SQ4R strategy is asking questions. They state that asking questions aimed at critical thinking and analysis during the implementation of this strategy will help students comprehend the subject and improve their critical thinking skills.

IRA is different from classical oral reading in the Turkish Language Curriculum (Ministry of National Education [MEB], 2006) that is conducted to correctly articulate the words in a text. As part of IRA, the teacher conducts a systematic reading in line with the teaching goals determined for before, during and after reading. During reading, the teacher acts as a model for students by explaining how and why the strategies are used. The teacher stops reading at preset spots to ask questions that encourage students to think and creates a platform for discussion, thus shows students the understanding and thinking processes by expressing his/her own thinking process (Harris & Hodges, 1995). Paul (2012) argues that in order to teach critical thinking, it is necessary that the teacher himself/herself is able to think critically and show his/her own thinking process. Students can thus look at the reading process from a critical perspective. IRA is recommended by the American National Reading Panel as an effective method to improve the comprehension and thinking skills of students of all ages (Anderson, Hiebert, Scott, & Wilkinson, 1985). Studies also suggest that the IRA strategy improves students' comprehension, problem-solving and critical thinking skills by promoting interaction between the teacher and students as well as among students (Morrison & Włodarczyk, 2009; Johnston, 2015). The steps of IRA strategy which are systematized by Fountas and Pinnell (2006) are as follows: 1. Text selection and preparation, 2. Introduction to the course, 3. Reading the text (embedded teaching, discussing the text), 4. Discussing the text, and self-evaluation, 5. Recording the reading (as a reminder), 6. Writing and performing.

Mogno (2010) analyzed the effect of metacognition on critical thinking in his study. "Metacognitive Assessment Inventory" (MAI) developed by Schraw and Dennison was employed to determine students' cognitive knowledge and cognitive regulation to implement metacognitive strategies, as well as the "Watson-Glasser Critical Thinking Appraisal" (WGCTA) consisting of "inference, recognition of assumption, deduction, interpretation, and evaluation of arguments" factors to determine the critical thinking skills. The study is based on the hypothesis that critical thinking takes place when individuals utilize their metacognitive knowledge and strategies that enable them to obtain the desired result. Structural equations model (SEM) was used to determine the effect of metacognition on critical thinking. Two models were established for this purpose. As a result, it was concluded in both models that metacognition affected critical thinking.

Sadeghi, Hassani, and Rahmatkent (2014) studied the relationship between metacognition and critical thinking in language education. Participants of the study were 102 students who attended two different language courses and were successful in TOEFL exam. Data were collected through the "Metacognitive Strategy Questionnaire by Item Type (MSQIT)" designed by Purpura and the "California Critical Thinking Skills Test (CCTST)" containing the analysis, evaluation, inference, deduction and induction factors. In the end, a positive correlation was found between metacognition and critical thinking. In other words, critical thinking improves as students' skills to implement metacognitive strategies improve.

Boran (2016) examined the relationship between metacognition and critical thinking dispositions of gifted students. The results showed that there is a positive correlation between metacognition and critical thinking.

In the light of the abovementioned studies, metacognition and critical thinking are interrelated concepts. Semerci (2003) also defines critical thinking as developing the ability to improve and evaluate one's learning process. The individual can play an active role in his/her own learning and thinking process through the conscious use of cognitive strategies. Behaviors and tendencies in the planning,

organization or review stages of learning and thinking processes constitute critical thinking. In this sense, it is crucial to investigate which models, methods, strategies, and techniques are effective and to organize learning platforms accordingly. The following sub-problems are addressed in this study, which aims at explaining the nature of the relationship between metacognitive reading strategies and critical thinking:

1. Is there a significant difference between the critical thinking levels of students in the experimental group (SQ4R-IRA) where metacognitive reading strategies were implemented and of those in the control group?
2. How do qualitative data explain the quantitative results for the critical thinking level of students from the SQ4R group who participated in the implementation stage?
3. How do qualitative data explain the quantitative results for the critical thinking level of students from the IRA group who participated in the implementation stage?

Method

Mixed research methodology combining qualitative and quantitative methods was employed in the study to enable clearer answers to study questions (Creswell & Clark, 2015). Design of the study is *partially mixed sequential dominant status design*, which refers to a study consisting of two parts conducted sequentially and where the qualitative or quantitative component is more dominant (Leech & Onwuegbuzie, 2009). The aim of this two-part study is to support, explain or exemplify quantitative data with qualitative data (Yıldırım & Şimşek, 2013).

Quantitative Dimension: In the quantitative dimension of the study, *quasi-experimental design with non-equivalent pre-test/post-test control group* was employed since the strategies were implemented in the already available classes of the school kullanılmıştır (Cohen, Manion, & Morrison, 2007). Therefore, pre-tests were used to ensure that the groups had similar characteristics. Assignment of these classes as experiment and control groups was conducted impartially. A symbolic representation of the model is shown in Table 1 (Karasar, 2012):

Table 1. Symbolic Representation of the Model

Groups	Pre-Test	Experimental Procedure	Post-Test
G1	O _{1.1}	X ₁	O _{1.2}
G2	O _{1.3}	X ₂	O _{1.4}
G3	O _{1.5}		O _{1.6}

G1: Experiment1 Group, G2: Experiment2 Group, G3: Control Group. X₁: Experimental procedure employing the SQ4R strategy, X₂: Experimental Procedure employing the IRA strategy. In all groups:

O_{1.1}, O_{1.3}, O_{1.5}: refer to critical thinking test pre-test scores,

O_{1.2}, O_{1.4}, O_{1.6}: refer to critical thinking test post-test scores.

Qualitative Dimension: "Case study" method was used to obtain more detailed results from the collected quantitative results (Yıldırım & Şimşek, 2013).

Study Population and Sample

The Population of the study consists of 6th-grade students in the 2016-2017 school year in Pendik district of Istanbul.

Study Group of Qualitative Dimension: Purposeful sampling method was employed to determine the study group to be used in the study. For this purpose, the school was first determined through the *convenient sampling method* (Yıldırım & Şimşek, 2013) and the 6th-grade students of Yildirim Beyazit Secondary School in the Pendik district was chosen as the study sample, upon consideration of

physical features of the school, adequate number of subjects and teachers, willingness of school administration and students. Afterward, the aim was determined as the participation of students meeting the pre-set criteria, based on the *criterion sampling* approach (Yıldırım & Şimşek, 2013). To this end, 5 out of 10 6th-grade classes at the school took a critical thinking pre-test. Following the test, these 5 classes displayed no difference in pre-test results; two of them were chosen as experimental groups and one as control group randomly.

Table 2. Variance Analysis Results for Measurements to Determine Experiment and Control Groups

		Sum of Squares	df	Mean Square	F	Sig.
Critical thinking	Between groups	1,739	4	,435	1,276	,282
	Within groups	53,477	157	,341		
	Total	55,216	161			

5 classes were compared for participation in the experimental procedure, and no variation was observed between the classes in terms of critical thinking levels ($p>0.05$).

Table 3. Cross Tabulation of Grade and Gender Variables of Experiment and Control Groups

Grade* Gender Cross-tabulation			Gender		Total
			Male	Female	
6th grade	Experiment-1 Group	Number	19	13	32
		% within Gender	40,4%	27,1%	33,7%
	Experiment-2 Group	Number	16	17	33
		% within Gender	34,0%	35,4%	34,7%
	Control Group	Number	12	18	30
		% within Gender	25,5%	37,5%	31,6%
Total	Number	47	48	95	
	% within Gender	100,0%	100,0%	100,0%	

When the table is examined it is seen that the experiment group 1 consists of 32 students (44.4% male, 27.1% female), experiment group 2 is consists of 33 students (34% male, 35.4% female) and the control group consists of 30 students (25.5% male and 37.5% female).

Qualitative Dimension: In the qualitative dimension of the study, volunteers among the students who were in the experimental groups and continuously showed up in the implementation stage were added to the sample through purposeful sampling. Accordingly, 16 students from each experimental group, and thus 32 students in total participated in interviews.

Data Collection Tools

Quantitative Dimension: One of the most important steps of critical thinking education is asking questions that will guide students into thinking because critical thinking begins in a sense by asking questions (Schmit, 2002; Nosich, 2015). Students need to be able to address open-ended questions/problems so that they can prepare for life by improving their personal and professional development, in another word interpret, evaluate and find solutions to a topic (Lynch & Wolcott, 2001). For this purpose, a literature review was conducted to determine the critical thinking criteria and the questions that would represent them (King, 1995; Learning Development, 2010; The California Academic Press, 1990, as cited in Facione, 2015). Expert opinion (N=9) was obtained to determine the criteria for questions to be asked after reading and an analytic rubric was created to assess these criteria. Accordingly, performance criteria to determine the post-reading critical thinking skills of students were established under 5 headings: analysis, inference, explanation, making assumptions, and evaluation.

Afterward, a suitable text based on the criteria was chosen by consulting the 5 Turkish language teacher and 4 expert evaluators, and 15 open-ended questions were prepared that suited the specified criteria. A preliminary implementation was conducted with 15 students through the prepared text and questions.

Lawshe technique was used for the content validity of the scale. According to the Lawshe technique (1975), opinions of minimum 5 and maximum 40 experts are needed. While achieving the content validity ratios, the opinions of the experts are collected for each substance. Content validity ratio (CVR) is calculated by dividing the number of experts indicating the substance is *necessary* to the total number of experts indicating any opinion about that substance and subtracting 1 from the ratio.

$$CVR = \frac{NO}{N/2} - 1$$

NO indicates the number of experts who say the item is necessary and n indicates the total number of experts who express. Items with a negative or 0 content validity ratios are eliminated in the first stage. The significance is tested with statistical criteria for items with positive CVR values. The content validity index is calculated by the arithmetic mean of content validity ratio of the items in the original scale. The minimum values of CVR values (content validity criteria) were converted into tables by Veneziano and Hooper (1997). Accordingly, the minimum values for the number of experts also give the statistical significance of the item (as cited in Yurdagül, 2005). According to this technique, CVR = 0.75 for 9 experts. Items with a CVR average above 0.75 were included in the rubric. A valid form was prepared by calculating the rubric's content validity index (CGI) as 0.87.

A preliminary implementation was conducted with 15 students (consist of 5th, 6th, 7th and 8th grade) through the prepared text and questions. This was followed by the presentation of the rubric, reading the text, and post-reading questions for the review of 4 subject experts and 2 assessment and evaluation experts; based on feedbacks, 5 open-ended questions were designated to be asked to the students. The rubric took its final shape after some adjustments.

The final version of the rubric was tested before it proceeded to the main implementation. The reliability of the study is ensured by the *independent evaluator interdependency reliability*. Data obtained from 57 students out of 110 who participated in the study was evaluated by the researcher and two Turkish language teachers to determine the concordance between evaluators. As a result of *Pearson correlation analysis*, a positive and significant correlation was found between evaluators. It was concluded after these procedures that the questions prepared and the rubric was suitable for implementation.

Table 4. Correlation Analysis Results to Determine the Concordance between Evaluators based on Critical Thinking Criteria

	e1-e2&e3			e1-e2			e1-e3		
	r	sd	p	r	sd	p	r	sd	p
1. analysis	0,877	55	p<.01	0,899	26	p<.01	0,851	27	p<.01
2. inference	0,880	55	p<.01	0,894	26	p<.01	0,867	27	p<.01
3. explanation	0,922	55	p<.01	0,949	26	p<.01	0,845	27	p<.01
4. making assumption	0,929	55	p<.01	0,933	26	p<.01	0,899	27	p<.01
5. evaluation	0,853	55	p<.01	0,857	26	p<.01	0,849	27	p<.01

A positive and significant correlation was observed for the 1st question, which meets the analysis (0,877) criterion, 2nd question, which meets the inference (0, 880) criterion, and 5th question, which meets the evaluation (0,853) criterion. A very high, positive and significant correlation was found for the answers to the 3rd question, which meets the explanation (0,922) criterion, and to the 4th question, which meets the making assumptions (0,929) criterion. In other words, different evaluators obtained similar results using the analytic rubric prepared.

Rubric's performance levels are divided into five levels, expressed in both quantitative (0-4) and qualitative terms (e.g., developable). For each criterion performance, criteria were defined and the evaluation was made accordingly. In order to ensure consistency between definitions, expressions that clearly indicate the difference between performance levels were identified and emphasized. These can be summarized as follows:

- 0 "inadequate": Indicates that the student cannot perform the expected performance (answer questions) on the specified criteria.
- 1 "negligible": Indicates that the student is performing on the specified criteria but that the performance is minimal (e.g., giving one sample) or that the answer is irrelevant to the text.
- 2 "developing": Indicates that the student has a moderately acceptable performance on the criterion, but cannot fulfill the distinguishing features such as justification, giving examples, explaining, and using clues.
- 3 "accomplish": Indicates that the student has performed adequately on the criterion and has at least one justification, sample presentation, explanation, and use of clues.
- 4 "exemplary": Indicates that the student performs at the highest level regarding the criteria and fully fulfills the distinctive features such as providing more than one reason, giving examples, explaining and using clues.

Qualitative Dimension: Qualitative data of the study was collected through a *semi-structured interview form*. The aim was to obtain detailed information about the implementation process and its results (Barbour & Schostak, 2005). The students were asked whether the application enabled them to address the subject from different perspectives to determine how the application affected the critical thinking skills of the students.

Data Collection

Quantitative Dimension: Study data was collected during the fall term of the 2016-2017 school year. Implementation was conducted in Turkish language courses and other courses with related content once a week for 3 hours and continued for 8 weeks. Implementation in the experimental groups was conducted according to the SQ4R and IRA strategies. Current applications in the Turkish language curriculum were maintained in the control group. Prior to implementation, expert opinions were obtained and consequently the texts as well as number and order of post-reading questions to be used in the implementation, and the text to be used as pre-test/post-test and number and order of post-reading questions were prepared according to specified criteria. At the end of each applied course, students were asked 5 open-ended questions related to the subject for analysis, inference, explanation, making assumptions and evaluation purposes, and no intervention took place as the students gave answers. Both experimental groups were asked the same post-reading questions. During the implementation, answers that the students gave to the post-reading questions were assessed according to the prepared rubric, and feedback was provided to the students after each implementation round.

Data was collected from experiment and control groups at the beginning and end of reading courses conducted according to the metacognitive awareness strategies, with the data collection tools created by the researcher. Applications in the experimental groups were carried out by the researcher.

The rubric created by the researcher was used to evaluate the critical thinking skills of the students. Application stages of the rubric are as follows: First, the students are asked to read a text that is suitable to the abovementioned criteria and answer 5 open-ended critical thinking questions about the subject of the text. Answers of the students are evaluated through the analytic rubric that consists of analysis, inference, explanation, making assumptions, and evaluation criteria.

Qualitative Dimension: Semi-structured interviews were conducted with volunteers from the present experimental groups to determine how the 8-week application affected the critical thinking and questioning skills of students. Each interview was run for 15-20 minutes. Interviews were first recorded and transcribed later on. The students were asked whether the application enabled them to address the subject from different perspectives to determine how the application affected the critical thinking skills of the students.

Data Analysis

Quantitative Dimension: SPSS 22 software package was employed for data analysis. Firstly, 'paired samples t-test' was used to determine whether there was a significant difference between the pre-test post-test critical thinking levels arithmetic means of the paired groups. One-way ANOVA analysis was used to determine variation between groups and Scheffe Post-Hoc test analysis to determine between which groups the variation occurred. The arithmetic mean of scores was calculated by taking into the scoring criteria. Each question asked to students was evaluated between 0 and 4. The total critical thinking score was obtained from the sum of these scores.

Qualitative Dimension: "MAXQDA 12" software was used for the analysis of transcribed interviews, and content analysis was carried out. Data obtained was sorted according to theme and codes.

Results

1st Research Question: Statistics for the control and experimental groups are given in tables.

Table 5. One-way Analysis of Variance Results for the Pre-Test Critical Thinking Levels of Students in the Experiment-1 (SQ4R), Experiment-2 (IRA) and Control Groups

Independent Variable		Sum of Squares	df	F	p
Critical thinking(pre-test)	Between groups	18,50	2	1,00	0,37
	Within groups	848,30	92		
	Total	866,80	94		

Table 5 reveals there is no variation for the pre-test score averages of the groups at the critical thinking level ($F(2, 92)=1,00; p>0.05$).

Table 6. Paired Samples t-Test Results of Pre-Test Post-Test Critical Thinking Levels of Students in the Experiment1 (SQ4R) Group

	\bar{X}	n	sd	t	df	p
Critical thinking pre-test	7,19	32	2,76	-5,85	31	0,00*
Critical thinking post-test	9,72	32	2,64			

* $p<0,001$

Table 6 reveals there is a variation for the pre-test/post-test score averages of the students at the critical thinking level ($p<0,001$). Between pre-test ($\bar{X}=7,19$) and post-test ($\bar{X}=9,72$), there is a variation in favor of post-test ($\bar{X}=9,72$) in terms of overall critical thinking level.

Table 7. Paired Samples t-Test Results of Pre-Test Post-Test Critical Thinking Levels of Students in the Experiment2 (IRA) Group

	\bar{X}	n	sd	t	df	p
Critical thinking pre-test	7,42	33	3,22	-11,21	32	0,00*
Critical thinking post-test	13,12	33	2,80			

* $p<0,001$

Table 7 reveals there is a variation for the pre-test/post-test score averages of the students at the critical thinking level ($t(31)=-5,85$; $p<0,001$). Between pre-test ($\bar{X}=7,42$) and post-test ($\bar{X}=13,12$), there is a variation in favor of post-test ($\bar{X}=13,12$) in terms of overall critical thinking level.

Table 8. Paired Samples t-Test Results of Pre-Test Post-Test Critical Thinking Levels of Students in the Control Group

	\bar{X}	n	sd	t	df	p
Critical thinking pre-test	8,23	30	3,10			
Critical thinking post-test	8,80	30	3,12	-1,06	29	0,30

Table 8 reveals there is no variation for the pre-test/post-test score averages of the students at the critical thinking level ($p>0,05$).

Table 9. One-way Analysis of Variance Results for the Post-Test Critical Thinking Levels of Students in the Experiment-1 (SQ4R), Experiment-2 (IRA) and Control Groups

Independent Variable		Sum of Squares	df	F	p
Critical thinking(post-test)	Between groups	331,81	2		
	Within groups	750,78	92	20,33	0,00*
	Total	1082,59	94		

* $p<0,001$

Table 9 reveals a variation in critical thinking overall ($F(2, 92)=20,33$; $p<0,001$) between the experiment and control groups.

Table 10. Scheffe Test Analysis Results for the Post-Test Critical Thinking Levels of Students in the Experiment-1 (SQ4R), Experiment-2 (IRA) and Control Groups

Variable	Group (i)	Group (j)	\bar{X} (i)	\bar{X} (j)	i - j	p
Critical Thinking (post-test)	Experimental-1	Experimental-2	9,72	13,12	-3,40	0,00*
	Experimental-1	Control	9,72	8,80	0,92	0,45
	Experimental-2	Control	13,12	8,80	4,32	0,00*

* $p<0,001$

According to Table 10, there is a variation for the post-test score averages of the students at the critical thinking level between experiment-1 group and experiment-2 group ($p<0,001$). Between Experiment-2 ($\bar{X}=13,12$) and Experiment-1 group ($\bar{X}=9,72$), there is a variation for post-test in favor of Experiment 2 ($\bar{X}=13,12$) in terms of critical thinking levels. There is no variation for the post-test score in critical thinking level between the experiment-1 and control groups ($p>0,05$). There is a variation for the post-test score averages of the students at the critical thinking level between experiment-2 and control group ($p<0,001$). Between experiment-2 ($\bar{X}=13,12$) and control group ($\bar{X}=8,80$), there is a variation in favor of experiment-2 ($\bar{X}=13,12$) in terms of critical thinking level. It can be concluded that IRA strategy implemented in the Experiment-2 group is more effective in improving students' critical thinking skills than the SQ4R reading strategy implemented in the Experiment-1 group as well as than the applications in the control group carried out based on the current Turkish language curriculum.

2nd Research Question: Table 11 shows the statements of students in Experiment1 of the application regarding critical thinking. The students were asked whether the application enabled them to address the subject from different perspectives to determine how the application affected the critical thinking skills of the students. According to the data obtained, some of the students (7/16) stated that the application improved their critical thinking skills whereas other (9/16) stated that it did not. The students who believed that the application had improved their critical thinking skills stated that

understanding what they read (4/16) helped them with remembering (1/16) and thus they solved post-reading questions based on what they understood (4/16), which improved their thinking skills (2/16). Furthermore, some students stated that pre-reading questions (1/16) and set a reading goal (1/16) also improved their thinking skills.

The students who believed that the application did not improve their critical thinking skills stated that not the application itself but the post-reading questions (9/16) were effective in improving their thinking skills. In other words, these students stated that the SQ4R strategy was not effective in improving their critical thinking skills.

Table 11. Comments of the Experiment-1 (SQ4R) Group about Critical Thinking

Critical Thinking	N
Yes	7
1. Reading Comprehension	4
a) Helping remember	1
2. After reading questions	4
a) Improving thinking skills	2
3. Setting a reading goal	1
4. Before reading questions	1
No	9
1. After reading discussion questions	9

Students who replied Yes (7/16) stated that the strategy helped them comprehend what they had read, and it was easier for them to now address non-textual issues. Related comments of the students are as follows:

"I am thinking because non-textual questions address lessons the text gives us, and since I remember these lessons through the strategies we have applied, I can answer the questions better. If we had not applied this strategy, I could not have been able to answer the questions the same way, because I could not have remembered much. I would have written short answers, but now I can write long answers because I do remember. It also helped me think about different issues. I can think about a variety of things after I read the text. I can come up with questions that would never have come to my mind before I applied this strategy." (P1)

The students who replied No (9/16) stated that the strategy did not urge them to think about different matters related to the text. However, they stated that post-reading questions regarding critical thinking helped them. In other words, it can be argued that the strategy implemented did not prompt critical thinking in students. Related student comments are as follows:

"Post-reading questions helped me because no matter how well I had understood and summarized this text, I could not have asked these explanatory questions. These questions enabled us to understand the text better. They provided a deeper understanding of the text. The questions helped us think. As I read the questions, I think about what and hows. This helps me think logically. For example, questions about an institution must be plausible; if it is something impossible, I should not be thinking about it. I could not have asked such explanatory questions if I had dealt with only the text and exercises. The questions helped me gain a multi-faceted perspective." (P5)

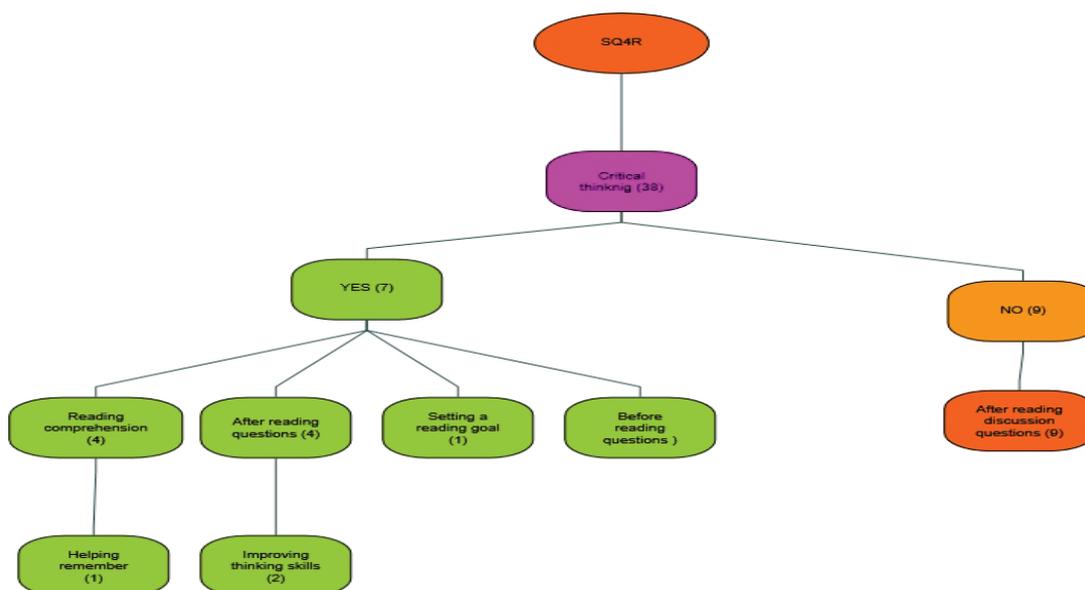


Figure 1. Code Frequencies of the Experiment-1 (SQ4R) Group About Critical Thinking

3rd Research Question: Table 12 shows the statements of the students in Experiment2 of the application regarding critical thinking.

The students were asked whether the application enabled them to address the subject from different perspectives to determine how the application affected the critical thinking skills of the students. According to the data collected, all students (16/16) stated that the application improved their critical thinking skills.

Table 12. Comments of the Experiment-2 (IRA) Group about Critical Thinking

Critical Thinking	N
1. Improving Thinking Skills	4
a) Making explanations	8
b) Establishing cause and effect relationships	6
c) Developing different perspectives on the subject	4
d) Making predictions	3
e) Making connections with real life	3
f) Empathizing	1
g) Improving problem-solving skills	1
2. Telling Stories/Giving Examples	8
a) Answering questions	7
b) Activate prior knowledge	7
c) Making prediction	5
3. Discussing the Text Through Questions	8
a) Answering questions	1
b) Answering non-text questions	3

According to Table 12, students state that their thinking skills such as making explanations (8/16), establishing cause and effect relationships (6/16), developing different perspectives about the subject (4/16), making predictions (3/16), making connections with real life (3/16), empathizing (1/16), and solving problems improved (1/16). It was stated that telling stories and giving examples (8/16) before and after reading improved critical thinking skills, and helped with answering questions related

to critical thinking (7/16), making predictions (5/16) and activated prior knowledge (7/16) and thus prompted thinking from different perspectives. It was also pointed out that discussing the text through questions (12/16) also promoted critical thinking. Related comments of the students are as follows:

“Our teacher read the text out loud and I believe I could answer textual questions better with the help of my classmates’ comments. First having answered the textual questions, I was able to deal with non-textual questions through my own sentences based on what I had learned from the text.” (S5)

“I am thinking because our teacher implements a certain strategy by giving real-life examples, which I find interesting. When answering questions, I remember the examples my teacher gave and this makes me think about different aspects. I remember the stories you told, and I think about these stories; what my classmates shared also prompts me to think. To be able to talk to my classmates and my teacher helps me think about different issues.” (S2)

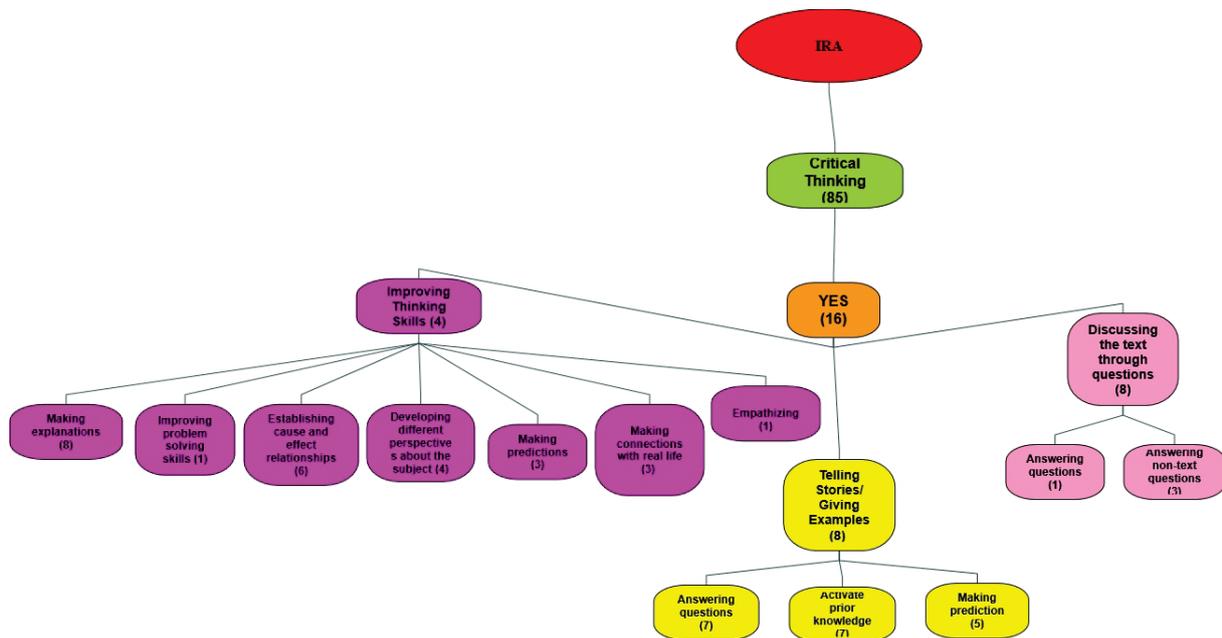


Figure 2. Code Frequencies of the Experiment-2 (IRA) Group About Critical Thinking

Conclusion and Discussion

This study aimed at determining whether there was a difference between the critical thinking levels of students who attended different metacognitive awareness training and of students who followed the current Turkish language curriculum. It was concluded, according to paired samples t-test, there is a variation for post-test in favor of SQ4R and IRA in terms of critical thinking levels. There is no variation for control group. After comparing the post-test scores of students who attended the IRA training or the SQ4R strategy training or were in the control group, that there was a significant difference in favor of the experimental group attending the IRA training. There was no significant difference between the SQ4R experimental group and the control group. Qualitative data supports quantitative data. All students from the IRA experimental group stated that the strategy applied contributed to their critical thinking skills, whereas most of the students in the SQ4R group stated that the strategy applied did not contribute to their skills.

Following the application with the Experiment2 group, the students were asked whether their skills to address and evaluate an issue from different perspectives improved after the application, to determine how the application affected their critical thinking skills. According to the data, all students (16/16) stated that the application improved their critical thinking skills. Students stated that their thinking skills such as making explanations (8/16), establishing cause and effect relationships (6/16),

developing different perspectives about the subject (4/16), making predictions (3/16), making connections with real life (3/16), empathizing (1/16), and solving problems (1/16) improved after the application.

In the IRA strategy, the teacher supports students directly through explanations during the reading process when students lack prior knowledge about a subject and thus helps them build background knowledge. This enables students to discuss the topic with their classmates and teacher, and express their opinions during reading and inconsequent activities. Furthermore, the teacher promotes the development of metacognition by explaining students the strategies that would help students with comprehension and by demonstrating how these strategies can be used. Thus, the teacher helps students address the text with a critical eye by passing on/demonstrating his/her own comprehension and thinking process (Paul, 2012). Serafini and Giorgis (2003) list the benefits of IRA activities at the secondary and high school level as follows:

1. It provides a platform for a deeper discussion of the topic by enabling social interaction among students.
2. It enables students to interact with the text and thus acquire new information and meet different experiences.
3. It enables the student to make connections between what they learn at school and what they learn in real life.

It was stated that storytelling and giving examples before and after reading (8/16) improved critical thinking skills, and helped with answering questions related to critical thinking (7/16), making predictions (5/16) and activated previous learnings (7/16) and thus prompted thinking from different perspectives. Effects of telling stories on critical thinking are well-known. It was pointed out in various studies that the discussion platform created in classroom through stories improved students' skills to respect different cultures/ opinions, become self-confident, empathize, realize phenomena that they cannot experience in real life, increase their motivation to learn, solve problems, and think critically (Temple, Smith, & Smith, 2015; Yang & Wu, 2012).

It was stated that discussing the text through questions (12/16) also promoted critical thinking. One of the most important steps in the critical thinking training is asking questions because critical thinking starts by asking questions (King, 1995; Schmit, 2002; Facione, 2015; Nosich, 2015). In the IRA strategy, the teacher determines, prior to the reading activity, the questions to be asked to the students; during reading, he/she stops at appropriate places to prompt students to think.

Teachers must ask questions that will encourage students to think so that they can apply in real life what they learn or infer from texts. These questions must provide students a deeper understanding of the text by making them question the information in the text, come up with alternatives, and draw conclusions by comparing the information provided (MEB, 2012). In the IRA strategy, the teacher acts as a model for students with his/her questions and explanations and improves their textual and non-textual higher level thinking skills. During reading, the teacher asks questions aiming a better comprehension of the text and encourages the participation of students. Since the teacher and students go through the reading process together (Oyler, 1996), learning takes place in a social interaction (Dorn & Soffos, 2005). This also enables students to understand the text better and evaluate themselves. The findings of this study suggest that the IRA strategy contributed to the improvement of students' critical thinking skills.

According to paired samples t-test, in terms of the experiment-1 group, there is a variation in favor of post-test in terms of overall critical thinking level. This variation seen in Experiment-1 group is as usual. Because in experimental group 1, in-class applications were developed to improve students' metacognition, as in experimental group-2. When quantitative and qualitative results evaluated together, it was stated that the strategy did not urge the student to think about different matters related to the text. However, the students stated that post-reading questions regarding critical thinking helped

them. In other words, it can be argued that the strategy implemented did not prompt critical thinking in students. However, in some studies, it has been stated that SQ3R / SQ4R will be effective in good readers with strategic reading skills in a short period of instruction, but longer periods are needed for less talented students (Caverly, Orlando, & Mullan, 2000; Jairam, Kiewra, Rogers-Kasson, Patterson-Hazley, & Marxhausen, 2013). Therefore, this result can be tested by studies where the application process is kept longer.

According to independent samples t-test, it was concluded that there is no difference between the Experiment1 group, where the SQ4R strategy was implemented, and the control group, where the current Turkish language curriculum was implemented. According to the data collected, some of the students (7/16) stated that the application improved their critical thinking skills, whereas other (9/16) stated that it did not. The students who believed that the application had improved their critical thinking skills stated that understanding what they read (4/16) helped them with remembering (1/16) and thus they solved post-reading questions based on what they understood (4/16), which improved their thinking skills (2/16). Furthermore, some students stated that pre-reading questions (1/16) and set a reading goal (1/16) also improved their thinking skills. The students who believed that the application did not improve their critical thinking skills stated that not the application itself but the post-reading questions (9/16) were effective in improving their thinking skills. In other words, these students stated that the SQ4R strategy was not effective in improving their critical thinking skills. Coon and Mitterer (2011) argue that the most important part of SQ4R is reflective questioning and answering. During the implementation of this strategy, questions must be prepared that enable a deeper understanding of the content of a text. Critical thinking does not take place unless reflective questions are asked that promote a deeper understanding. The interviews revealed that most students did not know how to formulate questions for a deeper understanding and therefore could not think about such questions on their own. Li, Chen, Fan, and Huang (2014) argue that SQ4R and similar strategies leave students on their own at the implementation stage and students who are unable to implement the strategy correctly fail to display the performance expected of them. For this reason, despite being a popular strategy in the literature, strategies like SQ3R/SQ4R are not suitable to be used in classroom activities that aim at teaching a new subject or skill. The findings of this study also suggest that the SQ4R strategy left students on their own in the practical stage and the students could not formulate reflective questions that would enable them to think critically.

Analysis of the quantitative and qualitative results together revealed that the IRA strategy is more effective in improving critical thinking skills than both the SQ4R strategy and the current Turkish language curriculum, by providing interaction in the classroom. Paul (2012) argues that one of the most important tasks of a teacher is to be able to think critically himself/herself and show his/her thinking process to students. In the IRA strategy, the teacher acts as a model for students by explaining to them how and why to use strategies that are suitable for their learning objectives, whereas in the SQ4R strategy the teacher first teaches students the implementation steps and then encourages them to use these strategies and think, but without explaining where, how and why to use the strategies. In other words, the teacher is simply a "guide". The Turkish Language Curriculum also adopts the approach where the teacher acts as a guide. Furthermore, application of reading strategies is not conducted in a systematic and holistic way, but separately. However, it has been argued that holistic strategies, i.e. systematization of pre-, during and post-reading strategies, are more effective in teaching these strategies (Carter, 2011; Hattie et al., 1996). The current Turkish Language Curricula (MEB, 2006, 2017, 2018) aim at educating students into individuals with advanced critical thinking skills. It is well-known that critical thinking starts by asking questions (Facione, 2015; Nosich, 2015). However, an analysis of Turkish language course books reveals that they contain questions that enable only a superficial understanding of texts, i.e. questions whose answers can already be found in the text, rather than questions representing higher level thinking that encourage analytic, creative and critical thinking (Gültekin et al., 2016). In the groups where the teacher acted as a guide, strategy teaching was carried out with both holistic and individual approach; however, no significant improvement was observed in the students' thinking skills. On the other hand, a significant improvement was observed in the group

where the teacher was a model. In other words, it can be argued that the teaching approach had an impact on students' thinking skills.

It is known that the rate of Turkish students in the high-performance group of PISA examinations (MEB, 2013, 2016), which are considered to provide the necessary labor force for economic development of countries, is very low. The rate of students in the 5th and 6th proficiency levels, who possess such skills as interpreting complex texts through deeper understanding, problem-solving, evaluation, decision making, making a connection to real life, is quite low. The findings of this study suggest that applying strategies where the teacher acts as a "model" through explicit teaching and interaction in the classroom is promoted in countries such as Turkey that display a low performance in thinking skills will contribute to the critical thinking skills of students. It can be argued that preparing and evaluating reading questions according to critical thinking criteria, and providing feedback to students will improve students' thinking skills. In future research, the effectiveness of the Interactive Read Aloud strategy can be investigated at different grade levels. Thus the results obtained from the study can be tested. In this study, in-class applications obtained by using narrative texts. Therefore research on the subject can be enriched by using different text types and different strategies.

Assumptions and Limitations

It was assumed that the students participated in the practices willingly and, the measurement tool used in the research was adequate to measure critical thinking skills in Turkish lessons. The study is limited by 6th-grade students, narrative text type, and metacognitive awareness reading strategies (SQ4R and IRA).

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